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BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT.

Classification (Cancelled) (Changed to CONFIDENTIAL)
By Authority of Joint Chiefs of Staff (Action 15 Apr 49)
By John Biggar Capt AESWP Date 1 May 51

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Director
Defense Atomic Support Agency
Washington, D. C. 20301

U.S.S. SEARAVEN (SS 196)

TEST ABLE [U] (8)

(11) 1947, (12) 82 p. (14) XRD-47

[redacted]
SPECIAL WEAPONS PROJECT

(6) OPERATION CROSSROADS

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DIRECTOR OF SHIP MATERIAL
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GROUP-3 1 JAN 1965
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BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT

Classification (~~Concelled~~) (Changed to CONFIDENTIAL)
By Authority of Joint Chiefs of Staff (Action 15 Apr 49)
By [illegible] Date 1 May 51
AFSWP

[illegible] REPORT DIRECTLY
[illegible]

[illegible] Washington, D. C. 20301

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[redacted]

USS SEARAVEN (SS 196)

[redacted] DATA [redacted]
[illegible] Act 1946

TABLE OF CONTENTS

U.S.S. SEARAVEN (SS196)

SHIP CHARACTERISTICS

Building Yard: Portsmouth Naval Shipyard.

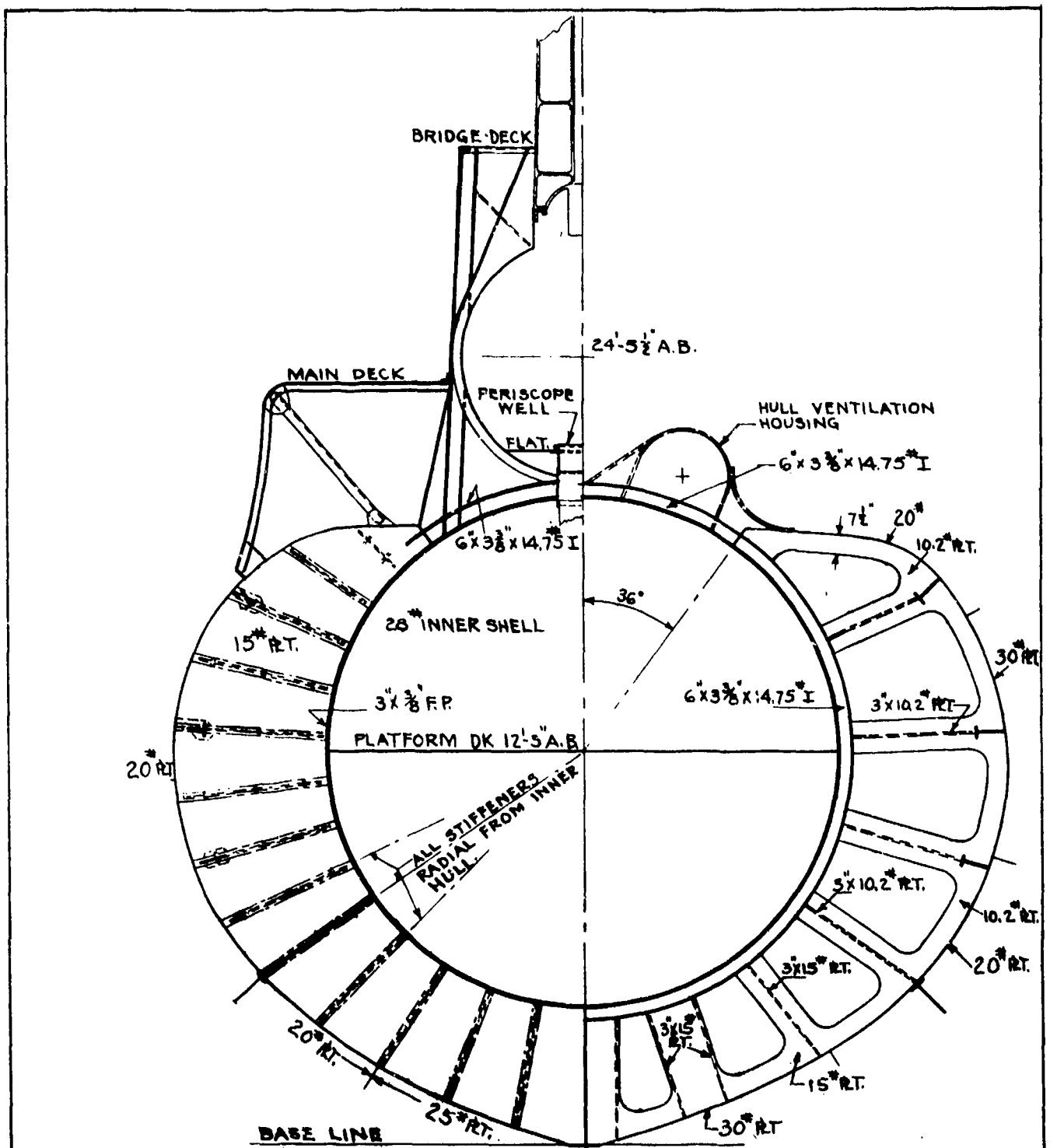
Commissioned: 2 October 1939.

HULL

Light Hull Construction.
Length Overall: 310 feet 6 inches.
Length (between perpendiculars): 302 feet 6 inches.
Beam (extreme): 26 feet 10 1/2 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): Fwd. 16 feet 9 inches.
Aft. 17 feet 8 inches.
Standard Displacement: 1450 tons.
Displacement (at time of test): 1965 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 Electric.
Main Storage Battery: Gould.
Main Controls: General Electric.
Reduction Gears: Farrel-Birmingham.
Diesel Electric Drive.



