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TECHNICAL INSPECTION REPORT

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By Authority of JOINT CHIEFS OF STAFF JCS 1795/36 DATED 15 APRIL 1949
By John L. Doyle Date 24 SEP 1953

367469

U.S.S. SEARAVEN (SS196)

TEST BAKER

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JOINT TASK FORCE ONE

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1 JAN 1965

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REG. NO: 55

4779

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BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT

SUBMITTED:

C. L. Gaasterland,
Commander, U.S.N.

APPROVED:

F. X. Forest,
Captain, U.S.N.

SECRET

USS SEARAVEN (SS196)

193600

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TABLE OF CONTENTS

U.S.S. SEARAVEN (SS196)

SHIP CHARACTERISTICS

Building Yard: Portsmouth Naval Shipyard.

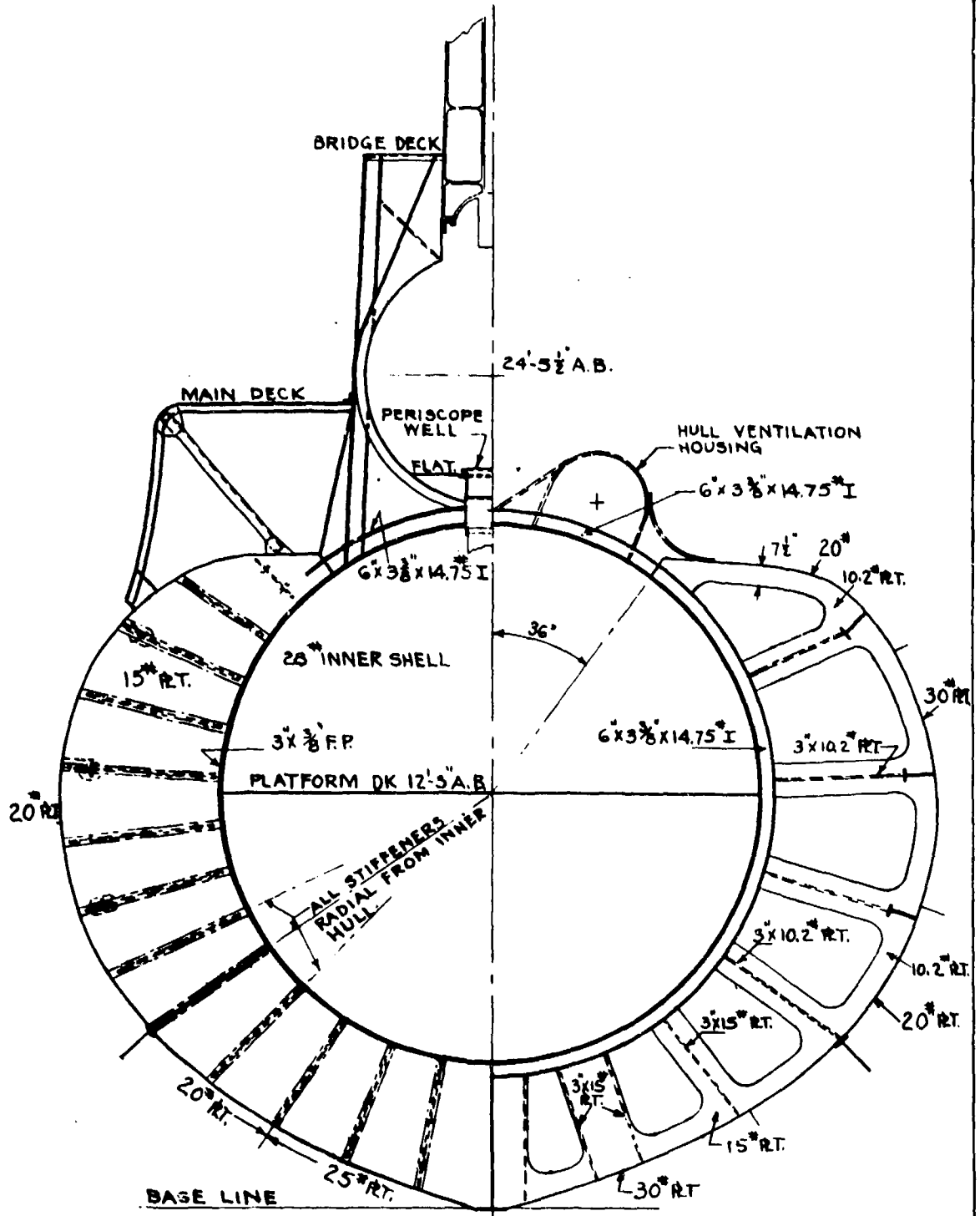
Commissioned: 2 October 1939.

HULL

Light Hull Construction.
Length Overall: 310 feet 6 inches.
Length (between perpendiculars): 302 feet 6 inches.
Beam (extreme): 26 feet 11 inches.
Beam (molded): 24 feet 2 1/8 inches.
Height (lowest point of keel to top of periscope supports): 47 feet 8 inches.
Drafts (at time of test): Submerged.
Standard Displacement: 1450 tons.
Displacement (at time of test): 2428 tons.

MAIN PROPULSION PLANT

Main Engines: General Motors, 16 cylinder, Type 16-248.
Auxiliary Engine: General Motors, 6 cylinder, Type 6-241.
Main Motors and Generators: General Motors.
Main Storage Battery: Gould.
Main Controls: General Electric.
Reduction Gears: Farrell-Birmingham.
Diesel Electric Drive.



FRAME 71
LOOKING FOR'D.
SUPERSTRUCTURE SHOWN
AT FR. 74
SECRET

TEST B

FRAME 85
LOOKING FOR'D.

U.S.S. SEARAVEN (SS 196)
4777

TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

The SEARAVEN was submerged to eighty feet keel depth for Test B at a range of approximately 1400 yards from the center of the burst. Upon being resurfaced no significant flooding was found. A gasket leak under the main induction valve allowed flooding into the main induction system, some of which seeped into the crews washroom and forward engine room. The ship had previous trouble with this valve when set up by hand from outside and does not attribute the leakage to the bomb. There was no readable change in drafts and list.

(b) Structural damage.

There is no structural damage.

(c) Other damage.

All propulsion machinery was tested and is operable as before the test.

The master gyro compass follow up system was inoperable due to an open circuit in a relay-coil of the alarm circuit, probably caused by moisture grounds.

Enough mercury spilled from the auxiliary gyro compass to prevent proper flotation.

Supply leads to the internal fitting in a lighting distribution box at Frame 59 in the control room were found loose from connections.

The resistor cutout switch in the solenoid circuit of the bow plane tilting motor at frame 31 in the forward torpedo room was found out of adjustment.

An open armature coil was found in the motor of No. 1 Fuel Oil Purifier at Frame 113 in the forward engine room.

II. Forces Evidenced and Effects Noted.

(a) Heat.

None.

(b) Fires and explosions.

None.

(c) Shock.

Shock was of a minor nature. Spilled mercury in the auxiliary gyro compass, a loose supply lead to one lighting distribution box and mal-adjustment of the cut-out switch in the bow plane tilting motor circuit are attributed to shock.

(d) Pressure.

The 'Coordinators Report on Air Blast and Water Shock for tests A and B' of 27 September 1946 indicates that the peak water pressure was some thing less than 800 lbs. per square inch. Elastic distortion of the torpedo room hull, measured at four stations, was not greater than 0.07 inches.

III. Effects of Damage.

(a) Effect on machinery, electrical and ship control.

None, other than temporary loss of power operation of bow plane tilting.

(b) Effect on gunnery and fire control.

The gyro follow up system failure would necessitate feeding Own Ship's Course to the Torpedo Data Computer by hand.

(c) Effect on watertight integrity and stability.

None.

(d) Effect on personnel and habitability.

None.

(e) Total effect on fighting efficiency.

Fighting efficiency would have been affected slightly and temporarily by the necessity of feeding Own Ship's Course to the Torpedo Data Computer by hand while repairing gyro follow-up system.

IV. General Summary of Observers' Impressions and Conclusions.

It is concluded that a submarine submerged at this distance from the type of atomic bomb used in Test B would not suffer material damage. For general views of the SEARAVEN after Test B, see photographs on pages 32 to 39.

V. Preliminary Recommendations.

None.

