AD NUMBER

AD367453

CLASSIFICATION CHANGES

TO: unclassified

FROM: confidential

LIMITATION CHANGES

TO:

Approved for public release, distribution unlimited

FROM:

Distribution: USGO: others to Director, Defense Atomic Support Agency, Washington, D. C. 20301.

AUTHORITY

DSWA ltr., 18 Apr 1997; DSWA ltr., 18 Apr 1997

XRD

CONFIDENTIAL

(14) XRD-88

CONFIDENTIAL
Security Information

(9)

BUREAU OF SHIPS GROUP (1)

TECHNICAL INSPECTION REPORT.

CONFIDENTIAL
Security Information

Classification (Cancelled) (Changed to _____)
By authority of JOINT CHIEFS OF STAFF JCS 1795/36 DATED 15 APRIL 1949
By John D. Coyelle Date 24 SEP 1953

367453

(6) OPERATION CROSSROADS.

U.S.S. NEVADA (BB36).

TEST BAKER [U]. (8)

U. S. GOVERNMENT AGENCIES MAY OBTAIN COPIES OF THIS REPORT DIRECTLY FROM DDC. OTHER QUALIFIED DDC USERS SHALL REQUEST THROUGH
Director
Defense Atomic Support Agency
Washington, D. C. 20301

(11) 1947,

(12) 123p.

CONFIDENTIAL
Security Information

OPERATION CROSSROADS

DIRECTOR OF SHIP MATERIAL

JOINT TASK FORCE ONE

DDC
RECEIVED
DEC 2 1965
TISIA E

SECRET

03015713

REG. NO.

9257-8

CONFIDENTIAL

GROUP-3
Downgraded at 12 year intervals;
Not automatically declassified.
1 JAN 1965

193 600

CONFIDENTIAL

BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT

U. S. GOVERNMENT AGENCIES MAY OBTAIN COPIES OF THIS REPORT DIRECTLY FROM DDC. OTHER QUALIFIED DDC USERS SHALL REQUEST THROUGH

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

SECRET

USS NEVADA (BB36)

Page 1 of 123 Pages

"This document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U. S. C., Section 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law."

CONFIDENTIAL

GROUP-3
Downgraded at 12 year intervals;
Not automatically declassified.

1 JAN 1965

TABLE OF CONTENTS

	PAGE NO.
Ship Characteristics Sheet	3
Midship Section	4
Overall Summary of Damage	5
Hull Technical Inspection Report (Section I)	14
Machinery Technical Inspection Report (Section II)	33
Electrical Technical Inspection Report (Section III)	44
Photographic Section (Section IV)	52
Ship Flooding Diagram (Appendix)	82
Commanding Officers Report (Appendix)	84

U.S.S. NEVADA (BB 36)

SHIP CHARACTERISTICS

Building Yard: Fore River Shipbuilding Company.

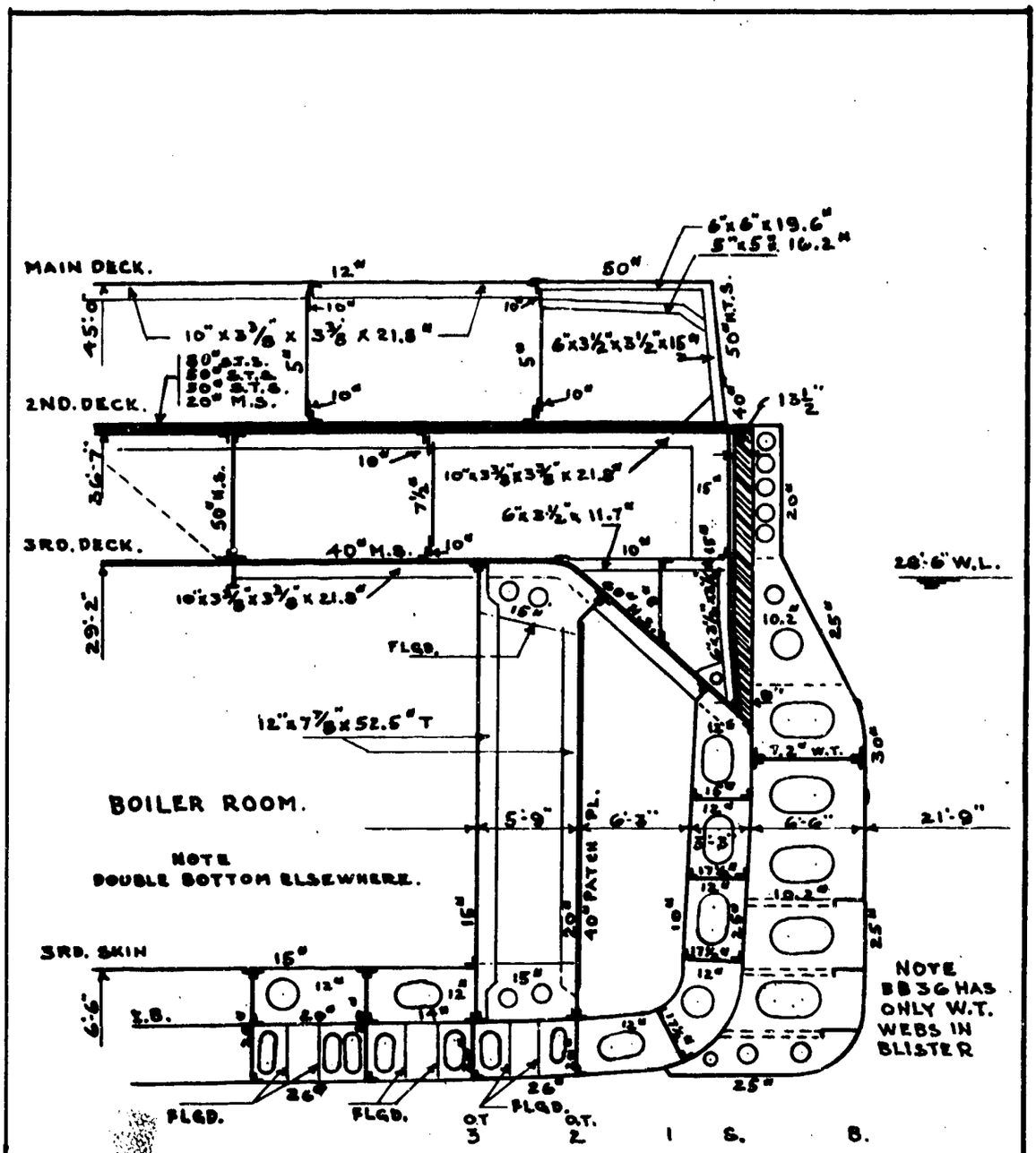
Commissioned: 11 March 1916.

HULL

Length Overall: 583 feet 0 inches.
Length on Waterline: 575 feet 0 inches.
Beam (extreme): 108 feet 0 inches.
Depth (molded at side, to main deck, amidships):
44 feet 5 1/2 inches.
Drafts at time of test: Fwd. 28 feet 4 inches.
Aft. 32 feet 9 inches.
Standard displacement: 29,000 tons.
Displacement at time of test: 32,690 tons.

MAIN PROPULSION PLANT

Main Engines: Parsons turbines, one high pressure, low pressure, and astern turbine for each of the two shafts. Mfg'd by the New York Navy Yard. Steam press. 265 psi. gauge.
Reduction Gears: Two complete units installed, single reduction type.
Boilers: Six installed - Water tube express type, Mfg'd by Norfolk Navy Yard.
Shafting: Two installed-outside dia., 14", inside dia. 8".
Main Condensers: Two installed, cooling surface 14569 sq. ft. Mfg'd by Fcre River Shipbuilding Corp'n.
Propellers: Two installed, blades Mfg'd by N.Y. Phil.
Turbo Generators: Four installed, 400 KW. Mfg'd by Westinghouse Electric Co., turbines by the Moore Steam Turbine Co,



MIDSHIP SECTION

TEST B

SECRET

U.S.S. NEVADA (BB36)

9257-B

TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

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

	Draft Forward	Draft Aft	List
Before Test	28' 9"	22; 6"	1/2° Port
After Test	28' 6"	33' 0"	1 1/4° Port

The drainage tank, D-614-W, was completely filled, the H.P. compressor room, D-536-E, was completely flooded, and the steering gear compartment, D-437-E, and access trunk, D-426-T were slightly flooded from a leak in the rudder stock packing gland. The extent of this flooding is due to the absence of check valves in the gravity drain system.

The 14 inch handling room, D-407-B, contains three inches of water as a result of a split fitting in an overboard discharge line.

Inner bottom tanks, frames 82 to 98, and wing tanks, frames 54 to 110, are contaminated, apparently from seepage through seams in the shell plating.

Water taken in through ventilation systems has flooded several upper spaces, varying from a traceto two or three inches.

The after diesel generator room and the steering gear room were flooded. Flooding was progressive from the steering gear room (D-437-E) to the drainage tank D-614-W, overflowing the drainage tank to completely flood the H.P. air compressor and diesel generator room (D-536-E).

(b) Structural damage.

HULL

There is practically no increase in damage to the superstructure as a result of Test B. Some previous existing cracks were increased. The smoke pipe is collapsed further. There does not appear to be any increase inthedishing of superstructure decks, bulkheads, or deck houses. The upper and main decks in previously damaged areas may have deflected, as the buckling of some of the supporting stanchions between the main and second decks appears to have increased slightly. Two uptakes at frame 83, port and starboard, are bulged, probably by blast. There is evidence of increased damage on the third deck. Between frames 23 and 30 on the second platform level. The starboard bulkhead of compartment A-505-A is bulged in about two inches, and the frames are slightly bent. Several of the bulkheads which support barbettes 1 and 2 are buckled just below their connection to the second deck.

MACHINERY

No comment.

ELECTRICAL

Not observed.

(c) Other damage.

HULL

The only further damage appears to be the rupture and distortion of all the boiler casings that were repaired after being damaged during Test A.

MACHINERY

The intake shutters of 11 out of the 12 forced draft blowers were driven past their stop pins. The foundation of No. 3 spring bearing (starboard shaft alley) was loosened where it is bolted onto the ship's structure. The flange of the overboard connection to the port main condenser (which was open during the test) sprung a

small leak. The electric steering system, the after diesel generator and the after H.P. air compressor were damaged by flooding. Several gages scattered throughout the plant were disarranged. No other damage was found by visual inspection. Shock may have thrown some units out of alignment.

ELECTRICAL

All electrical equipment mounted in the steering engine room the after diesel generator room, the after gyro compass room, and the after high pressure air compressor compartment were rendered inoperative by flooding. The forward and after gyro showed some signs of shock damage.

II. Forces Evidenced and Effects Noted.

(a) Heat.

HULL

There is no evidence of heat.

MACHINERY

There was no evidence of heat.

ELECTRICAL

None observed.

(b) Fire and Explosions.

HULL

There were no fires or explosions.

MACHINERY

There was no evidence of fires or explosions.

ELECTRICAL

None observed.

(c) Shock.

HULL

Outside of the light topside damage attributable to air blast or falling water, the only effect of Test B upon the ship appears below the waterline. This damage is believed to be directly attributable to a shock wave transmitted into the structure by the underwater pressure wave. This damage has resulted in the loosening of some foundation bolts, the breaking of pipe hangers, the scattering of equipment, and the opening of seams in the underwater shell.

MACHINERY

The NEVADA received an underwater shock of considerable magnitude, as evidenced by loosening of holding down bolts, cracking of paint around machinery foundations, disarrangement of gages, etc. The effects of shock are particularly noticable on the starboard side of the vessel.

ELECTRICAL

The fact that this vessel experienced a fairly large amount of shock was evidenced in the damage to both gyro compasses, dislodging of finder relays in the automatic telephone switchboard, and the movement of the starboard anchor windlass motor. With the exception of the damage to the gyro compasses, the shock had no significant effect on the vessel's electrical equipment. The apparent direction of this shock could not be ascertained.

(d) Pressure.

HULL

The existence of a mild blast wave is evidenced in the further damage of the boiler casings. The additional collapse of the

outer casing of the stack could also be a result of air blast, or the effect of falling water.

MACHINERY

Blast pressure jammed shut the intake flappers of 11 of the 12 forced draft blowers.

ELECTRICAL

None observed.

(e) Effects peculiar to the Atom Bomb.

HULL

Excluding radioactivity, the effect of the bomb upon this ship does not appear to be peculiar.

MACHINERY

Shock and blast pressure of such magnitude at the range of the NEVADA from an underwater explosion are apparently peculiar to the Atom Bomb.

ELECTRICAL

None observed.

III. Results of damage.

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

HULL

Except for the ruptured boiler casings, the effect upon machinery, electrical and ship control is practically negligible.

MACHINERY

The effect of the test on the machinery of the NEVADA is largely conjectural in the absence of opportunity fortesting out machinery, some of which may be out of alignment. Effects of known damage are as follows:

Boilers could have been steamed at only very low rates (natural draft) until the forced draft blower intake flappers were cleared, requiring about 4 hours. The after diesel generator and main steering system were made inoperable by flooding, but it is not believed that this would have occurred if the crew had been aboard. In any case, damage to them would not have handicapped operation appreciably. Ample power was available, and the emergency steering system was fully operable after Test B.

ELECTRICAL

The flooding of the steering engine room would not have greatly decreased the maneuverability of the vessel, since steam steering could be used as a stand-by. Other propulsion, and ship control electrical equipment was not affected by Test B.

(b) Effect on gunnery and fire control.

HULL

The turrets show evidence of being lifted by the underwater shock. The connecting bolts for the rear holding down clip of turret 2 are sheared off. The shell hoist motors of turrets 3 and 4 are out of alignment and the elevating screw in turret 2 binds. It is believed that the effect of the test upon fire control is very small.

MACHINERY

No comment.

ELECTRICAL

There was no visible indication that Test B had any effect on gunnery or fire control electrical equipment.

(c) Effect on water-tight integrity and stability.

HULL

The effect on watertight integrity and stability is negligible.

MACHINERY

No comment.

ELECTRICAL

There was no visible indication that Test B had any effect on watertight integrity and stability of this vessel from an electrical standpoint.

(d) Effect on personnel and habitability.

HULL

Aside from the radioactivity, the effect would have been negligible.

MACHINERY

It is not believed that Test B would have had any appreciable effect on personnel or habitability except for radioactivity.

ELECTRICAL

The habitability of this vessel would not have been effected by electrical damage.

(e) Effect on fighting efficiency.

HULL

The only item that would have affected the fighting efficiency was the shearing of bolts in the rear holding down clip in turret 2.

MACHINERY

Boiler power was temporarily greatly reduced by the jamming of the forced draft blower intake shutters. It is estimated that maximum speed would have been reduced to about 8 knots for approximately 4 hours, after which speed could have gradually been raised to normal maximum.

ELECTRICAL

There was no effect on the fighting efficiency of this vessel from electrical damage.

IV. General Summary of Observers' Impressions and Conclusions.

HULL

The extent of damage to the exterior hull below the waterline and the hull appendages cannot be ascertained unless the ship is dry docked. Apparently, the ship suffered only minor damage from Test B.

MACHINERY

Modern battleships do not have blowers that could be made inoperable by a casualty of the nature described above. It is not believed that the machinery of a modern battleship would have received any appreciable damage at the range at which the NEVADA was exposed.

ELECTRICAL

In general, the shock of the underwater atom bomb

burst had no serious effect on the electrical equipment of this vessel. Due to availability of stand-by equipment, the loss of the after emergency diesel generator sets, electric steering, and the gyro compasses would not have greatly affected the operability and fighting efficiency of the vessel.

V. Preliminary General or Specific Recommendations of Inspection Group.

HULL

No comment.

MACHINERY

As the blower arrangement on the NEVADA is obsolete, no recommendation is pertinent.

ELECTRICAL

It is recommended that the gyro compass element supporting mechanism be made more resistant to shock. In addition, some means should be provided to prevent spillage of mercury in the Arma type gyro compasses.

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.

	Draft Forward	Draft Aft	List
Before Test	28' 9"	22' 6"	1/2° port
After Test	28' 6"	33' 0"	1 1/4° port

The drainage tank, D-614-W, was completely filled, the H.P. compressor room, D-536-E, was completely flooded, and the steering gear compartment, D-437-E, and access trunk, D-426-T were slightly flooded from a leak in the rudder stock packing gland. The extent of this flooding is due to the absence of check valves in the gravity drain system.

The 14 inch hand ..g room, D-407-B, contains three inches of water as a result of a spli: fitting in an overboard discharge line.

Inner bottom tanks, frames 82 to 98, and wing tanks, frames 54 to 110, are contaminated, apparently from seepage through seams in the shell plating.

Water taken in through ventilation systems has flooded several upper spaces, varying from a trace to two or three inches.

(b) Structural damage.

There is practically no increase in damage to the superstructure as a result of Test B. Some previously existing cracks were increased. The smoke pipe is collapsed further. There does not

appear to be any increase in the dishing of superstructure decks, bulkheads, or deck houses. The upper and main decks in previously damaged areas may have deflected, as the buckling of some of the supporting stanchions between the main and second decks appears to have increased slightly. Two uptakes at frame 83, port and starboard, are bulged, probably by blast. There is evidence of increased damage on the third deck, between frames 23 and 30, on the second platform level. The starboard bulkhead of compartment A-505-A is bulged in about two inches, and the frames are slightly bent. Several of the bulkheads which support barbettes 1 and 2 are buckled just below their connection to the second deck.

(c) Other damage.

The only further damage appears to be the rupture and distortion of all the boiler casings that were repaired after being damaged during Test A.

II. Forces Evidenced and Effects Noted.

(a) Heat.

There is no evidence of heat.

(b) Fires and Explosions.

There were no fires or Explosions.

(c) Shock.

Outside of the light topside damage attributable to blast, or falling water the only effect of Test B upon the ship appears below the waterline. This damage is believed to be directly attributable to shock wave transmitted into the structure by the underwater pressure wave. This damage has resulted in the loosening of some foundation bolts, the breaking of pipe hangers, the scattering of equipment, and the opening of seams in the underwater shell.

(d) Pressure.

The existence of a mild blast wave is evidenced in the further damage of the boiler casings. The additional collapse of the outer casing of the stack could also be a result of air blast, or the effect of falling water.

(e) Effects peculiar to the Atom Bomb.

Excluding radioactivity, the effect of the bomb upon this ship does not appear to be peculiar.

III. Effects of Damage.

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

Except for the ruptured boiler casings, the effect upon machinery, electrical and ship control is practically negligible.

(b) Effect on gunnery and fire control.

The turrets show evidence of being lifted by the underwater shock. The connecting bolts for the rear holding down clip of turret 2 are sheared off. The shell hoist motors of turrets 3 and 4 are out of alignment and the elevating screw in turret 2 binds. It is believed that the effect of the test upon fire control is very small.

(c) Effect on watertight integrity and stability.

The effect on watertight integrity and stability is negligible.