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

FRAME 85
LOOKING FOR'D.

TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

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

Draft and list were normal after the test; no flooding occurred.

(b) Structural damage.

No structural damage was experienced.

(c) Other damage.

Machinery, electrical, ship control, fire control and electronic equipment was fully operable after the test.

II. Forces Evidenced and Effects Noted.

(a) Heat.

Direct radiant heat blistered and scorched the top coat of paint on exposed surfaces which were essentially normal to the rays. The heat flash apparently attacked the ship from about 135° relative. There is a very slight scorching of the outer coat of paint on the exposed vertical surfaces of the starboard side of the superstructure and conning tower fairwater. The scorching is greatest near the stern and decreases toward the bow. No scorching was noted on horizontal surfaces or where the vertical surfaces were shielded by other structure. There were no apparent reflections of the heat wave back onto a surface which did not face the blast. Topside cables in some few instances, where completely

exposed, had a light covering of char or soot which could be rubbed off with the fingers, but in no case was the insulation damaged.

(b) Fires and explosions.

None.

(c) Shock.

There is no evidence of shock.

(d) Pressure.

The "Coordinator's Report on Air Blast and Water Shock for Tests A and B" indicates that the peak pressure was approximately 5.5 lbs. per square inch and the duration of the positive pressure phase in the order of 0.94 seconds. Hull distortion in the torpedo rooms were less than 0.01 inches with no permanent set.

(e) Any effect peculiar to the atom bomb.

Heat, pressure and slight radioactivity were the only effects noted peculiar to the atom bomb.

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.

It is believed there would have been no effect on personnel inside the sealed pressure hull. Habitability was unimpaired.

(e) Total effect on fighting efficiency.

There was no reduction in fighting efficiency from a material standpoint. Exposed personnel topside would have been at least temporarily out of action.

IV. General Summary of Observers' Impressions and Conclusions.

The SEARAVEN had been moored on the surface approximately 1750 yards from the center of the burst. From inspection, the impression formed is that this ship was subjected to a directional flash of more or less instantaneous heat followed by a relatively high velocity wind. It is concluded that a submarine on the surface at such a distance from an explosion of the type experienced in Test A will not be affected from a material standpoint but would have casualties among exposed topside personnel. Had the submarine been submerged there would have been no damage and no casualties. General views showing the SEARAVEN after the test are included in the Photographic Section on pages 29 to 35.

V. Preliminary Recommendation.

The only recommendation that can be made on the basis of damage to this ship is that insofar as practicable, topside personnel be shielded from flash burns by suitable clothing and enclosed stations. The report of the Commanding Officer of the USS SEARAVEN contains some recommendations based on damage to the USS SKATE which warrant careful investigation and consideration. However, since they are not based on damage to the SEARAVEN they are not included herein.

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 is no flooding and no change in draft or list.

(b) Structural damage.

There is no structural damage.

(c) Other damage.

None to Hull material.

II. Forces Evidenced and Effects Noted.

(a) Heat.

Direct radiant heat blistered and scorched the top coat of paint on exposed surfaces which were essentially normal to the rays. A heat flash apparently attacked the ship from about 135° relative. There is a very slight scorching of the outer coat of paint on the exposed vertical surfaces of the starboard side of the superstructure and conning tower fairwater. The scorching is greatest near the stern and decreases toward the bow. No scorching was noted on horizontal surfaces or where the vertical surfaces were shielded by other structure. There were no apparent reflections of the heat wave back onto a surface which did not face the blast.

(b) Fires and Explosions.

None.

(c) Shock.

A tea cup on the edge of the sink was not displaced.

(d) Pressure.

The "Coordinator's Report on Air Blast and Water Shock for Tests A and B" indicates that the peak pressure was approximately 5.5 lbs. per square inch and the duration of the positive pressure phase in the order of 0.94 seconds. Hull distortions in the torpedo rooms were less than 0.01 inches with no permanent set.

(e) Effects apparently peculiar to the Atom Bomb.

None noted.

III. Effects of Damage.

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

Not observed.

(b) Effect on gunnery and fire control.

Not observed.

(c) Effect on watertight integrity and stability.

None.

(d) Effect on personnel and habitability.

Insofar as hull structure is concerned there is no effect on habitability. It is estimated that topside personnel exposed directly to the flash would have suffered flash burns.

(e) Effect on fighting efficiency.

None.

IV. General Summary of Observers' Impressions and Conclusions.

From inspection, the impression formed is that this ship was subjected to a directional flash of more or less instantaneous heat followed by a relatively high velocity wind. It is concluded that a submarine on the surface at such distance from an explosion of the type experienced in test A will not be affected as far as hull material condition is concerned.

V. Preliminary Recommendations.

The only recommendation that can be made on the basis of damage to this ship is that insofar as practicable, topside personnel be shielded from flash burns by suitable clothing and enclosed stations. The report of the Commanding Officer of the USS SEARAVEN contains some recommendations based on the damage to the USS SKATE which warrant careful investigation and consideration. However, since they are not based on damage to the SEARAVEN, they are not included herein.

DETAILED DESCRIPTION OF HULL DAMAGE

A. General Description of Hull Damage.

No damage except as cover in B and T.

B. Superstructure.

There is a very slight dishing of some 5 pound plating on the port side of the conning tower fairwater. A 20" x 24" access door in the same 5 pound plating was blown in and distorted. There is no other 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 Compartments (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. Covering.

There is a very slight scorching of the outer coat of paint on the exposed vertical surfaces of the superstructure and conning tower fairwater. The greatest scorching occurred at the stern and decreased toward the bow.