TECHNICAL INSPECTION REPORT

SECTION I - HULL

GENERAL SUMMARY OF HULL DAMAGE

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding sources.

There was no significant flooding. A gasket leak under the main induction valve allowed flooding into the main induction system, some of which seeped into the crews wash-room and forward engine room. The ship had previous trouble with this valve when set up by hand from outside and the Commanding Officer does not attribute the leakage to the bomb. There was no readable change in drafts and list.

(b) Structural damage.

There is no structural damage. Three bolts in No. 2 main engine sheared but after examination, the ship's force feels this pre-Baker damage.

(c) Other Damage.

The ship's force reports all equipment operable.

II. Forces Evidenced and Effects Noted.

(a) Heat.

None.

(b) Fires and explosions.

None.

(c) Shock.

The shock was relatively light. Rust was shaken loose from ventilation ducts and small flakes of paint were found throughout the ship. A gage glass on the circulating fresh water tank for No. 2 main engine was broken.

(d) Pressure.

The "Coordinator's Report on Air Blast and water Shock for Tests Able and Baker" of 27 September 1946 indicates that the peak water pressure was something less than 800 lbs. per square inch. Elastic distortion of the torpedo room hull, measured at four stations was not greater than 0.07 inches.

(e) Any effects apparently peculiar to the Atom Bomb.

None.

III. Effects of Damage.

(a) Effect on machinery, electrical and ship control.

None.

(b) Effect on gunnery and fire control.

None.

(c) Effect on watertight integrity and stability.

None.

(d) Effect on personnel and habitability.

None.

(e) Total effect on fighting efficiency.

There is no effect on the fighting efficiency insofar as hull material is concerned.

IV. General Summary of Observers' Impression and Conclusions.

It appears that a submarine submerged at this distance from the type of Atomic Bomb used in Test Baker would not be significantly affected as far as the material condition of the hull is concerned.

V. Preliminary Recommendations.

None.

DETAILED DESCRIPTION OF HULL DAMAGE

A. General Description of Hull Damage.

No damage.

B. Superstructure.

No damage.

C. Turrets, Guns and Directors.

No damage.

D. Torpedo Mounts, Depth Charge Gear.

No damage.

E. Weather Deck.

No damage.

F. Exterior Hull.

No damage.

G. Interior Compartments (above W.l.).

No damage.

H. Armor Decks and Miscellaneous Armor.

Not Applicable.

I. Interior Compratments (below W.l.).

No damage.

J. Underwater Hull.

No damage.

K. Tanks.

No damage.

L. Flooding.

None.

M. Ventilation.

No damage.

N. Ship Control.

No damage.

O. Fire Control.

No damage.

P. Ammunition Behavior.

No damage.

Q. Ammunition Handling.

No damage.

R. Strength.

No damage.

S. Miscellaneous

No comment.

T. Coverings.

No damage.

U. Welding and Rivetting.

No damage.

TECHNICAL INSPECTION REPORT

SECTION II - MACHINERY

GENERAL SUMMARY OF MACHINERY DAMAGE

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

The SEARAVEN was submerged to eighty feet keel depth for Test Baker. Upon being resurfaced her draft was normal with no list. Main induction piping outboard was flooded. This was due to seepage at main induction valve closed by hand from topside with dogging wrench. This flooding was not as a result of the bomb.

(b) Structural damage.

None observed.

(c) Other damage.

All machinery undamaged, tested and operable as before Test B, except for bow plane power tilting inoperable due to linkage attached to bow plane solenoid operated clutch having been shaken out of position to the extent that it would not function. This linkage operates the resistor switch of the solenoid field. Hand operation not affected.

II. Forces Evidenced and Effects Noted.

(a) Heat.

None observed.

(b) Fires and explosions.

None observed.

(c) Shock.

Shock, if any, was very minor aboard this vessel since no disarrangement of loose gear inside the ship was noted. See Paragraph I(c) above for indication of some shock.

(d) Pressure.

No evidence of unusual pressure was noted.

(e) Any effects apparently peculiar to the Atom Bomb.

The only effect peculiar to the Atom Bomb noted was the retention of radioactivity by the outboard surfaces of the ship.

III. Effects of Damage.

(a) Effect on propulsion and ship control,

Power operation of bow plane tilting temporarily lost.

(b) Effect on gunnery and fire control.

None observed. Undamaged.

(c) Effect on watertight integrity and stability.

None observed. Undamaged.

(d) Effect on personnel and habitability.

Personnel and habitability would have been uneffected except for possible radiological effects. Inside pressure hull was below limit of radiological tolerance.

(e) Total effect on fighting efficiency.

None.

IV. General Summary of Observers' Impressions and Conclusions.

It is apparent that a modern submarine would have been undamaged by the underwater burst of an Atomic Bomb under conditions similar to those of Test Baker.

V. Preliminary Recommendations.

No comment.

DETAILED DESCRIPTION OF MACHINERY DAMAGE

A. General Description of Machinery Damage.

(a) Overall condition.

All machinery was undamaged, was tested and found operable when the ship was reboarded except the linkage attached to the bow plane tilting clutch which operates the resistor switch to the solenoid field coil. This linkage was shaken out of its proper position. In addition there was a broken gage glass on No. 2 main engine circulating fresh water tank.

(b) Areas of major damage.

There was no major damage.

(c) Primary cause of damage in each area of major damage.

The cause of minor damage described in (a) above was shock of a minor nature aggravated by age and material condition.

(d) Effect on target on overall operation of machinery plant.

None, except bow planes temporarily could not be tilted by power. Hand power not effected.

B. Boilers.

Not Applicable.

C. Blowers.

Not Applicable.

D. Fuel Oil Equipment.

No damage.

E. Boiler Feedwater Equipment.

Not Applicable.

F. Main Propulsion Machinery.

(a) Main engines.

(1) Foundations.

No damage.

(2) Casings and cylinders.

No damage.

(3) Bearings, crankshafts, pistons, etc.

No damage.

(4) Couplings.

No damage.

(5) Fuel injection system.

No damage.

(6) Superchargers.

No damage.

(7) Governors.

No damage.

(8) Inboard and outboard exhaust valves.

No damage.

(9) Mufflers and exhaust piping.

No damage.

(10) Cooling system.

Broken gage glass on No. 2 main engine circulating fresh water tank.

G. Reduction Gears.

No damage.

H. Shafting and Bearings.

No damage.

I. Lubrication system.

No damage.

J. Condensers and Air Ejectors.

Not Applicable.

K. Pumps.

No damage.

L. Aux. Generators (Turbines and Gears).

Discussed under Item F.

M. Propellers.

No damage.

N. Distilling Plant.

No damage.

O. Refrigeration Plant.

No damage.

P. Winches, Windlasses, and Capstans.

No damage.

Q. Steering Engine.

(a) Steering rams and cylinders.

No damage.

(b) Hydraulic systems including pumps, piping, etc.

No damage.

(c) Bow plane rigging mechanism.

No damage.

(d) Bow plane tilting mechanism.

The linkage attached to the solenoid clutch which operates the resistor switch of the solenoid field was shaken out of its proper position so that it would not perform its function. Hand operation of bow planes not effected.

(e) Stern plane tilting mechanism.

No damage.

(f) Foundations.

No damage.

(g) Miscellaneous (steering stands, valves, gages etc.).

No damage.

R. Elevators, Ammunition Hoists, Etc.

Not Applicable.

S. Ventilation (Machinery)

No damage.

T. Compressed Air Plant.

No damage.

U. Diesel (Generators and Boats).

Not Applicable. See Item F.

V. Piping Systems.

No damage.

W. Hydraulic System.

No damage.

X. Navigational Instruments.

No damage.

Y. Periscopes.

No damage.

Z. Radar and Sonar.

No damage.

AA. Miscellaneous.

None.

TECHNICAL INSPECTION REPORT

SECTION III - ELECTRICAL

GENERAL SUMMARY OF ELECTRICAL

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

Not observed.

(b) Structural damage.

Not observed.

(c) Damage.

The master gyro compass follow-up system was inoperable due to an open circuit in a relay coil of the alarm circuit probably caused by moisture grounds.

Enough mercury spilled from the auxiliary gyro compass to prevent proper flotation.

Supply leads to the internal connections in a lighting distribution box in the control room were found loose.