(d) Effect on personnel and habitability.

Aside from the radioactivity, the effect would have been negligible.

(e) Effect on fighting efficiency.

The only item that would have affected the fighting efficiency was the shearing of bolts in the rear holding down clip in turret 2.

IV. General Summary of Observers' Impressions and Conclusions.

The extent of damage to the exterior hull below the waterline and the hull appendages cannot be ascertained unless the ship is dry docked. Apparently, the ship suffered only minor damage from Test B.

V. Preliminary General or Specific Recommendations of Inspection Group.

No comment.

VI. Instructions for loading the vessel specified the following:

ITEM	LOADING
Fuel oil	33.3%
Diesel oil	50%
Ammunition	66 2/3%
Potable and reserve feed water	95%
Salt water ballast	1850

Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the ship's force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

DETAILED DESCRIPTION OF HULL DAMAGE

A. General Description of Hull Damage.

(a) Overall condition of vessel.

Structurally, the only significant damage reported is in way of the underwater shell amidships. Some of the inner bottom and wing tanks apparently have small seam leaks. The extent of this damage cannot be ascertained until the ship is placed in dry-dock.

Light equipment is displaced. There is a slight increase in some previous damage to deck beams, brackets and stanchions. Several ventilation systems have allowed topside water to enter some compartments.

General views of the exterior are shown on pages 53 to 76, inclusive.

(b) General areas of hull damage.

The hull damage appears to be along the bottom between frames 82 and 98, and in way of the port and starboard blisters, frames 54 to 110. Some of the lower compartments and tanks in way of the steering gear room, D-437-E, were flooded through gravity drains from water seeping in around the rudder post.

An increase in the deflection of the weather deck is noticeable between frames 23 and 30, and aft of No. 4 barbette.

(c) Apparent causes of hull damage.

The effect of blast at this range is apparently very light. Damage sustained by the hull is believed to be a result of the underwater shock wave.

(d) Principal areas of flooding with sources.

The port engine room is flooded to a depth of two feet, through a cracked flange in the condenser overboard discharge

line.

The 14 inch handling room, D-407-B, contains about three inches of water, which entered through a split in an overboard discharge line.

Inner bottom tanks between frames 82 and 98 and wing tanks between frames 54 and 110 have partially flooded apparently through open seams in the shell plating.

A few after spaces were flooded by water which seeped through the rudder trunk and backed into these spaces through drainage lines.

Some compartments above the water line contained small amounts of water contaminated by radioactive particles which apparently came through the ventilation system from topside.

(e) Residual strength, buoyancy and effect of general condition of hull on operability.

There is no appreciable change in residual strength, buoyancy or operability.

B. Superstructure.

(a) Description of damage.

There is no significant additional damage to the superstructure. Topside structure weakened during Test A shows a slight increase in damage in a few places; the stack is further distorted, for instance, and equipment is displaced.

(b) Causes of damage in each area.

The small amount of damage observed could be attributed to a light blast wave or falling water.

(c) Evidence of fire in superstructure.

None.

(d) Estimate of relative effectiveness against heat and blast of: Various plating thickness, various shaped surfaces, STS compared to MS, aluminum structures.

There was not a sufficient amount of damage sustained to make a relative comparison among these items.

(e) Constructive criticism of superstructure design or construction.

Structurally, there is no criticism of the performance of individual superstructure items at this range.

C. Turrets, Guns and Directors.

(a) Protected Mounts.

1. General condition, including operability, if known.

Turrets 1 to 4 inclusive:

The turrets were considerably jarred by the underwater shock. There is evidence that both turrets 1 and 2 lifted. In turret 2 the connecting bolts for the rear holding down clip are sheared off. This permitted the clip to fall between the barbette and stool but does not interfere with the train of the turret. The operability of all turrets is unaffected by the test.

On the first platform, under turret 1, the transverse bulkhead at frame 32 is buckled at the top in three places. The longitudinal bulkhead on the port side of the 14 inch handling room, A-421-B, is also slightly buckled at the top. Under turret 2, the transverse bulkhead at frame 48 was buckled across the entire top. This damage was caused by the interaction of the underwater shock force and the inertia of the barbettes and turrets.

5" / 38, mounts (twin)

No damage.

2. Effectiveness of installed turrets or shields.

Satisfactory.

(b) Unprotected Mounts.

1. General condition, including operability, if known.

No damage.

2. Effectivness and sufficiency of crew shelters.

The shields provide little protection for the crew against blast and radioactivity.

(c) Directors and Rangefinders (in enclosed mounts).

No damage.

(d) Constructive criticism of design or construction of mounts, directors, foundations and shelters.

No comment.

D. Torpedo Mounts, Depth Charge Gear.

Not applicable.

E. Weather Deck.

(a) General condition of deck and causes.

There appears to be a slight increase in the deflection of the forecastle deck just forward of No. 1 turret and of the main deck aft of No. 4 turret. This is evidenced in a small increase of buckling of stanchions in the spaces immediately below the areas that were damaged in Test A. Inasmuch as the blast was so light as not to have damaged any portion of the superstructure, it is believed that this further deck deflection may be the result of the underwater shock wave transmitted through the shell up into the ship or of water falling upon the already weakened weather decks. The nine deck deflection gages installed throughout the length of the ship to measure the relative displacements of the weather decks to the decks immediately below recorded no deflections.

(b) Usability if decks in damaged condition.

The weather decks show no significant change from their condition before Test B.

(c) Condition of equipment and fittings:

1. Mooring and towing fittings:

No further damage over that caused by Test A is apparent.

2. Boats and boathandling; life rafts;

There were no boats aboard, and there is no further damage to boathandling equipment.

3. Airplane handling gear.

The stern airplane crane was collapsed during Test A. The crane machinery is intact. No damage attributable to Test B is evident.

4. Barriers, arresting gear, catapults, etc.

The catapult does not appear to have received any further damage.

F. Exterior Hull.

(a) Condition of plating and causes of damage.

There is no damage to the hull above the water-line.

(b) Condition of exterior hull fittings and cause of damage.

No change in condition of hull fittings.

(c) Details of any impairment of sheer strake.

None.

(d) Condition of side armor belt.

Intact, no damage.

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

(a) Damage to structure and causes.

There is no significant damage attributable to Test B. Most of the areas damaged during Test A have received slight additional damage due to the weakened structure, apparently as a result of the underwater shock wave.

(b) Damage to joiner bulkheads and causes.

Joiner bulkheads in the forward section on the main and second decks are lightly buckled, due, apparently to the deflection of the decks.

(c) Details of damage to access closures and fittings.

An air port at frame 60 in compartment A-150-1L, main deck, starboard, is damaged. The temporary air ports in the shipfitters shop, main deck, are blown in.

(d) Condition of equipment within compartments.

Equipment which was not secured is generally displaced. Some lightly welded clips and hangers are broken loose, allowing lockers and shelving to be thrown about.

(e) Evidence of fire.

No evidence of fire.

(f) Damage in way of piping, cables, ventilation ducts, etc.

Outside of a few ventilation ducts that are jarred loose, all the piping, cables, and ventilation systems are in good condition.

(g) Estimate of reduction in watertight subdivision; habitability and utility of compartments.

There is no apparent reduction in watertight subdivision, habitability or utility of compartments.

H. Armor Decks.

The armor decks are intact and undamaged.

I. Interior Compartments (below w.l.).

(a) Damage to structure and causes.

Between the first and second platforms, frames 23-30, the starboard inboard transverse bulkhead is bulged inboard about two inches and the frames are slightly bent. Bulkheads 32 and 48 and the longitudinal bulkhead on the port side of the 14-inch handling room, A-421-B, are slightly buckled just below the first platform level. This damage is a result of the interaction of the forces transmitted through the structure by the underwater pressure wave and the inertia of the barbettes and turrets.

(b) Damage to joiner bulkhead and causes.

No damage.

(c) Details of damage to access closures and fittings.

No damage.

(d) Condition of equipment within compartments.

All furniture, machinery and miscellaneous equipment not secured are overturned and thrown about, bunks and lockers are down, floor plates are dislodged.

(e) Flooding.

The following compartments were flooded due to leakage around the rudder stock:

D-437-E, two feet; D-614-W, completely flooded; D-536-E, completely flooded; D-426-T, six inches.

The 14-inch handling room, D-407-B, contained about three inches of water from a break in an overboard discharge line.

(f) Damage in way of piping, cables, ventilation ducts, shafts, etc.

No damage.

(g) Estimate of reduction in watertight subdivision, habitability, and utility of spaces.

No appreciable reduction.

J. Underwater Hull.

(a) Interior inspection of underwater hull.

The starboard inboard longitudinal bulkhead between the first and second platform, frames 23 to 30, is bulged about two inches inboard. Soundings of inner bottom tanks in way of the keel, frames 82 to 98, indicate that some damage to the shell plating has occurred, allowing seepage of sea water into these tanks.

(b) Effect of damage on buoyancy, on operability or maneuverability

Buoyancy was decreased slightly incident to the minor flooding.

(c) Any known or suspected damage to shafts and propellors, struts, rudders, external keels.

None known.

(d) Details of impairment to keel structure.

Not observed.

K. Tanks.

(a) Condition of tanks in areas of damage.

The commanding officer reports that the following tanks are contaminated with sea water.

A-26-F	B-14-E	B-22-F	B-30-F	B-15-F
B-31-F	C-18-F	C-26-F	C-34-F	C-9-F
C-17-F	C-19-F	C-25-F	C-27-F	C-33-F
C-35-F	C-905-F	C-907-F	C-908-F	C-909-F
C-910-F	D-14-F	D-16-F	D-20-F	

All tanks that were flooded prior to Test B are not included in this tabulation. The increase in water in the above listed tanks was from one foot to completely filled. Limited time prevented complete inspection of the tanks.

(b) Contamination of liquids.

1. Extent and cause, if known.

Salt water contaminated the tanks listed above. The extent of this contamination is not accurately known as not all of the fuel tanks were inspected. It is believed that these tanks were contaminated by seepage through seams in the shell as a result of the underwater shock wave.

2. Effect upon ship operability.

The cruising radius of the ship would be materially reduced due to the fuel contamination in those tanks open to the sea.

(c) Damage (known or suspected) to torpedo defense system.

There may have been additional openings in the shell in way of the blister voids, as indicated by the additional flooding of blister voids on the port side.

L. Flooding.

The primary causes of flooding were leakage through the rudder trunk, through opened seams in the shell, and through cracks in piping. Secondary causes were flooding through the after drainage system which had no check valves to prevent back flow, through adjacent tank boundaries that were non-tight originally, and thrcugh ventilation ducts.

Before Test B Drafts Fwd. 28'-9'' Aft. 32'-6'' List 1/2°port
After Test B Drafts Fwd. 28'-6'' Aft.33'-0'' List 1 1/4°port

The Port Engine Room flooded to a depth of two feet through a crack in a brazed flange in the condenser overboard discharge.

Water which leaked through the rudder trunk into the steering gear compartment, D-437-E, drained into the Drain Collecting Tank, D-614-W. When D-614-W became completely full, water flowed backwards in the system due to the absence of check valves. The back flow flooded the H.P. Air Compressor Room, D-536-E, completely, and caused partial flooding of D-437-E to a depth of two feet, and of D-426-T to a depth of six inches.

D-407-B partially flooded to a depth of three inches from a split in an overboard discharge line.

The following tanks flooded through opened seams, adding from 1 to 2 feet of water to fill the tanks to capacity: A-26-F, B-14-F, B-15-F, B-[illegible]F, B-30-F, B-31-F, C-9-F, C-17-F, C-18-F, C-19-F, C-25-F, C-[illegible]-F, C-27-F, C-33-F, C-34-F, C-35-F, C-905-F, C-907-F, and C-908-F, C-909-F and C-910-F.

The following spaces had water varying from a trace to two or three inches on deck in the lowest part which entered through ventilation systems either as a direct result of the test or as a result of washing down the ship with high pressure hoses during decontamination: A-150-1L, A-543-E, B-171-L, B-270-4L, C-501-E, D-201-4L, D-203-1L, D-203-4L, D-206-2L, D-310-L, D-312-L, and D-314-L.

The flooding in the engineroom and in the after spaces caused by back flow in the drainage system could have been isolated and stopped by ships force. Flooding of the fuel oil tanks could not have been controlled and would have caused serious contamination of fuel oil. However, in general, the fuel oil tanks and blisters were not initially oil tight between adjacent tanks. The flooding through the ventilation systems was not serious and could have been controlled by ships force.

M. Ventilation.

(a) Damage to ventilation system and causes; ducts; closures; habitability.

The port and starboard uptakes at frame 83 are bulged, apparently by blast. Some ventilation ducts are separated between runs. However there is no adverse affect on habitability.

(b) Evidence that the ventilation system conducted heat, blast, fire or smoke below decks.

None.

(c) Evidence that ventilation system allowed progressive flooding.

None - however, some seepage from topside apparently came through the system. This water probably came from the high pressure washing down of the ship during decontamination.

(d) Constructive criticism of design and construction of system.

This particular system of ventilation seems quite vulnerable to radioactive particles, which may be washed into the interior compartments along with large quantities of sea water when the ship is exposed to the base surge of a shallow depth atomic explosion.

N. Ship Control.

(a) Damage to ship control stations and causes.

1. Bridge area.

No damage.

2. C.I.C.

No damage.

3. Gyro Compass equipment.

One gimbal is broken on the forward gyro compass and mercury is spilled from the flotation tank. The after gyro base is flooded with sea water.

4. Steering gear.

Had the ship been manned, the steering gear would have been undamaged. While the ship was abandoned leakage from the stuffing gland around the rudder post flooded this space and grounded all electrical fittings.

5. Interior Communications.

No significant damage.

(b) Constructive Criticism of ship control systems.

1. Layout and arrangement.

No criticism.

2. Location with respect to protection.

No criticism.

O. Fire Control.

(a) Damage to fire control stations and causes.

1. Directors and elevated control positions.

Additional damage to main battery directors is not apparent. Mk. 37 directors are frozen in train but the cause is not determined. Other control stations are not damaged.

2. Plot rooms and protected spaces.

No damage.

(b) List of stations having insufficient protection and estimated effect on fighting efficiency of the loss of each.

Little loss in efficiency is apparent from the test. The personnel manning unprotected stations may have been casualties from exposure to radioactivity.

(c) Constructive criticism of location and arrangement of stations.

Personnel in open stations should be provided with some sort of protection against radioactive spray and water.

P. Ammunition Behavior.

(a) Ready service ammunition; location protection; behavior under heat and blast.

Five main battery projectiles and two 5" projectiles are displaced as a result of shock. Otherwise the location, protection and stowage of ammunition is highly satisfactory. There is no change in stability of any ammunition resulting from blast or shock.

(b) Magazines; location; protection; forces involved; behavior.

Satisfactory, except a few battens became dislodged and several cans of 40 MM and 20 MM ammunition were thrown on the deck. (Photo 1934-5, page 77).

(c) List of stowages which are insufficiently protected and effects on ship survival of explosion of each stowage.

None.

(d) Behavior of gasoline stowage facilities.

No gasoline on board.

Q. Ammunition Handling.

(a) Condition and operability of ammunition handling devices.

The hydraulic motors for the right and left shell hoist in turret 3 and the hydraulic motor for the right shell hoist in turret 4 are out of alignment fromshock. All other ammunition handling equipment is satisfactory.

(b) Evidence that any ammunition handling devices contributed to passing of heat, fire, blast or flooding water.

None.

(c) Constructive criticism of design and construction of ammunition handling devices.

No comments.

R. Strength.

(a) Permanent hog or sag.

None evident.

(b) Shear strains in hull plating.

None apparent.

(c) Evidence of transverse or racking strains.

None evident.

(d) Details of any local failures in way of structural discontinuities.

No failures attributable to Test B.

(e) Evidence of panel deflection.

The starboard longitudinal bulkhead of compartment A-505-A, second platform, frames 23 to 30, is deflected inboard a maximum of about two inches.

(f) Turret, machinery and gun foundations.

The bulkheads supporting turrets one and two are slightly bulged near their connection to the third deck.

S. Miscellaneous.

No comment.

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 after diesel generator room and the steering gear room were flooded. Flooding was progressive from the steering gear room (D437E) to the drainage tank D614W, overflowing the drainage tank to completely flood the H. P. air compressor and diesel generator room (D-536E).

(b) Structural damage.

No comment.

(c) Other damage.

The intake shutters of 11 out of 12 forced draft blowers were driven past their stop pins. The foundation of No. 3 spring bearing (starboard shaft alley) was loosened where it is bolted onto the ship's structure. The flange of the overboard connection to the port main condenser (which was open during the test) sprung a small leak. The electric steering system, the after diesel generator and the after H.P. air compressor were damaged by flooding. Several gages scattered throughout the plant were disarranged. No other damage was found by visual inspection. Shock may have thrown some units out of alignment.

II. Forces Evidenced and Effects Noted.

(a) Heat.

There was no evidence of heat.

(b) Fires and explosions.

There was no evidence of fires or explosions.

(c) Shock.

The NEVADA received an underwater shock of considerable magnitude, as evidenced by loosening of holding down bolts, cracking of paint around machinery foundations, disarrangement of gages, etc. The effects of shock are particularly noticeable on the starboard side of the vessel.

(d) Pressure.

Blast pressure jammed shut the intake flappers of 11 out of 12 forced draft blowers.

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

Shock and blast pressure of such magnitude at the range of the NEVADA from an underwater explosion are apparently peculiar to the atom bomb.

III. Effects of Damage.

(a) Effect on machinery and ship control.

The effect of the test on the machinery of the NEVADA is largely conjectural in the absence of opportunity for testing out machinery, some of which may be out of alignment. Effects of known damage are as follows:

Boilers could have been steamed at only very low rates (natural draft) until the forced draft blower intake flappers were cleared, requiring about 4 hours. The after diesel generator and main steering system were made inoperable by flooding, but it is not believed that this would have occurred if the crew had been aboard. In any case, damage to them would not have handicapped operation appreciably. Ample power was available,

and the emergency steering system was fully operable after Test B.

(b) Effect on gunnery and fire control.

No comment.

(c) Effect on watertight integrity and stability.

No comment.

(d) Effect on personnel and habitability.

It is not believed that Test B would have had any appreciable effect on personnel or habitability except for radioactivity.

(e) Total effect on fighting efficiency.

Boiler power was temporarily greatly reduced by the jamming of the forced draft blower intake shutters. It is estimated that maximum speed would have been reduced to about 8 knots for approximately 4 hours, after which speed could have gradually been raised to normal maximum.

IV. General Summary.

Modern battleships do not have blowers that could be made inoperable by a casualty of the nature described above. It is not believed that the machinery of a modern battleship would have received any appreciable damage at the range of which the NEVADA was exposed.

V. Preliminary Recommendations.

As the blower arrangement on the NEVADA is obsolete, no recommendation is pertinent.