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.

Draft and list were normal; no flooding occurred.

(b) Structural damage.

No structural damage was experienced.

(c) Other damage.

All machinery and equipment was tested and is undamaged and operable as before test.

II. Forces Evidenced and Effects Noted.

(a) Heat.

Momentary extreme heat from the direction of the bomb burst is evidenced by heavily scorched and blistered paint on vertical surfaces toward the burst.

(b) Fires and explosions.

No fires and explosions occurred aboard.

(c) Shock.

No indication of shock was evidenced.

(d) Pressure.

None evidenced.

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

Slight radioactivity and heat were only effects noted peculiar to the Atom Bomb.

III. Effects of Damage.

(a) Effect on machinery and ship control.

None. No damage.

(b) Effect on gunnery and fire control.

None. No damage.

(c) Effect on watertight integrity and stability.

None. No damage.

(d) Effect on personnel and habitability.

It is doubtful if personnel topside would have been killed, although uncovered skin surfaces would probably have suffered severe burns. It is believed there would have been no effect on personnel inside the sealed pressure hull. Habitability was unimpaired.

(e) Total effect on fighting efficiency.

None to material. Any personnel topside would have been at least temporarily out of action.

IV. General Summary.

It is apparent that a submarine sealed up as for diving and rigged for depth charge attack yet still on the surface would be undamaged by air burst of an atomic bomb of similar strength and at a similar range as the test A Bomb.

V. Preliminary Recommendations.

No comment.

DETAILED DESCRIPTION OF MACHINERY DAMAGE

A. General Description of Machinery Damage.

(a) Overall condition.

Undamaged.

(b) Areas of major damage.

No damage.

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

No damage.

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

None. All equipment was operated under service conditions with vessel underway. Diving equipment was tested by stationary test dive.

B. Boilers.

Not applicable.

C. Blowers.

Not applicable.

D. Fuel Oil Equipment.

No damage.

E. Boiler Feedwater Equipment.

Not applicable.

F. Main Propulsion Machinery.

No damage.

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.

No damage.

R. Elevators, Ammunition hoists, etc.

Not applicable.

S. Ventilation (Machinery).

No damage.

T. Compressed air plant.

No damage.

U. Diesels (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 DAMAGE

I. Target Condition After Test.

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

Not observed.

(b) Structural damage.

None.

(c) Other damage.

No electrical equipment was damaged or inoperable due to the test.

II. Forces Evidenced and Effects Noted.

(a) Heat.

There was no evidence of heat having affected any equipment inside the pressure hull. Topside cables in some few instances, where completely exposed, had a light covering of char or soot which could be rubbed off with the fingers, but in no case was the insulation damaged at all.

(b) Fires and explosions.

None.

(c) Shock.

There was no evidence of shock damage.

(d) Pressure.

There was no evidence of pressure damage.

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

Other than slight radioactivity, the charring of the ship's superstructure on that side toward the blast, particularly on vertical surfaces, is the only phenomenon noted that may be considered peculiar to the atom bomb.

III. Effects of Damage.

(a) Effect on propulsion and ship control.

None.

(b) Effect on gunnery and fire control.

None.

(c) Effect on watertight integrity and stability.

Not observed.

(d) Effect on personnel and habitability.

None except for possible radiological effects and possible heat or blast effects on exposed personnel.

(e) Effect on fighting efficiency.

None.

IV. General Summary of Observers' Impressions and Conclusions.

There was no effect from the atom bomb on electrical equipment in this ship. It is considered that, for a submarine, even on the surface, this ship was outside the range of damage by the atom bomb.

V. Any preliminary General or Specific Recommendations of the Inspecting Group.

None.

DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

A. General Description of Electrical Damage.

(a) Overall condition.

No damage to electrical equipment.

(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 electrical plant.

The operability of the electric plant was in no way impaired, either directly or indirectly, by the atom bomb.

(e) Types of equipment most affected.

None.

B. Electric Propulsion Rotating Equipment (S41).

No damage.

C. Electric Propulsion Control Equipment (S41).

No damage. .

D. Generators - Ship's Service (S61).

Not applicable.

E. Generators - Emergency (S61).

Not applicable.

F. Switchboards, Distribution and Transfer Panels (S62).

No damage.

G. Wiring, Wiring Equipment and Wireways (S62).

No damage. Topside cables in some few instances, where completely exposed, suffered slight scorching of paint, but in no case was the insulation damaged.

H. Transformers (S62).

No damage.

I. Submarine Propelling Batteries (S62).

No damage. Commanding Officer's Report No. 11 states that the hydrogen concentration in each battery compartment on reboarding was 2.5%. Batteries were fully charged and on open circuit during the test. Analysis of electrolyte samples after the test by Pearl Harbor Naval Shipyard revealed no significant changes attributable to the atom bomb.

J. Portable Batteries (S62).

No damage.

K. Motors, Motor-Generator Sets and Motor Controllers (S63).

No damage.

L. Lighting Equipment.

No damage.

M. Searchlights.

The signal searchlight was removed from the vessel prior to test.

N. Degaussing Equipmgnt.

Not applicable.

O. Gyro Compass Equipment.

No damage.

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 (S65).

No damage.

V. F.C. Switchboards (S71).

No damage.