The linkage for the resistor cutout switch in the solenoid circuit of the bow plane tilting motor in the forward torpedo room was found out of adjustment.

An open armature coil was found in the motor of No. 1 fuel oil purifier in the forward engine room.

II. Forces Evidenced and Effects Noted.

(a) Heat.

No evidence.

(b) Fires and explosions.

None.

(c) Shock.

Spilled mercury from the auxiliary gyro compass, loose supply leads to one lighting distribution box, and the derangement to linkage for a cutout switch in the bow plane tilting motor circuit were the evidence of shock to electrical equipment.

(d) Pressure.

There is no evidence of pressure damage.

(e) Any effects apparently peculiar to the atom bomb.

None other than radioactivity.

III. Effects of Damage.

(a) Effect on propulsion and ship control.

None, other than temporary loss of remote control for bow plane tilting.

(b) Effect on gunnery and fire control.

The gyro follow-up system failure would necessitate feeding Own Ship's Course to the torpedo data computer by hand.

(c) Effect on watertight integrity and stability.

Not observed.

(d) Effect on personnel and habitability.

None, except for possible radiological effects.

(e) Effect on fighting efficiency.

Fighting efficiency would have been affected slightly and temporarily by the necessity of feeding Own Ship's Course to the torpedo data computer by hand during repairs, and the necessity of manually operating the bow plane tilting clutch.

IV. General Summary of Observers' Impression and Conclusions.

The damage to electrical equipment in this ship in Test Baker was slight. The most serious failure, that of the gyro follow-up system, is believed to have been caused by an overload due to moisture grounds from the long submergence of the ship and not to any direct effect of the bomb.

V. Preliminary Recommendations.

Improve the design of the clutch solenoid cut-out switch and linkage to withstand naval high impact shock requirements, where electrical operation is employed for bow plane tilting in future applications.

Design the sensitive relay coil for the master gyro compass follow-up circuits so that failur of the sensitive relay coil will not de-energize the gyro follow-up system.

DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

A. General Description of Electrical Damage.

(a) Overall condition.

The overall condition of electrical equipment after the test was good with the exception that a number of moisture grounds were present due to the long submergence of the ship. The damage directly attributable to the blast was slight.

(b) Areas of major damage.

None.

(c) Primary causes of damage in each area of major damage.

None.

(d) Effect of target test on overall operation of electric plant.

1. Electrical propulsion.

Operable.

2. Main storage batteries.

Operable.

3. Auxiliary power.

Operable except for difficulty with remote control for bow plane tilting.

4. Communications.

Operable.

5. Fire control circuits.

The master gyro compass follow-up system was inoperable. The automatic feed of Own Ship's Course to the torpedo data computer was therefore inoperable.

6. Lighting.

Operable. Internal connections in a lighting distribution box in the control room were found loose.

7. Ventilation.

Operable.

(e) Types of equipment most affected.

Master and auxiliary gyro compasses.

B. Electric Propulsion Rotating Equipment.

No damage.

C. Electric Propulsion Control Equipment.

No damage.

D. Generators - Ship's Service.

Not Applicable.

E. Generators - Emergency.

Not Applicable.

F. Switchboards, Distribution and Transfer Panels.

The only damage which occurred was the loosening of the supply cable internal connections in a lighting distribution box located at Frame 59 in the control room. It is probable that these connections were somewhat loose before the test and were further jarred loose by shock. No other similar derangements were found on this ship.

G. Wiring, Wiring Equipment and Wireways.

No damage.

H. Transformers.

No damage.

I. Submarine Propelling Batteries.

No damage, except that one transverse brace across the center rows of cells in the after well was shaken loose, according to Ship's Force Report No. 9, Form 17. Batteries were fully charged and on open circuit during the test. Commanding Officer's Report No. 11 states that an explosive mixture of hydrogen was found in the battery compartments. Analysis of electrolyte samples after the test by Pearl Harbor Naval Shipyard revealed no significant changes attributable to the atom bomb.

J. Portable Batteries.

No damage.

K. Motors, Motor-Generator Sets and Motor Controllers.

(a) Rotating equipment.

An open circuit occurred in an armature coil of the motor for No. 1 fuel oil purifier at Frame 113 in the forward engine room. It is believed that this resulted from moisture grounds and an attempt to operate the equipment before clearing the grounds. There was no evidence of shock damage.

(b) Control equipment.

The operating linkage for the resistor cutout switch in the solenoid circuit of the bow plane tilting motor was found out of adjustment. The cutout switch would not function properly after the test. After readjustment, the switch functioned properly. It is believed that shock caused this failure. No similar derangements occurred on other target ships.

Recommendations.

The cutout switch and linkage should be designed to withstand naval high impact shock requirements, if electrical operation is employed for bow plane tilting in future applications.

L. Lighting Equipment.

No damage other than as noted under Item F.

M. Searchlights.

The signal searchlight was removed from ship during test.

N. Degaussing Equipment.

Not Applicable.

O. Gyro Compass Equipment.

(a) Master.

When the master gyro compass was placed in operation the follow-up system did not function due to an open circuit in the coil of the sensitive relay which actuates a gyro alarm circuit. The gyro compass is an arma mark VII, Mod. 3. The relay is Arma part No. 50377-2, with name plate data: Ward Leonard, 8.07 volts, D-C, catalogue No. 251-40. Visual inspection of the relay revealed no evidence of shock damage. It is believed that the relay coil failed due to an over-voltage or over-current in the follow-up circuits possibly caused by moisture grounds. After the sensitive relay was

removed and a resistor substituted, the follow-up system operated, but without the gyro alarm functioning. A similar failure occurred on two other target submarines after Test B.

Commanding Officers Report No. 11 also states that an open field coil occurred in the gyro compassfollow-up motor.

Recommendations.

The sensitive relay coil should be designed to withstand higher values of voltage and current. Consideration should be given to revising the follow-up circuits so that failure of the sensitive relay coil will not de-energize the gyro follow-up system.

(b) Auxiliary.

Enough mercury was spilled from the auxiliary gyro compass to prevent proper flotation. This type of Arma compass is susceptible to mercury spillage under shock as similar failures have occurred on several other target submarines in Tests A and B. However, it is understood that this compass is now obsolete.

(c) Repeaters.

The gyro compass repeater on the bridge was inoperable because of a grounded cable where water had seeped through near the repeater while the ship was submerged.

P. Sound Powered Telephones.

No damage.

Q. Ship's Service Telephones.

Not Applicable.

R. Announcing Systems.

No damage.

S. Telegraphs.

No damage.

T. Indicating Systems.

No damage.

U. I.C. and A.C.O. Switchboards.

No damage.