DETAILED DESCRIPTION OF MACHINERY DAMAGE

A. General Description of Machinery Damage.

(a) Overall condition.

A flange in the port main overboard pipe opened slightly allowing water to leak into the engine room, but this did not impair operability. There is evidence of shock in numerous places, particularly the starboard engine room. This did not cause any visible damage but may have caused misalignment of some units. In the absence of opportunity for testing equipment, no positive statement as to overall condition can be made, however, it does not appear that operability of any unit was seriously impaired. The main steering unit is out of commission due to flooding, but the emergency steering unit is operable. The after diesel generator is inoperable because of flooding. The flooding of the steering gear room and after diesel generator could probably have been controlled if the crew had been aboard.

(b) Areas of major damage.

No major damage. Shock was particularly apparent in the starboard engine room. Evidence of shock are: Paint cracked at foundation and flanges of turbines, reduction gears, condensers, etc., loose gear thrown around.

(c) Primary causes of damage.

Shock and flooding (the latter could probably have been controlled if the crew had been aboard).

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

It is not believed that the test affected operation of the machinery plant to any appreciable extent, although it should be emphasized that most of the equipment has not been tested, and some units may be out of alignment.

B. Boilers.

Some of the temporary repair work done on #6 boiler after Test A was disarranged, giving evidence of some blast pressure and shock. This work was hastily done. The performance of the other boilers indicates that this damage would not have occurred if the work in question had been up to normal standards of workmanship. It is concluded that the test had no appreciable effect on the boilers. Photographs 140-8 and 9, pages 78 , and 79 .

Boilers 2 and 5 were tested hydrostatically for 3 1/2 hours after Test B. Comparison of the results with similar tests before Test B indicate that tightness of the boilers was not affected by Test B.

HYDROSTATIC TEST DATA ON BOILER #2

TIME	PRESSURE BEFORE TEST B	PRESSURE AFTER TEST B
0000	310 #	300
0030	308	300
0100	305	298
0130	302	297
0200	300	295
0230	297	293
0300	295	293
0330	292	292

HYDROSTATIC TEST DATA ON BOILER #5

0000	300	300
0030	299	298
0100	297	297
0130	294	297
0200	290	296
0230	285	294
0300	281	294
0330	276	293

C. Blowers, Forced Draft.

There was no evidence of damage to the blowers except the jamming of the intake shutters (see item "f"). All blowers have been turned freely by hand after Test B.

(a) Turbines or motors.

No apparent damage.

(b) Blowers.

No apparent damage.

(c) Foundations.

No apparent damage.

(d) External fittings.

No apparent damage.

(e) Shutters.

The intake shutters were pushed beyond their stops on eleven of the twelve blowers. This would have prevented operation of the boilers until repaired, requiring about 4 hours.

D. Fuel Oil Equipment.

No apparent damage.

E. Boiler Feedwater Equipment.

No apparent damage.

F. Main Engines.

The shock apparently caused some momentary displacement of turbines and heavy members connected thereto, as evidenced by some holding down bolts being slightly loosened and some paint being cracked around holding down bolts and sliding feet. This is particularly marked on the starboard side. The amount of motion was not over a few thousandths of an inch. There is no evidence of damage to the turbine, although only a visual external inspection was made.

G. Reduction Gears.

There was slight relative movement between the starboard reduction gear casing and the thrust bearing foundation, as evidenced by cracked paint and slightly loosened holding down bolts. There is no evidence of damage to the reduction gears from an external inspection.

H. Shafting and Bearings.

The foundation of No. 3 spring bearing, starboard shaft alley, was loosened where bolted to the ship's structure. No damage was apparent from visual inspection.

No other damage to shafting or bearings was apparent from visual inspection.

I. Lubrication System.

No apparent damage.

J. Condensers and Air Ejectors.

The flange of the overboard connection to the port main condenser opened a slight amount, allowing water to leak into the engine room. This pipe sagged about one inch due to failure of the three hangers supporting it. The injection and overboard valve of this condenser were open during Test B. This flange is at the inboard end of the section of pipe extending to the shell of the ship. Photographs 1934-2 and 3, pages 80 and 81. There is no evidence of any other damage to condensers, insofar as can be determined by visual inspection.

K. Pumps.

There was evidence of slight motion of #2 main condensate and the starboard main circulating pump. Some of the holding down bolts of these pumps were loosened and there was cracked paint at the foundation flanges. The motion is not believed to have been sufficient to damage the pumps. There was no evidence of any other damage to pumps, insofar as could be determined by visual inspection. A few pumps have been turned by hand. The after fire pump has been operated in service since Test B.

L. Auxiliary Generators (Turbine and Gears).

There was no apparent damage to the auxiliary generators, insofar as could be determined by visual inspection. #4 and #6 generators were jacked freely by hand.

M. Propellers.

Propellers are not visible and have not been inspected. There is no reason to believe that they were damaged.

N. Distilling Plant.

The thermometer on the first effect feed line of #2 evaporator set was broken. There was no other apparent damage to the distilling plant, insofar as could be determined by visual inspections. The distilling plant pumps have been turned by hand.

O. Refrigerating Plant.

No apparent damage.

P. Winches, Windlasses, and Capstans.

No apparent damage.

Q. Steering Engine.

Water entered the steering gear room from a leaky rudder post gland, flooding it to a depth of about four feet, and grounding out the servo-motors and main motors. This could probably have been prevented if the crew had been aboard during the test. There was no mechanical damage to the steering equipment, insofar as could be determined by visual inspection. The emergency steering unit was tested by power after Test B and operated satisfactorily.

R. Elevators, Ammunition Hoists, Etc.

No apparent damage.

S. Ventilation (Machinery).

No apparent damage.

T. Air Compressors.

The after H.P. air compressor was flooded but was apparently not mechanically damaged. There was no apparent damage to the other air compressors.

U. Diesels.

The after diesel generator was flooded but was apparently not mechanically damaged. The forward diesel generator was undamaged, and has been operated satisfactorily since Test B.

V. Piping.

(a) Main steam.

Three gages on the gage board of the starboard engine room had their pointers pushed past the stop pin.

(b) Auxiliary steam.

No apparent damage.

(c) Auxiliary exhaust.

No apparent damage.

(d) Condensate and Feedwater.

No apparent damage.

(e) Fuel.

No apparent damage.

(f) Lube oil.

No apparent damage.

(g) Firemain, sprinkling and water curtain.

No apparent damage.

(h) Condenser circulating water.

See description of leak in main overboard (port) under Condenser - Item "J". No other apparent damage.

(i) Drain.

No apparent damage. Part of this system has been in use since Test B.

(j) Compressed air.

Two gages on the gage board in the ice machine room had their pointers pushed past the stop pins. No other apparent damage.

(k) Hydraulic.

No apparent damage.

(l) Gasoline.

Not tested. This system was inoperable before Test B.

W. Miscellaneous.

(a) Gasoline stowage and equipment.

No apparent damage. The system was inoperable before Test B.

(b) Messing machinery.

No apparent damage.

(c) Messing equipment.

No apparent damage.

(d) Laundry equipment.

No apparent damage.

(e) Machine shop equipment.

No apparent damage.

TECHNICAL INSPECTION REPORT

SECTION III - ELECTRICAL

GENERAL SUMMARY OF ELECTRICAL DAMAGE

I. Target Condition After Test.

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

Not observed.

(b) Structural damage.

Not observed.

(c) Damage.

All electrical equipment mounted in the steering engine room, the after emergency diesel generator room, the after gyro compass room, and the after high pressure air compressor compartment were rendered inoperative by flooding. The forward and after gyro showed some signs of shock damage.

II. Forces Evidenced and Effects Noted.

(a) Heat.

None observed.

(b) Fires and explosions.

None observed.

(c) Shock.

The fact that this vessel experienced a fairly large amount of shock was evidenced in the damage to both gyro compasses, dislodging of finder relays in the automatic telephone switchboard, and the movement of the starboard anchor windlass motor. With

the exception of the damage to the gyro compasses, the shock had no significant effect on the vessel's electrical equipment. The apparent direction of this shock could not be ascertained.

(d) Pressure.

None observed.

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

None observed.

III. Effects of Damage.

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

The flooding of the steering engine room would not have greatly decreased the maneuverability of the vessel, since steam steering could be used as a stand-by. Other propulsion, and ship control electrical equipment was not affected by test B.

(b) Effect on gunnery and fire control.

There was no visible indication that test B had any effect on gunnery or fire control electrical equipment.

(c) Effect on watertight integrity and stability.

There was no visible indication that test B had any effect on watertight integrity and stability of this vessel from an electrical standpoint.

(d) Effect on personnel and habitability.

The habitability of this vessel would not have been affected by electrical damage.

(e) Effect on fighting efficiency.

There was no effect on the fighting efficiency of this vessel from electrical damage.

IV. General Summary of Observers' Impressions and Conclusions.

In general, the shock of the underwater atom bomb burst had no serious effect on the electrical equipment of this vessel. Due to the availability of stand-by equipment, the loss of the after emergency diesel generator sets, electric steering, and the gyro compasses would not have greatly affected the operability and fighting efficiency of the vessel.

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

It is recommended that the gyro compass element supporting mechanism be made more resistant to shock. In addition, some means should be provided to prevent spillage of mercury in the Arma type gyro compasses.

The automatic telephone switchboard finder relay should be made more resistant to shock.

DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

A. General Description of Electrical Damage

(a) Overall Condition.

Since there was no significant electrical damage to this vessel, the overall condition of the electrical system was generally unchanged from the first test.

Areas of major damage:

The steering engine room, the after emergency diesel generator room, the after gyro compass room, and the after high pressure air compressor compartment were flooded, causing damage to the electrical equipment in these spaces.

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

Grounds, and erosion due to salt water were the primary causes of electrical damage on this vessel.

(d) Operability of electric plant.

Except for the loss of the after emergency diesel generator set, the overall operability of the electric plant of this vessel was not affected by the underwater blast.

(e) Types of equipment most affected.

Gyro compass equipment suffered the most damage from the shock of the underwater blast. Rotating electrical equipment was damaged only from the flooding that followed the test.

B Electrical Propulsion Rotating Equipment.

Not applicable.

C. Electrical Propulsion Control Equipment.

Not applicable

D. Generators - Ship's Service.

No damage.

E. Generators - Emergency.

The after emergency diesel generator was inoperative due to flooding. There were no visible indications of shock damage to this unit.

F. Switchboards, Distribution and Transfer Panel.

There was no visible indication of any shock damage to equipment of this type. The No. 2 diesel generator switchboard, and the steering control panel, were damaged from salt water immersion.

G. Wiring, Wiring Equipment and Wire Ways.

No damage.

H. Transformers.

No damage.

I. Submarine Propelling Batteries.

Not applicable.

J. Portable Batteries.

The forward emergency diesel generator set starting batteries were slightly displaced in their racks from the shock. However, there was no visible indication that the batteries had been damaged.

Recommendations.

(a) It is recommended that some means be provided to secure batteries in their racks, so they will not be dislodged under shock conditions.

(b) The securing device should be an integral part of the battery rack to insure that the batteries will be secured at all times.

K. Motors, Motor Generator Sets and Motor Controllers.

Cracked paint around the holding down bolts of the starboard anchor windlass motor indicated that this unit moved under the shock. A careful examination showed no visible signs of a shock damage to the motor itself. The motor bearing inspection caps were dislodged by the shock.

The steering gear motors, servo pump motor and oil replenishing pump motors in the steering engine room were damaged from flooding.

Recommendations.

Bearing inspection caps should have holding down clips to prevent dislodgement under shock.

L. Lighting Equipment.

No damage.

M. Searchlights.

No damage.

N. Degaussing Equipment.

No damage.

O. Gyro Compass Equipment.

Both the forward and after Arma MK VIII gyro compass showed signs of mercury spillage. One of the neoprene mounted guide bearings on the forward gyro was pushed out of place. Apparently the gyro element dropped under shock, and the spindle came out of the guide bearing. When the element came up again, the spindle hit the neoprene mount breaking and dislodging it.

The compartment in which the No. 2 gyro was located was flooded about 1/2 ft. This flooding probably caused grounds in the control circuit in the base of the compass. However, since this unit was not tested, it was not ascertained whether these cables were grounded out.

Recommendations.

(a) It is recommended that the guide bearing arrangement on this type of compass be modified to prevent dislodgement under shock.

(b) Means should be provided to reduce mercury spillage on this type of compass.

P. Sound Powered Telephones.

No damage.

Q. Ship's Service Telephones.

This vessel had an Automatic Electric Company 150 line shock resistant telephone system. The line finders and connectors were not locked in position prior to test B resulting in five connectors being jarred free of the switch jacks by the underwater shock. Shelf wiring prevented connectors from falling, and resulted in no damage to this equipment. These units could easily be replaced in position allowing complete operation of the system.

Recommendations.

It is recommended that a more positive means of locking line finders in position be provided on this type of telephone switchboard.

R. Announcing System.

No damage.

S. Telegraph.

No damage.

T. Indicating System.

No damage.

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

No damage.

V. F.C. Switchboard.

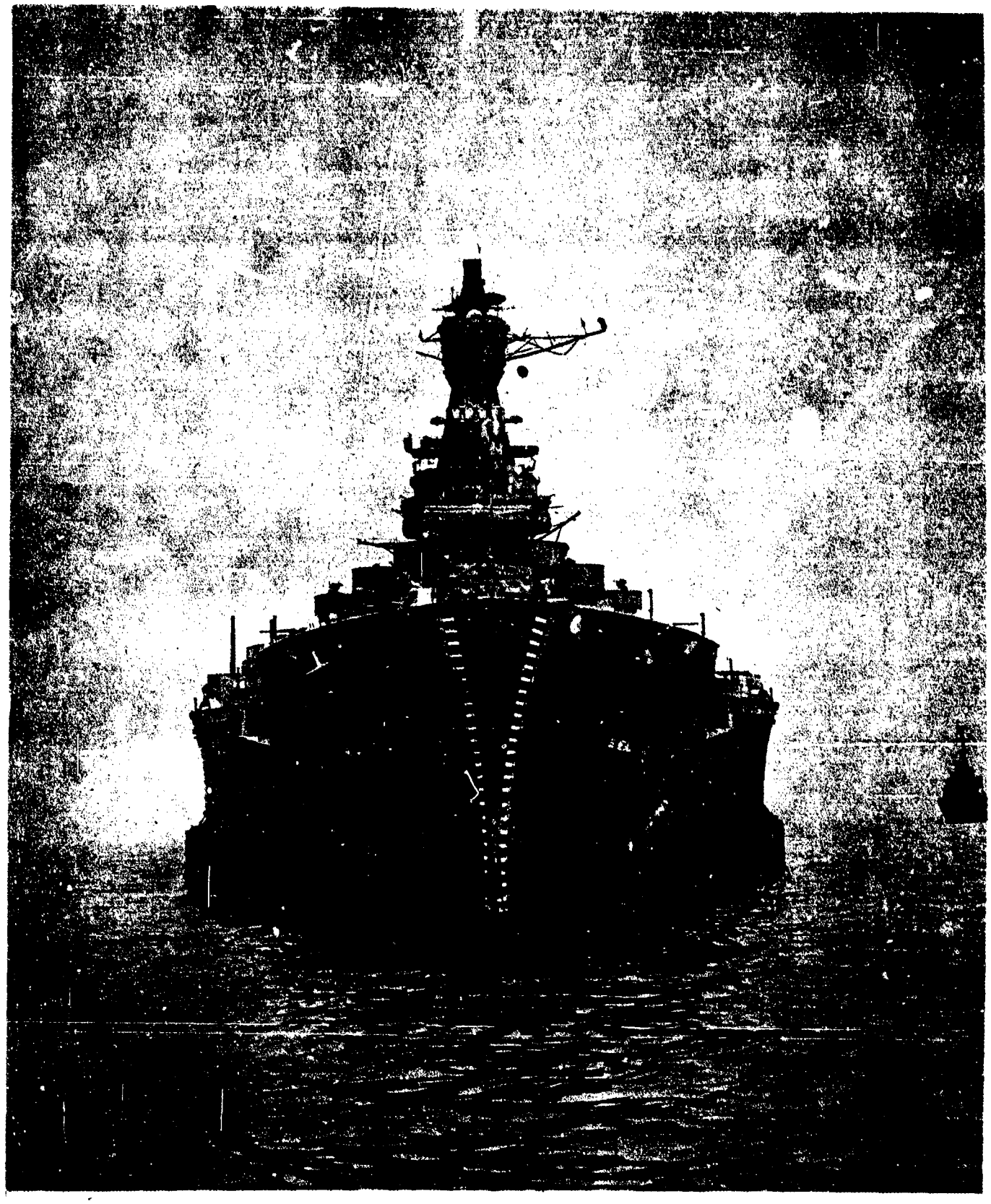
No damage.

SECTION IV

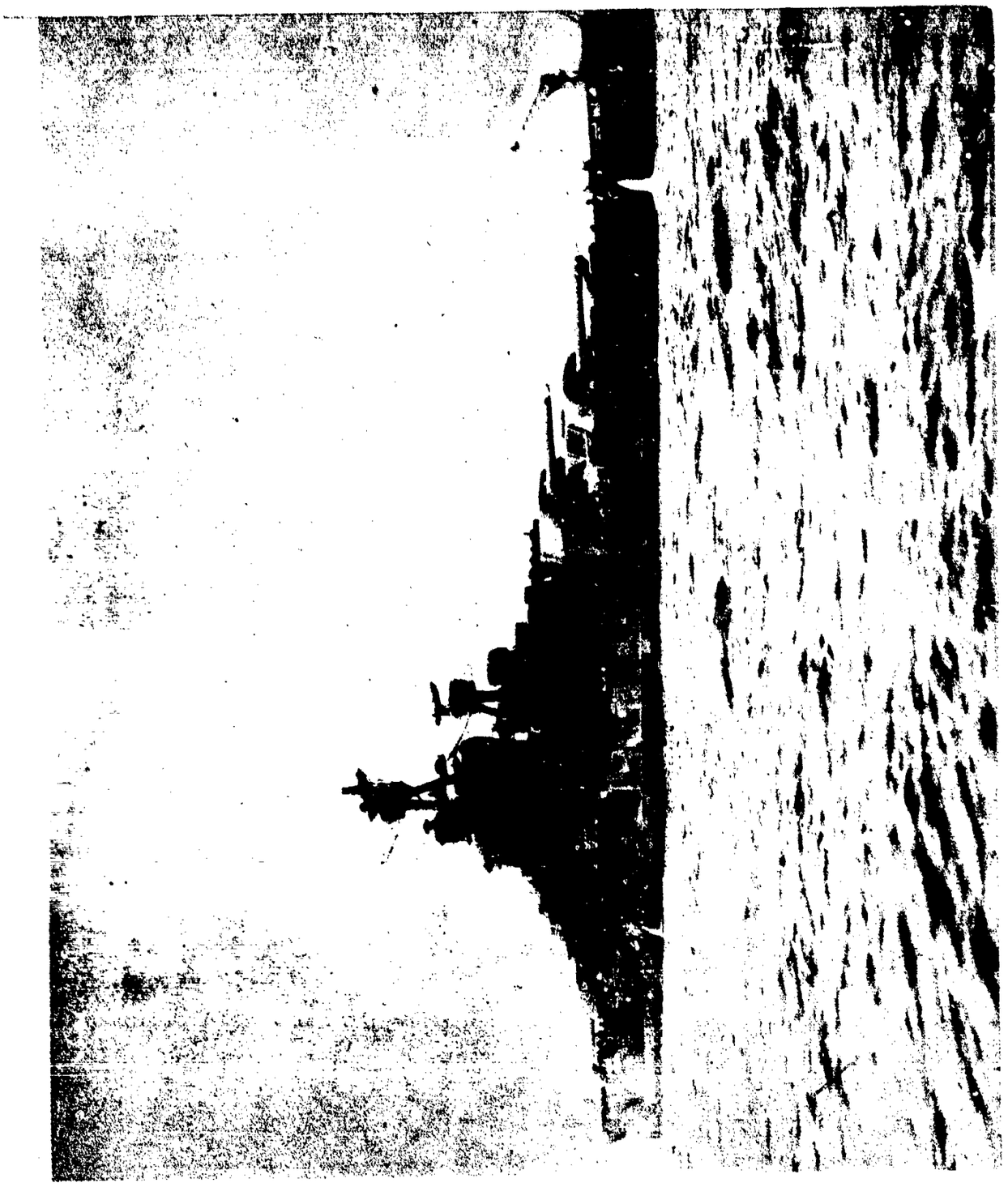
PHOTOGRAPHS

TEST BAKER

BB-CR-227-501-39. Bow view, before Test B.



