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(9) BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REP[redacted]T.

Classification (~~Cancelled~~) (Changed to ~~CONFIDENTIAL~~)
By Authority of JOINT CHIEFS OF STAFF Action of 15 April 1949
By John Clay Capt Date 24 Sept 1949
AFSWP

(6) OPERATION CROSSROADS.

U.S.S. BRULE (APA 66).

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FROM DDC. [redacted]

Defense Atomic Support Agency
Washington, D. C. 20301

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BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT

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By [illegible] Capt Date [illegible]
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U. [illegible]
FROM USS. [illegible]

[illegible] Support Agency
Washington, D. C. 20301

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USS BRULE (APA66)

Page 1 of 147 Pages

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U.S.S. BRULE (APA 66)

SHIP CHARACTERISTICS

Building Yard: Consolidated Steel Corp.; Wilmington, California.

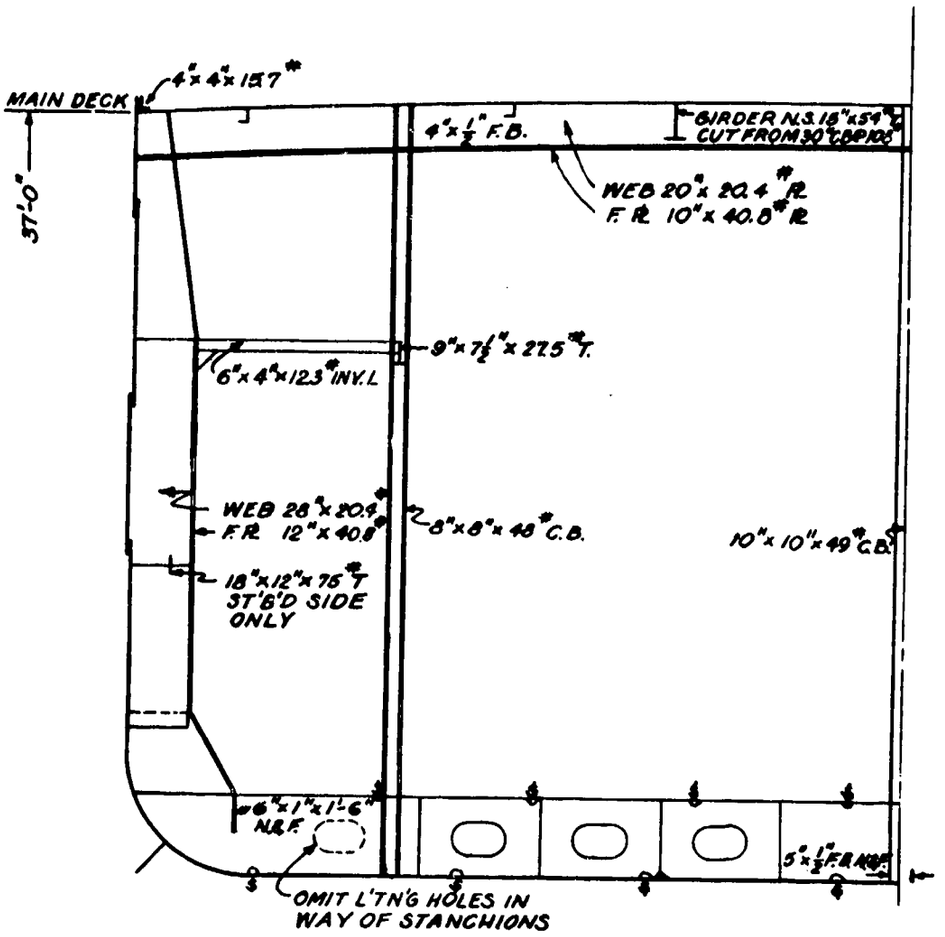
Commissioned: 31 October 1944.

HULL

Length Overall: 426 feet 0 inches.
Length on Waterline: 400 feet 0 inches.
Beam (extreme): 58 feet 0 inches.
Depth (molded to upper deck): 37 feet 0 inches
Drafts at time of test: Fwd: 9 feet 6 inches.
Aft: 15 feet 0 inches.
Limiting displacement: 7,080 tons.
Displacement at time of test: 5,211 tons.

MAIN PROPULSION PLANT

Main Engines: Two sets of Westinghouse steam turbines, directly connected to Westinghouse main generators. Two main shaft motors.
Main Condensers: Two are installed in ship.
Boilers: Two Babcock and Wilcox boilers are installed in ship. 450 psi gauge - 750° F.
Propellers: Two are installed in ship.
Main Shafts: Two are installed in ship.
Ships Service Generators: Five are installed in ship.
Two - 250 KW. - 450 V. - A.C.
One - 150 KW. - 450 V. - A.C.
Two - 100 KW. - 120/240 V. - D.C.



FRAME 76 LOOKING AFT

MIDSHIP SECTION

TEST A

[redacted]

U.S.S. BRULE (APA 66)

9089

TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

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

There was no flooding, consequently no change in drafts or list.

(b) Structural damage.

HULL

At the time of the test this vessel had all watertight closures open except those to magazines and ammunition hoists. All covers were off the cargo hatches. This was done in order to test the validity of a theory that less damage might result if interior spaces were left completely open in order to permit rapid equalization of exterior and interior pressures.

The vertical plating on the starboard side of the superstructure and in the starboard well deck is generally dished, with diminishing intensity from forward to aft.

Metal joiner bulkheads and sheet metal light locks on the main deck and above are blown out or distorted. Damage of this nature occurs principally in way of weather doors and cargo hatches and is carried for considerable distances into interior spaces. In the same areas there is no marked failure of structural bulkheads. Most metal furniture and lockers in areas near weather openings are damaged. Because access closures were opened, this damage is greater than it otherwise would have been.

Deck dishing is confined essentially to the upper deck and occurs in the area to starboard of the forward cargo hatch and aft of the after deck house.

The only shell dishing attributable to test A is slight and occurs on the starboard bow and quarter.

There is no structural damage below the waterline.

MACHINERY

The outer casings of both stacks were moderately dented. The steering wheel in secondary conn, superstructure deck, was bent (the shaft can be turned).

ELECTRICAL

Structural damage affecting electrical equipment was essentially as follows:

1. Dishing and whipping of starboard outboard bulkhead on main deck cracked insulating panels of boat davit controllers.

2. Rupturing of light metal bulkheads on main deck carried away a few cables, lighting fixtures and the dishwasher motor controller.

(c) Other damage.

HULL

No comment.

MACHINERY

The two starboard Welin davits sustained electrical damage. An oil ring jumped out of its groove on #1 ship's service generator. The car of the gasoline hoist jammed in its trunk, the trunk and carriage being sprung and distorted. The machine shop drill press column (cast iron) broke. There is monor damage to piping.

ELECTRICAL

One generator set was made inoperable due to an oil ring jumping or rolling out of place.

The two starboard boat davit controllers and a dish-washer controller were inoperable due to broken insulating panels.

A few storage batteries were jarred off racks.

Gyro repeaters on wings of bridge were blown from their supports.

The starboard 24" searchlight king pin was bent.

Two of the four operating table lights were damaged by blast.

The standard compass binnacle was torn loose.

II. Forces Evidenced and Effects Noted.

(a) Heat.

HULL

The source of radiation bore about 120 degrees relative. All surfaces facing aft or to starboard, unless shielded by structure, are blistered. Evidence of vortexing of the heat wave was seen on the starboard boat davits where blistering and scorching of paint occurred on the lee sides. Zinc chromate, formula 84, seems to be affected more than ordinary top coats similarly exposed. Wood surfaces received greater blistering than corresponding steel surfaces. Grease was not burned on cables or hoist drums. No glass was broken by heat. Scorching of all exposed fire hoses and cordage was noted. Insulation was scorched on a few electric cables on the starboard side aft.

MACHINERY

Paint on the starboard side of exposed machinery is scorched and blistered.

ELECTRICAL

Heat was evidenced by scorched paint on apparatus exposed to the blast and by cable insulation which exuded thru armor on a few exposed cables.

(b) Fires and explosions

HULL

No explosions and no fires of any importance occurred on the BRULE. Swabs in two topside racks burned Ignition is believed to have been caused by direct radiation penetrating the cotton fibres of the swabs.

MACHINERY

No evidence.

ELECTRICAL

No fires or explosions affecting electrical equipment were noted.

(c) Shock.

HULL

Shock damage is slight. A drill press pedestal in the machine ship is broken near the deck. Shock caused an oil ring to jump out of a bearing in number one ship's service generator. Gyro repeaters on both wings of the navigating bridge were knocked off their pedestals. A gyro repeater on the signal bridge level was adrift from its trunnions. Shock, or blast pressure, caused breakage of small salt water pipes in heads and showers. This piping was already badly corroded.

MACHINERY

No evidence.

ELECTRICAL

Shock may have caused the oil ring of No. 1 Ship's Service generator to jump out of its normal location. There was no other evidence of shock on electrical equipment.

(d) Pressure.

HULL

The pressure wave originated at a point bearing approximately 120 degrees relative. The pressure damage is of particular interest in that all weather openings were open except those to magazines and hoists. In way of the weather openings, joiner bulkheads and sheet metal lighlocks are demolished. This effect diminished with distance from the opening. Long flat panels of exterior plating on the starboard side of the superstructure and in the starboard main deck passageway are dished slightly. In general, it appears that the critical plating weight is slightly above 7 1/2 # MS. The semi-structural 5# plate longitudinal bulkhead on the main deck along the port edge of both cargo hatches was moderately dished by air blast, but this damage probably would not have occurred if hatch closures had been in place.

Both stacks are severely dished on the starboard after segment. The welded connection of the after stack to the top of the deck house is torn for a peripheral distance of 8 feet.

Forward and after starboard cargo booms, stowed horizontally in end cradles, are bent due to blast pressure and inertia effect.

MACHINERY

Blast pressure and the whipping motion of the ship following the blast caused all damage to the machinery installation. The blast came from starboard.

ELECTRICAL

Pressure or blast caused damage to topside exposed equipment such as searchlights, peloruses, binnacles and to lighting fixtures below decks near openings.

(e) Any effects peculiar to the Atom Bomb.

HULL

Other than the effects of radioactivity, the only effect peculiar to the atom bomb is that of intense heat.

MACHINERY

A blast pressure of this magnitude is apparently peculiar to the atom bomb.

ELECTRICAL

Effect peculiar to the atom bomb was a combination of heat and blast effect on exposed surfaces.

III. Effects of Damage.

(a) Effect on machinery and ship control.

HULL

Damage to boat davit controls resulted in the starboard Welin davits being put out of commission.

MACHINERY

The following machinery is inoperable: Both starboard Welin davits (because of electrical damage); gasoline hoist; drill press; #1 ship's service generator. Damage to piping is minor and of local significance only. Overall operation of the plant and ship control were not affected. Ample electric power is available from undamaged generators. This vessel shifted berths under her own power after Test A.

ELECTRICAL

Propulsion and propulsion control were not affected by test A damage to electrical equipment.

The effect of A bomb damage on ship control was negligible.

(b) Effect on gunnery and fire control.

HULL

No effect on gunnery or fire control resulted. The SC4 radar is inoperative because of electronics damage. The rangefinder is undamaged.

MACHINERY

No comment.

ELECTRICAL

The effect of A bomb electrical damage on gunnery and fire control was negligible.

(c) Effect on watertight integrity and stability.

HULL

Watertight integrity was impared only by the possibility that heavy seas could wash into the ship through distorted hatch coamings and covers on the upper deck aft and through damaged access closures in the starboard main deck weather passageway.

Damage to hatches and doors would have been materially less had these closures been dogged shut during the test.

Stability is not affected.

MACHINERY

No comment.

ELECTRICAL

Electrical damage had no effect on watertight integrity and stability.

(d) Personnel and habitability.

HULL

It is considered that all personnel on exposed decks and near weather access openings would have been injured by air blast, heat, or radioactivity. It is not believed that there would have been any effect on personnel below decks except those exposed to boiler flare-backs.

Habitability was reduced temporarily by damage to furniture and lockers, blocking of passages by demolished joiner-bulkheads, light locks, and ladder pans, and breakage of pipes in heads and showers.

MACHINERY

This vessel was left open during the test. Under these conditions, there would probably have been a considerable number of personnel casualties below deck. However, if she had been closed up (condition A), there would have been no personnel casualties below decks. Damage to piping in heads and showers had a temporary minor effect on habitability which could be remedied by the ship's force in a short time.

ELECTRICAL

Electrical damage had a negligible effect on personnel and habitability. Damage affecting habitability was limited to the breaking of a few lamp bulbs and fixtures.

(e) Effect on fighting efficiency.

HULL

Fighting efficiency would have been lost temporarily due to personnel casualties in gunnery, fire control, and ship control stations, and possible casualties in boiler rooms. A reduction in efficiency of the vessel in unloading troops would have resulted from failure of the electrical equipment controlling the starboard Welin davits. Some effect on ship propulsion would have resulted from generator damage.

MACHINERY

The only effect of the test on fighting efficiency from a machinery point of view was to reduce the vessel's ability to lower boats until the electrical damage to the starboard Welin davits was repaired.

ELECTRICAL

Fighting efficiency was considerably reduced by the damage to the starboard boat davit controllers.

IV. General Summary of Observers' Impressions and Conclusions.

HULL

Casualties to exposed personnel would have been heavy but the ship could have proceeded on her mission at reduced efficiency because of damage to boat davit controls. Most of the interior damage suffered by BRULE was caused by the fact that all access was left open. After a period of reorganization and cleaning up, the ship could probably have continued in operations with only slight reduction in efficiency.

MACHINERY

The BRULE was apparently just outside the range of serious damage to machinery from this form of attack.

ELECTRICAL

The only electrical damage having an appreciable effect on the operation of the vessel was that to the two starboard boat davit controllers. Damage to these units materially affected the ship's ability to disembark troops.

Damage to the 24" searchlight, the gyro repeaters and the standard compass had little effect on the operation or fighting efficiency of the ship. Damage to the No. 1 Ship's Service generator did not appreciably affect the operation of the vessel or fighting efficiency since ample power was available from a spare unit.

V. Preliminary Recommendations.

HULL

Gunnery and fire control personnel should be housed as far as practicable in protective enclosures of cylindrical or spherical shape to reduce loss of personnel or equipment due to effect of blast and heat.

Attention should be given to more effective means of cradling cargo booms to prevent bending due to inertia effects.

Joiner and sheet metal bulkheads should be kept to a minimum and should not be installed near weather access openings. Plating under 10 pounds in weight should not be used in areas exposed to air blast of this magnitude.

Electrical equipment boxes should be better protected against air blast and the equipment should be made more shock resistant.

MACHINERY

It is recommended that the design of oil rings on the ship's service generators of this vessel be studied to determine means of preventing casualties such as the one that occurred on this vessel.

ELECTRICAL

Oiling arrangements for rotating machinery should preferably be of the pressure type or should be so arranged that shock or rolling of the vessel to any angle at which the ship will stay afloat will not derange the lubrication system.

Motor controllers should be of navy standard type wherever practicably. Methods of supports should be such that a considerable movement or distortion of the supporting bulkhead or deck can take place without derangement of the controller mechanism. Where navy type controllers are not practicably, the controller should comply as nearly as practicably with Navy Department specifications for shock proofness. Supports for vital non-navy type controllers should be designed to protect the mechanism against shock.

Storage battery stowage racks should be designed to securely hold the plates and jars onto the racks. The securing means should be such as to minimize the probability of careless nonuse.

Gyro repeater mounting arrangements should be redesigned to eliminate gimbel rings where not essential and to provide a more rugged securing arrangement.

Searchlights (24" and 36") should be redesigned to have less resistance to air blast. If trunion arms and king pins are used they should be of a stronger design. High intensity signaling lights larger than 12" in diameter should be provided with remote shutter control and remote positioning so that the signalman can be in a protected location.

Operating room lights should be redesigned to provide a more rugged method of securing the lamp mechanism.

Magnetic compass binnacles should be redesigned to be less susceptible to blast damage and to have more rugged gimble rings.

Bull horns or similar intermittently used special equipment which must be installed in exposed locations. That which it is not practical to steam line, should be arranged for convenient storage in a protected location when not in use.

TECHNICAL INSPECTION REPORT

SECTION I - HULL

GENERAL SUMMARY OF HULL DAMAGE

I. Target Condition After Test.

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

There was no flooding, consequently no change in drafts or list.

(b) Structural damage.

At the time of the test this vessel had all watertight closures open except those to magazines and ammunition hoists. All covers were off the cargo hatches. This was done in order to test the validity of an opinion that less damage would result if interior spaces were left completely open in order to permit rapid equalization of exterior and interior pressures.

The vertical plating on the starboard side of the superstructure and in the starboard well deck is generally dished, with diminishing intensity from forward to aft.

Metal joiner bulkheads and sheet metal light locks on the main deck and above are blown out or distorted. Damage of this nature occurs principally in way of weather doors and cargo hatches and is carried for considerable distances into interior spaces. In the same areas there is no marked failure of structural bulkheads. Most metal furniture and lockers in areas near weather openings are damaged.

Deck dishing is confined essentially to the upper deck and occurs in the area to starboard of the forward cargo hatch and aft of the after deck house.

The only shell dishing attributable to Test A is slight and occurs on the starboard bow and quarter.

There is no structural damage below the waterline.

(c) Other damage.

No comment.

II. Forces Evidenced and Effects Noted.

(a) Heat.

The source of radiation bore about 120 degrees relative. All surfaces facing aft or to starboard, unless shielded by structure, are blistered. Evidence of vortexing of the heat wave was seen on the starboard boat davits where blistering and scorching of paint occurred on the lee sides. Zinc chromate, formula 84, seems to be affected more than ordinary top coats similarly exposed. Wood surfaces received greater blistering than corresponding steel surfaces. Grease was not burned on cables or hoist drums. No glass was broken by heat. Scorching of all exposed fire hoses and cordage was noted. Insulation was scorched on a few electric cables on the starboard side aft.

(b) Fires and explosions.

No explosions and no fires of any importance occurred on BRULE. Swabs in two topside racks burned. Ignition is believed to have been caused by direct heat radiation penetrating the cotton fibres of the swabs.

(c) Shock.

Shock damage is slight. A drill press pedestal in the machine shop is broken near the deck. Shock caused an oil ring to jump out of a bearing in number one ships service generator.

Gyro repeaters on both wings of the navigating bridge were knocked off their pedestals. A gyro repeater on the signal bridge level was adrift from its trunnions. Shock, or blast pressure, caused breakage of small salt water pipes in heads and showers. This piping was already badly corroded.

(d) Pressure.

The pressure wave originated at a point bearing approximately 120 degrees relative. The pressure damage is of particular interest in that all weather openings were open except those to magazines and hoists. In way of the weather openings, joiner bulkheads and sheet metal light-locks are demolished. This effect diminished with distance from the opening. Long flat panels of plating on the starboard side of the superstructure and in the starboard main deck passageway are dished slightly. In general, it appears that the critical plating weight is slightly above 7-1/2 # MS. The semi-structural 5# plate longitudinal bulkhead along the port edge of both cargo hatches was moderately dished by air blast, but this damage probably would not have occurred if hatch closures had been in place.

Both stacks are severely dished on the starboard after segment. The welded connection of the after stack to the top of the deck house is torn for a peripheral distance of 8 feet.

Forward and after starboard cargo booms, stowed horizontally in end cradles, are bent due to blast pressure and inertia. effect.

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

Other than the effects of radioactivity, the only effect peculiar to the atom bomb is that of intense heat.

III. Effects of Damage.

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

Damage to boat davit controls resulted in the starboard Welin davits being put out of commission.

(b) Effect on gunnery and fire control.

No effect on gunnery or fire control resulted. The SC4 radar is inoperative because of electronics damage. The range-finder is undamaged.