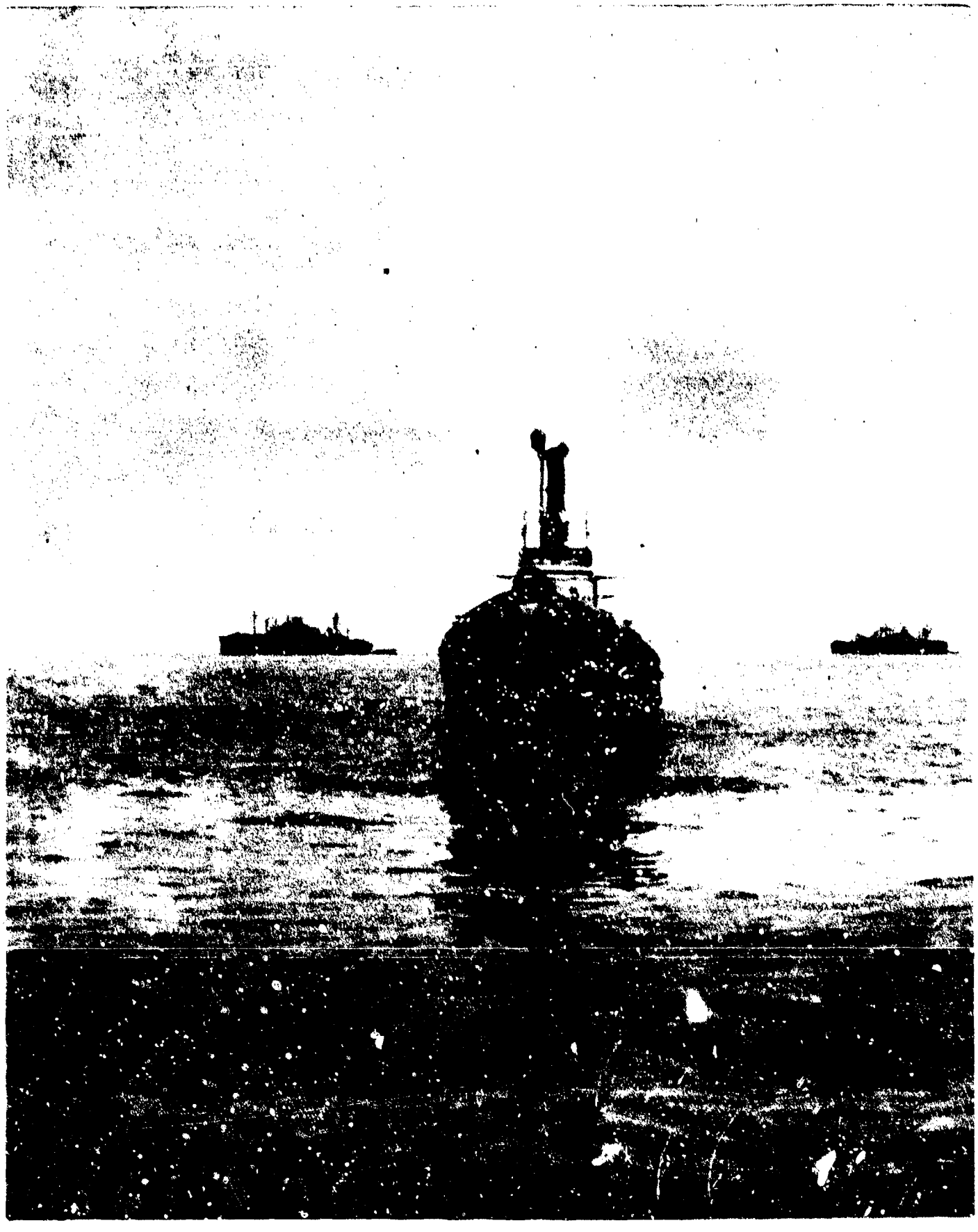
V. F.C. Switchboards.

No damage.