AB-CR-227-289-106. View from ahead after Test B.

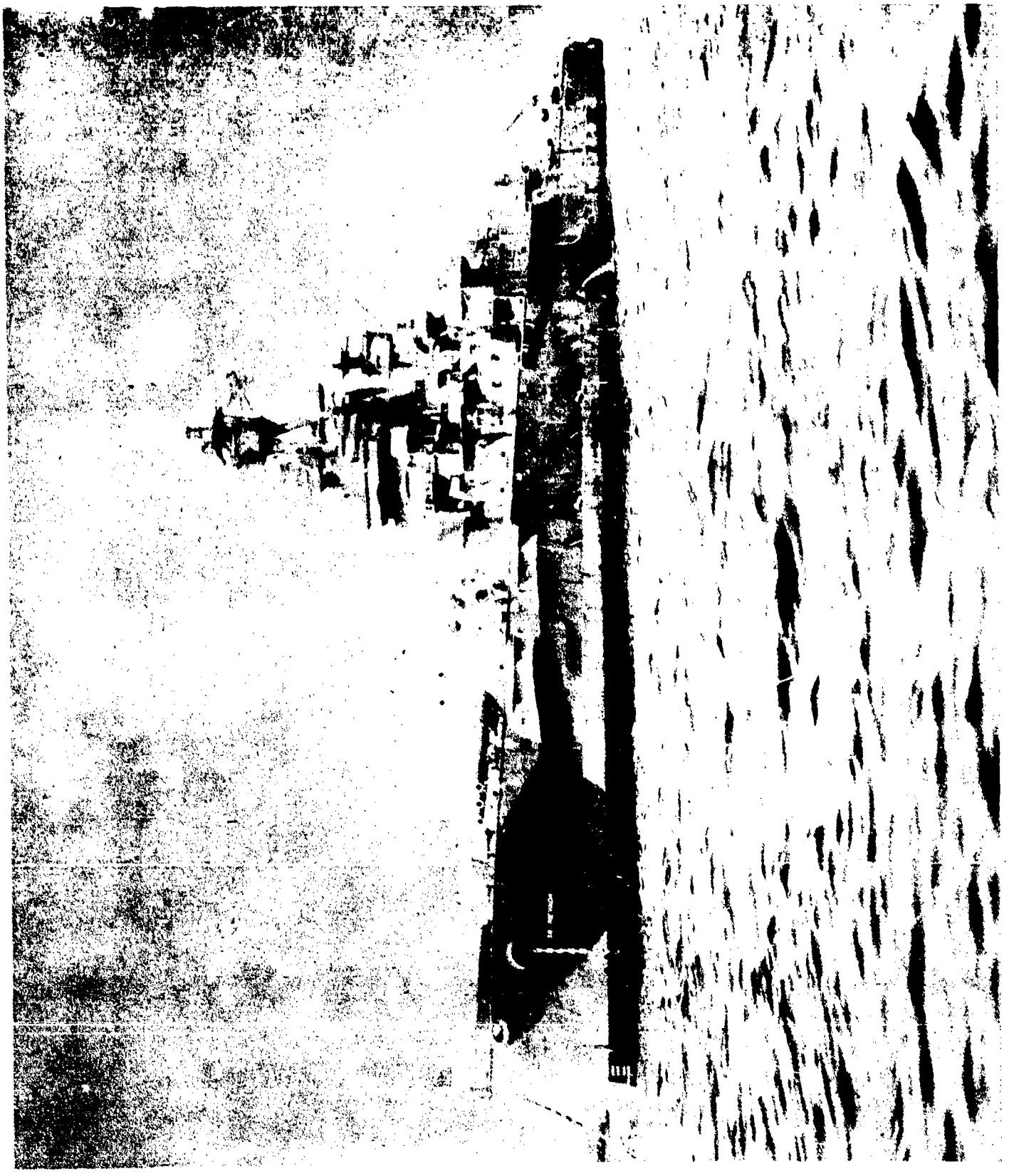


BB-CR-227-501-34. View from port bow before Test B.

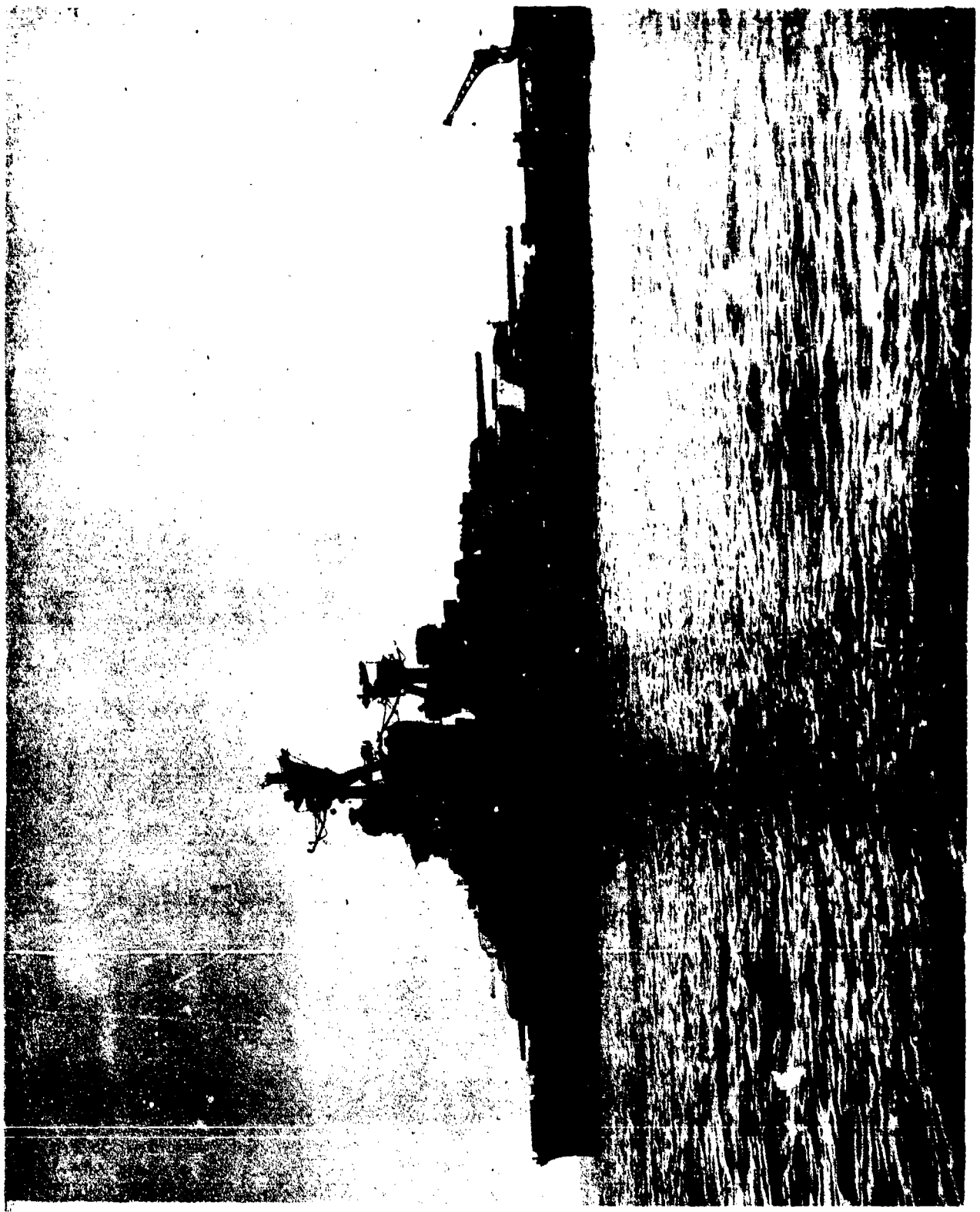
AB-CR-227-289-107. View from port bow after Test B.

BB-CR-227-501-33. View from off port beam before Test B.

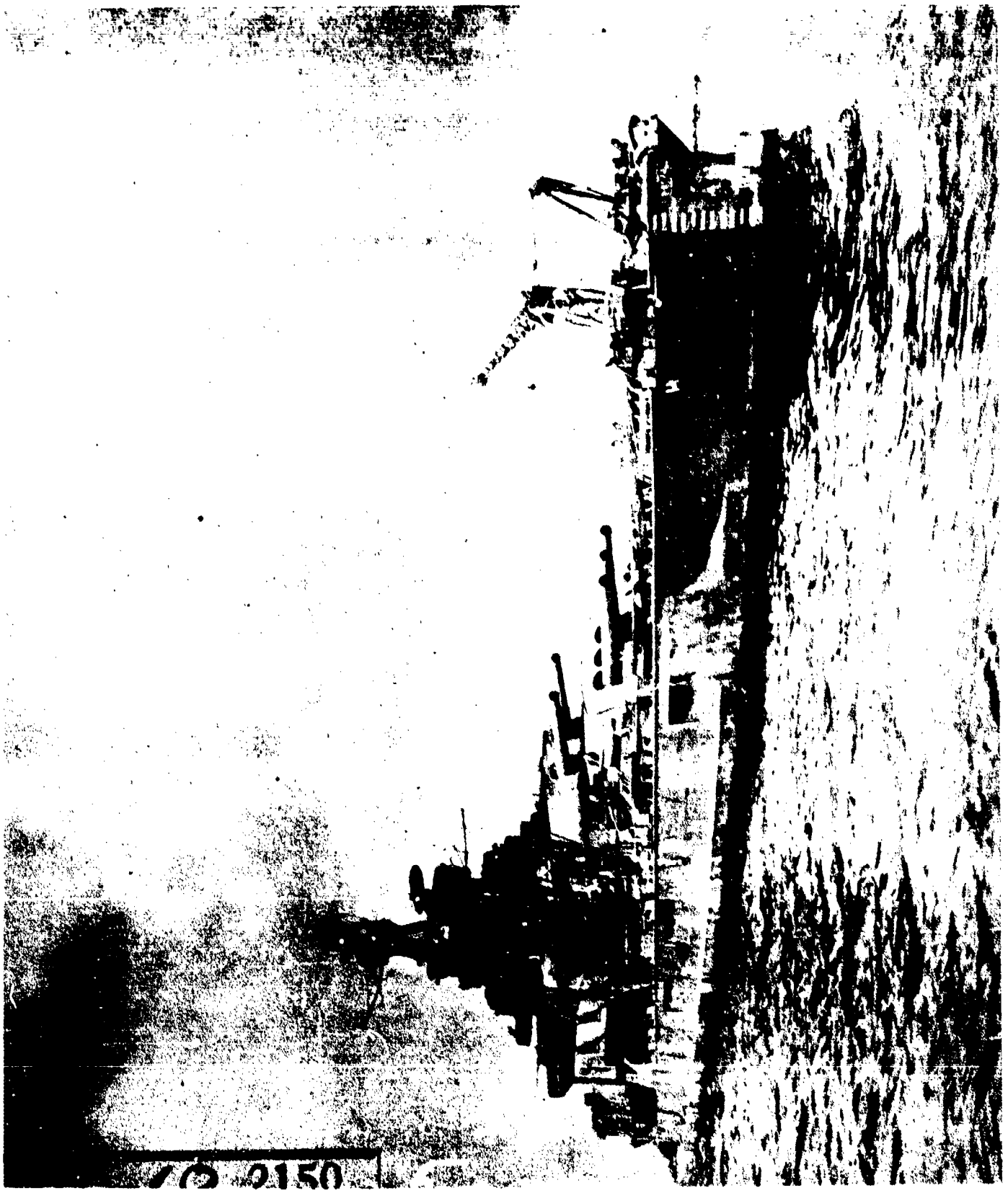
AB-CR-227-289-108. View from port beam after Test B.



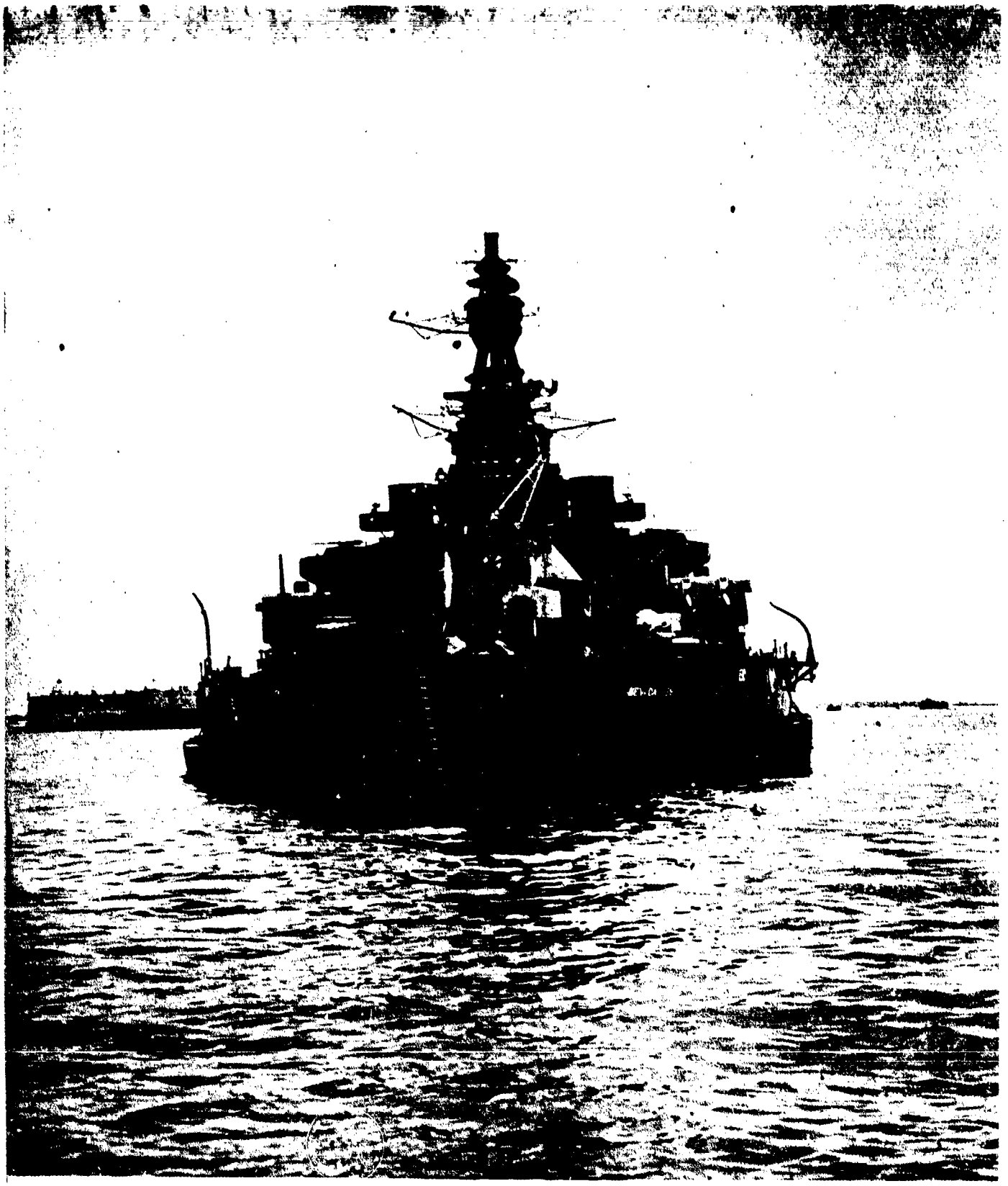
BB-CR-227-501-40. View from off port quarter before Test B.