(c) Effect on watertight integrity and stability.

Watertight integrity was impaired only by the possibility that heavy seas could wash into the ship through distorted hatch coamings and covers on the upper deck aft and through damaged access closures in the starboard main deck weather passageway.

Damage to hatches and doors would have been materially less had these closures been dogged shut during the test.

Stability is not affected.

(d) Effect on personnel and habitability.

It is considered that all personnel on exposed decks and near weather access openings would have been injured by air blast, heat, or radioactivity. It is not believed that there would have been any effect on personnel below decks except those exposed to boiler flare-backs.

Habitability was reduced temporarily by damage to furniture and lockers, blocking of passages by demolished joiner-bulkheads, light locks, and ladder pans, and breakage of pipes in heads and showers.

(e) Total effect on fighting efficiency.

Fighting efficiency would have been lost temporarily due to personnel casualties in gunnery, fire control, and ship control stations, and possible casualties in boiler rooms. A reduction in efficiency of the vessel in unloading troops would have resulted from failure of the electrical equipment controlling the starboard Welin davits. Some effect on ship propulsion would have resulted from generator damage.

IV. General Summary of Observers' Impressions and Conclusions.

Casualties to exposed personnel would have been heavy but the ship could have proceeded on her mission at reduced efficiency because of damage to boat davit controls. Most of the interior damage suffered by BRULE was caused by the fact that all access was left open. After a period of reorganization and cleaning up, the ship could probably have continued in operations with only slight reduction in efficiency.

V. Preliminary Recommendation.

Gunnery and fire control personnel should be housed as far as practicable in protective enclosures of cylindrical or spherical shape to reduce loss of personnel or equipment due to effects of blast and heat.

Attention should be given to more effective means of cradling cargo booms to prevent bending due to inertia effects.

Joiner and sheet metal bulkheads should be kept to a minimum and should not be installed near weather access openings. Plating under 10 pounds in weight should not be used in areas exposed to air blast.

Electrical equipment boxes should be better protected against air blast and the equipment should be made more shock resistant.

VI. Instructions for loading the vessel specified the following:

ITEM	LOADING
Fuel Oil	Minimum
Diesel Oil	Minimum
Ammunition	10%
Potable and reserve feed water	95%
Salt water ballast	1280

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.

The blast struck the vessel at an angle of approximately 120 degrees relative. Cargo hatch closures forward and aft were left off for the test and all watertight closures, except those to magazines and ammunition hoists, were left open. No boats were on board.

Damage to shell plating and decks is slight. Topside damage is largely superficial and is confined to dishing of plating less than 10 pounds in weight. Stacks and bulwarks are distorted, furniture and equipment is disarranged or broken, and paint is burned on surfaces exposed to the blast. Considerable damage occurred to a joiner and sheet metal bulkheads in areas near weather doors and hatches.

Photographs Pages 62 to 77 are general views of the exterior of the ship.

(b) General areas of hull damage.

Principal areas of damage are the superstructure and bridge area, the upper deck in way of the forward cargo hatch, the upper deck aft, the starboard well deck, the after deck house top, and interior areas in way of weather access openings. Damage to exposed plating is confined generally to surfaces facing aft or to starboard. Dishing of starboard plating noticeably diminishes from forward to aft.

(c) Apparent causes of Hull damage in each area.

The principal causes of damage is air blast, but some damage to equipment is the result of shock. Evidence of intense heat exists. Paint on surfaces exposed to the blast is burned or blistered

(photos 1819-8, Page 82). Swabs burned in topside storage racks, and the after signal halyards burned. Heat effects are not noted generally in areas shielded by structure (photo 1828-3, Page 83). Vortexing of the heat wave is indicated by blistered paint on the forward surfaces of the forward stack, of a boat davit, and of a gun tub (photos 1819-5,7,9, Pages 84 & 86). Interior areas are not affected by heat.

(d) Principal areas of flooding with sources.

There is no evidence of flooding. Drafts did not change during the test and soundings of tanks and voids remain the same.

(e) Residual Strength, Buoyancy, and effect of general condition of Hull on operability.

Residual strength and buoyancy are not affected. Operability would have been affected temporarily by disarrangement of moveable equipment and by blocking of passages by damaged joiner and sheet metal bulkheads. Personnel casualties would have been extremely high in exposed areas due to effects of radiation, air blast, and heat.

B. Superstructure.

(a) Description of Damage.

Top of house:

The deck plating is slightly dished between frames. Pipe rails and stanchions on the starboard side are bent forward and inboard abreast the signal station and after stack (photo 2172-9, Page 87). The starboard flag bag is demolished and its canvas cover is shreaded (photo 1827-2, Page 88). The port flag bag is slightly dished but otherwise intact. The starboard signal searchlight located at frame 60 is intact except for a bent flange and shutter. The port signal searchlight was blown off the ship.

The two 24-inch searchlights located on the forward stack are undamaged except for a bent frame and yoke on the starboard light (photos 2157-2, 2172-12 Pages 89 , and 90). All antennas are carried away except the SG radar and IFF radar. Failure of insulators is general. The fore topmast appears to be bent forward slightly (photo 1746-2, Page 78).

The forward and after stacks are severely dished and buckled on the starboard after quarter. The after stack is much more severely damaged than is the forward (photos 1819-6, 1827-3, 2172-11, Pages 91 , 92 , and 93). Both stacks are torn at the corners of a 28 x 42 inch rectangular coaming around a ventilation closure located near the deck on the starboard side. Stack casing and coaming are 7-1/2# plate. Rounded coaming corners probably would have prevented plate failure. Along the after starboard side of the after stack the welded connection of the outer stack casing to the deck plating is torn for a length of 8 feet (photos 1828-4 and 2172-10, Pages 94 , and 95). A vertical ladder on the radio direction finder house, forward side, port, is distorted and a deck locker located just forward of this house to port, is dished. The ladder and locker were shielded from the direct force of the blast by the RDF house (photo 1827-4, Page 96). The door of the RDF house is missing. The master compass pedestal, frame 90, is broken off and thrown forward and to port (photo 2172-9, Page 87). The gyro repeater is dislodged from its trunnions. All sides of the movie projection booth are severely dished. To port and starboard of the projection booth the 7-1/2# plate bulwarks of lookout stations are distorted. The 10# plate 20 MM gun bulwarks in this area are undamaged.

Navigating Bridge Level.

The forward bulwark of the starboard wing is bent forward approximately six inches and the bulwark capping is slightly

buckled. The forward bulwark of the port wing is intact. Gyro repeaters on both wings are dislodged from their pedestals. On the starboard wing a canvas covered expanded metal cleaning gear locker, facing forward, is severely dished aft and buckets stowed in the locker are collapsed as the result of reflection of blast pressure from the inboard bulkhead and forward bulwark (photo 1828-6, Page 97).

The pilot house is littered with debris from shattered plywood panels used as lightlockes and the starboard bulkhead is dished.

Considerable equipment is disarranged in Radio I (photo 1828-2, Page 98). At frame 96, starboard, the door to the fan room is dished. Railings in this area are bent. At bulkhead 103 starboard, the door to the trash burner room is severely distorted.

Superstructure Deck Level.

The forward bulwark, starboard, is bowed forward a maximum of 16-inches and the bulwark capping (1'' x 5'' plate) is buckled upward 2-inches and torn from its connection to the deck house. All connections of the vertical stiffeners (4'' x 3'' angles) on the forward bulwark are cracked in the welded connection to the deck. The welded connections of transverse beams under the starboard wing of the navigating deck are cracked at their juncture with the deckhouse bulkhead at frames 60, 61, and 62. Inside the deckhouse the deck beam brackets are crumpled. The deckhouse plating in this area is dished inboard 3-inches. The starboard and after exposed bulkheads of the main deckhouse are generally slightly dished, diminishing in severity from forward to aft.

Forward Deckhouse Top.

The 7-1/2# lookout bulwarks at frame 30 port, and starboard, are severely distorted by blast (photo 152-5, Page 99).

These bulwarks are secured to the deck by four clips, welded to the tub and bolted to the deck. Several of the holding down bolts sheared. Similar bulwarks atop the deckhouse at frame 102, secured to the deck by continuous welding, were only lightly dished.

After Deckhouse Top.

The flag bag (wooden frame) is demolished and a ventilation intake cover is blown off. The pipe supports and cross-bracing under the after 20 MM gun foundations, port and starboard, are slightly bent. A sheet metal enclosure installed around these foundations by the ships force is blown out.

Joiner bulkheads and doors in superstructure areas are dished or blown down. (photo 1819-10, Page **100**) Door hinge screws and riveted connections of joiner bulkhead panels appear to be sources of weakness. Metal lockers are badly damaged. Damage to vertical ladders topside is general; ladder stringers are severely distorted and upper and lower connections are broken. Ladders most severely damaged are those serving as access to the starboard searchlight platform on the forward stack, to the radio direction finder house top, and to the high gun foundation on the after deckhouse.

The fore topmast appears bent forward slightly (photo 1746-2, Page **78**).

(b) Causes of damage in each area.

Air blast is the cause of all damage except for heat damage to paint.

(c) Evidences of fire in superstructure.

No fires of any consequence occurred on this ship. Swabs burned in a rack on the starboard side of the superstructure deck at frame 85 and on the after deck house top at frame 147. The after signal halyards burned. Fire hose and cordage exposed to the blast are scorched but remain in usable condition. Paint on nearly all surfaces facing aft or to starboard is blistered. Paint on decks is somewhat scorched but to much lesser degree than that on vertical surfaces.

(d) Estimate of relative effectiveness against heat and blast, of plating thicknesses and shaped surfaces.

Gun bulwarks and bulkheads constructed of plating in excess of 7-1/2# weight were generally unaffected by the blast. Shape of structure appears to be of slight significance in comparison to weight of material and panel stiffening under the intensity of air blast encountered.

Joiner bulkheads, sheet metal light locks, ladder pans, metal lockers, and flag bags are particularly vulnerable to blast.

Tubular cargo booms having relatively long spans between supporting cradles, do not effectively resist bending from blast, because of the inertia effects of mass.

(e) Constructive Criticism of Superstructure Design or Construction.

Structural projections and pocketed spans should be eliminated. Plating lighter than 10# should be used only in relatively small, rigidly stiffened panels. Bulwarks, gun tubs, and lookout tubs should be of plating not lighter than 10# and should be connected to decks by continuous welds. Splinter and blast shields and fire control shelters should be of cylindrical or spherical shape to afford a maximum of protection to topside personnel. The use of joiner bulkheads should be kept to a minimum. In areas near weather access openings or in areas likely to be subjected to reflection or funneling of air blast pressure, light structural bulkheads should be used instead of metal joiner bulkheads. Ladder connections should be made more secure and the unsupported length of ladder stringers should not exceed about four feet. Antenna insulators of greater strength should be provided. Halyards should be of fire resistant material. High rigging should be made quickly replaceable by spares. Instrument pedestals should be made shock proof. Electrical apparatus should not be attached to bulkheads likely to suffer dishing or severe vibration from air blast.

C. Guns and Directors.

At the time of the test, four 20 MM guns were installed on the ship. These are apparently undamaged and operable in all respects. The rangefinder is undamaged.

D. Torpedo Mounts and Depth Charge Gear.

Not applicable.

E. Weather Deck.

(a) General condition of deck and causes of damage.

The general condition of weather decks is good except for light to moderate dishing by air blast. The upper deck is dished as follows:

Frames 30-40, starboard, between the deckhouse and deck edge - 2 inches.

Frames 40-42, starboard, between cargo hatch and deck edge - 1-inch.

Frame 128, port and starboard - 1/2-inch.

Frames 160-162, centerline - 1-inch.

A tabulation of deck deflection scratch gage locations and readings is enclosed as an Appendix.

In way of upper deck dishing, brackets connecting transverse deck girders to side shell frames are slightly distorted. This effect is more apparent on the starboard side.

The deckhouse transverse weather bulkhead 108 is dished forward in two panels, the interior centerline bulkhead and the outboard longitudinal bulkheads acting as panel boundaries.

The starboard weather passageway longitudinal bulkhead is dished throughout its length, with a maximum permanent deflection of four inches. Bulkhead 59 at the forward end of the passageway is slightly dished but the doors in this bulkhead are intact. A fashion plate installed by the ship's force at the forward end of the starboard weather passageway was blown in when its welded connections failed. However it served to shield the doors at the forward end of the passageway. All other doors and vent covers in the starboard weather passageway are distorted and some are missing.

(b) Usability of deck in damaged condition

Usability of weather decks is not impaired.

(c) Condition of equipment and fittings.

All mooring and towing fittings are in good condition. Boat davits and winches, port and starboard, are undamaged. However, boat handling electrical control panels located in the starboard weather passageway are damaged and will require replacement prior to operation of the starboard davits. Electrical contacts in the control box were jammed by the blast and burned out at the first attempt to start the boat handling equipment. All other hull machinery has been tested and operates satisfactorily. No boats were on board during the test. It is considered that boats stowed on the starboard side would have suffered blast damage. A liferaft stowed the upper deck at frame 85, starboard, was blown into the after cargo hatch opening.

Two starboard cargo booms, stowed in end cradles during Test A, were bent. The after 15 ton boom is bent at both ends of the central enlarged section. The diameter at points of bending is approximately 12-inches, and the permanent deflection is approximately 2-inches. Stowed booms should be provided with additional

support to that at the boom ends. One centrally located cradle, or two for long booms, should be used and cradles should have means of tightly clamping the boom.

Chain lifelines are carried away, frames 42 to 60, starboard. The wire life lines on the fantail are blown from the stanchion hooks as the result of spreading of the hooks. Distortion of pipe life rails is general on the starboard side on all decks.

The jack and ensign staffs are slightly bent.

On the upper deck, the 26-inch high hatch coamings at frame 149 are dished inward about 10 inches and the hatch covers are distorted. A 7-1/2# plate circular cover welded over the gun foundation ring at frame 157 from which the 5-inch gun had been removed was blown off. This had been installed by the ships force.

F. Exterior Hull (Above Waterline).

(a) Condition of exterior hull plating and causes of damage.

The starboard shell is damaged as follows:

Frames 32 to 42, there are small vertical waves about 1/2 inch deep and 3 feet long, between the main deck and first platform.

Frames 42 to 50, the sheer strake is dished inboard approximately 1/2-inch between the upper and main decks.

Frames 146 to 152, slight dishing between the main and upper decks.

Shell plating irregularities of this magnitude are common in ships of this class due to construction methods and normal operating conditions. It is difficult to determine how much of this damage has resulted from the test.

Paint is blistered or scorched on the starboard side over practically the entire area from stem to stern (photos 49-107, 1744-11, 12, 1746-1 Pages 73 , 81 , 80 , and 79).

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

Exterior hull fittings are in good condition with the exception of the wooden boat boom hinged at frame 58, starboard, and stowed forward in a horizontal position. The boom was broken about four feet from the hinge. The longer (forward) portion, to which the stay was attached came to rest in a vertical position against the starboard forward corner of the bridge structure (photo 1746-1, Page 79).

G. Interior Compartments above Waterline.

(a) Damage to structure and causes.

Damage to interior structure is limited to bowed stiffeners and distortion of connecting brackets in way of dished bulkheads and decks in the superstructure and in way of areas of dished weather deck and shell plating. Such damage is observed throughout the starboard and after bulkheads of the main deck house; on the starboard side, main deck, frames 30 to 52 and frames 126 to 128; and under the upper deck between frames 155 to 160. The starboard shell plating is dished between the main deck and first platform, frames 146 to 152.

The 5# structural bulkheads along the port side of the main cargo hatches on the main deck are dished about five inches. These bulkheads are stiffened with half round sections. The good performance of these bulkheads contrasts sharply that of metal joiner bulkheads which were sheltered by them but which are distorted and have failed in way of riveted connections to deck and overhead bounding strips (photos 1827-8, 1828-1, Pages 101 , and 102).

All damage has been caused by air blast.

(b) Damage to joiner bulkheads and causes.

Joiner bulkheads and sheet metal light locks and ladder pans in way of open weather doors and cargo hatches are

generally damaged. Most of the joiner work is secured to the top and bottom bounding strips with 1/8-inch rivets spaced four inches apart. Spans extend from deck to deck without additional stiffening. Most of the damage to such sheet metal work has resulted from failure of the riveted connections. Typical examples of bulkhead failures are:

Upper deck, frame 64, port, (photo 1827-1, Page 103).

Main deck, port side of both cargo hatches (photos 1827-8, 1828-1, Pages 101 and 102).

Main deck, frame 100, port, bulkhead of ships office (photo 1827-12, Page 104).

Typical examples of damage to light locks and ladder screens are:

Main deck, frame 30, starboard (photo 1827-11, Page 105).

Main deck, frame 68, port and starboard (photos 1827-5, 6, Pages 106 and 107).

Main deck, frame 87, port and starboard (photos 1828-12, 1829-4, Pages 108 and 109).

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

All weather access closures were left open during Test A.

At the after end of the starboard weather passageway, the inner door at frame 124 is torn in way of the upper hinge. The lower hinge is broken. A similar door on the port side is torn from its hinges. It is unlikely that such damage would have occurred had the doors been properly closed. All other weather doors in the starboard main deck passageway are moderately distorted. Had the doors been closed, they would probably have dished in a manner similar to the doors on ships at comparable distances from the burst.

Most interior joiner doors seem too heavy for associated joiner bulkheads. Many doors are blown down, the hinge screws having sheared. Some of the doors were blown as much as 30 feet from their frames. Removable panels in the lower half of the doors are generally blown out.

In both cargo hold areas, the pins which secure the hinged end pontoon sections in the open position are bent.

(d) Condition of equipment within compartments.

Metal furniture in the superstructure is damaged in way of dished bulkheads on the starboard side. Furniture and lockers in the vicinity of open weather doors are displaced and damaged (photos 1827-10, 9; Pages 110 and 111). Pipe berths and berth stanchions are disarranged in the crews berthing spaces adjacent the open cargo hatches (photo 1827-9, Page 111). A ventilation motor controller secured to a sheet metal light lock at frame 68, starboard, was wrecked when the light lock was demolished (photo 1827-5, Page 106). In the engineers workshop, the base of a drill is fractured (photo 1828-5, Page 112).

(e) Evidence of fire.

There is no evidence of fire in interior compratments. Interior paint is slightly scorched and blistered in way of open doors.

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

Shock or blast pressure caused breakage of badly corroded small salt water pipes in heads and showers on the main deck at frame 63. A hot water line is broken in way of damage to joiner bulkheads. On the upper deck at frame 107, a steam line is distorted. Piping in general held up well.

Electric fans and blowers sustained no casualties. Few light bulbs were broken. Lighting fixtures are broken in the operating room. Damage to ventilation ducts is slight. Some bulging of ducts and opening of duct seams occurred on the main deck and above. Ducts are blown open in the bakery (photo 2992-6, Page 113) and in crews berthing

main deck, frame 123, starboard. Much dirt was blown out of ducts into interior compartments. This was noted particularly in the laundry and pressing room on the first platform aft, where all equipment was covered with material blown from ventilation ducts.

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

Watertight integrity above the waterline would have been jeopardized in heavy seas due to crushing of hatch coamings on the upper deck at frame 149 and from distortion of watertight doors and door frames in the starboard weather passageway. Light-tight integrity is destroyed through damage of light locks in way of weather access openings. Habitability was temporarily reduced by blocking of passageways by demolished joiner bulkheads, by damage to furniture and lockers, by breakage of piping in heads and showers, and by dirt blown out of ventilation ducts. Messing facilities suffered no damage.

H. Armor Decks.

Not Applicable.

I. Interior Compartments (Below Waterline).

No damage.

J. Underwater Hull.

There is no known damage to the underwater hull, shafts, struts, or propellers.