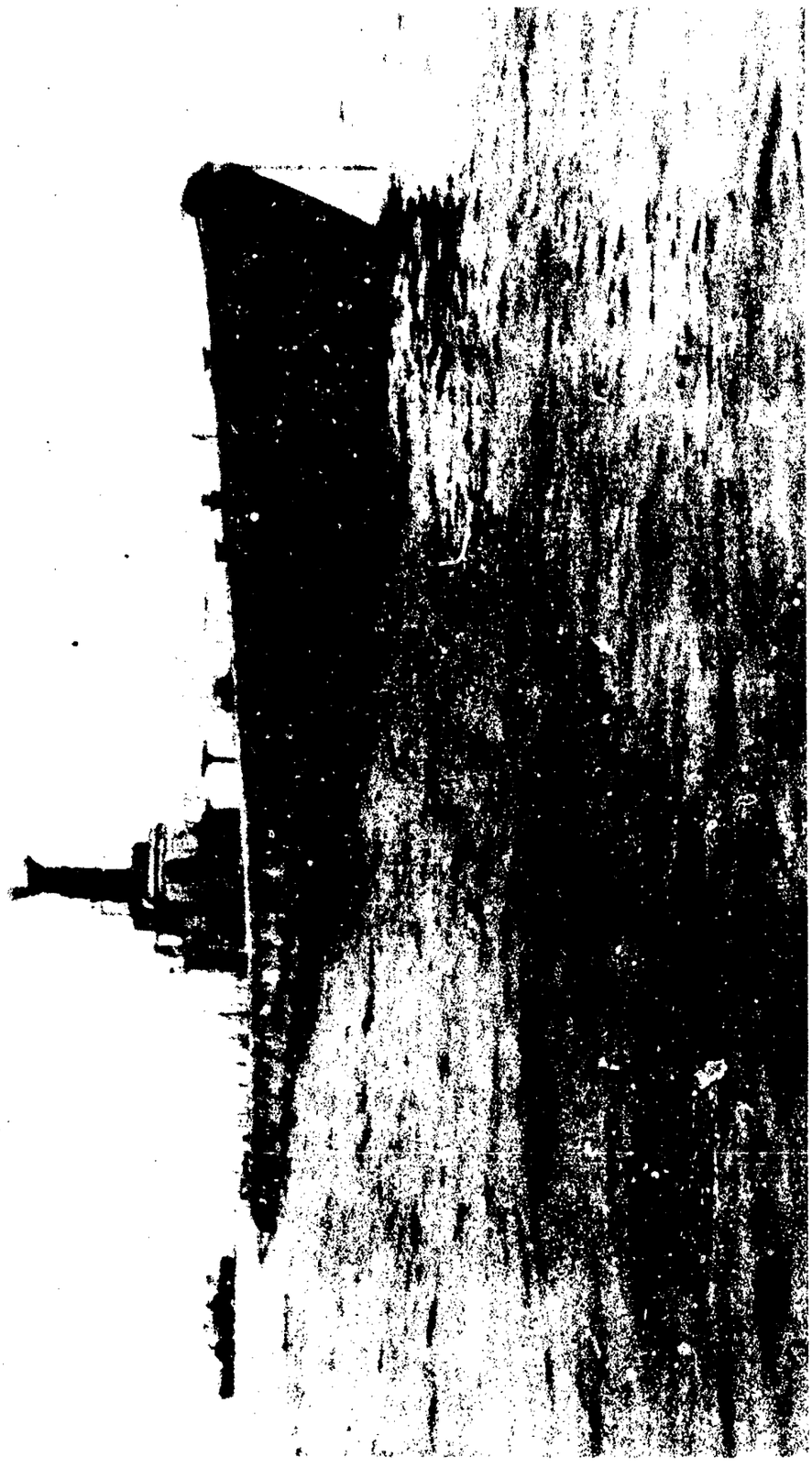
SECTION IV

PHOTOGRAPHS

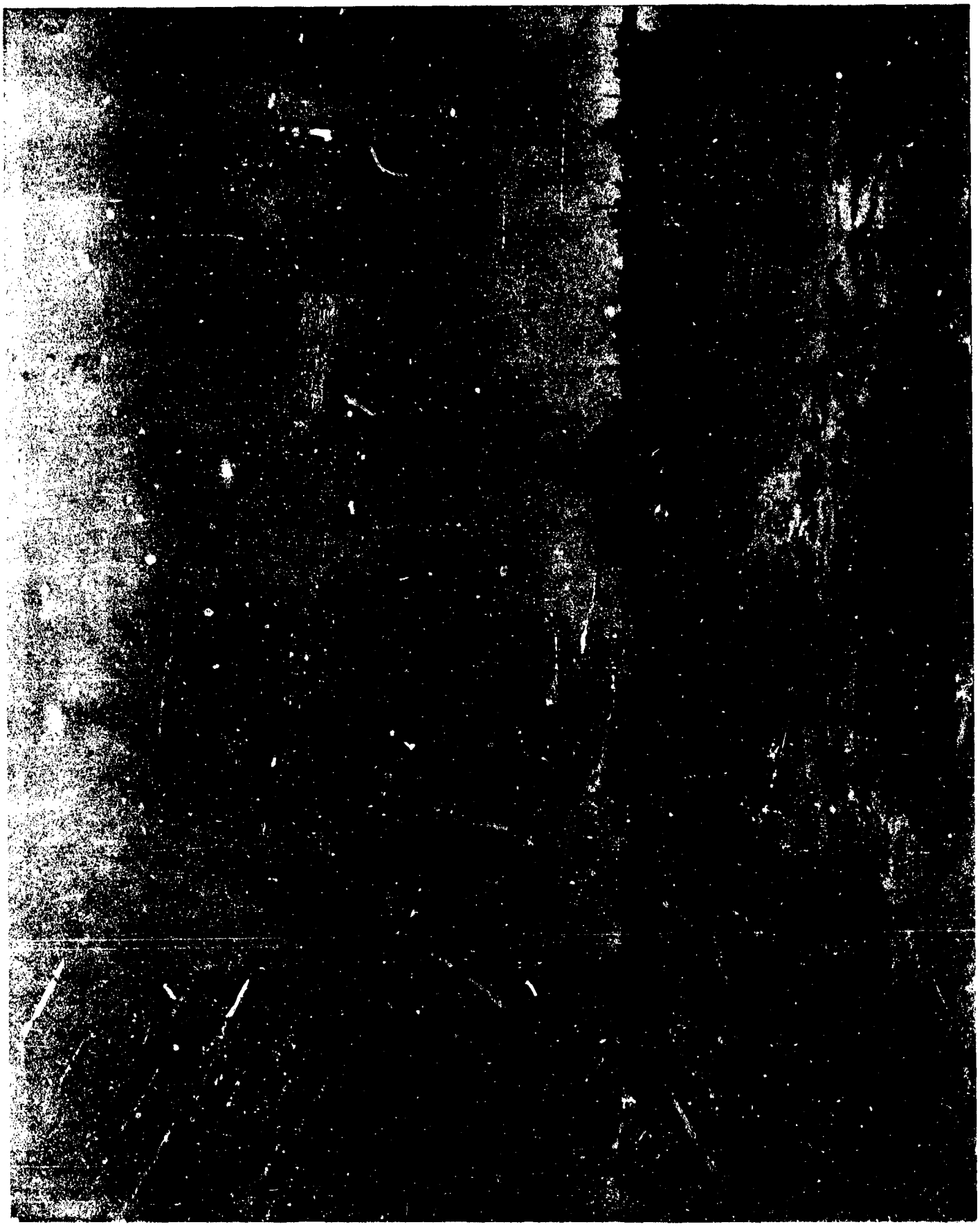
TEST BAKER



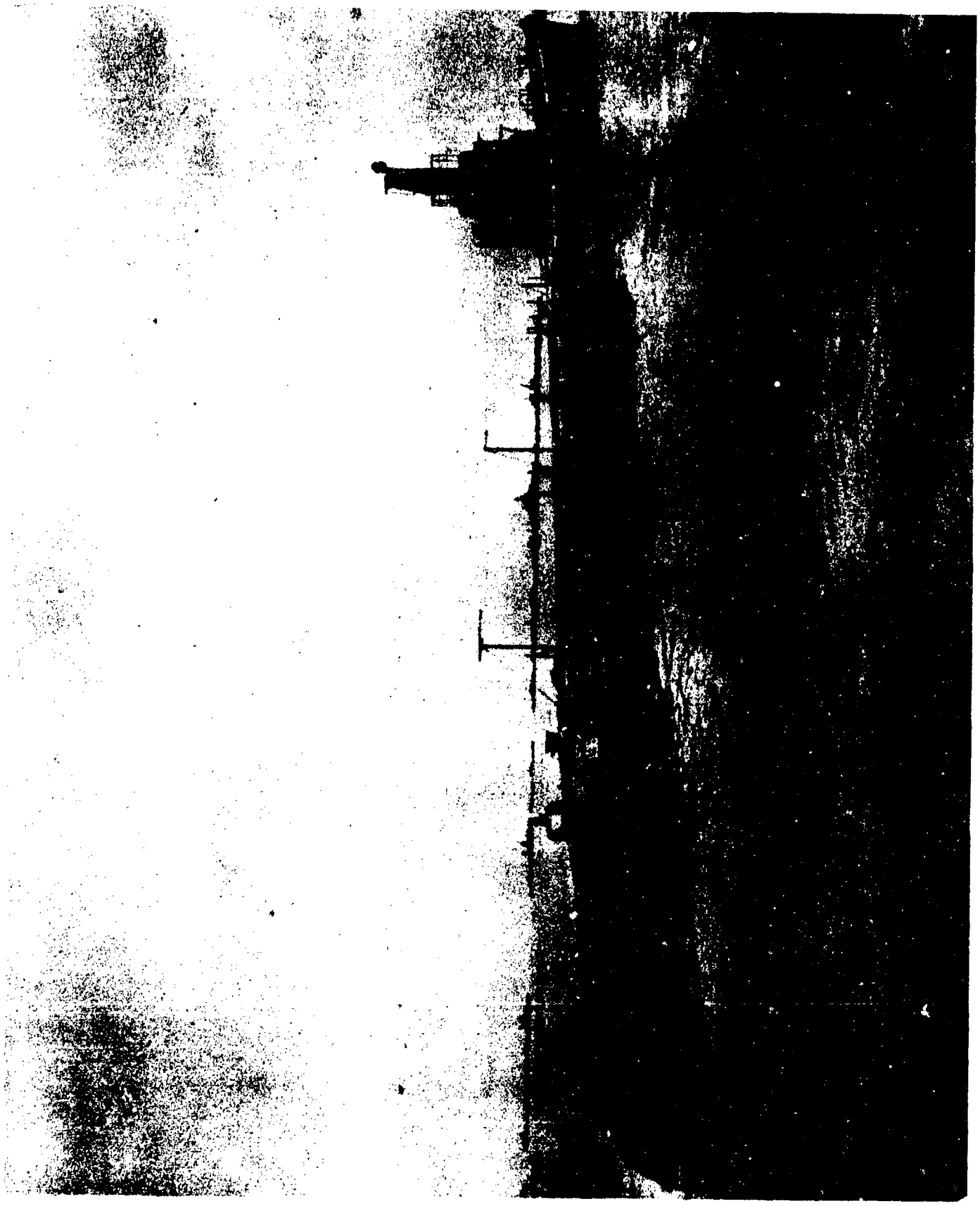
AB-CR-227-283-2: General view from ahead.



AB-CR-227-283-1: General view from starboard bow.



AB-CR-227-283-7: General view from starboard beam.



AB-CR-227-283-8: General view from starboard quarter.

AB-CR-227-283-6; General view from astern.

AB-CR-227-283-5: General view from port quarter.

AB-CR-227-283-4: General view from port beam.

AB-CR-227-283-3: General view from port bow.

APPENDIX

COMMANDING OFFICER'S REPORT

TEST BAKER

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION I

1. The U.S.S. SEARAVEN (SS196) was submerged in 27 fathoms of water with a keel depth of 75 feet. The position in the array was 1225 yards bearing 193(T) from berth 161 (center of array). The U.S.S. SEARAVEN (SS196) was submerged on the approximate heading of 080° T. The ship's anchor was out to 100 fathoms of chain and a second anchor was dropped underfoot to 105 fathoms of chain which had two fifteen fathom bights formed by clips. There was no indication c the first anchor dragging and the clips did not fail. The submarine was held down with weights located forward and aft on suspension bridles. Without the weights the submarine had 60,000 lbs. positive buoyancy.

2. The material condition of the ship for test BAKER was as follows: No. 1 high pressure air compressor inoperative because of a badly damaged cylinder block; No. 2 high pressure air compressor is in such a condition that it may fail in a manner similar to that of No. 1. All radar and counter radar equipment except SJ and SD antenna masts, sound receivers and remote sound head training equipment, guns and mounts removed; the superstructure plating in poor condition and weak because of excess corrosion (the portion aft of the conning tower is particularly bad); main engine mufflers badly corroded and shells very thin; circulating water piping in very poor condition because of corrosion (the piping to machinery in the pump room is very bad); hull valves and stops in a weakened and undependable condition. Main engine holding down bolts have commenced to crystalize and break. The following bolts were broken: No. 1 main engine - one at outboard blower end, one outboard control end; No. 2 main engine - one at outboard control end; No. 3 engine - one at

outboard control end. The main engines are in need of overhaul and require replacement of many worn parts. This ship has not been overhauled since June 1944. The employment since that time, making war patrols and furnishing training services, has prevented adequate maintenance which has resulted in the very poor material condition noted above. The pressure hull was in good condition. Main and auxiliary machinery, except as listed above was operable and fairly dependable. A board of Inspection and Survey convened on board in September 1945 and recommended scrapping this ship.

3. The material condition of hull valves and piping made the U.S.S. SEARAVEN (SS196) particularly susceptable to damage and flooding from a heavy underwater explosion.