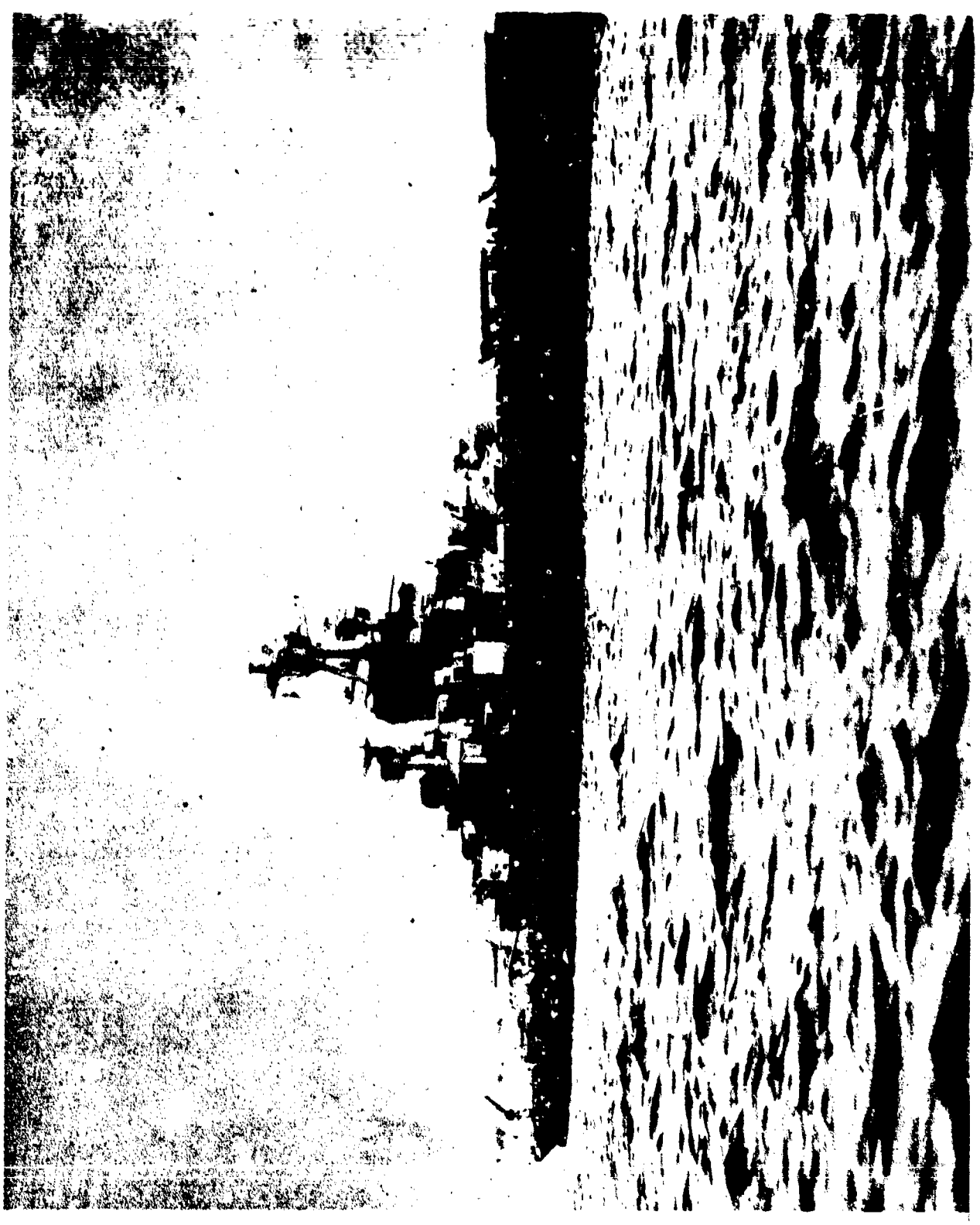
AB-CR-227-289-109. View from port quarter after Test B.



AB-CR-68-2150-5. Surface shot from off port quarter after Test B.



AB-CR-227-289-110. View from directly astern after Test B.



BB-CR-227-501-38. View from off starboard quarter before Test B.

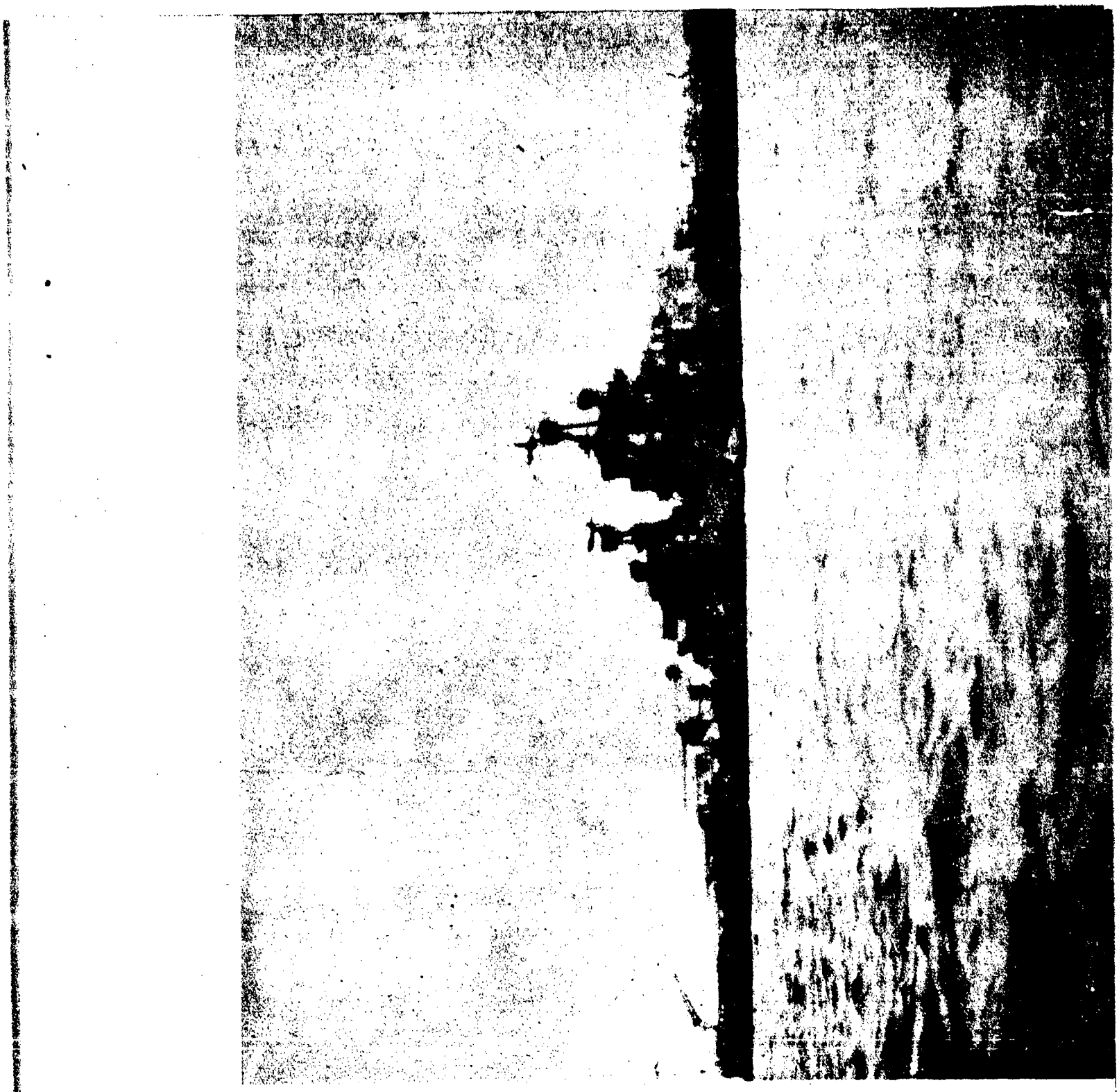
AB-CR-79-2967-11. Surface shot from off starboard quarter after Test B.

AB-CR-68-2150-3. Surface shot from off starboard quarter after Test B.

AB-CR-227-289-111. View from starboard quarter after Test B.

BB-CR-227-501-35. View from off starboard before Test B.

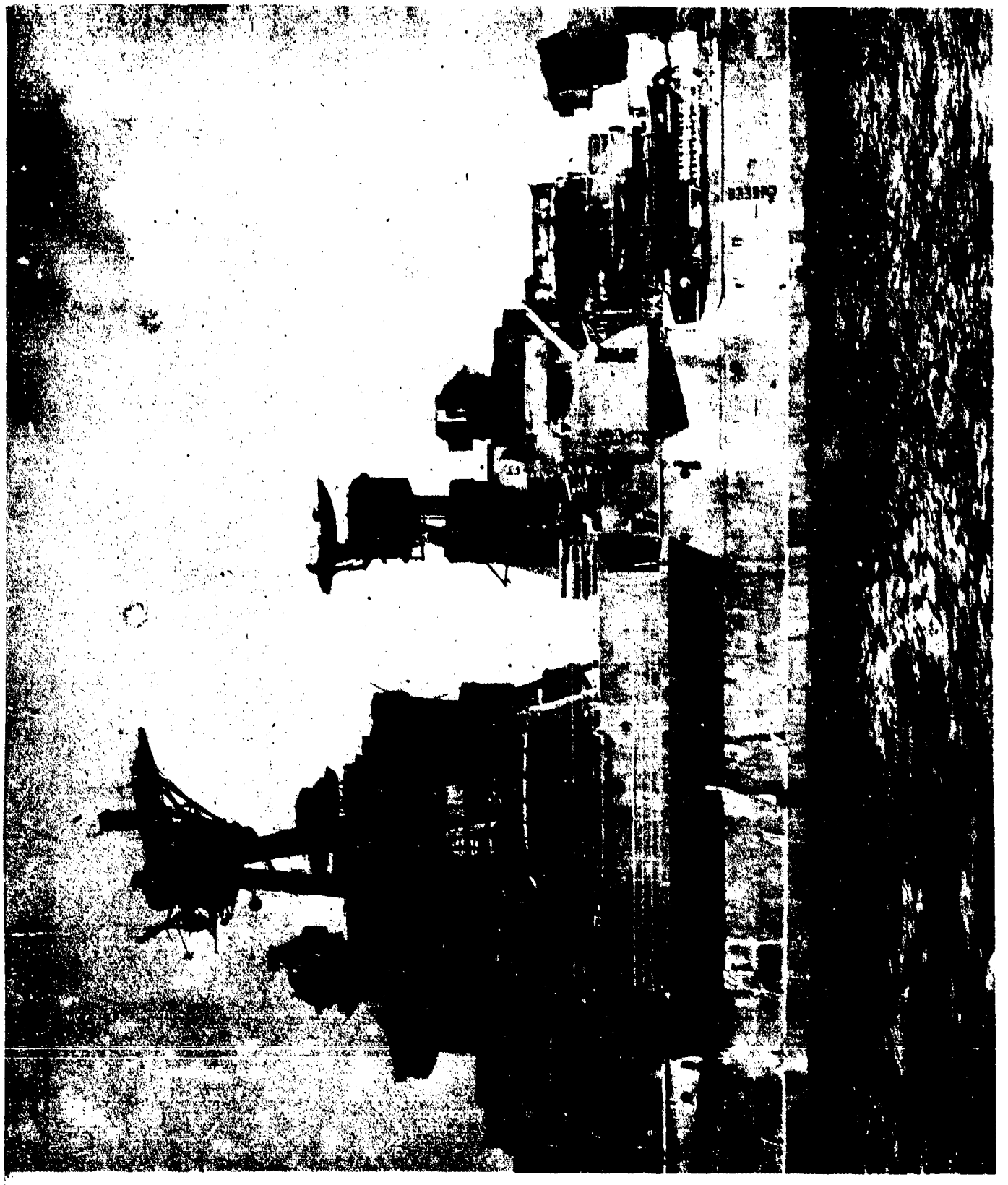
AB-CR-227-289-112. View from starboard beam after Test B.



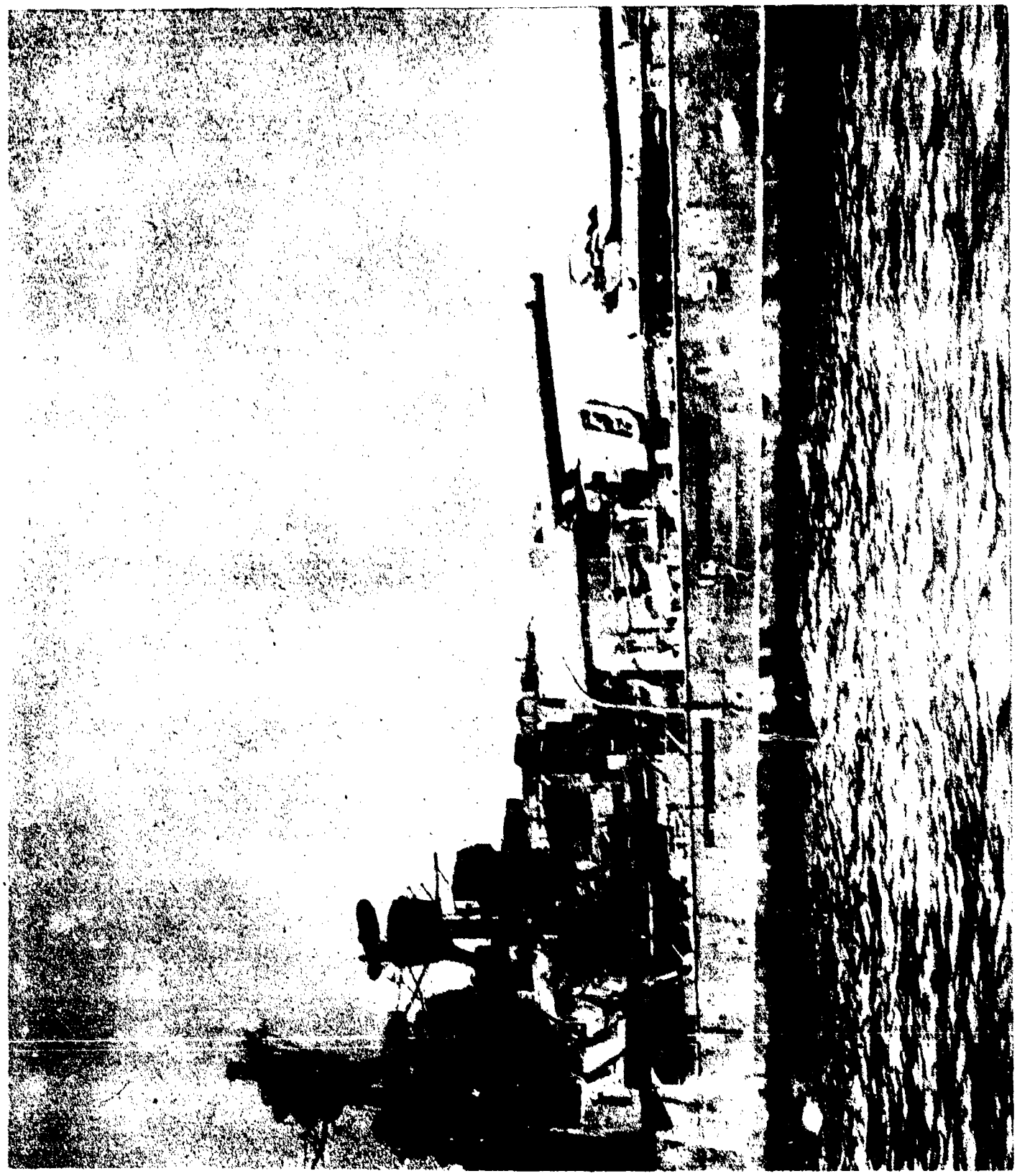
BB-CR-227-501-37. View from off starboard bow before Test B.

AB-CR-227-289-113. View from starboard bow after Test B.

AB-CR-68-2150-8. Close-up from off port bow after Test B.

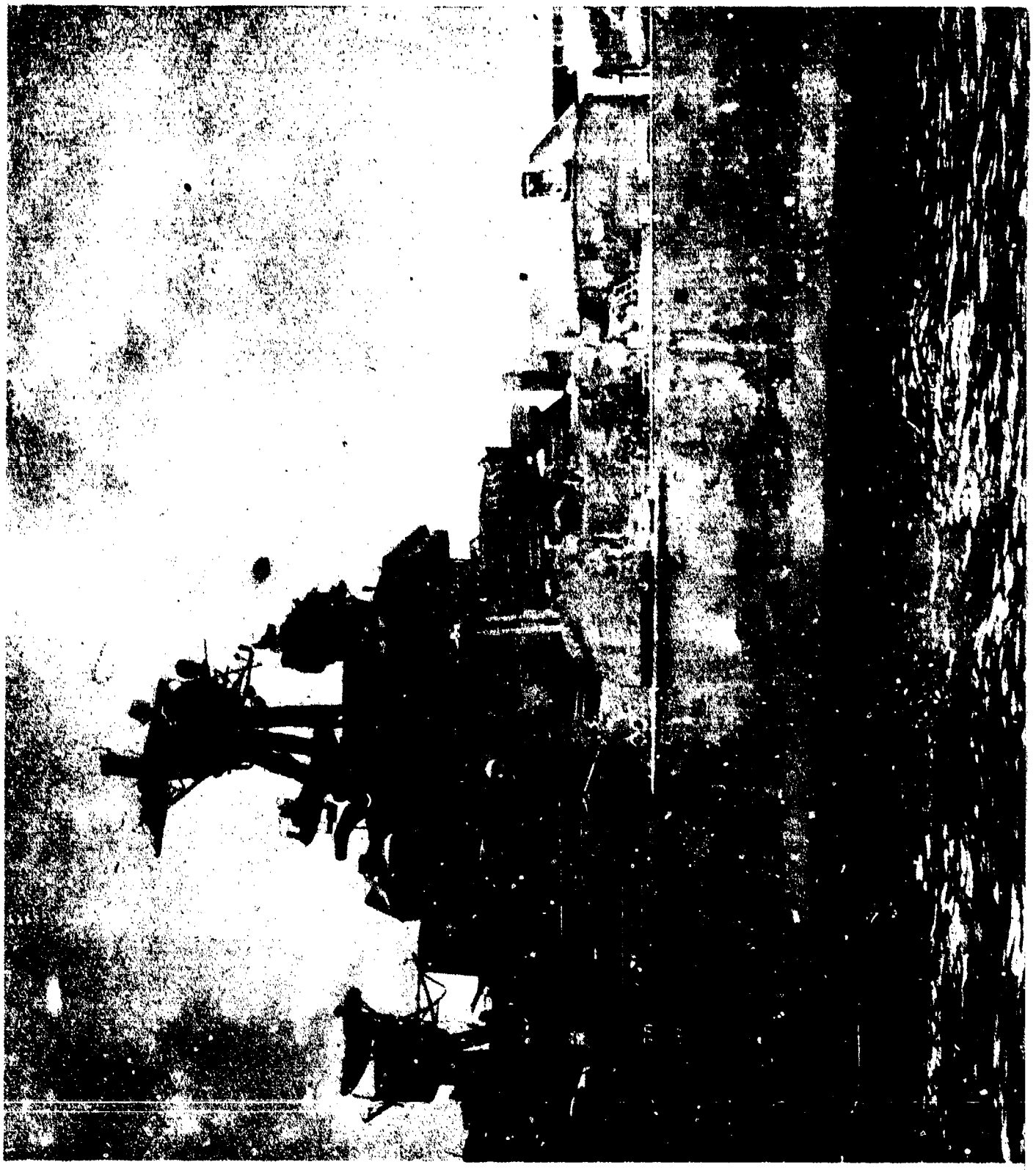


AB-CR-68-2150-7. Close-up of superstructure from off port beam after Test B.



AB-CR-68-2150-6. Close-up from off port quarter after Test B.

AB-CR-68-2150-2. Close-up of superstructure from off starboard quarter after Test B.



AB-CR-68-2150-1. Close-up view of starboard superstructure and shell after Test B.

AB-CR-68-2936-12. View from off starboard bow after Test B.

AB-CR-76-1934-5. Looking to starboard into 40MM ready service room, A-0401-M, forward tripod, showing stowage battens dislodged and ammunition cans displaced.

AB-CR-66-140-8. Peak of #7 boiler.

AB-CR-66-140-9. Front of No. 7 boiler.

AB-CR-76-1934-2. Port main overboard looking aft and outboard.