K. Tanks.

There is no evidence of damage to, or contamination of, any tanks. Tank soundings after the test correspond closely to soundings before the test.

L. Flooding.

There is no flooding.

M. Ventilation.

(a) Damage to ventilation system and causes.

Some bulging and opening of ventilation ducts occurred on the main deck and above. A duct is blown open in the bakery and in crews berthing on the main deck, starboard, at frame 123 (photo 2992-6, Page 113). Intake openings and bolted covers are damaged in all areas on the starboard side of the ship, particularly in the starboard weather passageway. The affect on habitability due to ventilation duct damage is slight.

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

There is no evidence that heat, fire or smoke was carried below decks through the ventilation system. Air blast, however, resulted in quantities of dust and dirt being blown out of ducts into interior spaces.

(c) Evidence that ventilation system allowed progressive flooding.

None.

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

In general the ventilation system performed satisfactorily. All blowers on the ship are operable.

N. Ship Control.

(a) Damage to ship control stations and causes.

The master compass pedestal on the top of the deck house at frame 90 is broken and thrown forward and to port. The gyro repeater at this location is adrift from its trunnions. The gyro repeaters on both wings of the navigating bridge are dislodged from their trunnions.

The steering gear has been tested and found operable from both motors and controllable from the pilot house telemotor, from the after steering station, and by trick wheels in the steering engine room. The wheel at the after steering station is slightly bent but this does not interfere with its operation.

(b) Constructive criticism of ship control.

Ship control stations exposed to blast should be housed in enclosures designed for a maximum of protection of instruments and operating personnel.

O. Fire Control.

The 5-inch and 40 MM directors were removed before Test A. The mark 14 sights on the four remaining 20 MM, guns are apparently undamaged. The SG radar is operable. The SC 4 radar is inoperable because of damage to the driver stack, tube breakage, and discoloration of the PPI scope.

Personnel casualties in fire control stations would have been extremely high due to effects of heat and air blast. The number of these stations should be kept to a minimum and personnel should be housed in cylindrical or spherical enclosures of not less than 10 lb. plate.

P. Ammunition Behavior.

The ship had 10 percent of ammunition allowance. All ammunition appears normal. Slight blast damage to ready service boxes is evident.

Q. Ammunition Handling.

(a) Condition and operability of ammunition handling devices.

Hoists numbers 1,2, and 4 operate satisfactorily and are apparently undamaged.

A case of small arms ammunition was jammed in hoist number 3 before Test A. The hoist carrier holding this case had been cut out before the test, making this hoist inoperable.

The gasoline hoist was inoperable before Test A. A carrier exposed to the blast, at the top of the hoist in way of the open door, is distorted, but could be straightened by the ship's force sufficiently to permit operation of the hoist.

(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.

Hoist hoods exposed to air blast should be designed to prevent the full force of the blast from entering the hoist trunk. Hoist flame seals should receive special attention to protect ammunition in hoists and handling rooms from heat effects of the bomb explosion.

R. Strength.

(a) Permanent Hog or Sag.

There is no evidence of hog, sag, or damage to members affecting longitudinal strength of the ship.

(b) Shear strains in hull plating.

No evidence.

(c) Evidences of transverse or racking strains.

None.

(d) Failures in way of structural discontinuities.

None.

(e) Evidence of panel deflection under blast.

The critical plating weight for all structure exposed to air blast appears to be about 10# M.S.

Panel deflections occurred in BRULE as follows, listed in order of most severe damage by air blast:

1. Joiner bulkheads and sheet-metal light locks.
2. Outer casings of stacks.
3. Weather bulkheads facing aft or to starboard.
4. Upper deck plating.

S. Miscellaneous.

(a) Heat effects on paint. (Photos 49-106 and 107, 1819 7, 8, 9, and 1828-3 Pages 71 , 73 , 85 , 82 , 86 , and 83 .)

1. The surface coat was U.S. Navy 5 N dark gray, over a lighter gray undercoat.

2. The surface coat is blistered over the greater portion of all surfaces facing aft or to starboard. Evidence of vortexing of the heat wave exists in blistered paint on the lee side of a starboard boat davit, the forward stack and a gun shield (photos 1819-5,7,9 Pages 84 , 85 , and 86). In rare instances the light gray undercoat is scorched to a yellow or brown.

3. In general, the "shadow" cast by vertical structure offered sufficient protection to prevent blistering of paint in the shadow. (photo 1828-3 Page 83).

4. On the port side, paint is blistered on davits and unsheltered structure.

5. In general, deck paint is in much better condition than paint on vertical plating.

6. On one door where gray and white paint were side by side, the gray paint showed more damage because of difference in heat absorption.

(b) Miscellaneous heat effects.

1. Insulation on electrical wiring is scorched on the starboard after bridge structure.

2. Scorching of all exposed fire hoses and cordage is noted. Manila life lines and rigging is scorched.

3. Pipe rails and stanchions are in general blistered only on the semi-circumferential area facing the direction of the blast.

4. Canvas wrapping on inclined ladder rails, starboard is blackened by heat and shredded by blast. The yellow paint under the canvas appears unharmed.

5. Cord wrapping on pipe rails are undamaged.

6. Wood surfaces received greater paint blistering than corresponding steel surfaces.

7. Leather on boat stowage cradles, starboard, is in good condition.

8. Grease was not burned on cables or hoist drums.

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.

No data taken by machinery group.

(b) Structural damage.

The outer casings of both stacks were moderately dented. The steering wheel in secondary conn, superstructure deck, was bent (the shaft can be turned).

(c) Damage: machinery and ship control.

The two starboard Welin davits sustained electrical damage. An oil ring jumped out of its groove on #1 ship's service generator. The car of the gasoline hoist jammed in its trunk, the trunk and carriage being sprung and distorted. The machine shop drill press column (cast iron) broke. There is minor damage to piping.

II. Forces Evidenced and Effects Noted.

(a) Heat.

Paint on the starboard side of exposed machinery is scorched and blistered.

(b) Fires and explosions.

No evidence.

(c) Shock.

No evidence.

(d) Pressure.

Blast pressure and the whipping motion of the ship following the blast, caused all damage to the machinery installation. The blast came from starboard.

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

A blast pressure of this magnitude is apparently peculiar to the Atom Bomb.

III. Effects of Damage.

(a) Effect on machinery and ship control.

The following machinery is inoperable: Both starboard Welin davits (because of electrical damage); gasoline hoist; drill press; #1 ship's service generator. Damage to piping is minor and of local significance only. Overall operation of the plant and ship control were not affected. Ample electric power is available from undamaged generators. This vessel shifted berths under her own power after Test A.

(b) Effect on gunnery and fire control.

No comment.

(c) Effect on watertight integrity and stability.

No comment.

(d) Effect on personnel and habitability.

This vessel was left open during the test. Under these conditions, there would probably have been a considerable

number of personnel casualties below deck. However, if she had been closed up (condition Able), there would have been no personnel casualties below decks. Damage to piping in heads and showers had a temporary minor effect on habitability which could be remedied by the ship's force in a short time.

(e) Effect on fighting efficiency.

The only effect of the test on fighting efficiency from a machinery point of view was to reduce the vessel's ability to lower boats until the electrical damage to the starboard Welin davits was repaired.

IV. General Summary of Observers' Impressions and Conclusions.

The BRULE was apparently just outside the range of serious damage to machinery from this form of attack.

V. Preliminary Recommendations.

It is recommended that the design of oil rings on the ship's service generators of this vessel be studied to determine means of preventing casualties such as the one that occurred on this vessel.

DETAILED DESCRIPTION OF MACHINERY DAMAGE

A. General Description of Machinery Damage.

(a) Overall condition.

The overall condition of the machinery of this vessel shows no change that would appreciably affect operation as a result of the target test.

Minor damage is listed under the following items:

K-Pumps; L-Auxiliary generators; P-Winches, windlasses and capstans; R-Elevators, ammunition hoists, etc.; V-Piping; W-Miscellaneous.

(b) Areas of major damage.

There is no major damage to the machinery. The minor damage is distributed throughout the main and upper decks of the ship.

(c) Primary cause of damage.

Blast pressure is the direct cause of the damage. Some damage was caused by the whipping motion of the ship following the blast, and some may have been caused by the heavy roll (70°) of the ship.

NOTE: Topside closures of this vessel were intentionally left open during Test A. Blast pressure was thus able to enter the machinery spaces direct.

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

The starboard Welin davits (#1 and #3) are inoperable because of electrical failures. No. 1 ship's service generator was made inoperable by the jumping out of an oil ring. This would probably have severely damaged the generator if it had been in operation. However, ample power is available from undamaged generators. The machine shop drill press is beyond repair. None of the above damage, nor any of the minor items of damage affects the overall operation of the machinery plant. However, ability of the vessel to lower boats is reduced until the two starboard Welin davits are again operable. The ship shifted berths under her own power after Test A, at which time all undamaged machinery was tested.

B. Boilers.

Undamaged. Both boilers were steamed after Test A and functioned normally.

Hydrostatic tests indicate no change in the tightness of the boilers.

The outer casings of both stacks were moderately dented by blast pressure (See Photos 2172-9, 10, 11, 12 & 1828-4; Pages 87 , 95 ,93,90, and 94). This does not impair operation.

Hydrostatic test data of #2 boiler:

	Before Test A	After Test A
Initial Pressure	500#	500#
Time required for pressure to drop		
100#	21 minutes	2 hours
200	44 "	5 "
300	2 hours	11 1/2 hours
400	4 3/4 hours	22 1/2 "

C Blowers

Undamaged. All blowers were operated at full load after Test A

D. Fuel Oil Equipment.

Undamaged. All equipment was operated under service conditions after Test A and functioned normally.

E. Boiler Feedwater Equipment

Undamaged All equipment was operated under service conditions after Test A and functioned normally.

F. Main Turbines.

Undamaged. Both main turbo-generators were operated in both directions after Test A and functioned normally.

G. Reduction Gears.

Not applicable

H. Shafting and Bearings

Undamaged Shafting and bearings were inspected while the main motors were being turned over, and functioned normally.

I. Lubrication System.

Undamaged. The lubrication system was operated under working conditions after Test A, and functioned normally.

J. Condensers and Air Ejectors

Undamaged. All condensers were tested under working conditions after Test A. They functioned normally, maintaining a vacuum of 28 inches.

K. Pumps.

The relief valve of #2 standby feed pump was jarred out of adjustment and required resetting. There is no other damage to pumps, all of which were operated after Test A, and functioned normally.

L. Generators

An oil ring jumped out of its grove on #1 ship's service generator (forward engine room). If the generator had been in operation at the time, it would probably have been severely damaged.

There was no other damage to turbo-generators, all of which were operated under load after Test A, and functioned normally.

M. Propellers.

Undamaged. The propellers were inspected from the surface of the water and checked while the main shafts were being turned. They functioned normally.

N. Distilling Plant.

Undamaged. Both distilling units were placed in operation immediately after Test A. They functioned normally.

O. Refrigerating Plant.

Undamaged. The refrigeration plant was placed in operation immediately after Test A. It functioned normally.

P. Winches, Windlasses and Capstans.

Winches - undamaged. All cargo winches were turned over by power and all functioned normally. There were no visible defects of any kind. The paint was blistered on the starboard

and top side of the housings where the winches were not protected by the superstructure from the heat.

Forward windlass - The forward anchor windlass was operated by power and functioned normally. The paint was blistered on the starboard side.

After windlass - The after anchor was housed but the capstan was operated by power. It functioned normally.

Welin davits #1 and #3 (starboard) are inoperable because of electrical failures resulting from the test, but have no mechanical damage. The port Welin davits were not affected by the test.

Q. Steering Engine.

The steering wheel in secondary conn, on the superstructure deck, was bent. This did not prevent operation of the steering gear and the rudder was moved from this station after Test A.

There was no other damage to steering equipment which was tested from all stations, using both units, after Test A.

R. Elevators, Ammunition Hoist, etc.

Ammunition hoists - All ammunition hoists which were operable before the test were also operable after the test. These are #1, #2 and #4 No. 3 hoist had a car jammed in the trunk prior to the test and was inoperable. Its condition was not changed by Test A.

Gasoline hoist - The gasoline hoist amidship is inoperable due to the fact that the car was jammed in the trunk during Test A. The trunk and the carriage was distorted and sprung by the blast.

S. Ventilation (Machinery).

Undamaged. All ventilation machinery was operated after Test A, and functioned normally.

T. Air Compressors.

Undamaged. The air compressor was operated after Test A, and functioned normally.

U. Diesels.

Undamaged. The diesel fire pumps were operated at 100 lbs. sq. in. for 5 hours after Test A, and functioned normally.

The emergency diesel generator was run at full load for six hours after Test A. Performance was normal.

V. Piping.

(a) Main steam.

A locking pin in the flexible shafting of the remote control operating gear of the forward engine room main steam cut-out valve sheared. This could easily be replaced and does not impair operation.

(b) Auxiliary steam.

No damage.

(c) Auxiliary exhaust.

No damage.

(d) Condensate and feedwater.

No damage.

(e) Fuel.

No damage.

(f) Lube oil.

No damage.

(g) Firemain, sprinkling and water curtain.

A number of small connections to the firemain, all of which had been greatly weakened by corrosion, were broken. These include salt water piping in heads and showers, and cooling water lines to the stern tube bearings. None of the damage affected operation of the firemain as a whole or would have any appreciable effect on operation.

(h) Condenser circulating water.

No damage.

(i) Drain.

A drain line from the forced draft blower relief valve, forward engine room, broke off adjacent to a union nut. This does not affect operation.

(j) Compressed air.

No damage.

(k) Fresh Water.

Small piping in two heads was broken.

All undamaged piping was tested at normal working pressure after Test A.

W. Miscellaneous.

The drill press in the machine shop in the after engine room was cracked off just above the column flange at the base plate. (See Photo 1828-5, page 112). It is of cast iron construction with the motor, pulleys and spindle supported at the upper end of a cylindrical column, which was secured by a flange to the base plate at its lower end. The break occurred about one inch above the flange. In regard to this failure, it is significant that the ship's inclinometer registered a roll of over 70° at the time of the blast. This drill press was manufactured by "Canedy-Otto", serial number HC-1534.

There is no damage to other utility equipment, all of which was operated after Test A.

TECHNICAL INSPECTION REPORT

SECTION III - ELECTRICAL

GENERAL SUMMARY OF ELECTRICAL DAMAGE

I. Target Condition After Test.

a) Drafts; lists; areas of flooding and sources.

1. Drafts and list not noted.

2. No flooding occurred.

(b) Structural damage.

1. Structural damage affecting electrical equipment was essentially as follows:

(a) Dishing and whipping of st'bd outboard bulkhead on main deck cracked insulating panels of boat davit controllers.

(b) Rupturing of light metal bulkheads on main deck carried away a few cables, lighting fixtures and the dish-washer motor controller.

(c) Damage to electrical equipment.

1. One generator set was made inoperable due to an oil ring jumping or rolling out of place.

2. The two starboard boat davit controllers and a dish-washer controller were inoperable due to broken insulating panels.

3. A few storage batteries were jarred off racks.

4. Gyro repeaters on wings of bri[illegible] ere blown from their supports.

5. The st'bd 24" searchlight king pin was bent.

6. Two of the four operating table lights were damaged by blast.

7. The standard compass binnacle was torn loose.

II. Forces Evidenced and Effects Noted.

(a) Heat.

Heat was evidenced by scorched paint on apparatus exposed to the blast and by cable insulation which exuded thru armor on a few exposed cables.

(b) Fires and explosions.

No fires or explosions affecting electrical equipment were noted.

(c) Shock.

Shock may have caused the oil ring of No. 1 Ship's Service generator set to jump out of its normal location. This may also have been caused by a heavy roll. There was no other evidence of shock on electrical equipment.

(d) Pressure.

Pressure or blast caused damage to topside exposed equipment such as searchlights, peloruses, binnacles and to lighting fixtures below decks near openings.

(e) Any effects peculiar to the Atom Bomb.

Effect peculiar to the atom bomb was a combination of heat and blast effect on exposed surfaces.

III. Effects of Damage.

(a) 1. Propulsion and propulsion control were not affected by Test A damage to electrical equipment.

2. The effect of A-bomb damage on ship control was negligible.

(b) The effect of A-bomb electrical damage on gunnery and fire control was negligible.

(c) Electrical damage had no effect on watertight integrity and stability.

(d) Electrical damage had a negligible effect on personnel and habitability. Damage affecting habitability was limited to the breaking of a few lamp bulbs and fixtures.

(e) Fighting efficiency was considerably reduced by the damage to the starboard boat davit controllers.

IV. General Summary.

The only electrical damage having an appreciable effect on the operation of the vessel was to the two starboard boat davit controllers. Damage to these units materially affected the ship's ability to disembark troops.

Damage to the 24" searchlight, the gyro repeaters and the standard compass had little effect on the operation or fighting efficiency of the ship. Damage to the No. 1 Ship's Service generator did not appreciably affect the operation of the vessel or fighting efficiency since ample power was available from a spare unit.

V. Recommendations.

(a) Oiling arrangements for rotating machinery should preferably be of the pressure type or should be so arranged that shock or rolling of the vessel to any angle at which the ship will

stay afloat will not derange the lubrication system.

(b) Motor controllers should be of navy standard type whenever practicable. Methods of support should be such that a considerable movement or distortion of the supporting bulkhead or deck can take place without derangement of the controller mechanism. Where navy type controllers are not practicable, the controller should comply as nearly as practicable with navy department specifications for shock proofness. Supports for vital non-navy type controllers should be designed to protect the mechanism against shock.

(c) Storage battery stowage racks should be designed to securely hold the plates and jars onto the racks. The securing means should be such as to minimize the probability of careless nonuse.

(d) Gyro repeater mounting arrangements should be redesigned to eliminate gimbal rings where not essential and to provide a more rugged securing arrangement.

(e) Searchlights (24" & 36") should be redesigned to have less resistance to air blast. If trunnion arms and king pins are used they should be of a stronger design. High intensity signaling lights larger than 12" in diameter should be provided with remote shutter control and remote positioning so that the signalman can be in a protected location.

(f) Operating room lights should be redesigned to provide a more rugged method of securing the lamp mechanism.

(g) Magnetic compass binnacles should be redesigned to be less susceptible to blast damage and to have more rugged gimbal rings.

(h) Bull horns or similar intermittently used special equipment which must be installed in exposed locations and which it is not practical to stream line, should be arranged for convenient storage in a protected location when not in use.

DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

A. General Description of Electrical Damage.

(a) Overall Condition.

The overall condition of the electrical plant remains essentially the same as before Test A.

(b) Areas of Major Damage.

There was no major electrical damage. Areas of minor damage were bridge, superstructure, operating room and engine room.

(c) Primary Causes of Damage in each area of Major Damage.

1. Damage on bridge, superstructure and in operating room due to blast.

2. Damage in engine room was due to shock or roll.

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

1. One of three Ship's Service generators rendered inoperative. Ship can operate on two remaining generators.

2. Engine and boiler auxiliaries were not affected.

3. One of three exciters for electric propulsion was rendered inoperative. The remaining two exciters have sufficient capacity to supply full excitation.

4. Communications within the ship were not appreciably affected. Air blast horn and beach master loud speaker for landing operations were rendered inoperable.

5. Fire control circuits were not appreciably affected.

6. Ventilation was not affected by electrical damage.

7. Lighting was not appreciably affected except for two operating room lights. The two remaining lights were adequate to continue an operation until spares could be installed.

8. Boat landing facilities were curtailed 50% due to blast damage to motor controllers.

(e) Types of equipment most affected.