4. The ship was secured for test BAKER in accordance with the "Submarine Supplement" to "Instructions to Target Vessels for Tests and Observation by Ship's Force". This made each compartment watertight to the sea and each adjacent compartment. All machinery was secured and power removed from all electrical circuits except the auxiliary power cables from the after battery to the auxiliary board and from the auxiliary board to the starting switch of the ventilation blowers. The main storage battery had been given a normal charge and placed on open circuit a few days previous to submergency. All air banks were fully charged. No. 2 and 3 main vents and safety vent were open. The emergency vents were closed. Packing and stern tube glands were tight. In general, with a few exceptions to facilitate salvage if necessary, the ship was secured as for a depth charge attack.

5. Fuel tanks were filled to capacity with fuel. Ammunition on board, including torpedoes, was the full allowance. Lub oil tanks were filled to capacity and sumps to the operating level. A full allowance of oxygen was stored in the regularly assigned places.

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION II

1. The U.S.S. SEARAVEN (SS196) received minor damage from test BAKER. No hull damage was sustained. The gyro followup system was made inoperative by an open circuit in the sensitive relay and an open field coil in the followup motor. The mercury in the auxiliary gyro was spilled. The operating linkage which opens and closes the protective resistance circuit of the bow plane clutch solenoid was shaken out of adjustment so that it would not open the contacts. One lead in the control room forward lighting switch box was shaken loose. An amarture coil on No. 1 fuel oil purifier was opened. An explosive mixture of hydrogen was found in the battery compartments. A deficiency in oxygen and slight traces of carbon monoxide were found in others.

2. The fighting efficiency was slightly reduced by the failure of the gyro follow up system. Such a failure requires the introduction of own ship's course into the TDC by hand. The ship's head would have to be read at the gyro and passed to the conning tower. The failure of the operating linkage on the bow plane clutch solenoid resistance cutout contacts would have left the contacts closed and resulted in a fire had the circuit been energized for more than a short time. The other casualties would not effect fighting efficiency or ability to remain in action. The commanding officer can only conjecture as to the effect such an explosion would have on depth control. It is believed only a temporary loss of depth control would result and that control could soon be regained without serious mishap.

3. The commanding officer does not know what immediate radiological effect would be had but it is known that if the submarine

remained in the vicinity long the topside would be contaminated. When the U.S.S. SEARAVEN (SS196) was reopened after test BAKER the interior of the conning tower was found to be 0.15 Roentgen per day and the forward torpedo room 0.12 Roentgen per day. The bridge was so contaminated that personnel could remain there for only a very short time. It is estimated that the shock effect on personnel of certain temperments would have been very serious. Ship's fresh water remain safe for all uses.

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION III

PART "A" - GENERAL SUMMARY

I. Target Condition After Test:

(a) Drafts without weights before and after submergency test were 16'9" forward and 17'8" aft. Mean draft was 17'2-1/2". The main induction was flooded but no other flooding occurred. The ship had no list.

(b) There was no structural damage.

(c) Gyro power up system, auxiliary gyro, No. 1 fuel oil purifier motor, one lighting connection, and bow plane clutch solenoid linkage were damaged. Other electrical, ship control, gunnery, and electronics equipment and machinery were operable and undamaged. This ship has no fire control equipment.

(d) There were no fires. It is estimated that all hands would have eventually become radiological casualties and that a small percentage would have been shock casualties.

II. Forces Evidenced and Effects Noted:

(a) Heat: None.

(b) Fires and explosions: There were no fires or explosions. Ammunition was stowed in ready service stowages. The ship had a full allowance of ammunition and fuel to capacity.

(c) Shock: Rust was shaken loose from ventilation ducts and small flakes of paint were in evidence throughout the ship. A gage glass on the circulating fresh water tank, No. 2 main engine, was broken.

III. Results of Test on Target:

(a) Propulsion and ship control: The gyro repeater follow up system was made inoperative and mercury was spilled out of the auxiliary gyro. The damage to the bow plane clutch solenoid linkage could have caused a fire had this circuit been engaged.

(b) Gunnery and fire control. (No fire control equipment on board). Fire control would have been handicapped by lose of gyro repeater system.

(c) Water tight integrity and stability. Main induction flooded as a result of submergence.

(d) Habitability. No effect except radiologically.

(e) Fighting efficiency. Fighting efficiency would be slightly reduced as noted above.

IV. General Summary of Impressions and Conclusions:

A submarine submerged at 1250 yards from an atomic burst such as in test BAKER is not entirely secure from damage. The ship certainly receives a shock which can and does put sensitive electrical systems out of operation.

The question is raised as to what are the effects on depth control caused by such an underwater explosion. The writer can only guess but it is believed that control could be regained without a serious casualty.

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION III

PART "C" - INSPECTION REPORT

SECTION I - HULL

A. General Description of Hull Damage:

There was no hull damage.

B. Superstructure and Weather Decks:

(a) Description and causes of damage.

There was no damage to superstructure and weather decks or to ammunition and gear stowages topside.

(b) Evidence of fire.

There is no evidence of fire.

(c) Estimate of relative effectiveness against heat and pressure wave:

A submarine of light hull construction will withstand the pressure wave of a test BAKER type explosion at a range of 1250 yards.

(d) Constructive criticism of superstructure design and construction.

The outstanding comment that can be made in regards to superstructure design is that superstructures must be built so they can readily and easily be cleansed of radio active particles. The use of rust resisting and non absorbent materials is believed to be self evident. Comments made in this section of Report No. 11 on test ABLE are applicable.

C. Turrets, Guns and Directors:

(a) Guns.

No guns aboard. No damage to gun foundation.

(b) Target bearing transmitter.

None aboard.

(c) Periscopes and radar mast.

No damage.

(d) Criticism of design or construction.

No comment.

D. Torpedo Tubes and Appurtences:

(a) Tubes.

No damage.

(b) Cradles and loading gear.

No damage.

(c) Air flasks and warheads.

No damage.

(d) Criticism.

None.

E. Weather Deck:

Combined with Item B.

F. Exterior Hull Above Water Line:

(a) Condition and cause of damage to:

1. Pressure hull plating and framing.

No damage.

2. Bow framing.

No damage.

3. Stern framing.

No damage.

4. Welding.

No damage.

5. Structural castings.

No damage.

(b) Criticism of design in construction.

None.

G. Compartments:

(a) Damage to shell, bulkheads and framing and causes.

None.

(b) Damage to joiner bulkheads, decks, and floorplates and causes.

None.

(c) Damage to access closure and cause.

None.

(d) Damage to hull fittings and equipment and causes.

None.

(e) Damage to foundations, shock mounts and sound mounts and causes (include battery tanks).

None.

(f) Evidences of fire.

None.

(g) Damage to watertight integrity and causes.

None.

(h) Estimate of reduction in watertight subdivision, habitability and utility of compartments and casualties to personnel.

Only reduction of above due to radiological effects.

H. Armor Decks:

None fitted.

I. (Combined with Item G).

J. Underwater Hull:

(a) Condition and causes of damage to:

1. Pressure hull plating and framing.

No damage.

2. Bow framing.

No damage.

3. Stern framing.

No damage.

4. Structural casting.

No damage.

5. Struts and stern tubes.

No damage.

6. Rudders and planes.

No damage.

7. Keels.

No damage.

8. Miscellaneous fittings.

No damage.

(b) Effect of damage on:

1. Buoyancy.

No effect.

2. Operability surfaced and submerged.

No effect.

3. Maneuverability and resistance.

No effect.

(c) Constructive criticism as to design or construction.

None.

K. Tanks:

(a) Condition and causes of damage to:

1. Exterior tanks.

No damage.

2. Interior tanks.

No damage.

(b) Leakage and causes for all tanks.

None.

(c) Constructive criticism as to design, construction or location.

None.

L. Flooding:

(a) Description of major flooding areas.

The main induction was flooded. The cause of flooding is believed to be the inability to close the outboard valve tightly by

hand from the topside. Sea pressure was not permitted to seat the valve because of the design. The same situation does not exist when the valve is closed from below.

(b) Sources of flooding.

1. Opened boundaries.

None.

2. Failure to access closures.

None.

3. Failure of piping, ducting or wiring.

None.

(c) List of compartments or tanks believed to have flooded slowly so as to be susceptible to damage control.

No flooding except as noted in (a).

(d) Constructive criticism as to design or construction.

None.

M. Ventilation:

(a) Condition and causes of damage to:

1. Hull and battery ventilation system outboard.

No damage.

2. Engine induction system.

No damage.