SECTION IV

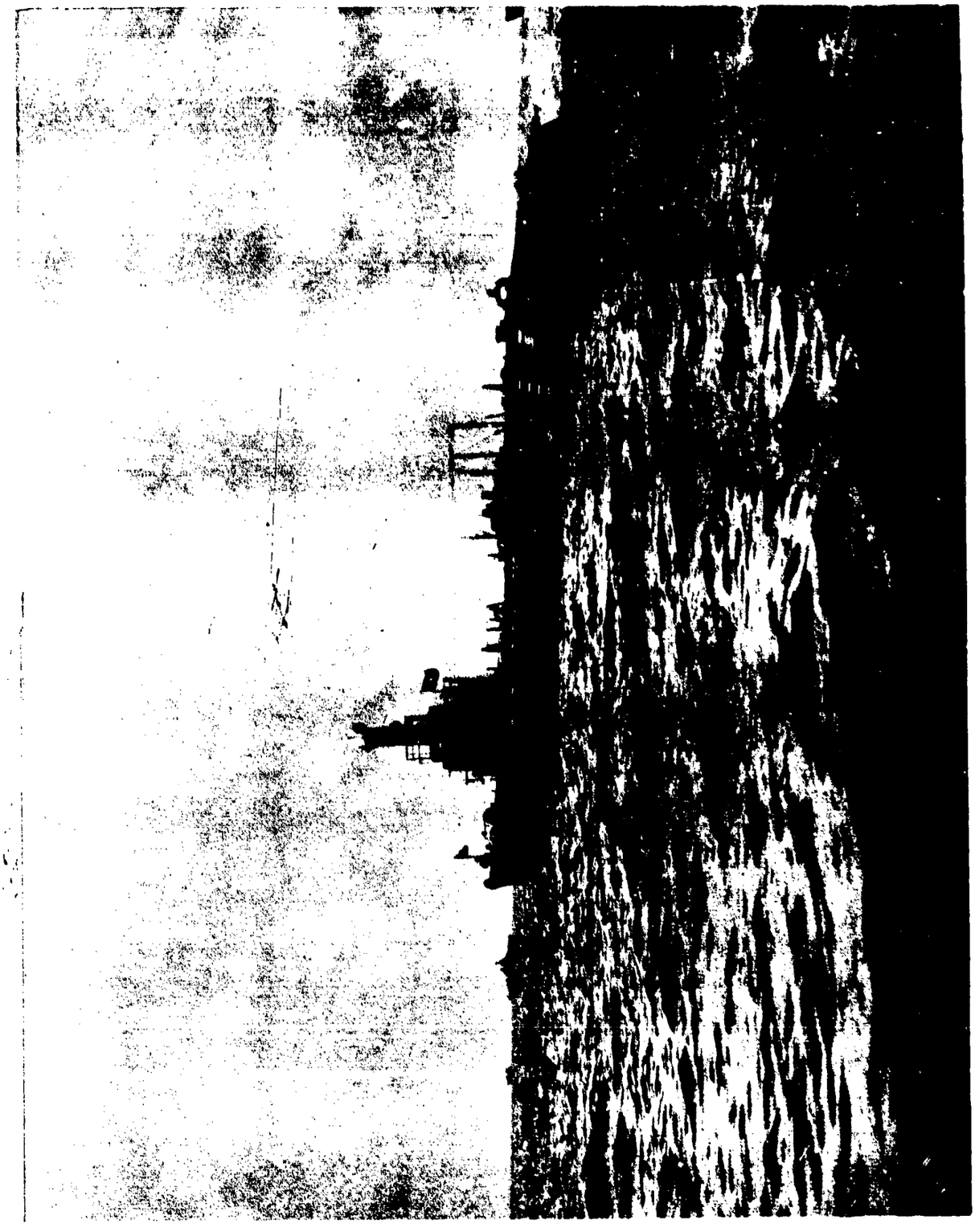
PHOTOGRAPHS

TEST ABLE

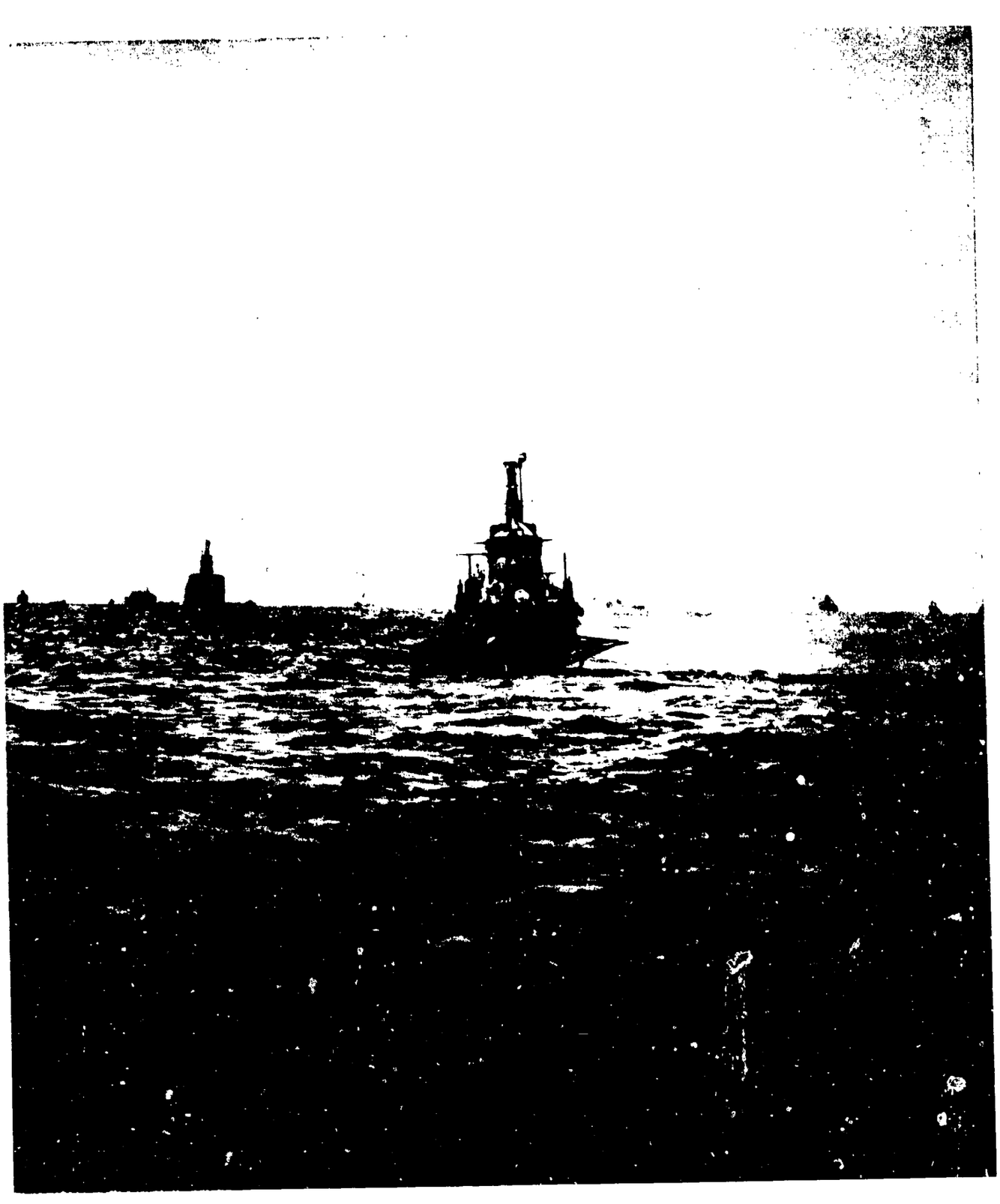
AA-CR-227-92-96. General view from starboard bow.