1. Turbo generator sets - lubrication was stopped.

2. Boat davits - motor controllers were damaged by blast.

3. Loud speakers - horns were blown to the deck and broken.

4. Standard compass binnacle torn loose.

B. Electric Propulsion Rotating Equipment.

No damage occurred other than as follows:

1. Number 1 exciter was made inoperable temporarily by burned out bearing when started up for test by the ship's force upon their return to the ship. It was found the oil ring on the after end of the A.C. generator had jumped out of its groove allowing the bearing to go dry. The exciter and generator are on the same shaft. Repair was made by ship's force.

C. Electric Propulsion Control Equipment.

No damage occurred.

D. Ship's Service Generators.

No damage occurred other than as noted below.

The after bearing of the A.C. generator burned out due to the oil ring jumping out of groove, allowing the bearing to go dry, when the generator was given a test run by ship's force.

E. Emergency Generator.

No damage occurred.

F. Switchboards and Distribution Panels.

No damage occurred.

G. Wiring, Wiring Equipment and Wireways.

Damage negligible and is listed below:

1. A local lead to the dish washer control was ruptured when the bulkhead it was attached to gave way.

2. A few exposed cables on the bridge were scorched, but not seriously. Photo 2157-4, page 115.

H. Transformers.

No damage occurred.

I. Submarine Propelling Batteries.

Not applicable.

J. Portable Batteries.

Light damage was done to batteries by improper securing before test and is listed below:

1. The radio batteries in locker on superstructure deck were demolished by jumping out of racks, due to not having battens in place.

2. Portable batteries lost considerable acid by not having their cell caps on.

K. Motors, Motor Generator Sets and Motor Controllers.

No damage occurred other than listed below:

1. The motor controller for the dish washer became inoperable when the mounting bulkhead carried away. Reference photo 1827-5, Page

2. Numbers 1 and 3 Welin boat davit motor controllers became inoperable. Both panels are cracked across the middle. Due to blast action on bulkhead. Reference photos 2156-11, Page 106 2156-12, Page 119, 2157-1, Page 120.

L. Lighting Equipment.

Lighting generally throughout the ship remained as before test. Slight damage occurred as listed below:

1. Two of the four lights over the operating table in the operating room were damaged. Damage was caused by blast through an open port. Socket mountings were blown out and glasses broken.

2. Commercial type fixtures in the wardroom were damaged.

Note: This ship was open on all weather decks.

M. Searchlights.

Damage to searchlights was of slight nature and is as follows:

1. The #1 12" signal searchlight on the starboard side of bridge had the shutter operating mechanism bent but appeared to be operable.

The #2 12" signal searchlight was blown off ship.

2. The 24" signal searchlight on the starboard side has a bent king pin. This did not affect the operability. Reference photo 2157-2, page 89.

N. Degaussing Equipment.

No damage occurred except as noted below:

1. The compass compensating coil on flying bridge is adrift.

O. Gyro Compass Equipment.

No damage occurred to master gyro compass. Slight damage to repeaters occurred as follows:

1. The port pelorus repeater was forced out of its gimbals.

2. The after steering station pelorus repeater was forced out of its gimbals.

3. The dead reckoning tracer was shaken loose and glass top was broken.

P. Sound Powered Telephones.

No damage occurred.

Q. Ship's Service Telephones.

Not applicable.

R. Announcing System.

No damage occurred other than as follows:

1. The air blast bull horn on the starboard bridge wing was broken from its mounting. Reference photo 2157-5, page 114.

2. The Beach Master portable announcing unit mounted on the flying bridge had its tripod bent out of shape and the diaphragm broken. The generator, amplifier and spare parts boxes caved in due to pressure. Reference photos: 1828-7, page 116 and 1828-10, page 117.

S. Telegraphs.

No damage occurred.

T. Indicating Systems.

No damage occurred.

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

No damage occurred.

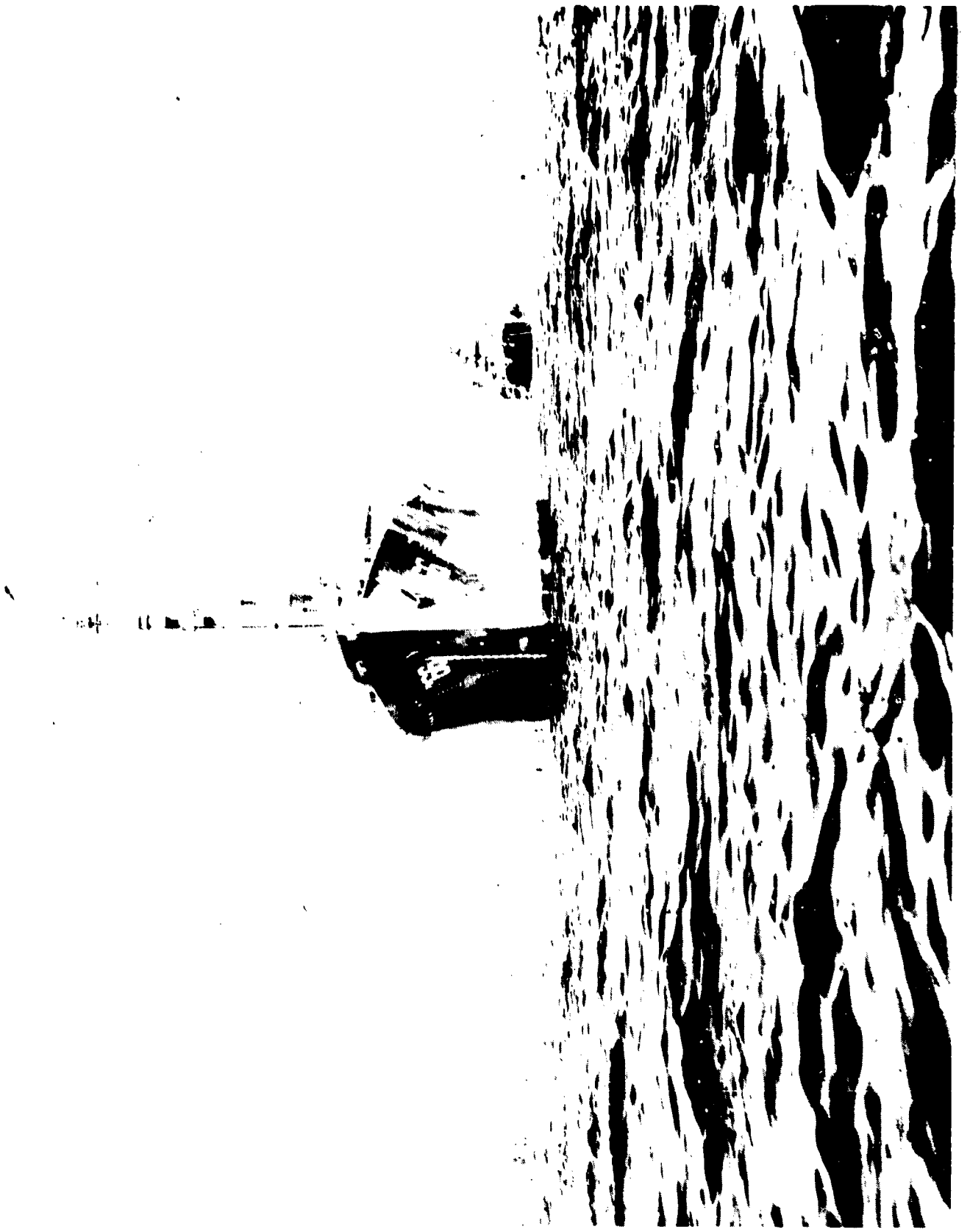
V. F.C. Switchboards.

No damage occurred.

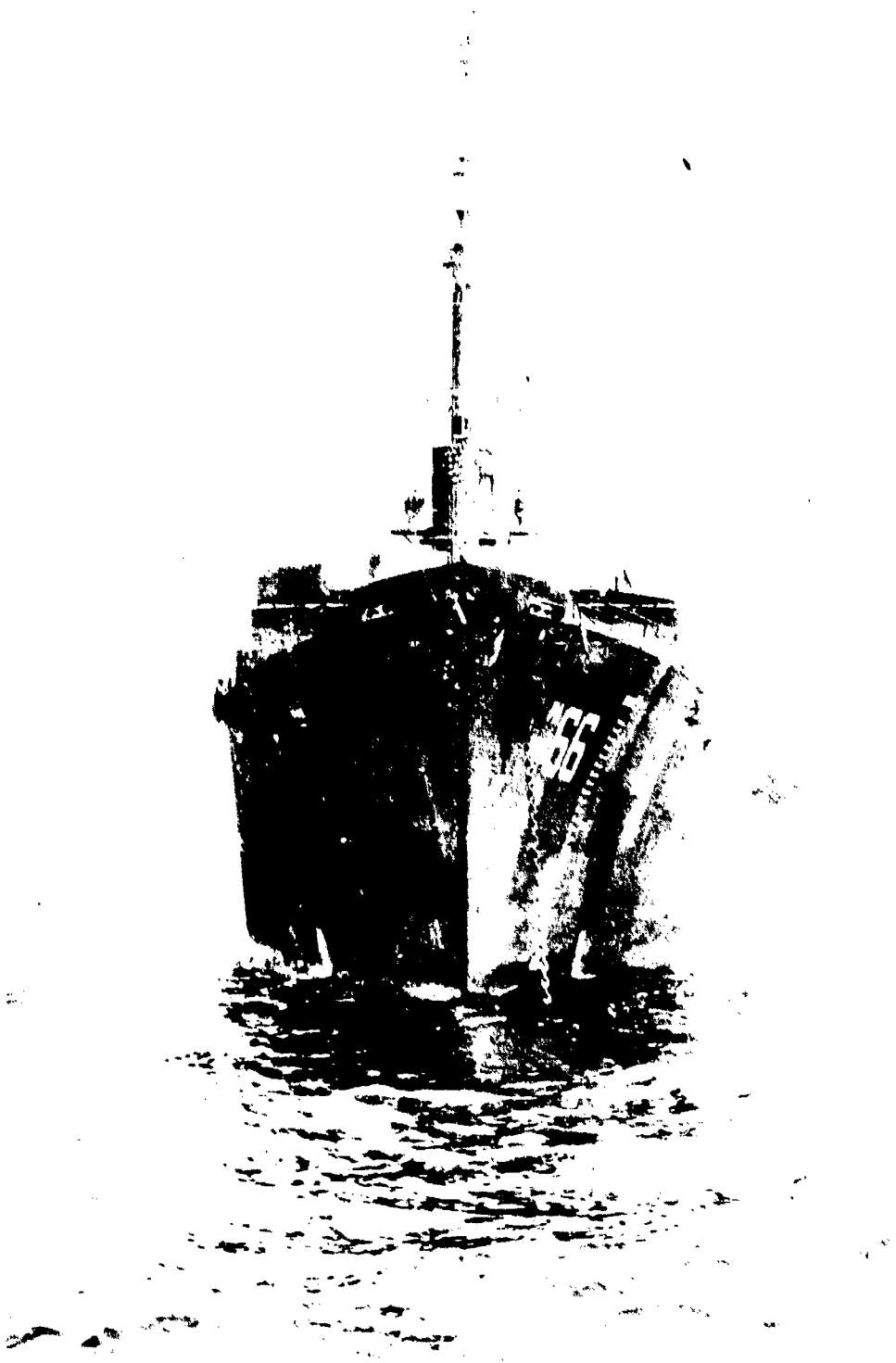
SECTION IV

PHOTOGRAPHS

TEST ABLE



BA-CR-196-164-38. Bow before Test A.

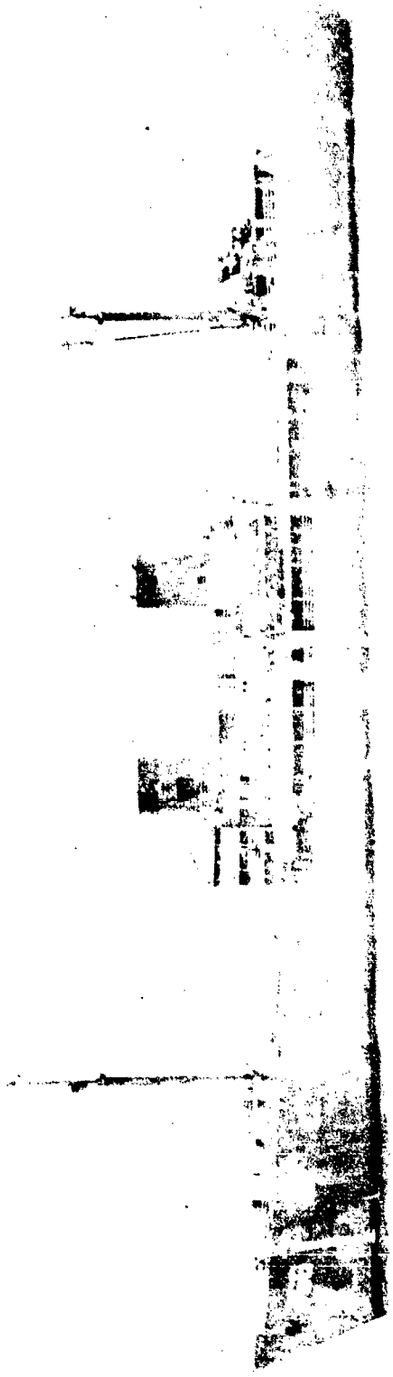


AA-CR-227-49-110. Bow after Test A.

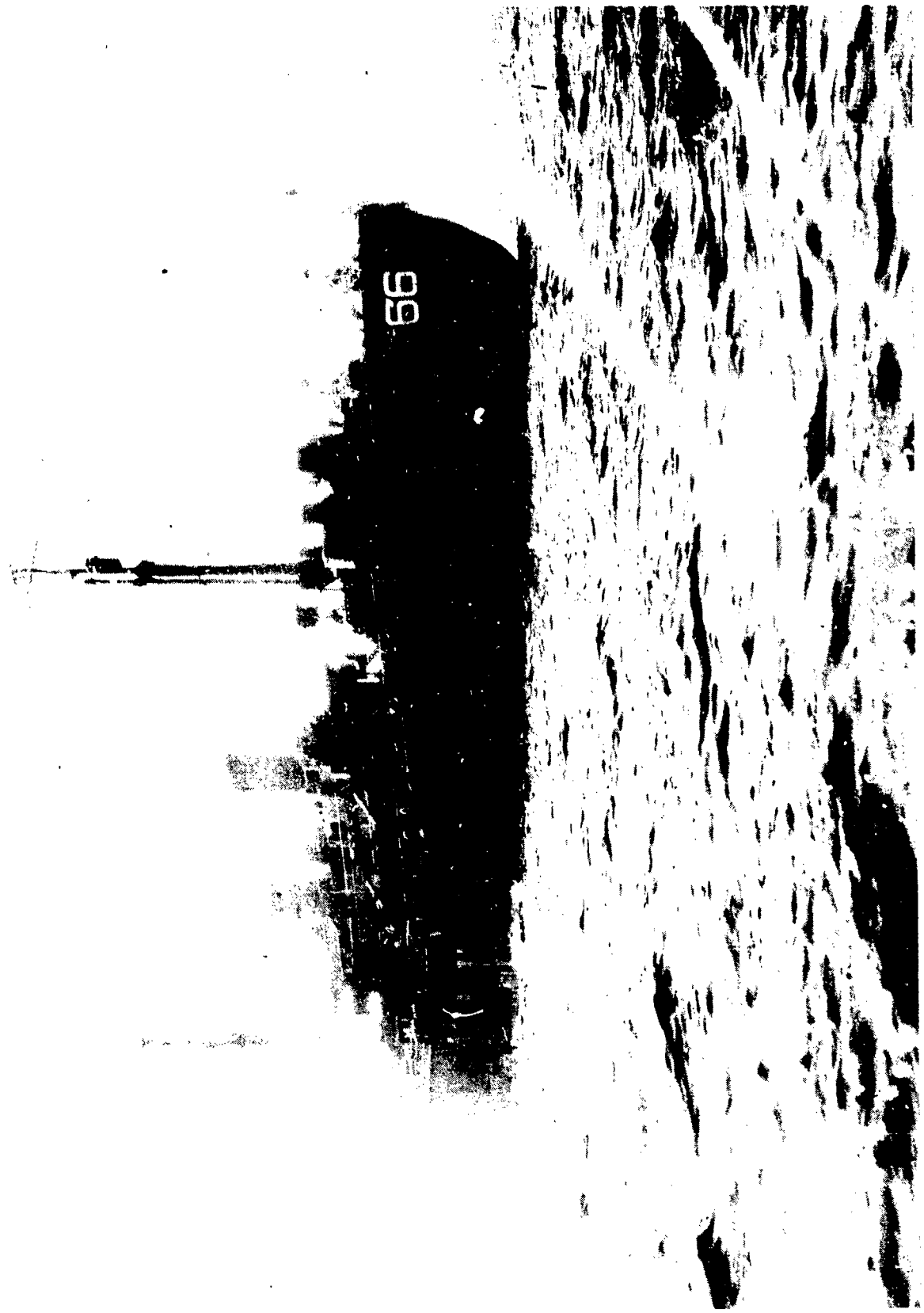
BA-CR-196-164-37. Port bow before Test A.

AA-CR-227-49-111. Port bow after Test A.

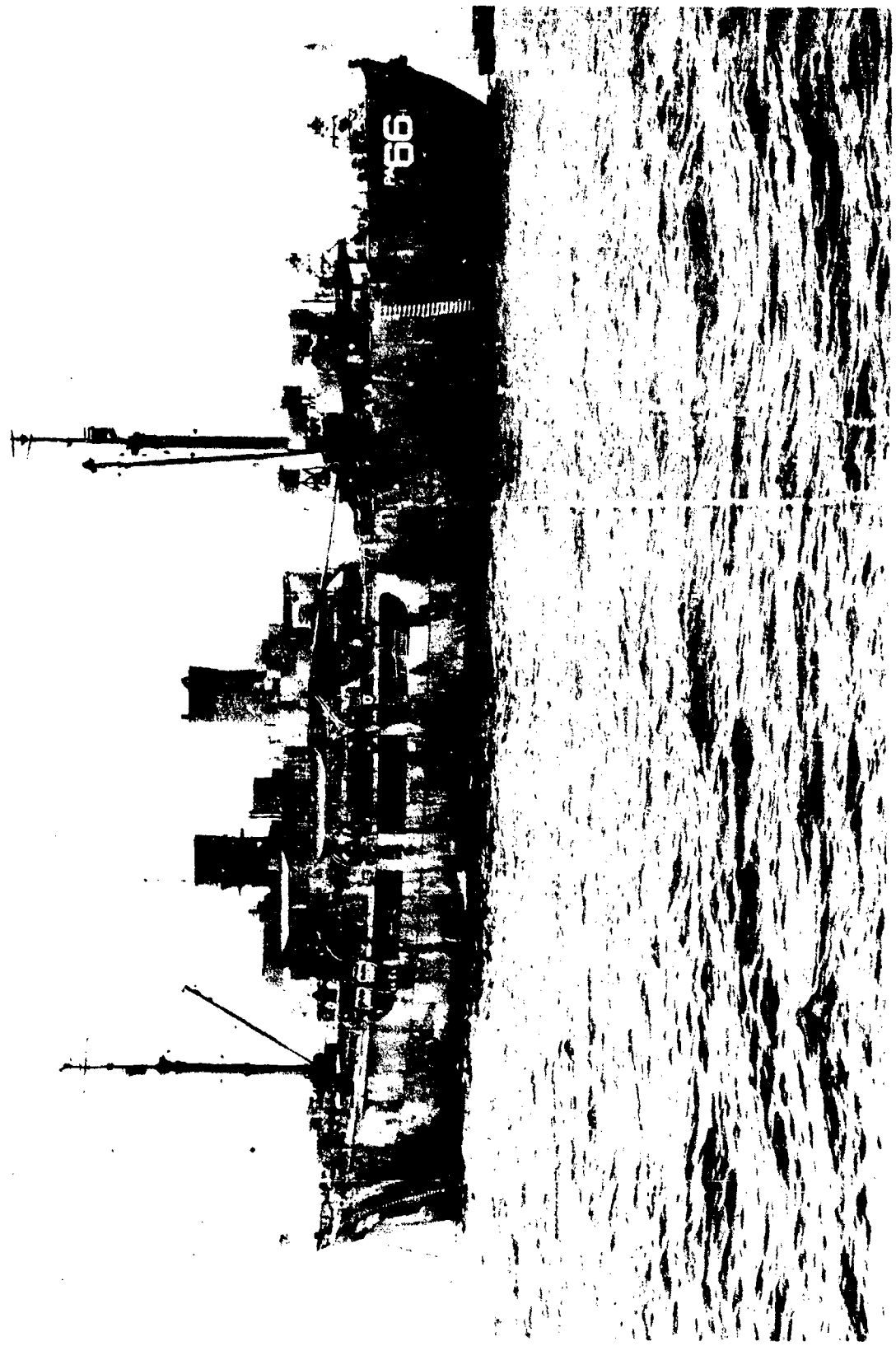
BA-CR-196-164-36. Port beam before Test A.