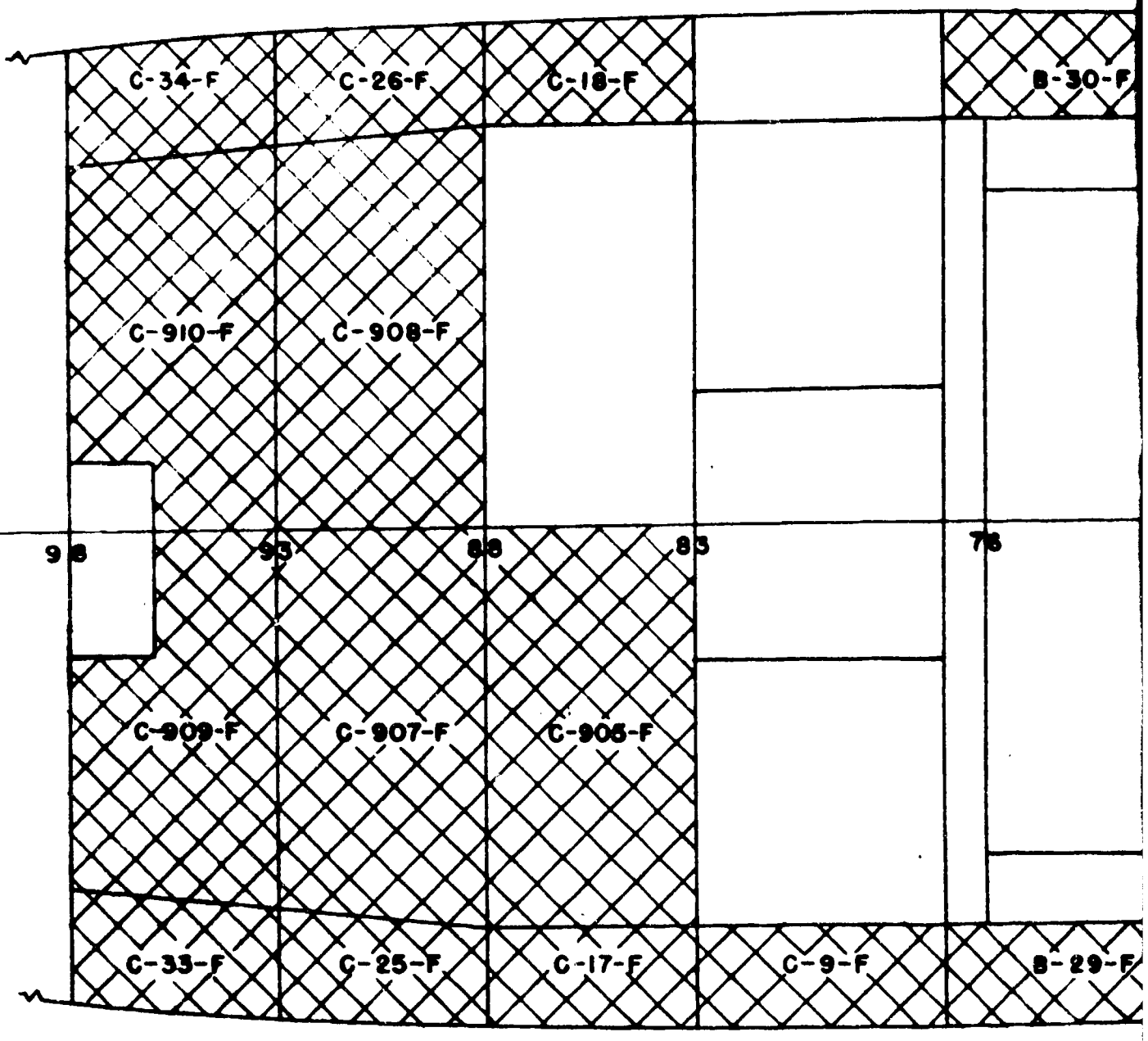
AB-CR-76-1934-3. Port main overboard looking forward and inboard.

APPENDIX

SHIP FLOODING DIAGRAM

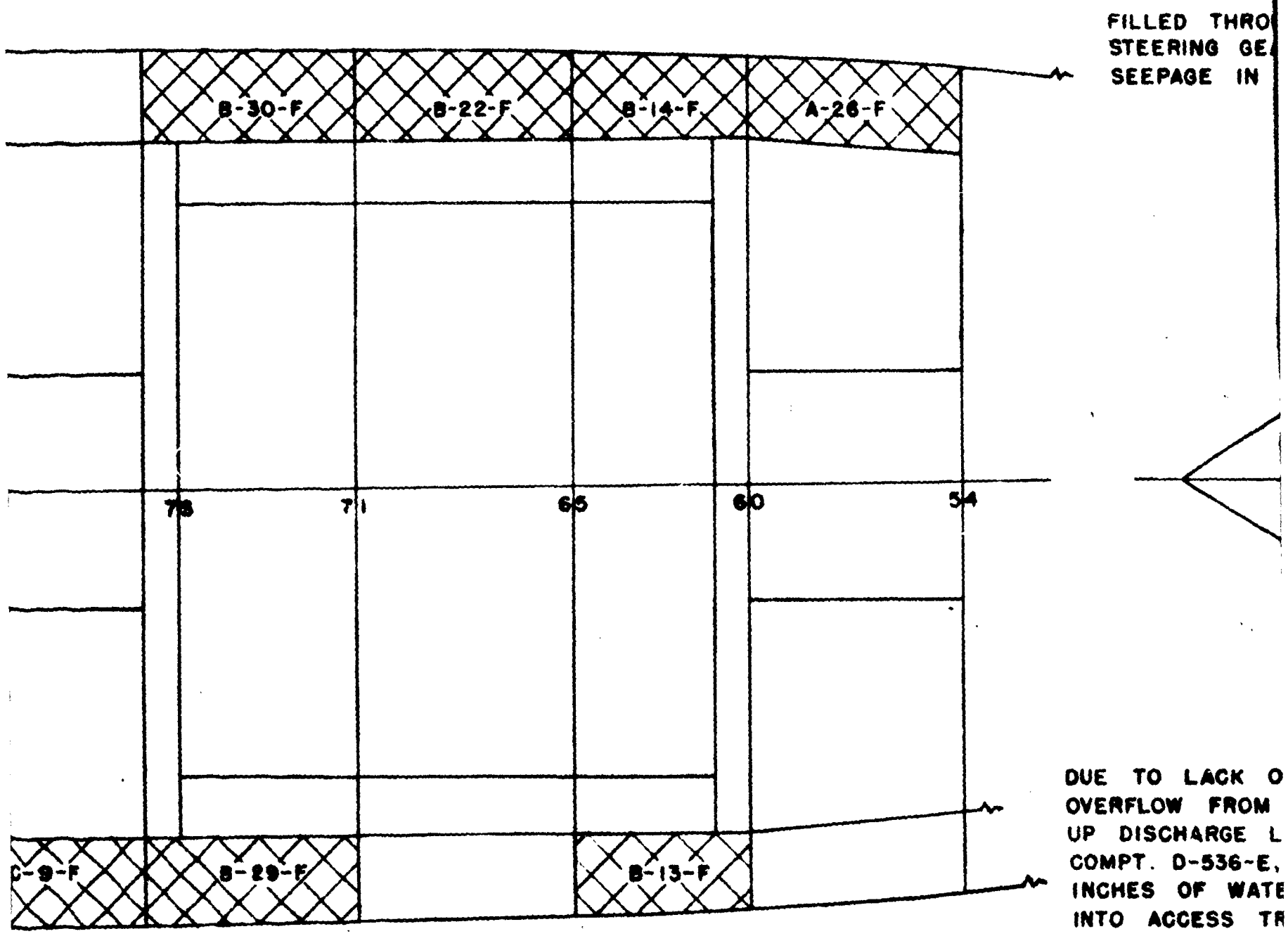
TEST BAKER

APPARENTLY DOUBLE BOTTOM TANKS
FLOODED THROUGH SEAMS IN SHEL



DOUBLE BOTTOM

DOUBLE BOTTOM TANKS
IROUGH SEAMS IN SHELL.

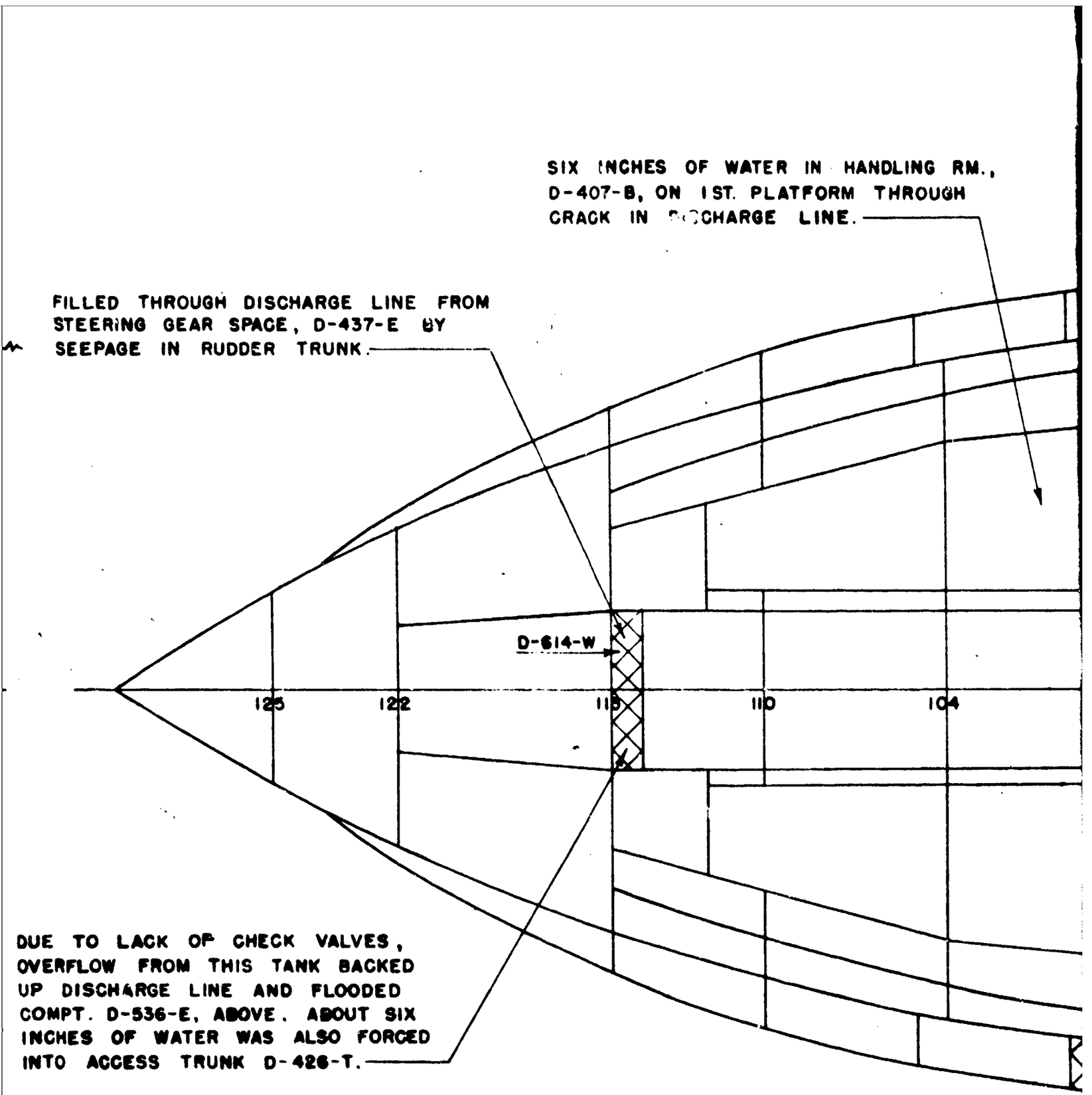


FILLED THRO
STEERING GE
SEEPAGE IN

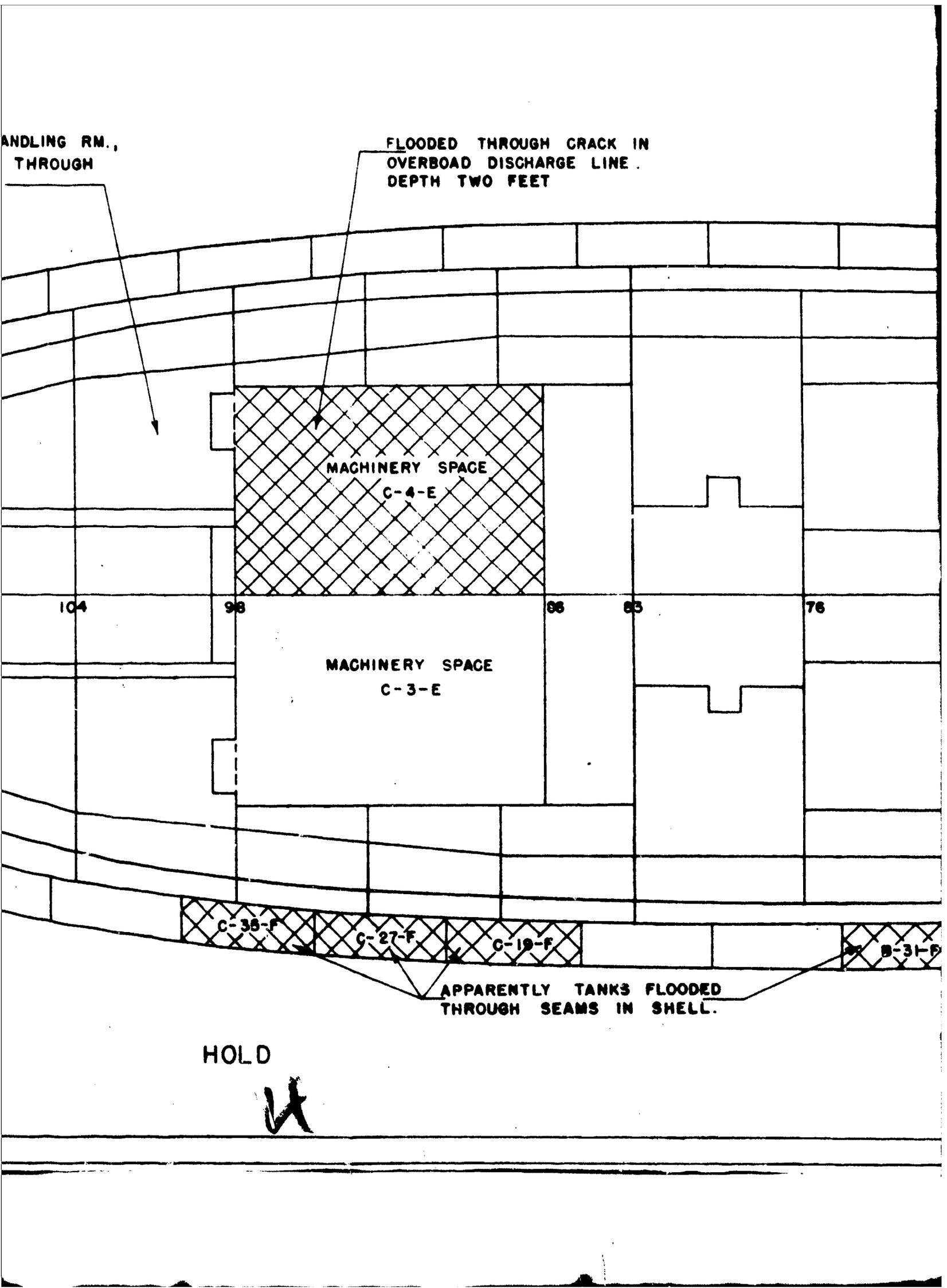
DUE TO LACK O
OVERFLOW FROM
UP DISCHARGE L
COMPT. D-536-E,
INCHES OF WATE
INTO ACCESS TR

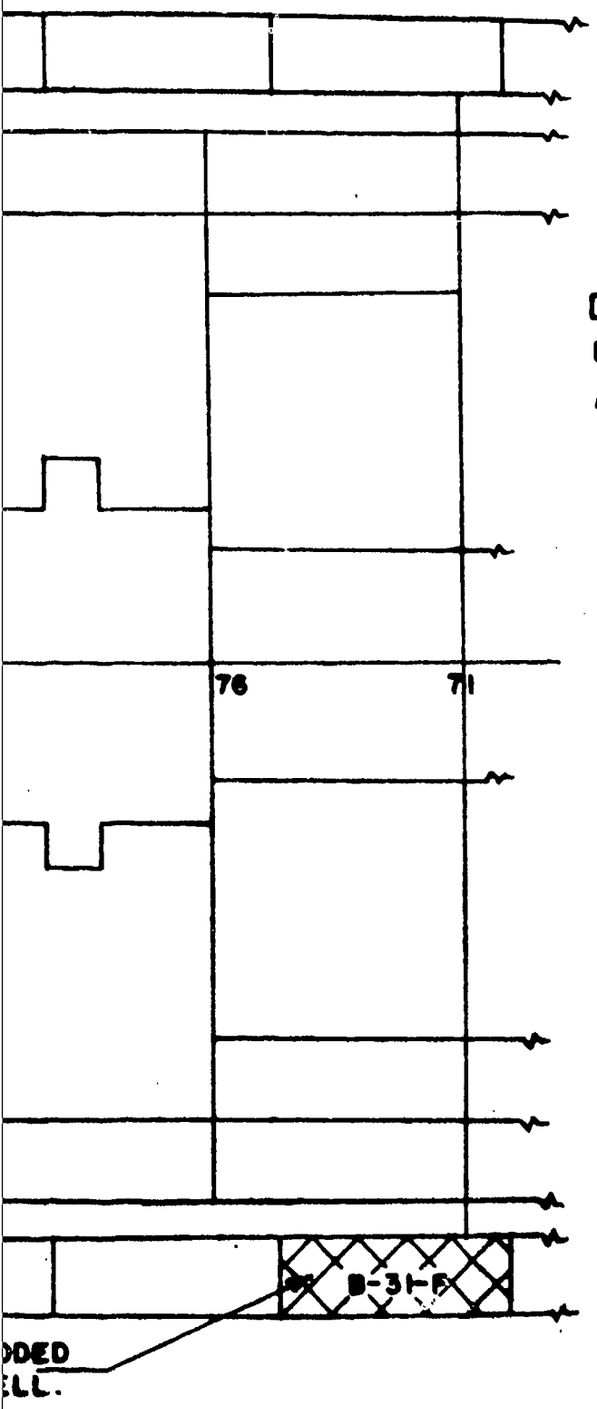
LE BOTTOM

2


SIX INCHES OF WATER IN HANDLING RM., D-407-B, ON 1ST. PLATFORM THROUGH CRACK IN DISCHARGE LINE.
FILLED THROUGH DISCHARGE LINE FROM STEERING GEAR SPACE, D-437-E BY SEEPAGE IN RUDDER TRUNK.
D-614-W
125
122
115
110
104
DUE TO LACK OF CHECK VALVES, OVERFLOW FROM THIS TANK BACKED UP DISCHARGE LINE AND FLOODED COMPT. D-536-E, ABOVE. ABOUT SIX INCHES OF WATER WAS ALSO FORCED INTO ACCESS TRUNK D-426-T.