3. Ventilation system inboard.

No damage.

(b) Evidences that ventilation system conducted heat, blast, fire, smoke or water into any compartment.

None.

(c) Constructive criticism of design or construction.

None.

N. Ship Control and Fire Control Stations:

(a) Damage to control stations due to failure of compartment boundaries.

1. Bridge.

None.

2. Conning Tower.

None.

3. Control Room.

None.

(b) Constructive criticism as to layout, arrangement, and protection.

None.

O. (Combined with Item N.).

P. Ammunition Stowage:

(a) Condition and causes of damage to:

1. Ready service stowage.

None.

2. Magazines.

None.

3. Constructive criticism as to location, protection, performance, and design or construction.

None.

Q. Ammunition Handling:

(a) Condition, operability and causes of damage to:

1. Passing scuttle.

None installed.

2. Torpedo loading cradles.

No damage.

3. Torpedo loading derrick.

No damage.

(b) Constructive criticism of design, construction, or location.

None.

R. Strength:

(a) Details of any damage to and causes of damage to:

1. Pressure hull plating including conning tower.

No damage.

2. Pressure hull framing.

No damage.

3. Main bulkheads.

No damage.

4. Welding or other joints.

No damage.

5. Structure in way of discontinuities.

None.

(b) Constructive criticism.

None.

S. Miscellaneous:

None.

T. Coverings:

(a) Condition and cause of damage to:

1. Paint.

Topside. No damage.

Exterior below water line. No damage.

Interior. Minute flaking.

2. Galvanizing, plating, etc.

No damage.

3. Linoleum.

No damage.

4. Non skid.

No damage.

U. Welding and Rivetting:

(a) General summary of welding performance.

Welding undamaged.

(b) General summary of rivet performance.

Rivets undamaged.

(c) Constructive criticism.

None.

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION III

PART "C" - INSPECTION REPORT

SECTION II - MACHINERY

A. General Description of Machinery Damage:

All machinery was undamaged and operable when the ship was reboarded, except the linkage attached to the bow plane tilting clutch which operates the resistor switch to the solenoid field coil was shaken out of its proper position so it could not function.

B. Boilers (S-51):

Not applicable.

C. Blowers (S-53):

Not applicable.

D. Fuel Oil Equipment: (S-55)

(a) Heaters.

No damage.

(b) Strainers.

No damage.

(c) Manifolds.

No damage.

(d) Fittings (thermometers, gages).

No damage.

(e) Flexible fueling hose.

No damage.

E. Boiler Feedwater Equipment (S-56):

Not applicable.

F. Main Propulsion Machinery (S-41):

(a) Main and auxiliary engines.

1. Foundation.

No damage.

2. Casing and cylinders.

No damage.

3. Bearings, crankshafts, pistons, etc.

No damage.

4. Couplings.

No damage.

5. Fuel injections system.

No damage.

6. Superchargers.

No damage.

7. Governors.

No damage.

8. Inboard and outboard exhaust valves.

No damage.

9. Mufflers and exhaust piping.

No damage.

10. Cooling system.

No damage except for broken gage glass on No. 2 main engine circulating fresh water tank.

G. Reduction Gears (S-42):

(a) Foundations and casing.

No damage.

(b) Gears and shafting.

No damage.

(c) Bearings.

No damage.

(d) Couplings (flexible and solid).

No damage.

(e) Fittings (oil sights, thermometers, etc.).

No damage.

(f) Turning gears.

No damage.

H. Shafting and Bearings (S-43):

(a) Shafting.

No damage

(b) Bearings and bearing foundations.

No damage.

(c) Alignment.

No damage.

(d) Hull packing gland.

No damage.

(e) Thrust bearings.

No damage.

(f) Strut bearings.

No damage.

I. Lubrication System (S-45):

(a) Coolers.

No damage.

(b) Filters and strainers.

No damage.

(c) Purifiers.

No damage.

(d) Tanks (sump, settling, etc.).

No damage.

(e) Fittings (gauges, etc.).

No damage.

J. Condensers and Air Ejectors (S-46):

Not applicable.

K. Pumps (S-47):

(a) Circulating pumps.

No damage.

(b) Trim pump.

No damage.

(c) Drain pump.

No damage.

(d) Priming pumps.

No damage.

(e) Fuel oil pumps.

No damage.

(f) Lubricating oil pumps.

No damage.

(g) Distiller feed pump.

No damage.

L. Auxiliary Generators (S-61):

Discussed under Item F (Main Propulsion).

M. Propellers (S-44):

(a) Blades.

No damage.

(b) Caps, nuts, etc.

No damage.

N. Distilling Plant (S-59):

(a) Distillers.

No damage.

(b) Compressors.

No damage.

(c) Miscellaneous valves fittings, gages, attached piping, etc.

No damage.

O. Refrigerating and Air Conditioning Plant (S-59):

(a) Compressors.

No damage.

(b) Motors.

No damage.

(c) Condensers.

No damage.

(d) Foundations.

No damage.

(e) Refrigerant piping and cooling coils.

No damage.

(f) Insulation and lagging.

No damage.

(g) Miscellaneous valves, switches, control, fittings, etc.

No damage.

P. Winches, Windlasses, and Capstans (S20, S26):

(a) Foundation and bed plates.

No damage.

(b) Brakes and brake lining.

No damage.

(c) Gearing.

No damage.

(d) Drums, bearings, shafting.

No damage.

(e) Hydraulic systems.

No damage.

(f) Fittings, valves, etc.

No damage.

Q. Steering and Diving:

(a) Steering rams and cylinders.

No damage.

(b) Hydraulic systems including pumps piping, etc.

No damage.

(c) Bow plane rigging mechanism.

No damage.

(d) Bow plane tilting mechanism.

The leakage to the solenoid clutch which operates the resistor switch of the solenoid field was shaken out of its proper position so that it would perform its function.

(e) Stern plane tilting mechanism.

No damage.

(f) Foundations.

No damage.

(g) Miscellaneous (steering stands, valves, gages, etc.).

No damage.

R. Elevators, Ammunition, etc. (S78, S83):

Not applicable.

S. Ventilation (Machinery) (S-38):

(a) Battery ventilation blowers.

No damage.

(b) Battery air flow meters.

No damage.

(c) Hull supply and exhaust blowers.

No damage.

(d) Engine air and ventilation induction hull valves and mechanisms.

No damage.

(e) Bulkhead flappers.

No damage.

(f) Foundation and mountings.

No damage.

(g) Fans and motors.

No damage.

T. Compressed Air Plant (S-49):

(a) High pressure air compressors.

No damage.

(b) Low pressure blowers.

No damage.

(c) Foundations.

No damage.

(d) Coolers.

No damage.

(e) Air banks.

No damage.

(f) Torpedo impulse flasks.

No damage.

(g) Miscellaneous gages, attached piping, etc.

No damage.

U. Diesels (S-50):

Not applicable. See Item F.

V. Piping Systems (S-48):

(a) High pressure (3000 lb.) air piping.

No damage.

(b) Main ballast tank blow (600 lb.) air piping.

No damage.

(c) Service (200 lb.) air piping.

No damage.

(d) Main ballast tank bl w (10 lb.) air piping.

No damage.

(e) Torpedo impulse air piping.

No damage.

(f) Engine air starting piping.

No damage.

(g) Engine shut-down air piping.

No damage.

(h) Salvage air piping.

No damage.

(i) Main ballast tank vent piping.

No damage.

(j) Hull and battery ventilation piping.

No damage.

(k) Trimming system piping.

No damage.

(l) Drain system piping.

No damage.

(m) Magazine flooding piping.

No damage.

(n) Plumbing piping.

No damage.

(o) Fuel oil piping.

No damage.

(p) Fuel oil compensating piping.

No damage.

(q) Lubricating oil piping.

No damage.

(r) Hydraulic system piping.

No damage.

(s) Engine cooling salt water piping.

No damage.

(t) Engine cooling fresh water piping.

No damage.

(u) Main motor cooling salt water piping.

No damage.

(v) Distiller feed piping.

No damage.

(w) Refrigeration circulating water piping.

No damage.

(x) Air conditioning circulating water piping.

Nc damage.

(y) Freon piping and coils.

No damage.

(z) Air compressor circulating water piping.

No damage.

(aa) Potable fresh water piping.