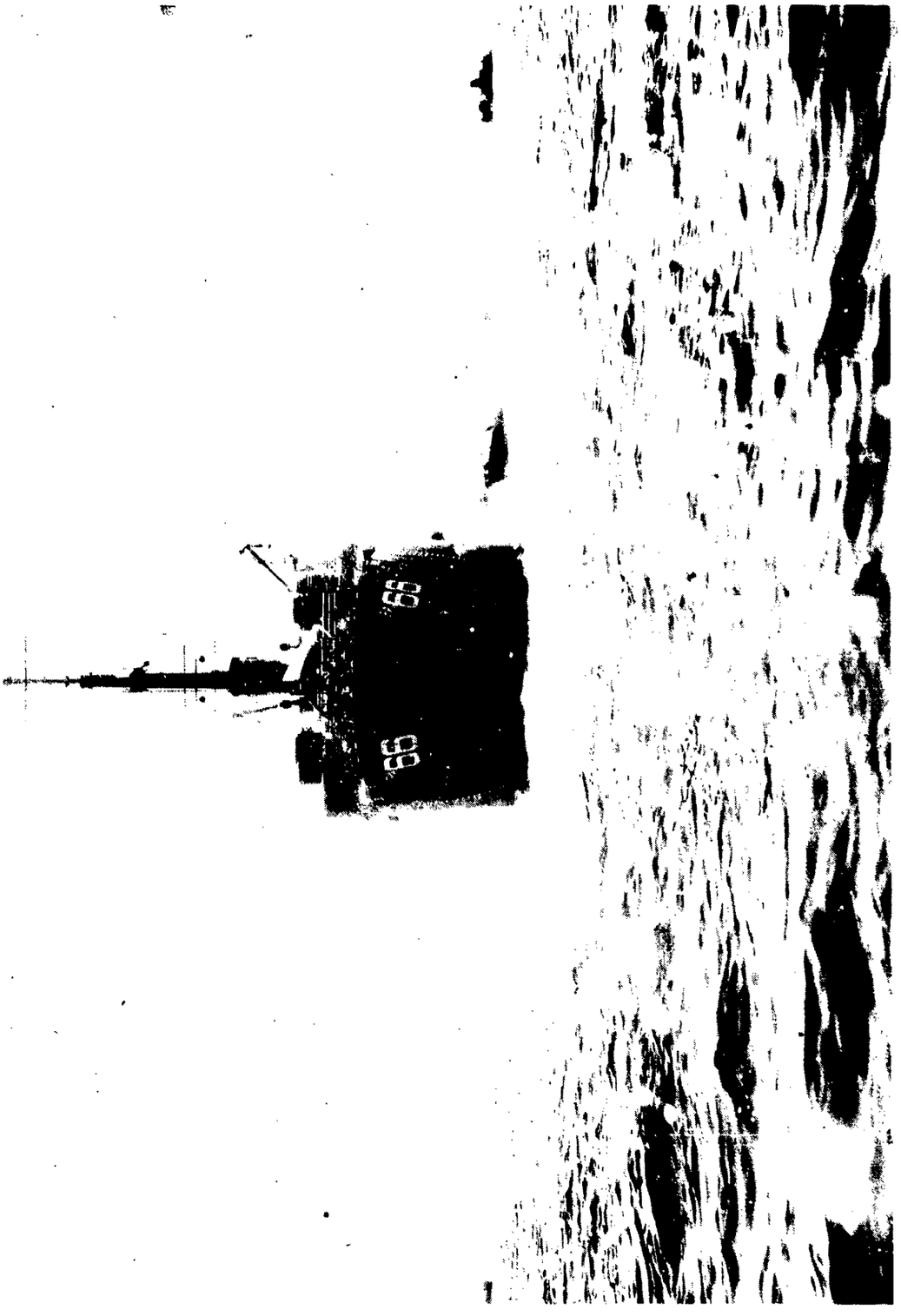
AA-CR-227-49-112. Port beam after Test A.



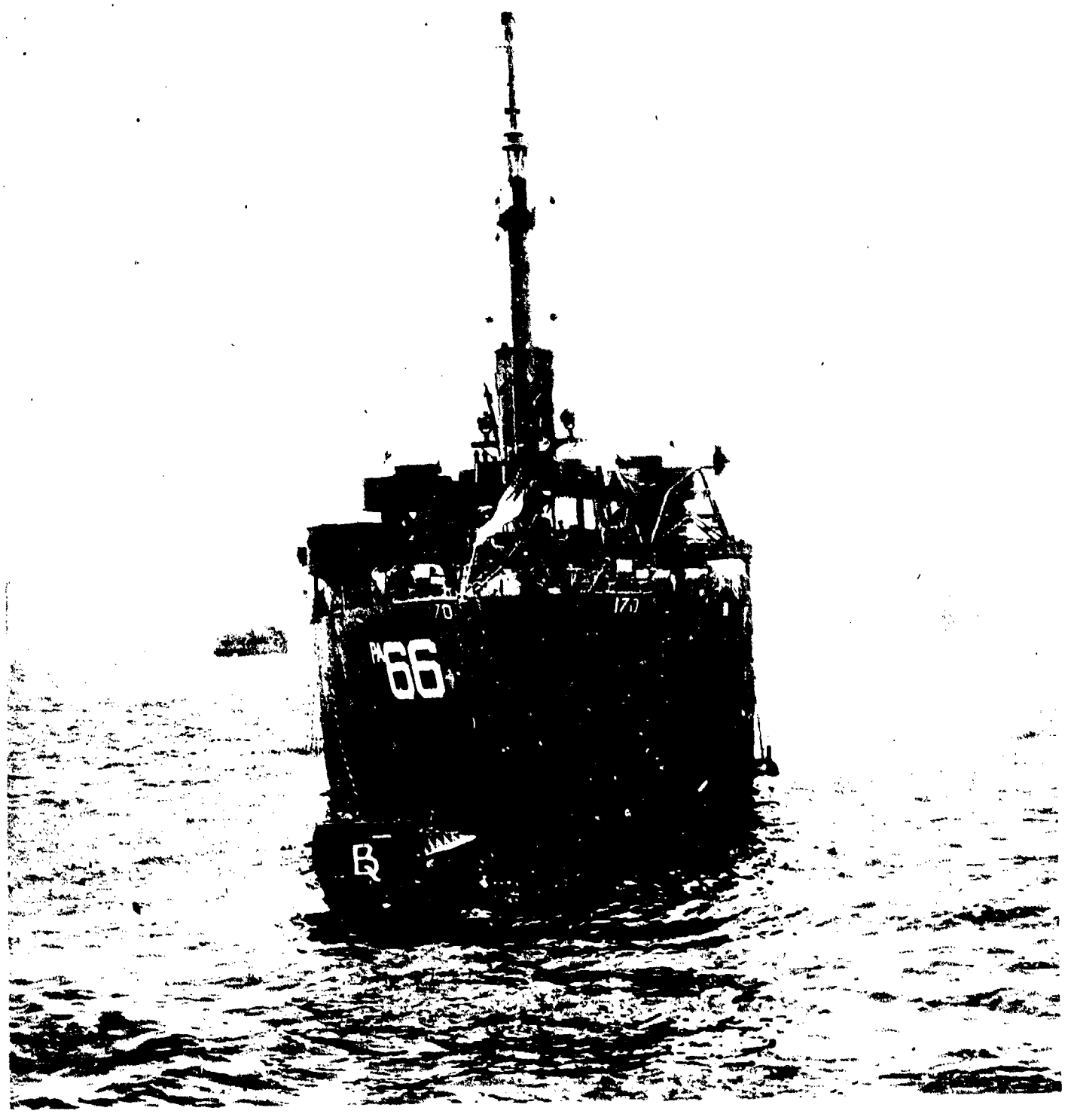
BA-CR-196-164-43. Starboard quarter before Test A.



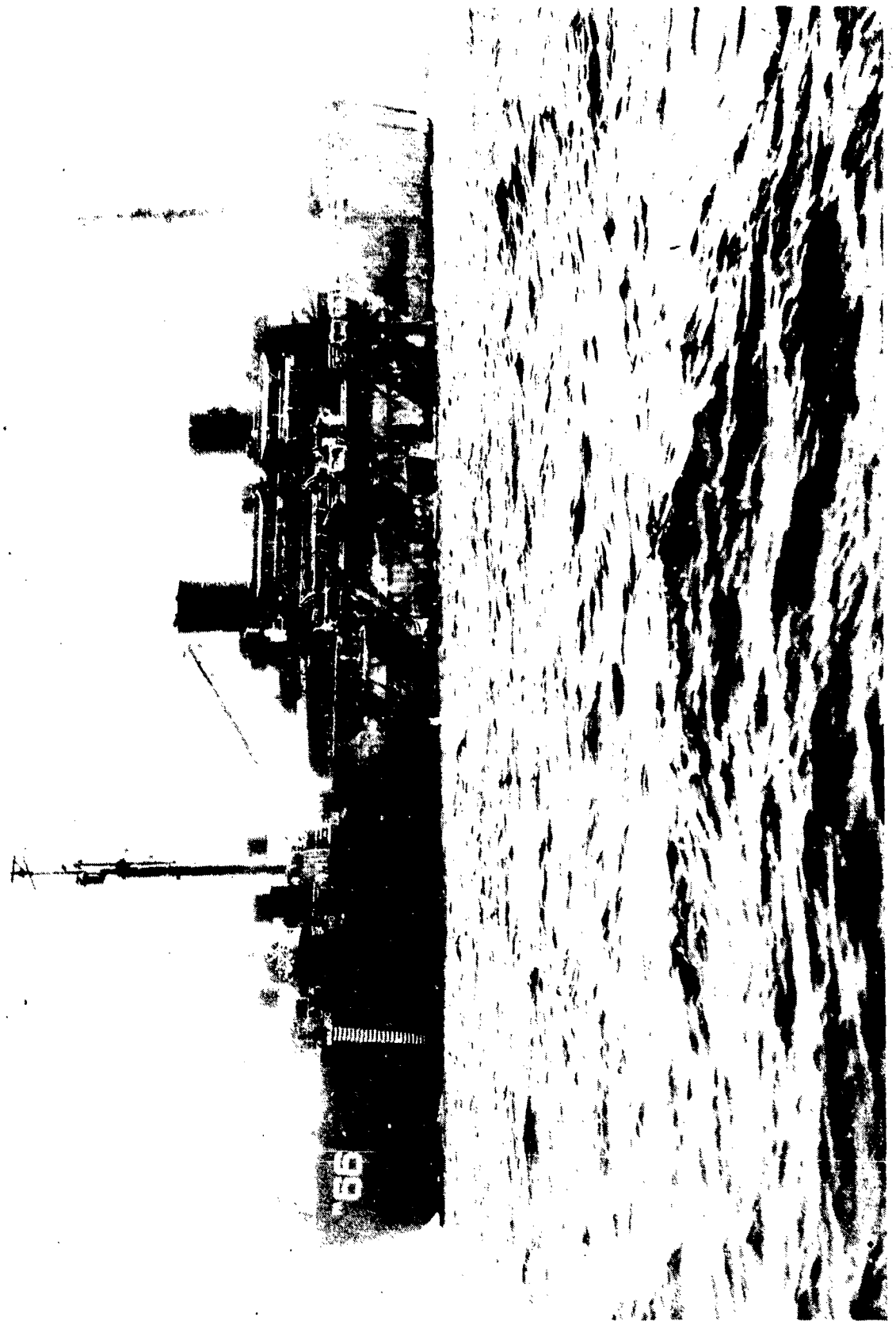
AA-CR-227-49-105. Port quarter after Test A.



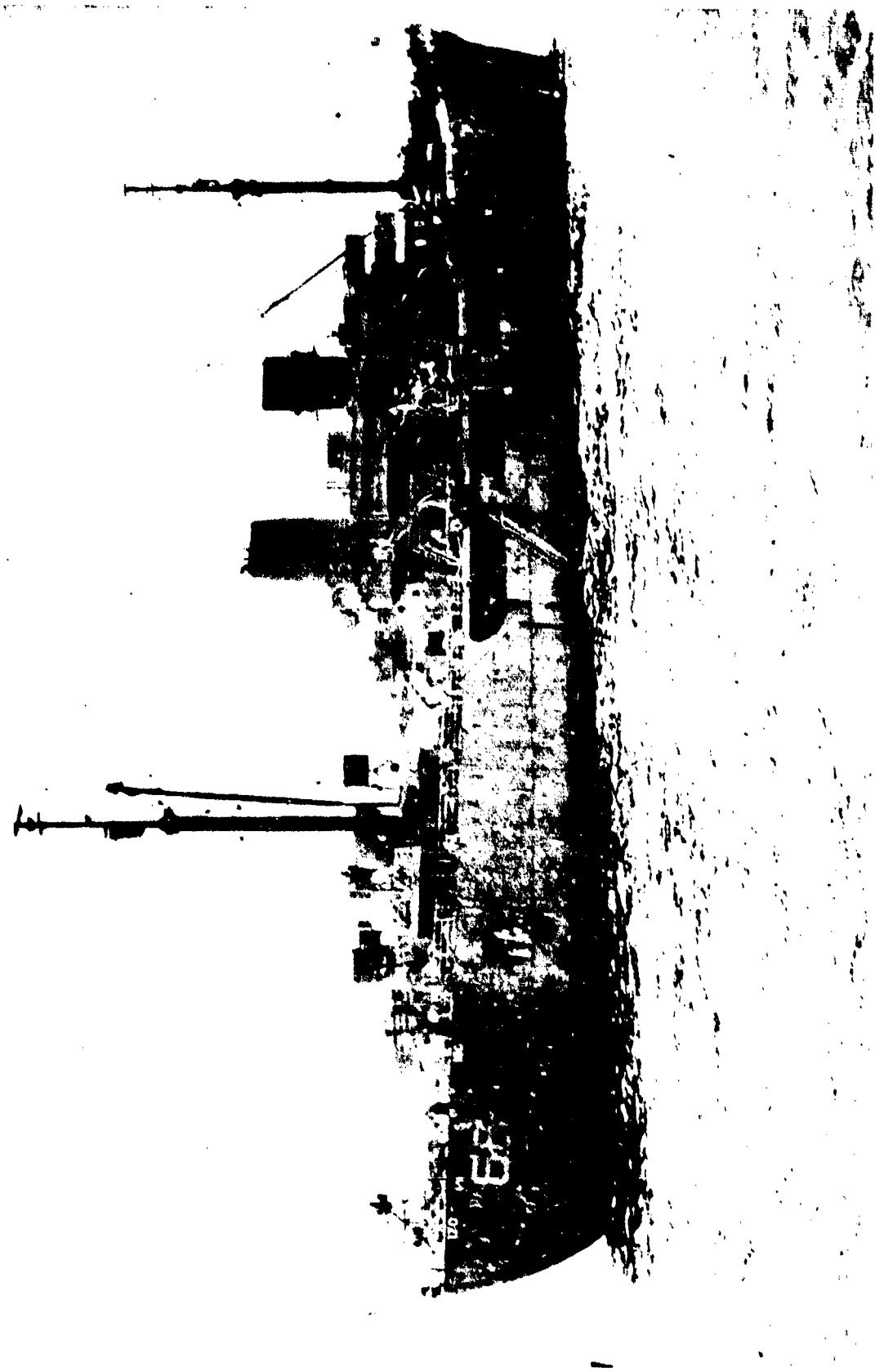
BA-CR-196-164-42. Stern before Test A.



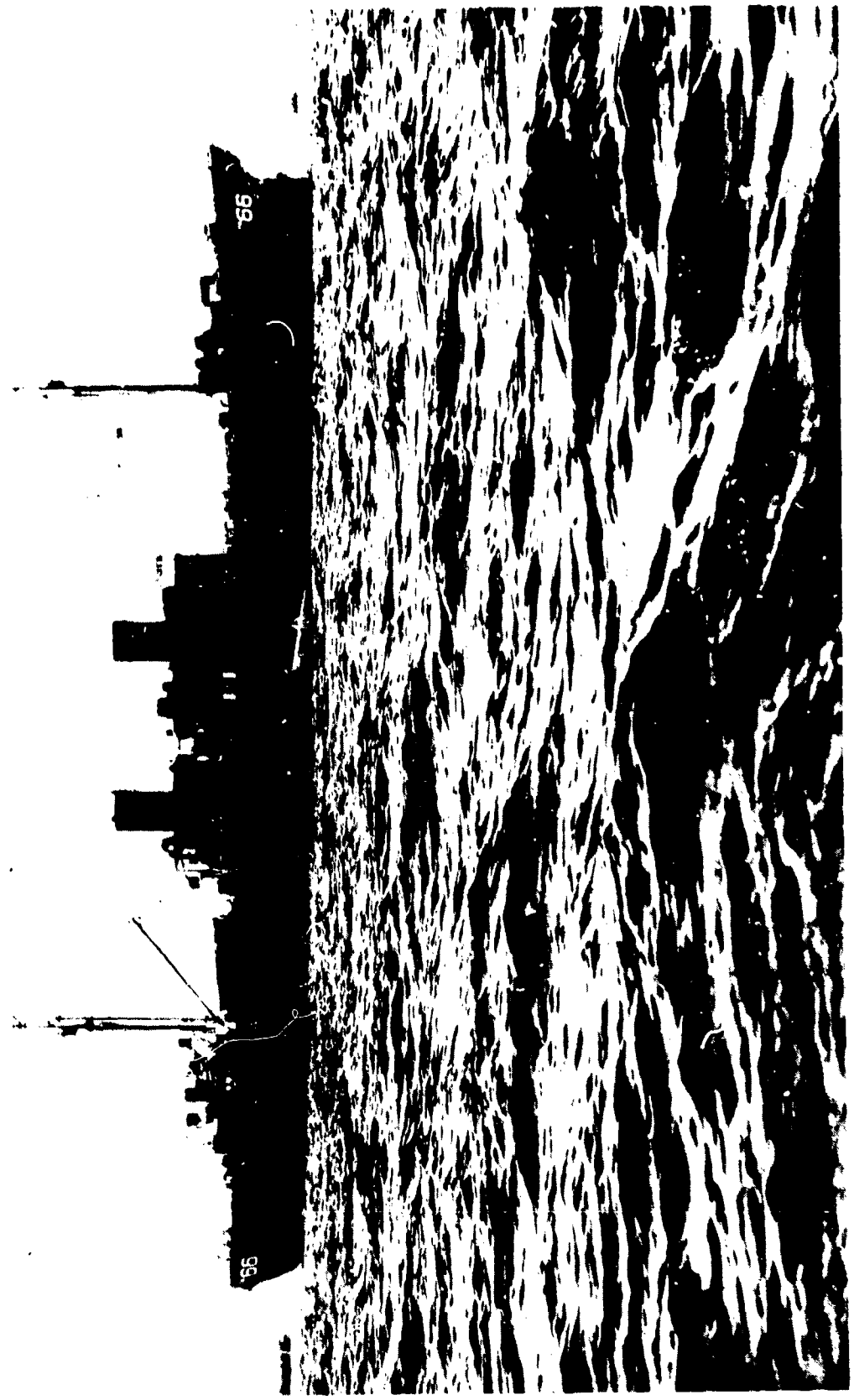
AA-CR-227-49-106. Stern after Test A.