3


ANDLING RM.,
THROUGH
FLOODED THROUGH CRACK IN
OVERBOAD DISCHARGE LINE.
DEPTH TWO FEET
MACHINERY SPACE
C-4-E
104
98
86
83
76
MACHINERY SPACE
C-3-E
C-35-F
C-27-F
C-19-F
B-31-F
APPARENTLY TANKS FLOODED
THROUGH SEAMS IN SHELL.
HOLD



DRAFTS:

BEFORE TEST B: FORD. 28'-9", AFT 32'-6": LIST 1/2° (P)

AFTER TEST B: FORD. 28'-6", AFT 33'-0" LIST 1 1/4° (P)

SLOW FLOODING

SECRET

NAVY DEPT. BUREAU OF SHIPS

FLOODING DIAGRAM

TEST B

U.S.S. NEVADA BB 36

5

APPENDIX

COMMANDING OFFICERS REPORT

TEST BAKER

TECHNICAL INSPECTION REPORT

PART A - GENERAL SUMMARY

I. Target Condition After Test.

(a) The drafts before B day were 28'9'' forward, 32'6'' aft. After B test, the drafts were 28' forward, 33' aft. This was an increase of six inches aft over the draft just prior to the B test. There was 1-1/4° port list after the test. The change in draft and list was partially due to the flooding of compartments D-614-W; D-426-T; D-437-E and D-536-E, as well as to the additional flooding in the port blister voids due to seepage from one void to another. The damage to the port blister was done between A and B days while a tanker was along port side. It is believed the fuel tanks were ruptured by shock, these tanks are listed in Part C, Item K.

(b) Structural Damage: There was very little if any additional damage done to the superstructure.

Hull: There is a slight dishing of the hull plating forward on the starboard side between frames 23-30 between first and second platforms. The hull plates in other parts of the ship may have been dished additionally in this test as evidenced by flooding of fuel oil tanks.

Hull Interior: There are deck beams in the forward part of the ship that show evidence of bending due to the B test. Some of these frames were distorted in A test but show additional stress now. This is especially noted between frames 20-40 on the main and second deck. The damaged area aft due to the A test received additional damage as shown by a slight amount of movement of the decks. No additional flooding or torn plating was noted, however, it may exist. This area is the main, second and third decks aft of No. 4 turret.

(c) Operability: machinery, electrical, ship control, fire control, gunnery, electronics.

None of the C and R machinery was operated but evidence indicates that it was still in operable condition except for possible electrical grounds caused by washing down the ship from tugs alongside.

Both the boilers that had been repaired since the A test were put out of commission as were all turbine blowers. The casings of the un-repaired boilers were also further blown out.

Electrical Damage: There was slight damage to the forward Gyro and the telephone selector switches caused by shock. There was evidence of secondary damage due to flooding of electrical motors, controls and wiring in the steering gear room and after Gyro compartment. There was flooding also in the after diesel generator and high pressure air compressor compartment.

Ship Control: There was no apparent damage to ship control.

Fire Control: Visual and limited manual and electrical tests of fire control equipment revealed no additional damage. Modified tests were run on computors, range keepers and stable elements with satisfactory results.

Gunnery: Damage from shock to turret installations resulted in holding down clip #3 in turret #2 being sheared off and shell hoist motors of turrets #3 and #4 being knocked out of alignment and the elevating screw binding in turret #2. No additional damage to other batteries was noted as a result of test Baker.

Electronics: No additional major damage to search radar or fire control radar was apparent. There was evidence of very slight additional damage to electronics equipment caused primarily by shock and secondarily by salt water.

(d) Heat; fires; estimated personnel casualties.

There was no evidence of any fires or damage due to heat.

II. Forces Evidenced and Effects Noted.

(a) No heat reached the interior of the ship. If any heat reached the weather decks or superstructure, any evidence thereor, was washed away by tugs conducting decontamination work prior to reboarding.

(b) Fires and Explosions.

No evidence of fires and explosions.

(c) Shock:

The structural damage shows evidence of shock as shown by additional leaks in blister voids and fuel tanks with slight further bending of frames and stanchions in the forward part of the ship. Also moveable equipment such as lockers, C02 fire extinguishers, chairs, etc., which were overturned, were probably displaced by shock or possibly by a roll or sudden lift of the ship.

The following apparent damage to machinery from shock occurred: The starboard low pressure turbine moved in a vertical and horizontal plane; A similar movement of the No. 1 and No. 2 main circular pumps was noted. The breaking of one gimbal in the forward gyro and spilling of mercury from the flotation tank also could be attributed to shock, as could the cracking in the brazed joint of the No. 2 main condenser overboard discharge line. One group of selectors for the automatic telephone system was dislodged also probably from shock.

(d) Pressure.

No effects from pressure as were caused in A test.

(e) No effects noted as peculiar to the atom bomb. The bomb effect was similiar to a ship being in the vicinity of a mine explosion, in otherwords, loose material in various spaces was tossed about.

III. Results of Test on Target.

(a) Effect on propulsion and ship control.

The boiler casings were blown out on the only two boilers completely repaired after the A test and the damaged casings on the other four boilers were further damaged. All fireroom personnel may have been killed.

The Gyro Compasses would have probably been in error as a result of shock damage resulting in a broken gimbal ring and spilling of mercury from the flotation tank.

(b) Effect on Gunnery and Fire Control.

Damage from shock to turret installations resulted in holding down clip #3 in turret #2 being sheared off and shell hoist motors of turrets #3 and #4 being knocked out of alignment and the elevating screw binding in turret #2. No additional damage to other batteries was noted as a result of test B.

(c) Effect on watertight integrity and stability.

There was no additional damage to watertight integrity that could be attributed to B test damage, except leakage in fuel tanks and blisters.

(d) Effect on personnel and habitability.

Personnel casualties would have been high due to radioactivity and minor casualties would have been caused by falling gear and loose objects such as lockers, C02 bottles, dishes,etc. From the amount of damage sustained by the superstructure, it is believed that exposed personnel would not have been damaged by

heat or pressure wave. Certainly personnel with any sort of protection would not have been injured except by the radioactivity.

The entire ship showed that all loose gear would be tossed about and although the interior of the ship was fairly free from radioactivity it did sustain much more damage to light equipment than in the A test.

(e) Total effect of fighting efficiency.

From a gunnery equipment standpoint the underwater test was far less effective than the air burst. Extensive tests of fire control and gunnery equipment may reveal further damage but tests and inspections carried out with the limited time available revealed no serious casualties, other than a sheared holding down clip and binding elevating screw of turret #2. The loss of the master gyro would adversely effect the fighting efficiency of the ship but not necessarily to a fatal extent. All exposed personnel would have been subjected to radioactive spray and vapor cloud. These men might have been able to function for the time being until the radioactivity had taken its effect. However, the ships manueverability might have been seriously impaired as in A test from damage to boiler casings causing the loss of propulsion power.

IV. General Summary.

The effect of the B bomb on the USS NEVADA while it was not sufficient to sink the ship due to the distance from point of detonation still caused considerable damage. The main propulsion power would have been lost, due to the blowing out of the two repaired boiler casings and in all probability, it would have resulted in loss of the other four boilers had they been operable as these casings received additional damage. The shock received was enough to temporarily put out of commission the master gyro compasses.

Many fuel oil tanks and blister voids were ruptured by the blast. No examination was made of the rudder and propellers. The whole ship was jarred and shaken. This caused loose gear and that lightly secured gear such as desk, lockers, etc., to be thrown about. There was no damage to ammunition.

There was no apparent damage to electrical fittings, lights, motors, water lines, radio or radar equipment other than to tubes.

However, the whole topside, decks, bulkheads, waterways, ladders and ventilators were covered by radioactive spray and water containing sand and coral which was highly radioactive. The ship also was covered by the atomic cloud or vapor. All of these, the radioactive water, spray and atomic cloud, left the ship in a highly radioactive condition. This in itself made the ship dangerous for personnel to live in or remain onboard and even though they may have escaped any direct exposure to the fission particles, they might soon have been seriously injured.

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

The major damage to the U.S.S. NEVADA from the B bomb was radioactivity. All operable boilers were put out of commission and the ship received minor structural damage.

Some means must be devised to combat the radioactivity of the ship itself and to afford protection to personnel. To effect the latter, all personnel should be enclosed in shelters. The ship should be provided with quick closing vent covers for intakes with a self contained ventilation system and air conditioning so that no outside air need be taken into the ship until it can clear the radioactive area. A method of rapid decontamination must be devised so that the hull and all weather decks and surfaces can be quickly freed of all radioactive particles. This might possibly be accomplished by coating the ship with grease or paint that could be washed or scrubbed off removing the fission products with it.

PART C

INSPECTION REPORT

SECTION I - HULL

A. General Description of Hull Damage.

(a) Overall Condition of Hull Damage.

The overall structure condition of the NEVADA was not changed from that following the A test. However, all exposed areas were drenched by radioactive water, vapor, and dust, which kept the hull in a highly radioactive condition. There was an area of flooding caused by seepage at the rudder head. Small areas of water were found throughout the ship caused by water entering air intakes and exhausts from washing down by tugs or possibly from a wave which covered the s, p. A great deal of minor damage such as overturned furniture and foam cans was found throughout the ship.

(b) General Areas of Hull Damage.

Damage to the hull is indicated by the soundings made of various voids and tanks. There is apparently additional damage to the port blister at the forward and after ends. The additional amount of water taken in the blister voids varies from inches to about 8 feet. There was some type of hull damage to the bottom of the ship from frame 82-98 and also to the blisters, port and starboard from frame 54-110. To ascertain the damage to the bottom, the use of divers will be necessary.

(c) Apparent Causes of Hull Damage in Each Area.

The apparent cause of the damage was probably pressure built up from the shock wave of the explosion of the bomb, possibly causing the outside plates to crack or seams to rupture and rivets shear.

(d) Principal Areas of Flooding With Sources.

The after section of the ship that drains into after drainage tank was flooded due to water entering ship from around the rudder head. Compartments D-437-E; D-536-E; D-426-T and D-614-W were flooded by the above.

(e) Residual Strength, buoyancy and Effect of General Condition of Hull Operability.

The amount of damage does not appear to have appreciably changed the residual strength or buoyancy or operability of the ship. The flooded tanks and voids would be of no further use and counter flooding would remove the 1-1/4° port list.

B. Superstructure (exclusive of gun-mounts).

(a) Description of Damage, giving important dimensions.

No additional damage since A test.

(b) Cause of damage in each area.

None.

(c) Evidence of fire in superstructure.

None.

(d) Estimate of relative effectiveness against heat and blast of: Various plating thicknesses; various shaped surfaces; STS compared to MS; Aluminum structures

No apparent damage due to blast or heat to establish relative effectiveness of plating or shaped surfaces as a result of test B.

(e) Constructive criticism of superstructure design or construction, including important fittings and equipment.

It is believed, that the placing of self contained air conditioning units in the ship and the air intakes in more shielded areas as an attempt to take in less contaminated water, certainly should be done. Also, the installing of quick acting closures as protection against a radioactive cloud, is very necessary. All shaped surfaces should be rounded with the elimination, as much as possible of corners or recesses. Places where radioactive material could accumulate such as corners, depressions, waterways, and drains should be avoided.

C. Turrets, Guns and Directors.

(a) Protected Mounts.

1. The general condition of protected mounts was good. Turrets were operable except turret #2 elevating screw which bound inspots. No additional damage over test A to 5'' mount structures was apparent. Power units were energized but the 440 power was insufficient for operational test. Protected main battery directors suffered no additional damage. The Mk. 37 directors were frozen in train.

2. The effectiveness of installed turrets and shields was very good to excellent.

(b) Unprotected Mounts.

1. No additional damage to unprotected mounts was noted as a result of test B. All such unprotected mounts are very badly rusted and corroded incident to the use of lye and salt water for decontamination of the ship.

2. In addition to blast effect personnel would have been subjected to highly radioactive spray and smoke and vapors. No protection is afforded by the present design of open crew shelters.

(c) Directors and Range-Finders.

1. Protected main battery directors and rangefinders suffered no damage. Operability was apparently satisfactory. The Mk. 37 directors are frozen in train. The rangefinders suffered no damage. No additional damage was noted to the Mk. 51 directors.

2. The general condition of instruments is good to excellent.

(d) Constructive criticism of design or construction of mounts, directors, foundations and shelters.

No additional problems were noted as a result of test B that recommendations for test A would not overcome. These recommendations were that all anti-aircraft guns should be covered with light armor to protect personnel from the heat and blast and radioactive spray.

D. Torpedo Mounts, Depth Charge Gear.

Not applicable.

E. Weather Deck.

(a) General Condition of Deck and Cause of Damage.

The weather decks suffered additional damage apparently from wave or pressure but the amount was not readily ascertained. Damage consisted of very slight increase in the buckling of forecastle deck and main deck aft.

(b) Useability of Deck in Damaged Condition.

Decks were still in usable condition.

(c) Condition of Equipment and Fittings.

1. All cleats and bits were in good condition. The anchor windlass may have received further damage due to B test, but was not tested by hoisting riding anchor. No additional damage to other fittings.

2. No boats onboard. The boat handling boom had been severely damaged and bent in the A test. No additional damage observed from B test. Liferafts were knocked from their secured position but otherwise undamaged.

3. No additional damage apparent to airplane handling gear.

4. The catapult, badly damaged in test A, does not seem to have suffered any additional damage.

F. Exterior of Hull Above Waterline.

(a) through (d), no additional damage over A test.

G. Interior Compartments (above waterline or armor deck).

(a) Damage to structure and causes.

Most of the areas damaged in the A test received slight additional damage due to weakened structures. Cause of damage was apparently pressure.

(b) Damage to Joiner Bulkheads and Causes.

Joiner bulkheads in the forward section and on the main and second decks received damage due to apparent pressure to the upper deck.

(c) Details of Damage to Access Closures and Fittings.

No damage except to air port at frame 60 on starboard side of main deck in compartment A-150-1L. The temporary air port fittings in the shipfitter's shop on the main deck were blown in.

(d) Condition of Equipment Within Compartments.

All loose equipment was thrown about the compartments

and in some cases lockers and racks that were welded were torn loose - probably bad welds.

(e) Evidence of Fire.

No evidence of fire.

(f) Damage in way of piping, cables, ventilation ducts, etc.

The firemain and flushing systems were tested and no damage noted. No cable racks were down. A few cases of vent ducts being jarred loose were noted but in general, everything was in good condition.

(g) Estimate of reduction of watertight subdivision, habitability and utility of compartments.

No reduction in watertight integrity or habitability and utility of compartments was noted that could not have been corrected immediately except for the radioactivity.

H. Armor Deck.

There was no apparent damage to the armor deck nor to the hatches, gratings, uptake bulkheads or barbettes. Complete protection was afforded by the armor deck both from pressure and heat and from radioactivity.

I. Interior Compartments (below waterline).

(a) Damage to structure and causes.

No damage except the fuel oil tanks and blister voids were sounded and found to have taken on salt water, indicating that plates and seams were open to the sea.

(b) Damage to joiner bulkheads and causes.

No damage.

(c) Details of damage to access closures and causes.

No damage.

(d) Condition of equipment within compartments.

In practically all cases, the loose equipment was moved to the extent of being turned over or knocked down.

(e) Flooding.

The following compartments were flooded due to leakage around rudder head: D-437-E; 2 feet; D-614-W, completely; D-536-E, completely; D-426-T, six inches.

(f) Damage in way of piping, cables, ventilation ducts, shafts, etc.

No damage.

(g) Estimate of reduction in watertight subdivision, habitability, and utility of spaces.

No damage.

J. Underwater Hull.

(a) Interior Inspection of underwater hull.

Damage indicated that from frames 23-30 between first and second platform on starboard side the hull plating had been additionally dished in. Also from soundings indicated the underwater body from frame 83-98 in vicinity of keel was opened to allow flooding of fuel tanks in vicinity.

(b) Effect of damage on buoyancy, operability, maneuverability.

There was no apparent effect on the operability or maneuverability. Buoyancy was decreased about six inches by the stern and 1-1/4° port list.

(c) Any known or suspected damage to: Shafts and propellers, struts, rudders or external keels.

No damage known. None observed and no divers used to make examination of underwater hull.

(d) Details of impairment of keel structure.

None known.

K. Tanks.

(a) Condition of tanks in areas of damage.

The following fuel tanks showed indications of taking on salt water: A-26-F; B-14-F. B-22-F; B-30-F; B-15-F; B-31-F; C-18-F; C-26-F; C-34-F; C-9-F; C-17-F; C-19-F; C-25-F; C-27-F; C-33-F; C-35-F; C-905-F; C-907-F; C-908-F; C-909-F; C-910-F; D-14-F; D-16-F and D-20-F. All tanks that were flooded prior to B test are not included in this tabulation. The increase in water in the above listed tanks was from one foot to completely filled. Condition of tanks could not be inspected due to limited time available for inspection.

(b) Contamination of liquids.

The oil tanks were contaminated with salt water in the tanks listed above. Extent of possible damage to remainder of tanks not known. The cruising radius of the ship would be materially decreased due to the contamination of the above listed fuel tanks.

(c) Damage (known or suspected) to torpedo defense system.

There may have been additional openings to the sea in the blister voids as indicated by additional flooding of blister voids on the port side.

L. Flooding.

(a) Description of major flooding areas.

Frames 83-98 in double bottom tanks
Frames 54-100 in inboard fuel tanks, port and starboard.
Frames 104-115 port double bottom tanks.
Frame 115 to stern, centerline, compartments on first and second platform and hold - due to leak from rudder head.

(b) Sources of flooding.

1. Opened boundaries.

The open boundaries for all fuel oil tanks flooded have been listed in Item K and for the flooding done by leakage around rudder head is listed in Item I.

2. Damaged or poorly designed system or fittings.

There are no check valves from the deck drains that feed into after drainage, thus allowing water to back up in those lines causing flooding of additional compartments after the after drainage tank fills.

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

D-437-E; D-614-W; D-536-E and D-426-T, also fuel oil tanks and voids could have been controlled by pumping.

M. Ventilation (exclusive of blowers).

(a) Damage to ventilation system and causes.

No serious damage, there were a few split seams in the ducts caused mostly by the shaking up of the ship. There was no effect on habitability. No ventilation systems were operated due to radioacitivity.

(b) Evidences that ventilation system conducted heat, blast, fire, or smoke below decks.

None.

(c) Evidence that ventilation system allowed progressive flooding.

The ventilation system did not allow progressive flooding but it did permit water to seep into various compartments apparently from hosing down by tugs.

(d) Constructive criticism of design and construction of system.