AA-CR-227-92-95. General view from ahead.

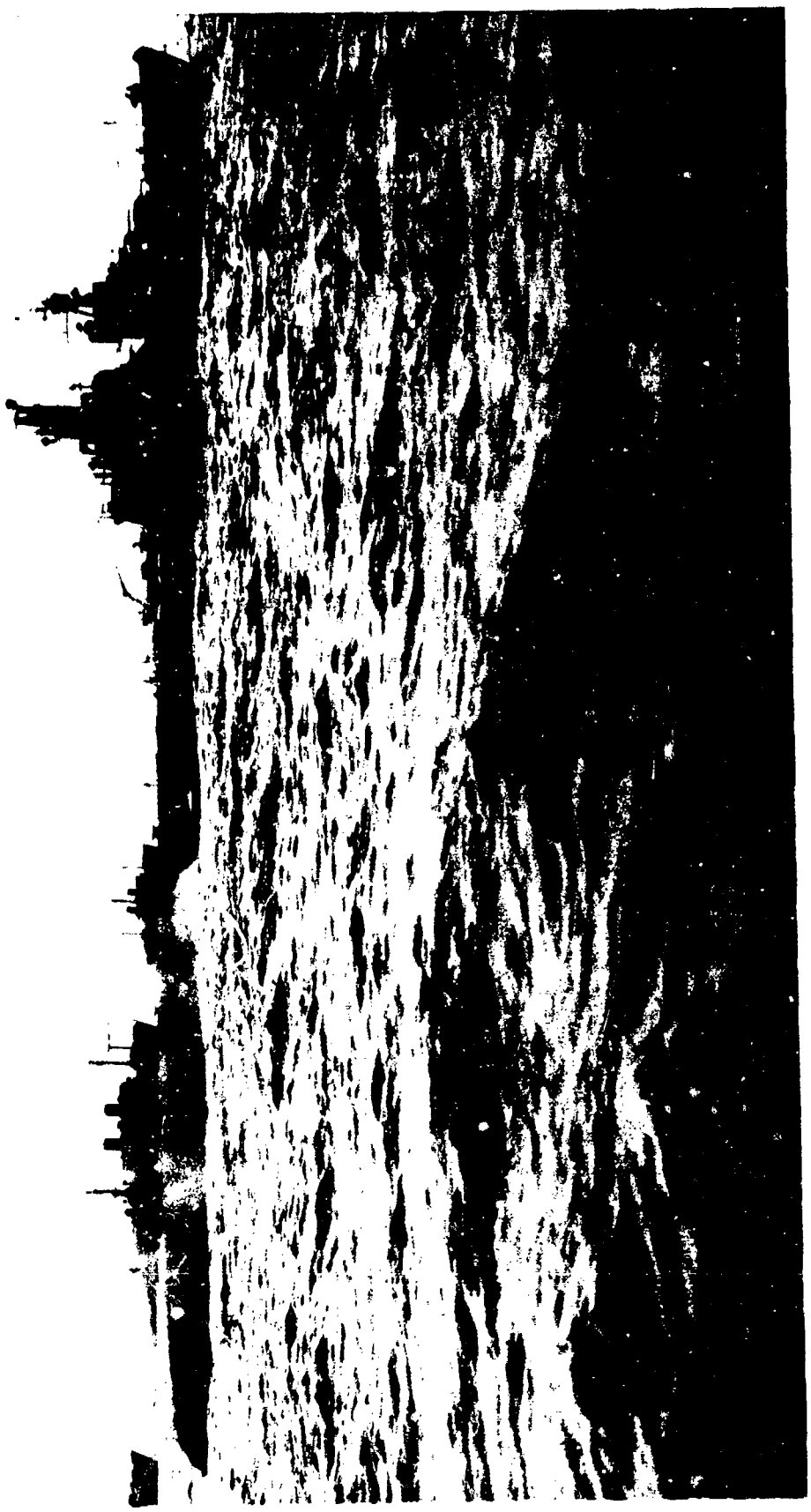
AA-CR-227-92-93. General view from port beam.