BA-CR-196-164-41. Starboard quarter before Test A.



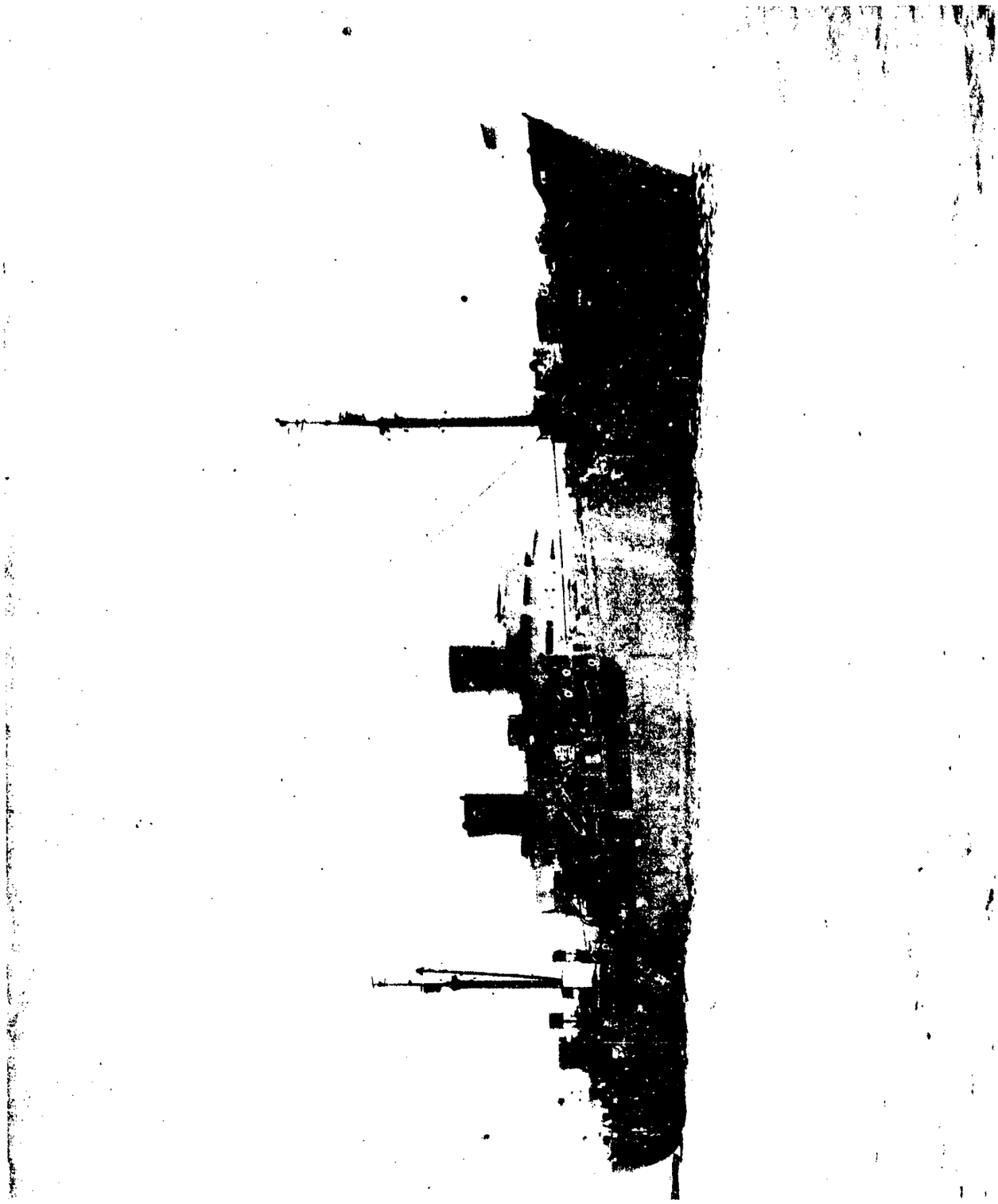
AA-CR-227-49-107. Starboard quarter after Test A.



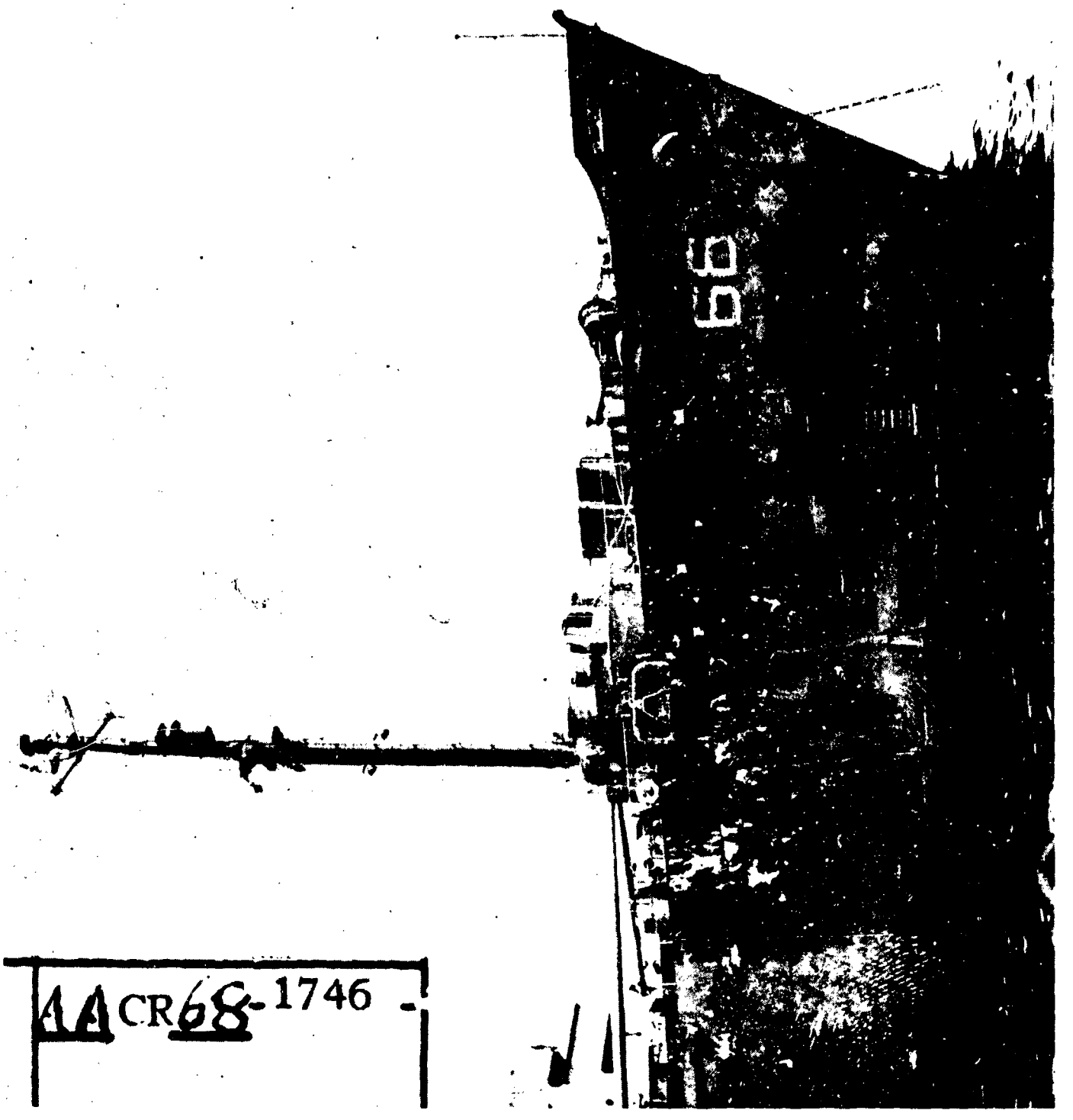
BA-CR-196-164-40. Starboard beam before Test A.

AA-CR-_37-49-108. Starboard beam after Test A.

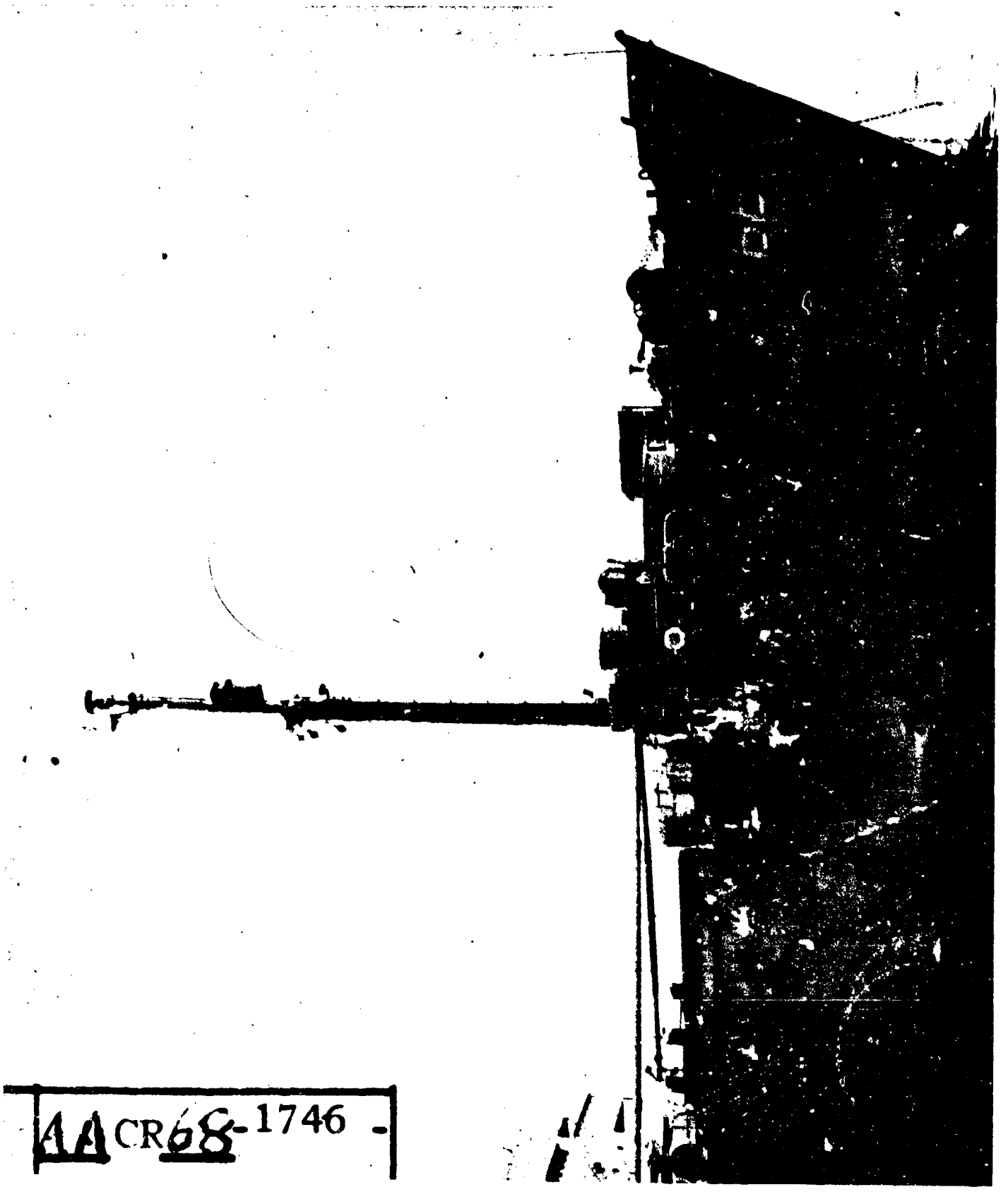
BA-CR-196-164-39. Starboard bow before Test A.



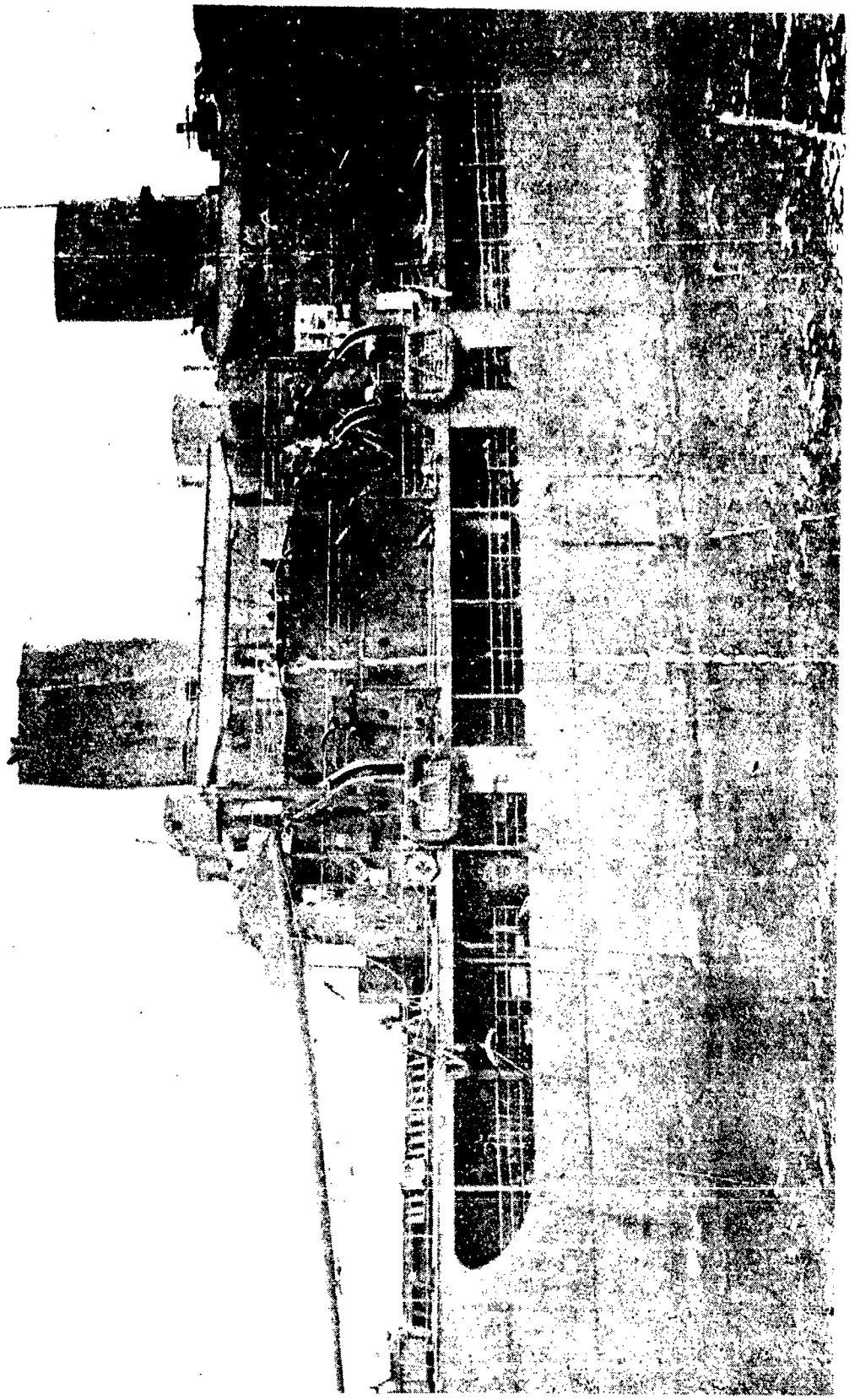
AA-CR-227-49-109. Starboard bow after Test A.



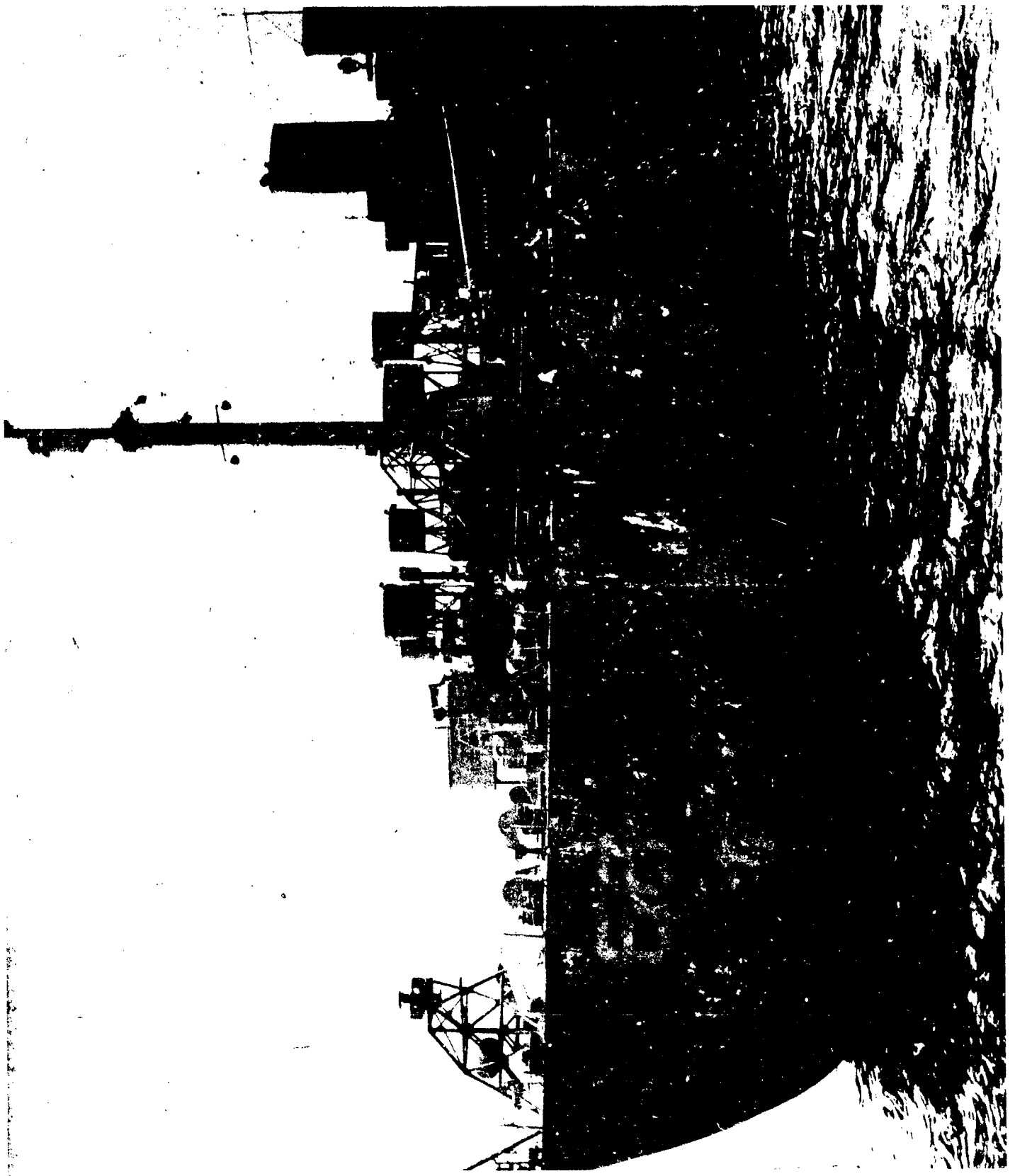
AA-CR-68-1746-2. View of starboard bow.