More airtight closures to the outside should be designed. These closures should be of a quick closing type. Also a self contained air condition system should be installed.

N. Ship Control.

(a) Damage to Ship Control stations and causes.

1. Bridge area.

No damage.

2. C.I.C.

No damage.

3. Gyro compass equipment.

One gimbal is broken on the forward gyro compass and mercury was spilled from the flotation tank. The after gyro compass was not operated but there was no apparent damage from visual observation. However, the base was flooded which may have caused a short in the wiring.

4. Steering gear.

The steering gear was damaged due to flooding which shorted out the electrical fittings. Had personnel been onboard, no damage would have resulted as the steering compartment would not have been flooded by progressive flooding.

5. Interior Communications.

No apparent damage except the ship's service telephone system had one group of selectors for automatic operation dislodged by shock. This could have been repaired quickly by personnel had they been onboard.

(b) Constructive criticism of ship control system.

None.

O. Fire Control.

(a) Damage to fire control stations and causes.

1. Directors and elevated control position.

Additional damage to main battery directors was not apparent. Mk. 37 directors were frozen in train but due to low tolerance (20 minutes only) cause was not determined. No additional damage to other control stations was noted as a result of test B.

2. Plot room and protected spaces.

No damage.

(b) List of stations having insufficient protection and estimated effect on fighting efficiency or the loss of each.

As material damage caused was relatively slight compared to test A, no new problems have been presented. The immediate effect on personnel of the radioactive cloud which completely covered the ship is unknown.

(c) Constructive criticism of location and arrangement of stations.

It is necessary that some sort of enclosed protection for exposed personnel be devised to save them from flash burns or radioactive spray and vapor.

P. Ammunition Behavior.

(a) Ready service ammunition, location, protection, behavior under heat and blast.

1. Main battery.

Five main battery projectiles were turned over, otherwise the location, protection and stowage proved highly adequate. No powder was disturbed. All ammunition remained stable and there were no indications of any change due to either blast or shock.

2. Secondary battery.

Two five inch projectiles were found overturned. Otherwise, comments are the same as for the main battery.

3. 40mm, 20mm and other.

40mm and 20mm ready service room proved adequate and no changes in stability of ammunition are apparent.

(b) Magazines, location, protection, forces involved, behavior.

1. Main battery powder and projectiles.

Locations and protection were adequate. The shock turned over five projectiles, otherwise no damage. Powder stowages remained intact.

2. Secondary Battery.

Secondary battery powder and projectiles; locations and protection were adequate. The shock turned over two projectiles, otherwise no damage. Powder stowages remained intact.

3. 40mm, 20mm, and other.

Location and protection adequate, no unusual results, stowages remained intact except for a few battens being dislodged allowing a few cans of 40mm and 20mm to fall on deck.

4. Bombs and pyrotechnics.

Stowages all adequate.

(c) List of stowages which are insufficiently protected.

None.

(d) Behavior of gasoline stowage facilities.

No gasoline onboard.

Q. Ammunition handling.

(a) Condition and operability of ammunition handling devices

1. Main battery hoists.

Right and left shell hoists, hydraulic motors were knocked out of alignment in turret No. 3. Right shell hoist hydraulic motor was out of alignment in turret No. 4. Otherwise all handling equipment was satisfactory.

2. Secondary battery hoists.

Only visual examination was made of hoists due to limited time available. No damage noted.

3. Passing scuttles.

All operable.

(b) Evidences that any ammunition handling devices contributed to passing of heat, fire, blast or flooding water.

None.

(c) Constructive criticism of design and construction of ammunition handling devices.

No evidence of damage resulting from faulty design. The only damage as mentioned before, was misalignment of three waterbury shell hoist motors.

R. Strength.

(a) Permanent hog or sag.

No permanent hog or sag evident.

(b) Shear strains in hull plating.

No indications.

(c) Evidence of transverse or racking strains.

Transverse strains were indicated only by additional bending of deck beams on main and second deck in both the forward and after ends of the ship.

(d) Details of any local failures in way of structural discontinuities.

No evidence except for cases where stanchions from deck to deck were off center and bent and a slight bending of deck beams resulted.

(e) Evidence of panel deflection under blast.

None.

(f) Turret, machinery and gun foundations.

No apparent damage except three waterbury shell hoist motors were jarred out of alignment in turrets 3 and 4 and elevating screw out of alignment and sheared holding down clip in turret two.

S. Miscellaneous.

(a) Evidence of heat damage variations under various colors of camouflage painting.

No evidence of heat. (No camouflage painting).

(b) Etc., other miscellaneous effects or condition noted during inspection.

None.

PART C

SECTION II - MACHINERY

A. General Description of Machinery Damage.

(a) Overall condition.

Good.

(b) Areas of major damage.

All boilers and fireroom blowers.

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

Blast effect and shock.

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

There was no damage to put the Engineering Department out of commission except the ruptured boiler casings.

B. Boilers (S-51).

(a) Air casings.

All the boiler casings were ruptured and distorted by blast effect.

(b) External fittings.

No damage.

(c) Fuel oil burner assemblies.

No damage.

(d) Brickwork and furnaces.

A small portion of the brickwork was knocked down. Estimate 3% damaged. The boilers could have had fires maintained in them for a short period to two to three hours before burning out the casings.

(e) Steam and water drums and headers.

No damage.

(f) Tubes.

No apparent damage. Boilers No.'s 1, 2 and 5 were tested hydrostactically. The test was satisfactory showing no damage to tubes.

C. Blowers (S-53).

No apparent damage to turbines or motors, blowers, foundations, external fittings or blower rooms. Eleven of a total of twelve shutters were jammed closed passed the stops.

D. Fuel Oil Equipment (S-55).

No apparent damage to heaters, strainers, manifolds or fittings.

E. Boiler Feedwater Equipment (S-56).

No apparent damage to heaters, deaerating tanks, feed-water tanks or miscellaneous items.

F. Main Turbines (S-41).

There was no apparent damage to casings, bearings, rotors, blading and shrouding, packing and glands, valves, foundations or fittings. But there was evidence that the low pressure turbines had moved in a vertical and horizontal plane. It is believed that no damage would have resulted.

G. Reduction Gears (S-42).

There was no apparent damage to foundations and casings, gears and shafting, bearings, couplings, fittings and turning gears.

H. Shafting and Bearings (S-43).

There was no apparent damage to shafting, bearings and foundations, alignment or stern tubes. The external shafting was not visually inspected.

I. Lubrication System (S-45).

No apparent damage to coolers, filters and strainers, purifiers, tanks or fittings.

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

There was no apparent damage to water boxes, shell and shell connections, expansion joints, air ejectors, inter and after condensers. However, there was a cracked braze on flange on overboard discharge line on the #2 main condenser.

K. Pumps (S-47).

(a-c) There was no apparent damage to feed pumps, circulating pumps or condensate pumps.

(d) The no. 11 fire pump was damaged by flooding. Had operating personnel been onboard, no damage would have resulted. There was no damage apparent to other fire pumps.

(e) Lube oil pumps.

No apparent damage

(f) Fuel oil pumps.

No apparent damage.

(g) Other pumps.

No.'s 2 and 3 fresh water pumps was damaged by flooding. Had operating personnel been onboard, no damage would have resulted. No apparent damage caused to other pumps.

L. Auxiliary Generators (Turbine and Gears) (S-61).

There was no apparent damage to foundations, turbines, gears, coolers, governors or valves and fittings.

M. Propellers (S-44).

(a) Blades.

No visual inspection made.

(b) Caps and nuts.

No inspection made.

N. Distilling Plant (S-58).

There was no apparent damage to evaporators, distilling condensers or evaporator feed heaters. A thermometer was broken on the feed line to the #2 evaporator. No other fittings, gages or piping damaged.

O. Refrigerating Plant (S-59).

No apparent damage.

P. Winches, Windlasses and Capstans (S20, 26).

(a) Foundations and Bedplates.

There was no apparent additional damage due to B test. There was no apparent damage to motors, brakes, brake linings, gearing, hydraulic systems, fittings, wildcats and valves.

The shafting of both windlasses is probably out of alignment due to an apparent increase in the warping of the forecastle deck.

Q. Steering Engine (S-22).

There was no apparent damage to the foundations, Ram, quadrant, chains, screws, hydraulic system or follow up system. However, the motors were damaged by progressive flooding. Had operating personnel been onboard, no damage would have resulted.

R. Elevators, Ammunition Hoists.

There was no apparent damage to machinery foundations, motors and gearings, hydraulic system, guide rails, dredger chains, elevator platforms, brake and brake linings, control systems and follow up gear.

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

There was no apparent additional damage to fans and motors.

There was no apparent damage to foundations and mountings and heaters. Ventilation equipment was not operated due to safety precautions issued by RadSafe.

T. Air Compressors (S-49).

(a) Foundations.

There was no apparent damage.

(b) Compressors and motors.

The #2 high pressure air compressor motor and controller were damaged by flooding. Had operating personnel been aboard, no damage would have resulted. No other compressors were damaged.

(c) Coolers.

No apparent damage.

(d) Tanks.

No apparent damage.

(e) Miscellaneous gages.

No apparent damage.

U. Diesels (Generators) (S-50).

No apparent damage to foundations, casings and cylinders, bearings, crankshafts, pistons, fuel injection system, superheaters and governors. The #2 Diesel Generator compartment was completely flooded by progressive flooding. Had operating personnel been onboard, no damage would have resulted.

V. Piping.

(a) Main Steam.

No apparent damage.

(b) Auxiliary Steam.

No apparent damage.

(c) Auxiliary Exhaust.

No apparent damage.

(d) Condensate and Feed Water.

No apparent damage.

(e) Fuel and Feed Water.

No apparent damage.

(f) Lube Oil.

No apparent damage.

(g) Fire Main, Sprinkling and Water Curtain.

No apparent damage.

(h) Condenser Circulating Water.

There was a cracked braze on flange on the #2 main condenser overboard discharge line. Apparently caused by shock.

(i) Drain.

No apparent damage.

(j) Compressed Air.

No apparent damage.

(k) Hydraulic.

No apparent damage.

(l) Gasoline.

No apparent damage.

(m) Other systems.

No apparent damage.

W. Miscellaneous.

No apparent additional damage to any other miscellaneous machinery.

PART C

SECTION III - ELECTRICAL

A. General Description of Electrical Damage.

(a) Overall Condition.

The overall condition of the electrical system is good.

(b) Areas of Major Damage.

The steering room and the after high compressor air compartments were flooded causing damage to electrical material.

(c) Primary Causes of Damage in Each Area of Major Damage.

Resulting grounds and erosion due to salt water.

(d) Operability of Electric Plant.

1. Ship's Service Generator Plant.

No apparent damage.

2. Engine and Boiler Auxiliaries.

No apparent damage.

3. Electrical Propulsion.

Not applicable.

4. Communications.

The automatic telephcne connector band was dislodged by shock. But system was still in operation. No other damage apparent.

5. Fire Control Circuits.

No apparent damage.

6. Ventilation.

No apparent damage.

7. Lighting.

No apparent damage.

(e) Types of Equipment most Affected.

Gyro Compasses. Rotating equipment by flooding only.

B. Electric Propulsion Rotating Equipment.

Not applicable.

C. Electric Propulsion Control.

Not applicable.

D. Ship's Service Generators, (S-61).

No apparent damage.

E. Emergency Generators (S-61).

The #2 Diesel Generator was flooded. Had operating personnel been onboard, no damage would have resulted. No other apparent damage than that caused by flooding was caused to the emergency diesel generators.

F. Switchboards, Distribution and Transfer Panels.

No damage to any mechanical equipment of this type except that the #2 diesel generator switchboard was damaged by salt water.

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

There was no apparent additional damage caused by the B test on items of this type.

H. Transformers.

There was no apparent damage to framework and mountings or electrical connections.

I. Submarine Propelling Batteries (S62).

Not applicable.

J. Portable Batteries (S-62).

. No apparent damage.

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.

Framework, mountings, comutators and Slip rings, brushes and brushrigging, bearings and speed regulators. There was damage by flooding to the steering gear main motors, servo pump motors, replenishing pump motor of all items listed above. Also the No. 2 and No. 3 fresh water pump motors were damaged in the same way.

(b) Control Equipment.

No apparent damage to any of this equipment except that the controllers for the #2 and #3 fresh water pumps were damaged by salt water flooding.

L. Lighting Equipment (S-64) and M. Searchlights.

There was no additional damage to the only three searchlights, 1-24'' and 2-12'' remaining after the A test.

There was no apparent damage to any lamps, fluorescent lights, reflectors, fixture mounts, shock mounts, pendant lamp holders or lamp globes.

N. Degaussing Equipment.

There was no apparent damage to any of this equipment.

O. Gyro Compass Equipment.

(a) Master.

The #1 Master Gyro compass had a broken gimbal and the mercury splashed from the flotation tank. The compartment in which the #2 master gyro was located was flooded about 6''. This flooding could have caused grounds in the control circuits in the base of the Master Compass and it is suspected that mercury splashed from the flotation tank. There was no other apparent damage.

(b) Repeaters.

There was no additional damage caused by B test.

(c) DRT and DRA.

No additional apparent damage.

P. Sound Powered Telephones.

There was no apparent damage to hand-sets, head-sets, jack and switch boxes and stowage other than that already caused by A test.

Q. Ship's Service Telephones.

(a) Exchange.

The connectors from bank #1 were dislodged.

(b) Line equipment.

No apparent damage.

R. Announcing System.

There was no apparent additional damage to this system.

S. Telegraphs.

No apparent damage.

T. Indicating Systems.

No apparent damage.

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

No apparent damage.

V. F.C. Switchboards.

No apparent damage.

PART C

SECTION IV - ELECTRONICS

A. General Description of Electronics Damage.

(a) Overall Condition.

Additional damage to electronic equipment was caused primarily by shock. Very minor damage was caused by salt water immersion. In the latter case it is not known whether the water was dropped by action of the bomb, or was sprayed over the ship by decontamination teams. Additional damage to that already caused by test A was slight and limited almost entirely to areas above the main deck.

(b) Areas of Major Damage.

Areas of damage consisted of exposed elements (antennas) and units mounted within superstructure compartments, primarily, Radar aft and Reconn.

(c) Primary Cause of Damage in Each Area.

The primary cause of damage was shock.

(d) Operability of Electronics Equipment.

The operability of equipment immediately after the explosion, assuming that power was available, would be almost identical with the operability before. This is due to the fact that practically all antenna units were down before test B.

(e) The equipment most severely affected by test B were those radar units located in Radar aft (Aux. CIC) and in Reconn. The only Fire Control Radar operative before the test, the Mark 28, was rendered inoperative due to damage of the antenna.

B. Fire Control Radar.

The Fire Control Radar aboard consisted of two Mk. 12 and one Mk. 3 and one Mk. 28. The Mk. 28 was the only radar operative prior to test B, the others having no antennas. Additional damage to the Fire Control sets was as follows:

Mk. 28: Antenna binds and will not move properly. Magnetron broken at glass seal.

Mk. 3: One tube in the CW52AA F unit broken.

Mk. 12: (After) (Aux. CIC) The CW55ADN Range Operator's indicator unit was thrown forward and torn from its mounting, but sustained no other damage. The CW43ABU transmitter-receiver unit had three 446A tubes thrown from their sockets, one being broken. The CW20-ACC indicator power unit had one rectifier tube broken.

Mk. 12 (Reconn-Forward): An internal short-circuiting of the spark wheel modulator motor prevented checking the sweeps and pulses. The main frame of this unit sustained no other apparent damage.

Mk. 22 (Radar Aft): CW30ADS Modulator was torn loose from its mountings, breaking S902 meter switch and R-924 voltage regulating potentiometer. One tube in the CW55AFN indicator unit was broken.

Mk. 22 (Fwd): Sustain no additional damage.

C. Surface Search Radar.

No operable search (surface) radar existed before B test because all antennas were down. Additional damage consisted of:

Forward SG: Foundation bolts sheared off and main frame moved forward about six inches, bending wave guide slightly. Water had dripped over main frame and collected in a puddle at base.

Magnet field density had fropped to 1190 Gauss, probably as a result of shock. All circuits in the indicator operative and all circuits in the main frame, with the exception of the magnetron output are operative.

After SG: Was subjected to heavy vibration and shock. Tuning meter on the received on main frame broken. Rubber shock stripping around center panel of modulation generator torn loose. Otherwise no apparent damage.

D. Air Search Radar.

The SK radar suffered the following additional damage. All ring oscilator tubes broken. Upper shock mounts on transmitter frame broken. Power and control cables near transmitter frame soaked in water. Indicator console in CIC undamaged.

E. Radar Repeaters.

All radar repeaters apparently undamaged. No power available for testing this equipment, but it is presumed they would work if power were available.

F. Radar Counter Measures Equipment.

No apparent change.

G. Radar and Radio Beacons.

No apparent change.

H. IFF Equipment.

No apparent change.

I. Communication Transmitters (Radio).

The TAJ transmitter, located in Radio Two had its final amplifier tube thrown out of its mounting. No other damage to any transmitter.

J. Communication Receivers (Radio).

The RBK receiver in Radio two was knocked loose from its cabinet and thrown to the deck, breaking one tube. This equipment was operative upon restoration of the tube. Otherwise no damage to radio receivers.

K. Communication Antennas (Radio).

No change.

L. Radio transceivers (combined transmitters and Receivers.).

No change.

M. Sonar Echo Ranging and Listening Equipment.

None aboard.

N. Sonar Echo Sounding Equipment and Altimeters.

No change.

O. Loran Navigation Equipment.

The Loran unit was torn loose from its mounting but apparently undamaged. Power was not available to test this equipment, however it is presumed that it could work.

P. Power Supplies (Motor Generators and Filters).

No apparent damage.

Q. Television and Teletype Equipment.

None aboard.

R. Test Equipment (including frequency meters).

No change.

S. Instrumentation.

Not checked.

T. Telephone Equipment.

All remote boxes and panels appeared to be undamaged. Due to lack of time aboard it was impossible to test these equipments.

U. Direction Finders (Radio).

None aboard.

V. Spare Parts.

With the exception of some spare parts improperly stowed in the superstructure compartments, no spare parts were damaged.

W. Army Electronics.

None onboard for B test.

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 Report

AD-376836L	XRD-98
AD-376835L	XRD-97
AD-376834L	XRD-96
AD-376833L	XRD-95
AD-376832L	XRD-94 re-ingest
AD-367458	XRD-93
AD-367457	XRD-92-Volume 2
AD-367456	XRD-91-Volume 1
AD-367455	XRD-90
AD-367454	XRD-89
AD-367453	XRD-88
AD-367452	XRD-87
AD-366764	XRD-86
AD-376837L	XRD-99
AD-366758	XRD-78
AD-366734	XRD-44
AD-366763	XRD-85
AD-376829L	XRD-77
AD-367462	XRD-103
AD-367463	XRD-104
AD-367461	XRD-102
AD-367460	XRD-101

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