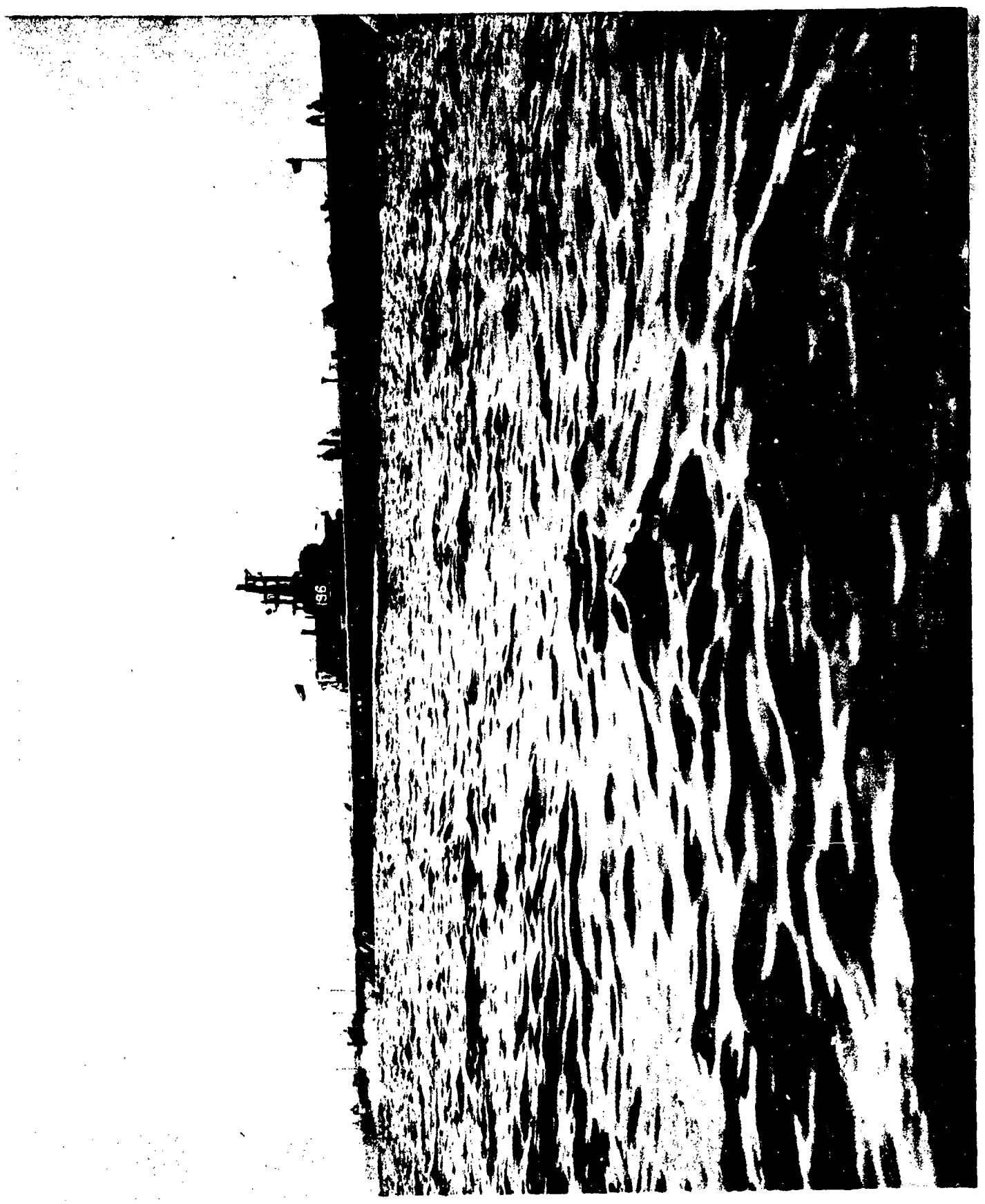
AA-CR-227-92-92. General view from port quarter.



AA-CR-227-92-91. General view from astern.



AA-CR-227-92-90. General view from starboard quarter.



AA-CR-227-92-89. General view from starboard beam.

APPENDIX

COMMANDING OFFICER'S REPORT

TEST ABLE

REPORT #11

COMMANDING OFFICER'S REPORT

SECTION I

1. The U.S.S. SEARAVEN (SS196) was anchored in berth 130 in 27 fathoms of water with 100 fathoms of chain out to the anchor. This put the U.S.S. SEARAVEN (SS196) 2000 yards bearing 031 T. from the center of the array.

2. The material condition of this ship for Test A was as follows: No. 1 high pressure air compressor was inoperative because of a badly damaged cylinder block caused by a casualty six months ago. A photograph of this damage was taken by the Bureau of Ships Submarine Unit, Crossroads. All radar and counter radar equipment except for the SJ and SD antenna masts, sound receivers and remote sound head training equipment, guns and mounts, and torpedo fire control equipment were removed. The superstructure framing and plating is in poor condition and weak because of corrosion. The portion aft of the conning tower is particularly bad. Main engine mufflers were badly corroded and the shell very thin. With these exceptions all equipment was in an operable condition and dependable.