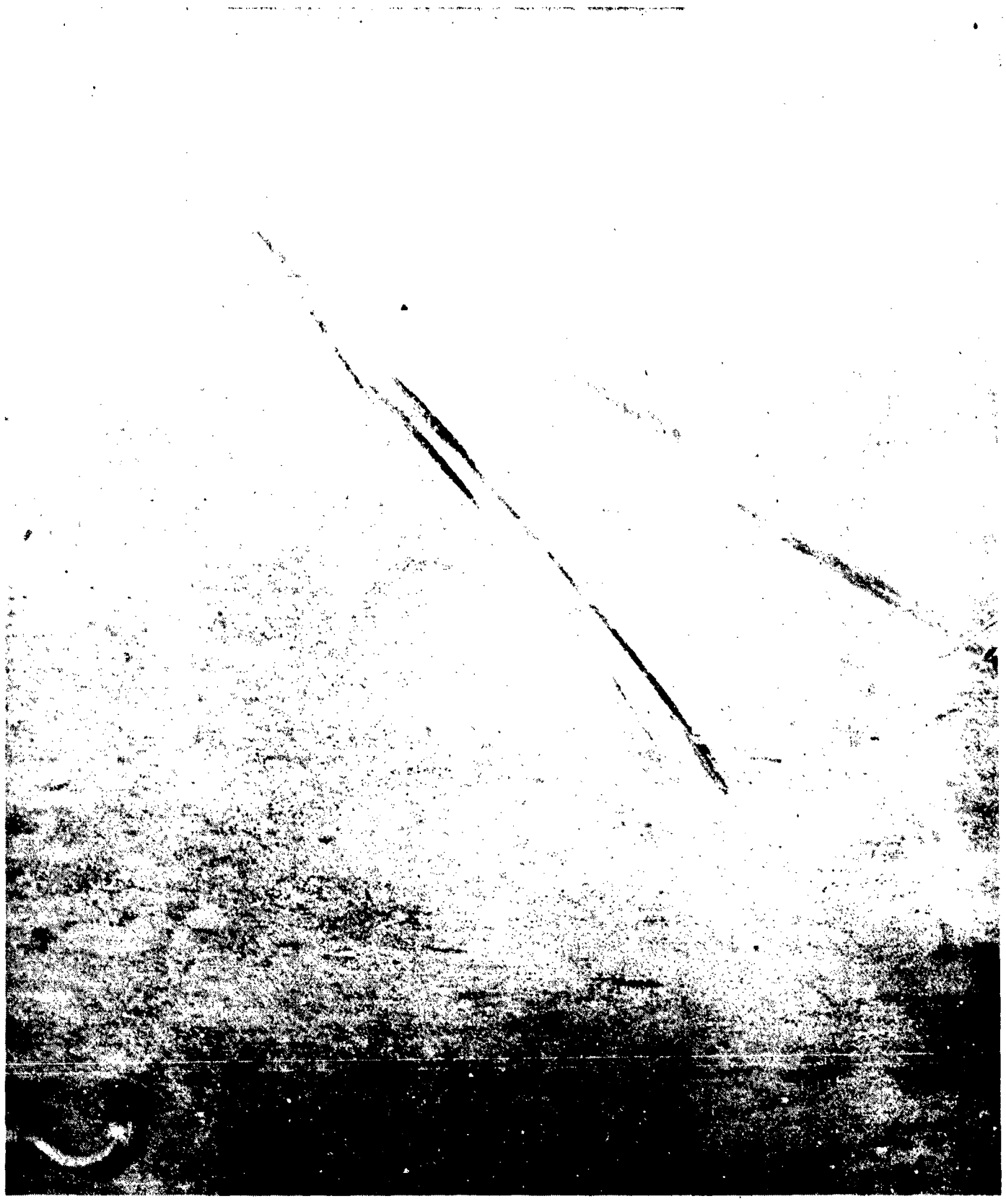
AA-CR-68-1746-1. View of starboard bow.



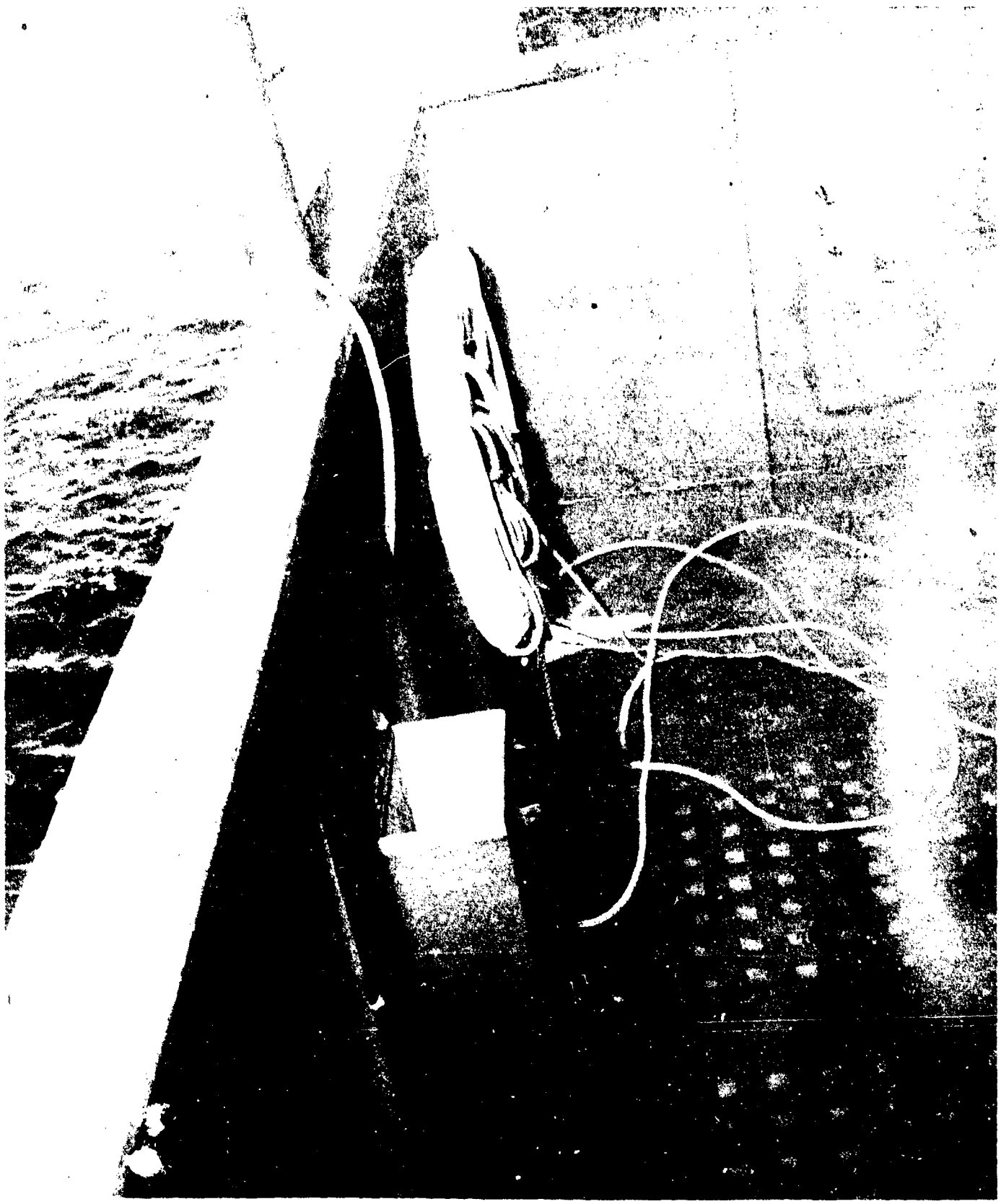
AA-CR-68-1744-12. View of starboard side amidships.



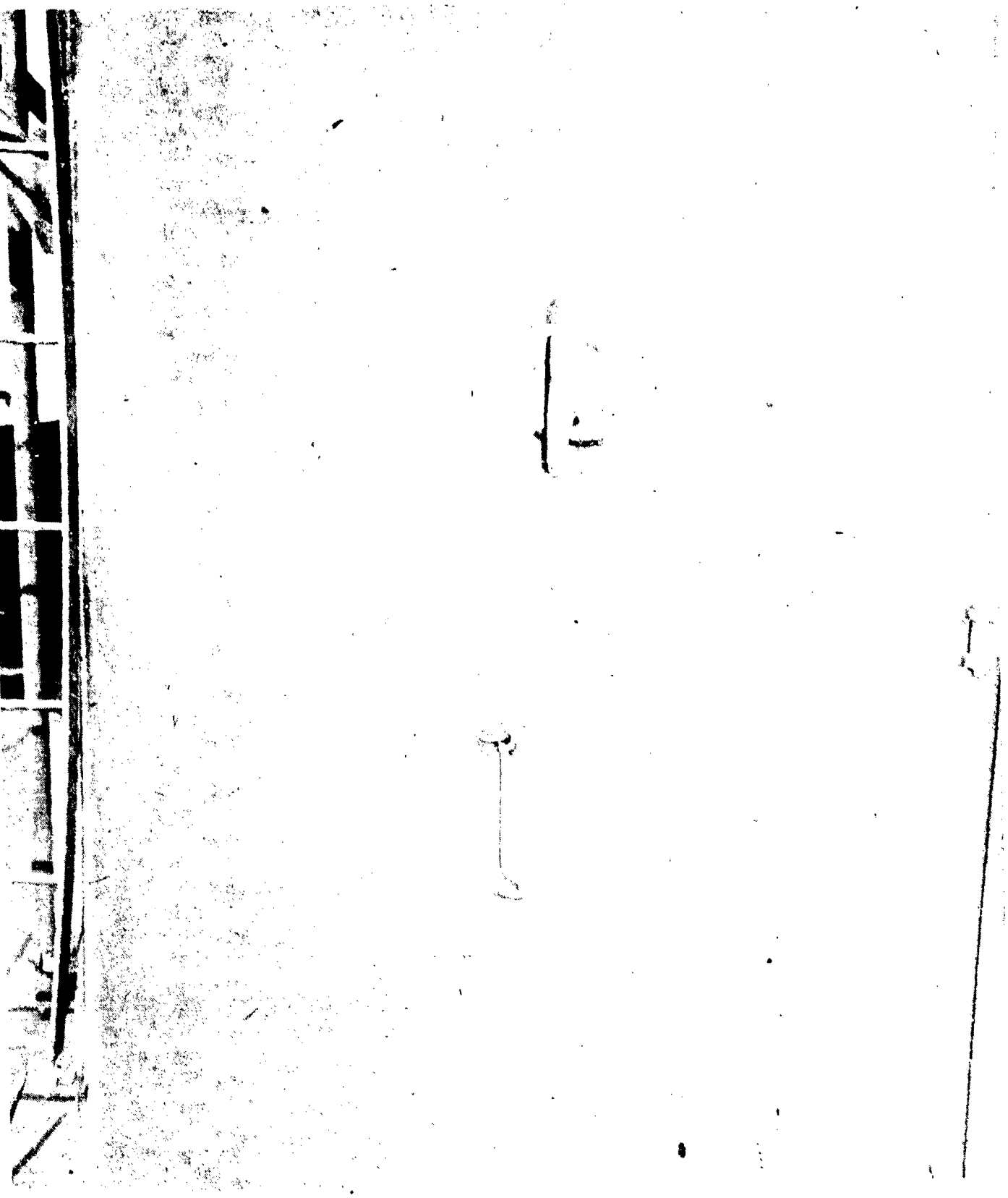
AA-CR-68-1744-11. View of starboard quarter.



AA-CR-65-1819-8. Scorched paint on bulkhead on starboard side of RDF shack, top of house.

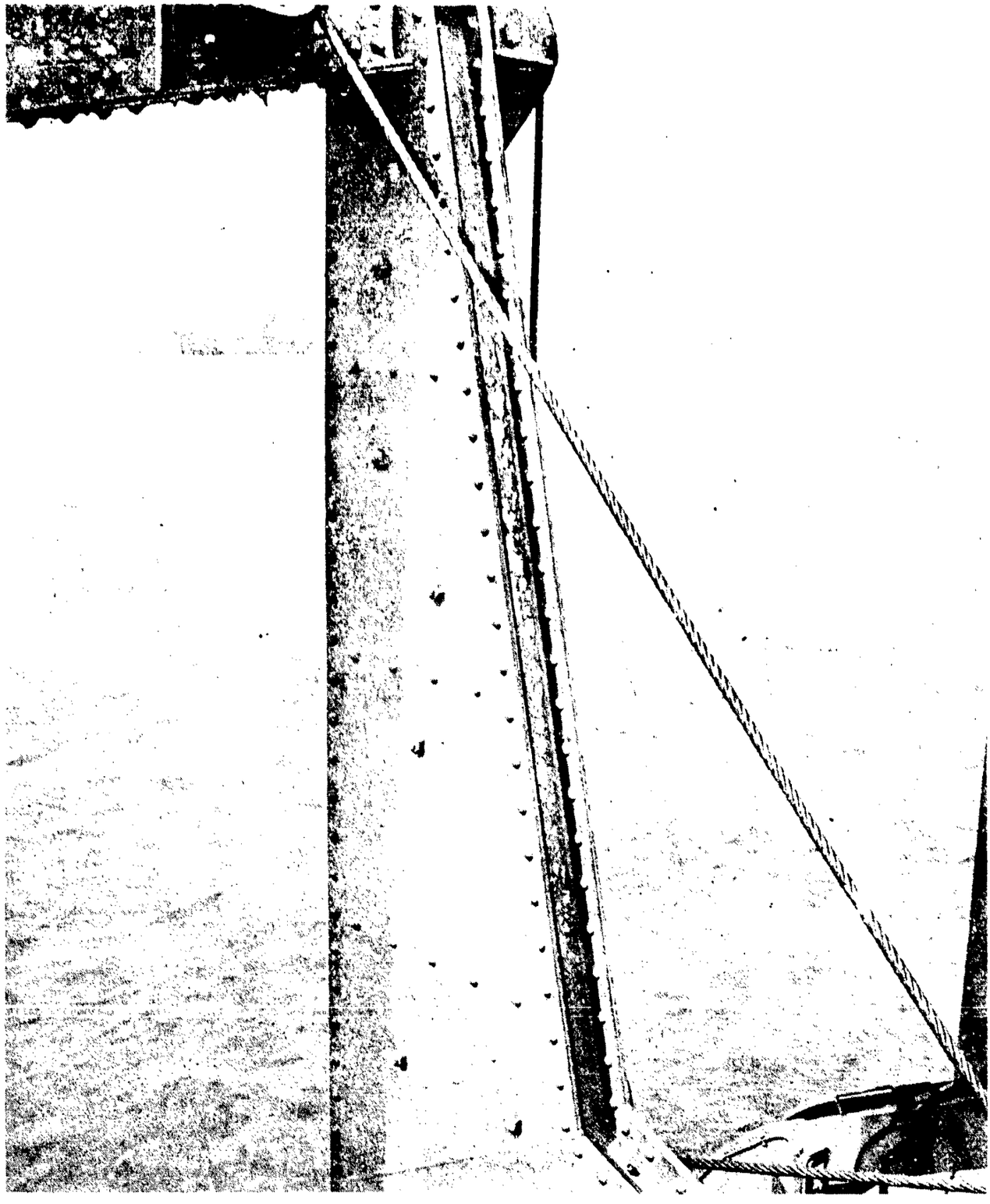


AA-CR-82-1828-3. Looking aft at shadow of pipe stanchion on starboard wing of navigation deck.



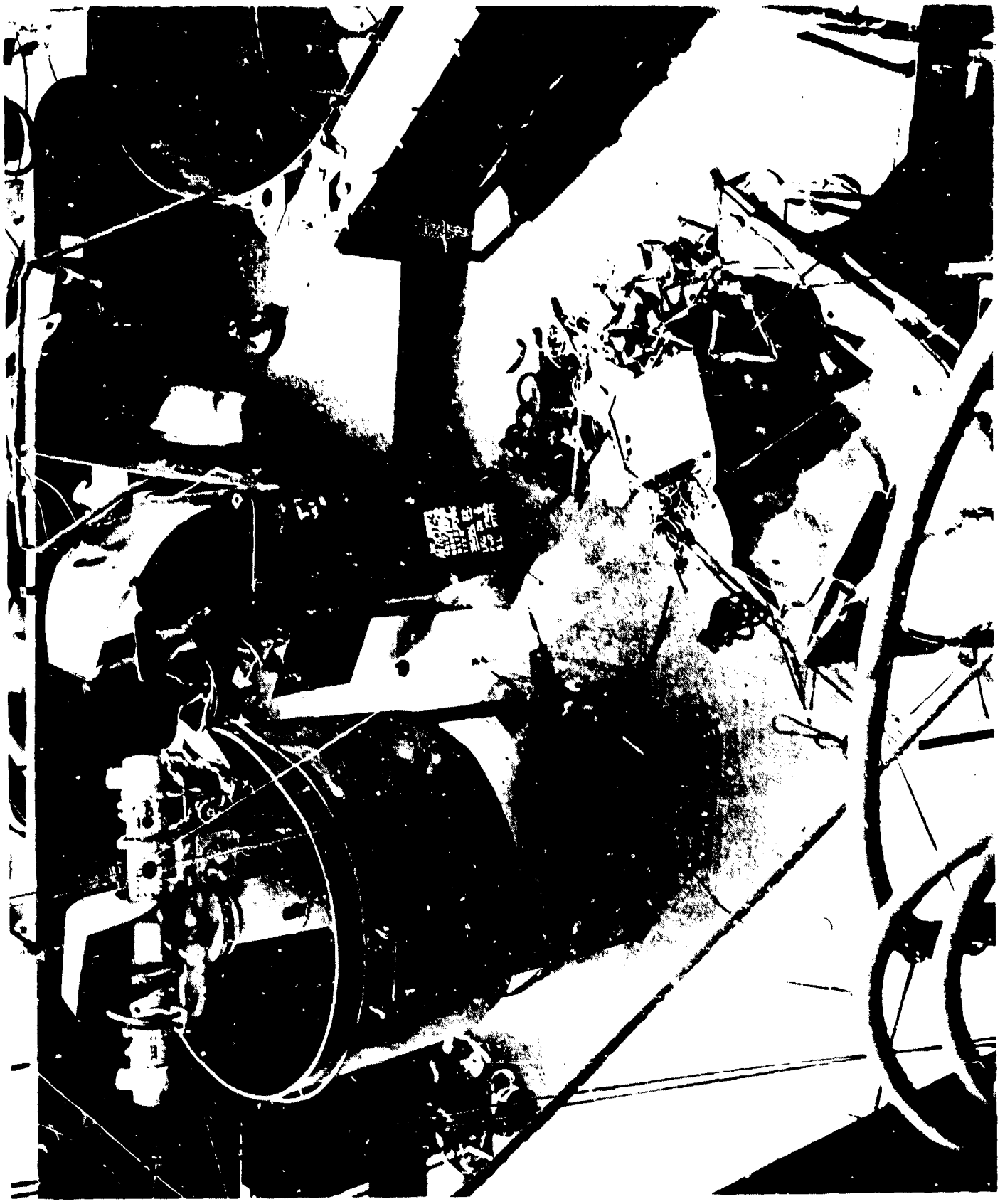
AA-CR-65-1819-5. Forward stack, starboard side forward, showing blister paint, looking aft.