No damage.

(bb) Battery water piping.

No damage.

W. Hydraulic System (S-21):

(a) Main hydraulic pumps.

No damage.

(b) Hydraulic accumulator.

No damage.

(c) Main vent hydraulic operating mechanisms.

No damage.

(d) Ballast tank flood valve hydraulic operating mechanisms.

No damage.

(e) Engine air induction valve operating mechanism.

No damage.

(f) Ventilation induction valve operating mechanism.

No damage.

(g) Main engine exhaust valve operating mechanism.

No damage.

(h) Auxiliary engine exhaust valve operating mechanism.

No damage.

(i) Sound head lower/raise mechanism.

No damage.

X. Navigational Instruments (S-24):

(a) Underwater log.

No damage.

(b) Magnetic compasses.

No damage.

Y. Periscopes:

(a) Optics, bearings, train, stadimeter, etc.

No damage.

(b) Mechanical hoist mechanism.

No damage.

Z. Radar and Sonar (S67, S68):

(a) Mechanical hoisting mechanism.

No damage.

(b) Training mechanism.

No damage.

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION III

1 ART "C" - INSPECTION REPORT

SECTION III - ELECTRICAL

A. General Description of Electrical Damage:

The slight damage to electrical equipment is attributed primarily to shock which caused open electrical circuits. The gyro repeater follow-up system was made inoperative because of an open field in the follow-up motor and an open coil in the relay of sensitive follow-up system. No. 1 fuel oil purifier received an open armature coil. The lighting switch box in the forward end of the control room had a lead shaken loose. The auxiliary gyro spilled part of it's mercury.

B. Electric Propulsion Rotating Equipment. (Propulsion motors, propulsion generators, submarine auxiliary generators, exciters, motor-generator sets). S-41:

(a) Frame and mounting.

No damage.

(b) Commutator or slip rings.

No damage.

(c) Brushes and brush rigging.

No damage.

(d) Bearings.

No damage.

(e) Fans and blowers.

No damage.

(f) Internal lighting fixtures.

No damage.

(g) Air coolers and filters.

No damage.

C. Electric Propulsion Control Equipment (Propulsion control cubicles, transfer switch panels, controllers for motor-generator sets). S-41:

(a) Framework and mountings.

No damage.

(b) Electrical connections and wiring.

No damage.

(c) Busbars.

No damage.

(d) Contactors, switches and relays.

No damage.

(e) Rheostats and resistors.

No damage.

(f) Mechanical operating mechanisms and interlocks.

No damage.

(g) Insulating materials.

No damage.

(h) Instruments.

No damage.

(i) Fuses.

No damage.

(j) Rectifiers.

No damage.

(k) Regulators.

No damage.

D. Generators - Ships Service (S61):

See Item K.

E. Generators - Emergency S61:

Not applicable.

F. Switchboards, Distribution and Transfer Panels (Ships service, emergency, battery charging, lighting and test switchboards - Power and lighting distribution panels - Submarine torpedo heating and hydrogen burning panels - Transfer panels - Degaussing panels). (S-62):

(a) Framework and mounting.

No damage.

(b) Electrical connections and wiring.

No damage.

(c) Busbars.

No damage.

(d) Circuit breakers, contactors, switches and relays.

No damage.

(e) Rheostats and resistors.

No damage.

(f) Mechanical operating mechanisms and interlocks.

No damage.

(g) Insulating materials.

No damage.

(h) Instruments.

No damage.

(i) Rectifiers.

No damage.

(j) Fuses.

No damage.

(k) Voltage regulators.

No damage.

G. Wiring, Wiring Equipment, and Wireways (S-62):

(a) Cable (Power, lighting, I.C., F.C., propulsion).

No damage.

(b) Wireway supports.

No damage.

(c) Connection, junction boxes, receptacles, and plugs.

Forward lighting switch box in control room had a broken lead.

H. Transformers (Lighting and I.C.) (S-62):

(a) Framework and mountings.

No damage.

(b) Electrical connections.

No damage.

I. Submarine Propelling Batteries (S-62):

(a) Jars.

No damage.

(b) Covers.

No damage.

(c) Wedges and strongbacks.

No damage.

(d) Busbars and cell connections.

No damage.

(e) Acid spillage.

None.

J. Portable Batteries (S-62):

(a) Mounting.

No damage.

(b) Jars.

No damage.

(c) Cell and cable connections.

No damage.

(d) Acid spillage.

None.

K. Motors, Motor Generator Sets, and Motor Controllers. Motor and controllers for engine room auxiliaries, Steering gear, deck auxiliaries, air conditioning and refrigeration, ventilation, distilling equipment, etc. Motor generator sets for lighting, welding, degaussing, battery charging, interior communications, etc. (S-63):

(a) Rotating equipment:

1. Framework and mounting.

No damage.

2. Commutator or slip rings.

No damage.

3. Brushes and brush rigging.

No damage.

4. Bearings.

No damage.

5. Speed regulators.

No damage.

6. Field and armature windings.

No. 1 fuel oil purifier motor received an open armature coil.

(b) Control equipment:

1. Framework and mounting.

No damage.

2. Electrical connections and wiring.

No damage.

3. Contactors, switches and relays.

No damage.

4. Rheostats and resistors.

No damage.

5. Insulating materials.

No damage.

6. Pilot circuit devises.

No damage.

7. Brakes.

No damage.

L. Lighting Equipment (S-64):

(a) Lamps (Rough service, rough service high impact and fluorescent lights).

No damage.

(b) Reflectors.

No damage.

(c) Fixture mounts.

No damage.

(d) Shock mounts (U-strap type and plate type).

No damage.

(e) Pendant lamp holders.

None installed.

(f) Lamp globes.

No damage.

M. Searchlight (36", 24", 12" and 8") (S-66):

No search light aboard during test.

N. Degaussing Equipment (S-81):

Not applicable.

O. Gyro Compass Equipment (S-24):

(a) Master.

No damage.

(b) Repeaters.

Gyro repeater follow up motor received an open field coil and the sensitive relay coil received a broken wire.

(c) DRT and DRA.

No damage.

P. Sound Powered Telephones:

(a) Headsets.

No damage.

(b) Handsets.

No damage.

(c) Jack and switch boxes.

No damage.

(d) Stowage.

No damage.

Q. Ships Service Telephone:

Not applicable.

R. Announcing Systems:

(a) Portable (PAM and PAB).

No damage.

(b) Amplifier racks.

No damage.

(c) Control racks.

No damage.

(d) Transmitting station.

No damage.

(e) Reproducers.

No damage.

(f) Inter-communicating units.

No damage.

S. Telegraphs.

No damage.

T. Indicating Systems:

No damage.

U. I.C. and A.C.O. Switchboards:

No damage.

V. F.C. Switchboards:

No damage.

REPORT NUMBER ELEVEN

COMMANDING OFFICER'S REPORT

ATOMIC BOMB, TEST BAKER

SECTION III

PART "C" - INSPECTION REPORT

SECTION IV - ELECTRONICS

A. General Description of Electronics Damage:

There was no electronics damage.

B. Fire Control Radar:

None installed.

C. Surface Search Radar:

None installed.

D. Air Search Radar:

None installed.

E. Radar Repeaters:

None installed.

F. Radar Counter Measures Equipment:

None installed.

G. Radar and Radio Beacons:

None installed.

H. IFF Equipment:

None installed.

I. Communication Transmitters (Radio):

No damage.

J. Communication Receivers (Radio):

No damage.

K. Communication Antennae (Radio):

No damage.

L. Radio Transceivers (Combined Transmitters and Receivers):

No damage.

M. Sonar Echo Ranging and Listening Equipment:

Receivers and remote training equipment removed before test. No damage to that remaining.

N. Sonar Echo Sounding Equipment and Altimeters:

No damage.

O. Loran Navigation Equipment:

None installed.

P. Power Supplies (Motor Generators and Filters):

No damage.

Q. Television and Teletype Equipment:

None installed.

R. Test Equipment (Including Frequency Meters):

No damage.

S. Instrumentation.

No damage.

T. Telephone Equipment:

No damage.

U. Direction Finders (Radio):

None installed.

V. Spare Parts:

No damage.

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-366588	XRD-203-Section 12
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

TRC 18 April 1997

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 2 reinject
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-801406L ✓ 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