3. The ship was secured for the test in accordance with the "Submarine Supplement to "Instructions to Target Vessels for Tests and Observation by Ship's Force". This, in general, made each individual compartment watertight to the sea and the adjacent compartment. All machinery was secured. Power was removed from all electrical circuits except for 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 four days previous to securing the ship and then kept on open circuit. Air banks were

fully charged. In general the ship was secured as for a submerged depth charge attack with a few minor exceptions to facilitate salvage if it had been necessary.

4. The ship was fueled to capacity and had a full allowance of ammunition, including torpedoes. Topside ready ammunition lockers were filled. Lub oil tanks were filled to capacity and lub oil sumps to the operating level. A full allowance of oxygen was stored in the regular assigned places.

SECTION II

1. The U.S.S: SEARAVEN (SS196) received no damage from Test A. On reboarding the ship was quickly restored to it's normal condition. It was habitable and comfortable. The only unusual gas found in the ship on reboarding was hydrogen. A 2-1/2+% concentration of this gas was found in each battery compartment. The presence of hydrogen is not a condition caused by the atomic bomb. A like concentration was found when this ship was reboarded after having been closed two days for Queen day rehersal. The superstructure paint was blackened and blistered on the starboard side. The blisters are small and found to be more dense on rounded surfaces. The rounded surfaces near the stern has the most. The vertical plating of the conning tower fairwater aft of frame 75, starboard side, is thickly covered with very small blisters. The formation of these blisters is the only effect of the atomic bomb on this target.

2. The fighting efficiency of this ship was not impaired in a material way. The effect on personnel would have reduced the fighting efficiency. All topside personnel would have suffered severe burns on uncovered skin. It is believed that two layers of finely woven cloth would have protected them from these flash burns. Normally at sea on the surface a submarine has two officers and four lookouts topside. These would have been the only burn casualties. The services of the lookouts and officer of the deck would be lost but otherwise the ship would function normally. The radiological effects have been excluded because the writer is unqualified to discuss them.

SECTION III

PART A - GENERAL SUMMARY

I. Target Condition After Test.

(a) Drafts before and after test were 16'9" forward and 17'8" aft. Mean draft was 17'2-1/2". No flooding occurred. The ship had no list.

(b) There was no structural damage.

(c) All 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. The starboard side of the superstructure was blackened. Paint on stanchions and superstructure plating was blistered on the starboard side. The commission pennant and a piece of white line which secured a gasoline can to the 4" gun foundation were partially burned. It is estimated that there would have been no personnel casualties below decks. Topside personnel would probably have suffered severe burns on uncovered skin. In making this estimate the commanding officer has excluded the radiological effects on personnel.

II. Forces Evidenced and Effects Noted.

(a) The Test A bomb produced heat sufficient to blister the paint on the starboard side of the superstructure. Most of these blisters are about the size of fly specks. Near the stern and on lifeline stanchions the size of the blister is larger.

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

(c) There was no evidence of shock. A cup left sitting on the edge of a sink was found to have been undisturbed when the ship was reboarded.

III. Results of Test on Target.

There was no effect on:

(a) Propulsion and ship control.

(b) Gunnery and fire control. (No fire control equipment on board).

(c) Watertight integrity and stability.

(d) Habitability.

(e) Fighting efficiency.

IV. General Summary of Impressions and Conclusions.

This ship suffered no damage. It is believed personnel topside could have been protected from burns by a double thickness of clothing. A ship at a range of 2,000 yards is absolutely safe from damage. Personnel burns and the radiological effects on personnel are the only problems of safety and fighting efficiency.

V. Preliminary Recommendations.

The superstructure and topside fittings appear to be the most vulnerable part of a submarine exposed to the blast of an above water atomic bomb explosion. It is suggested that the superstructure could be greatly reduced and strengthened. Topside fittings should be eliminated as much as possible. Electrical cables through the pressure hull should be reduced. Many fittings such as mufflers might be relocated within the pressure hull. Much of the main induction piping could be eliminated by interchanging the after battery and the after

engine room. The induction piping necessary could be within the pressure hull and of much lighter construction. Such important fittings as main vents and pressure hull openings must be strong and well protected. With the present design a weaker portion of the superstructure can tear lose and damage a main vent, a section of piping, or another fitting that would otherwise remain undamaged.

SECTION III

PART C - INSPECTION REPORT

SECTION A - 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.

Sheet metal at this range will withstand the heat and pressure wave regardless of shape. No further conclusions can be drawn from observation of this ship because of lack of damage.

(d) Constructive criticism of superstructure design and construction.

The superstructure is too large and too weakly constructed. By having less superstructure and strengthening it damage to this part of the ship could be greatly reduced. The superstructure now serves the primary purpose of providing a gun

platform. It adds to the comfort and safety of the crew in port. Sometime in the future the primary purpose will vanish.

Until that time it is necessary to provide a suitable gun platform. It is believed that the present submarine superstructure could be reduced and faired to meet this requirement. The weight reduction by eliminating part of the superstructure could then be used to strengthen the remaining superstructure. It is believed that the number of fittings in the superstructure could be reduced. The important ones, such as main vents, openings to the pressure hull, the submerged signal gun, ammunition scuttle, and engine air induction, should be well protected from damage. This will require strong foundations and a rigid superstructure about these fittings.

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.

Periscope shears and radar mast require strengthening. Perhaps a periscope designed to telescope and not require such high shears is the solution.

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 on construction:

None. - See Item B(d) for fittings.

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.

No reduction in the above.

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.

No flooding.

(b) Sources of flooding.

1. Opened boundaries.

None.

2. Failure of 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.

(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 of 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.

The ammunition passing scuttle as now installed on submarines is weak. The upper portion and outer door is no stronger than the superstructure that surrounds it.

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.

Item B(d) for criticism of superstructure strength.

S. Miscellaneous.

Color effects on outside paint.

The gray paint was turned black where blistered. Paint on the starboard side was blackened by a substance similar to soot.

T. Coverings.

(a) Condition and cause of damage to:

1. Paint.

Exterior topside. Paint blistered on starboard side. Blistering occurred greatest at the stern and decreased towards the bow. The paint, starboard side, conning tower fairwater is completely covered with tiny blisters.

Exterior below water line. No damage.

Interior. No damage.

2. Galvanizing, plating, etc.

No damage.

3. Linoleum.

No damage.

4. Non skid.

No damage.

U. Welding and Riveting.

(a) General summary of welding performance.

Welding undamaged.

(b) General summary of rivet performance.

Rivets undamaged.

(c) Constructive criticism.

None.

SECTION III

PART C - INSPECTION REPORT

SECTION B - MACHINERY

A. General Description of Machinery Damage.

All machinery was undamaged and operable when the ship was reboarded.

B. Boilers.

Not applicable.

C. Blowers.

Not applicable.

D. Fuel Oil Equipment.

(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.

Not applicable.

F. Main Propulsion Machinery.

(a) Main and auxiliary engines.

1. Foundations.

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.

G. Reduction Gears.

(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.

(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.

(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.

Not applicable.

K. Pumps.

(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.

Discussed under Item F (Main Propulsion).

M. Propellers.

(a) Blades.

No damage.

(b) Caps, nuts, etc.

No damage.

N. Distilling Plant.

(a) Distillers.

No damage.

(b) Compressors.

No damage.

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

No damage.

O. Refrigerating and Air Conditioning Plants.

(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, controls, fittings,etc.

No damage.

P. Winches, Windlasses, and Capstans.

(a) Foundations 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.

No damage.

(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).

(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) Foundations and mountings.

No damage.

(g) Fans and motors.

T. Compressed Air Plant.

(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.

Not applicable. See Item F.

V. Piping Systems.

(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 blow (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.

No 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.

(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.

(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.

(a) Mechanical hoisting mechanism.

No damage.

(b) Training mechanism.

No damage.

SECTION III

PART C - INSPECTION REPORT

SECTION C - ELECTRICAL

A. General Description of Electrical Damage.

No electrical damage was received. All equipment was found to be in good condition upon return to the ship.

B. Electric Propulsion Rotating Equipment.

(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.

(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.

C. Electric Propulsion Control Equipment.

(k) Regulators.

No damage.

D. Generators - Ships Service.

See Item K.

E. Generators - Emergency.

Not applicable.

F. Switchboards, Distribution and Transfer Panels.

(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.

F. Switchboards, Distribution and Transfer Panels.

(j) Fuses.

No damage.

(k) Voltage regulators.

No damage.

G. Wiring, Wiring Equipment and Wireways.

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

No damage.

(b) Wireway supports.

No damage.

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

No damage.

H. Transformers (Lighting and I.C.).

(a) Framework and mountings.

No damage.

(b) Electrical connections.

No damage.

I. Submarine Propelling Batteries.

(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.

(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.

(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.

(b) Control equipment:

1. Framework and mounting.

No damage.

2. Electrical connections and wiring.

No damage.

No damage.

3. Contactors, switches and relays.

No damage.

4. Rheostats and resistors.

No damage.

5. Insulating materials.

No damage.

6. Pilot circuit devices.

No damage.

7. Brakes.

L. Lighting Equipment.

(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. Searchlights (36", 24", 12", and 8").

No search light aboard during test.

N. Degaussing Equipment.

Not applicable.

O. Gyro Compass Equipment.

(a) Master.

No damage.

(b) Repeaters.

No damage.

(c) DRT and DRA.

No damage.

P. Sound Powdered 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.

SECTION III

PART C - INSPECTION REPORT

SECTION D - 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.

Classification ~~(Cancelled)~~ (Changed to CONFIDENTIAL)
By authority of ~~Joint Chiefs of Staff (Action 16 Apr 47)~~
By John Biggar Capt AFSWP Date 1 May 51

CONFIDENTIAL

[redacted]

Defense Special Weapons Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

TRC

9 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER
ATTENTION: OMI/Mr. William Bush

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency (formerly Defense Nuclear Agency) Security Office has reviewed and declassified the following reports: + ST-H

AD-366748	XRD-65
AD-366747	XRD-64
AD-366746	XRD-63
AD-376826	XRD-60
AD-376824	XRD-58
AD-376825	XRD-59
AD-376823	XRD-57
AD-376822	XRD-56
AD-376821	XRD-55
AD-366743	XRD-54
AD-376820	XRD-53
AD-366742	XRD-52
AD-366741	XRD-51
AD-366740	XRD-50-Volume-2
AD-366739	XRD-49-Volume-1
AD-366738	XRD-48
AD-366737	XRD-47

TRC 9 April 1997

SUBJECT: Declassification of Reports

AD-366736	XRD-46
AD-366735	XRD-45
AD-366723	XRD-37
AD-366721	XRD-35
AD-366717	XRD-31-Volume-2
AD-366716	XRD-30-Volume-1
AD-366751	XRD-68-Volume-2
AD-366750	XRD-67-Volume-1
AD-366752	XRD-69
AD-366744	XRD-61.

All of the cited reports are now **approved for public release. Distribution statement "A"** now applies.

Ardith Jarrett

ARDITH JARRETT
Chief, Technical Resource Center

Completed
1 mar 2000
B.W