AB-CR-65-1819-7. Paint scorching on inside of gun bulwark, top of house, starboard.

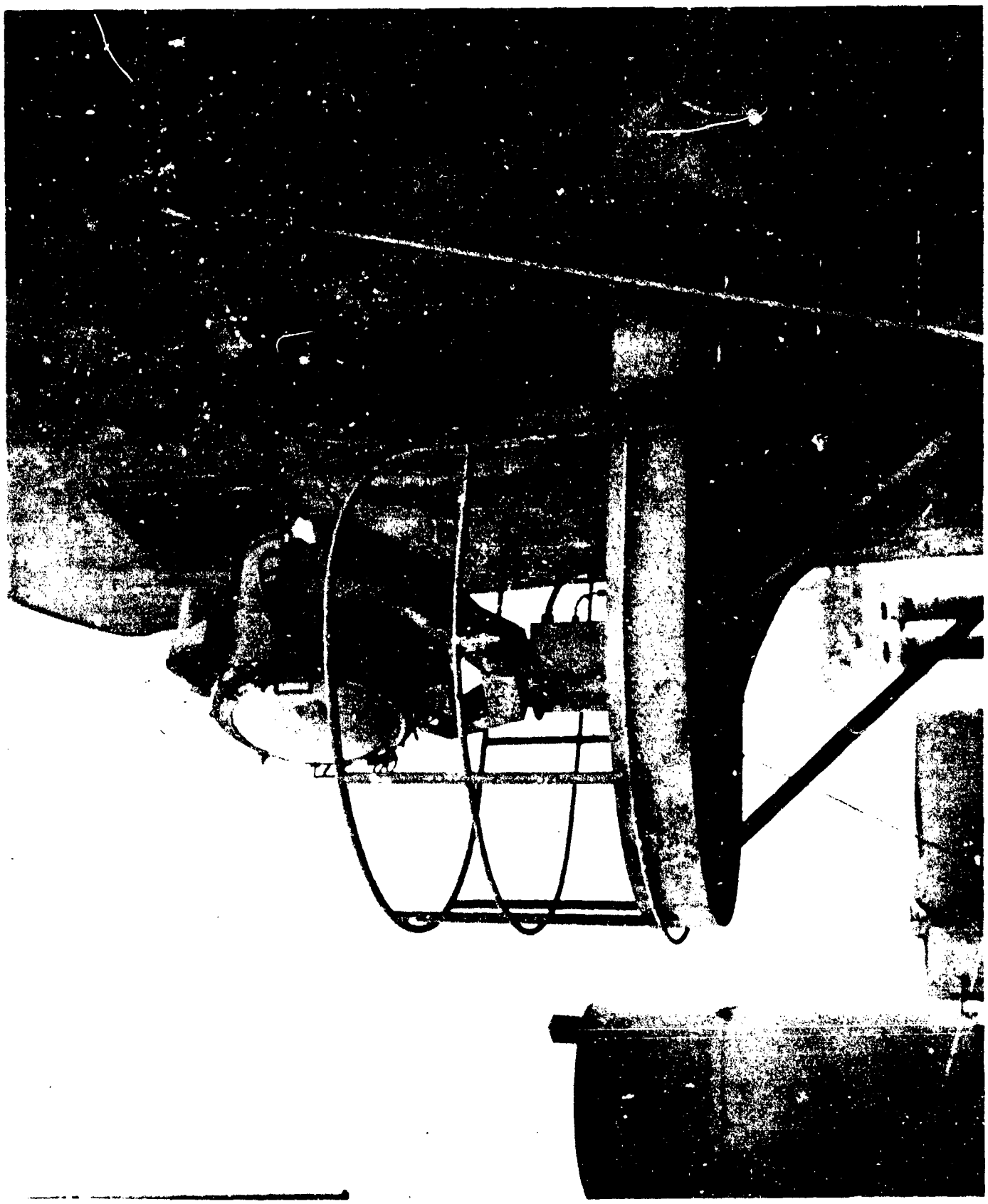


AA-CR-65-1819-9. Scorched paint on forward side of after leg of Welin davit on starboard side.

AA-CR-62-2172-9. Looking aft at damage to after stack. Note pedestal of missing magnetic compass in foreground.



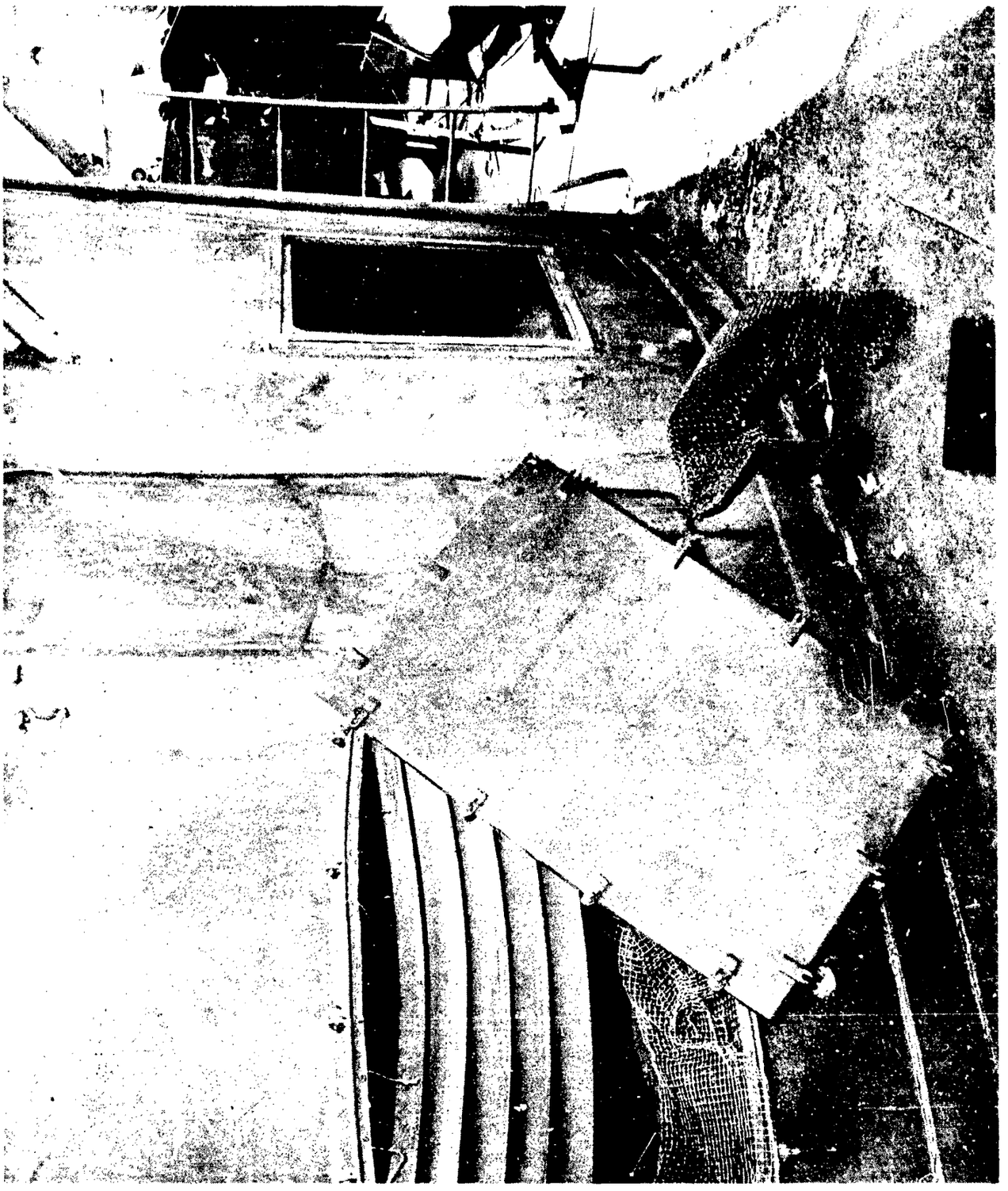
AA-CR-82-1827-2. Looking down and forward from starboard searchlight platform at blast damage on top of house in vicinity of fire control platform and signal station.



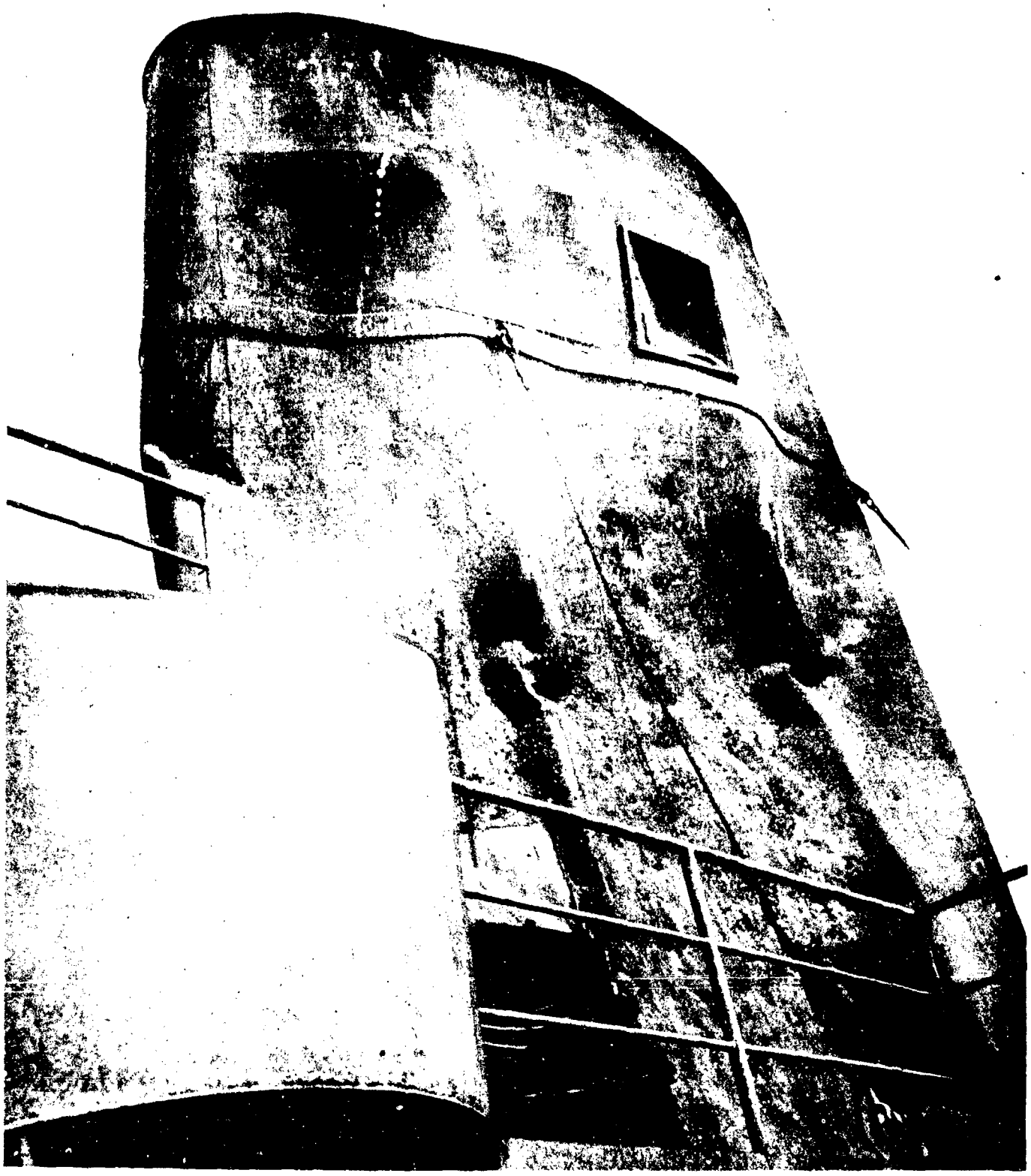
AA-CR-175-2157-2. Bent king-pin of 24 inch searchlight on starboard side of forward stack.

AA-CR-62-2172-12. Looking forward and to port at starboard side of forward stack. Note damaged yoke of starboard 24 inch searchlight.

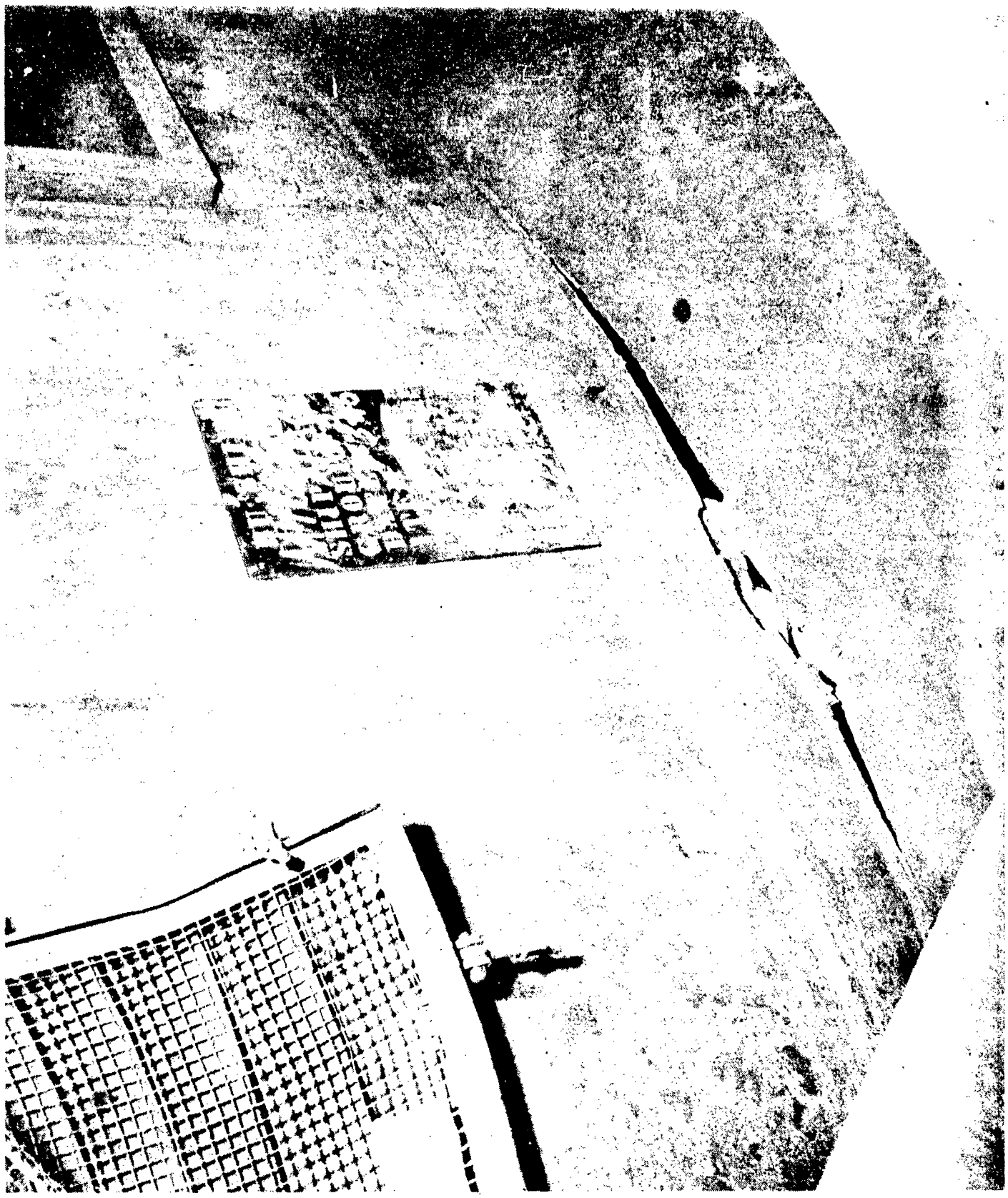
AA-CR-65-1819-6. Looking aft at starboard side of forward stack showing blast damage and scorched paint.



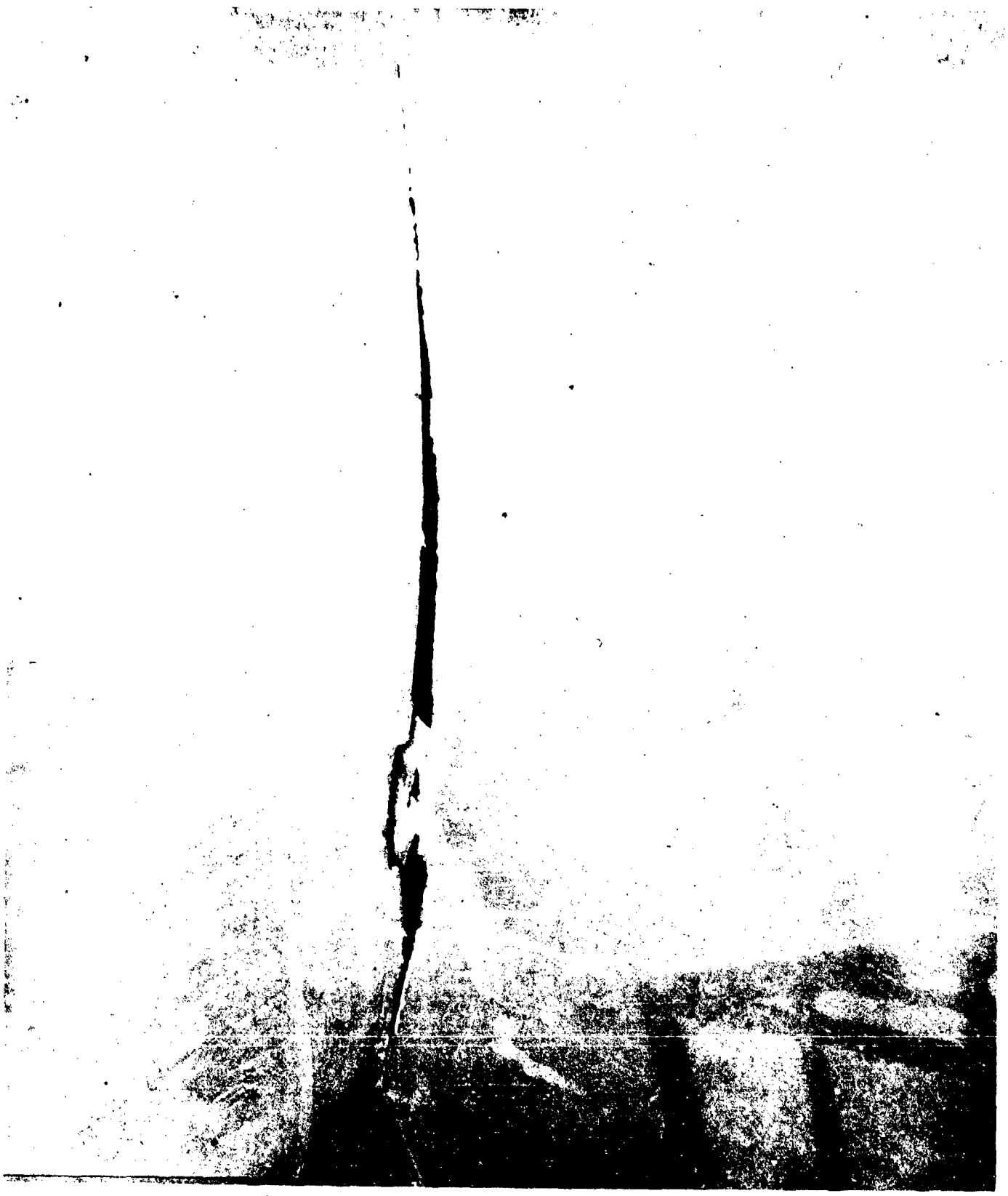
AA-CR-82-1827-3. Blast damage to vent closure on starboard side of forward stack.



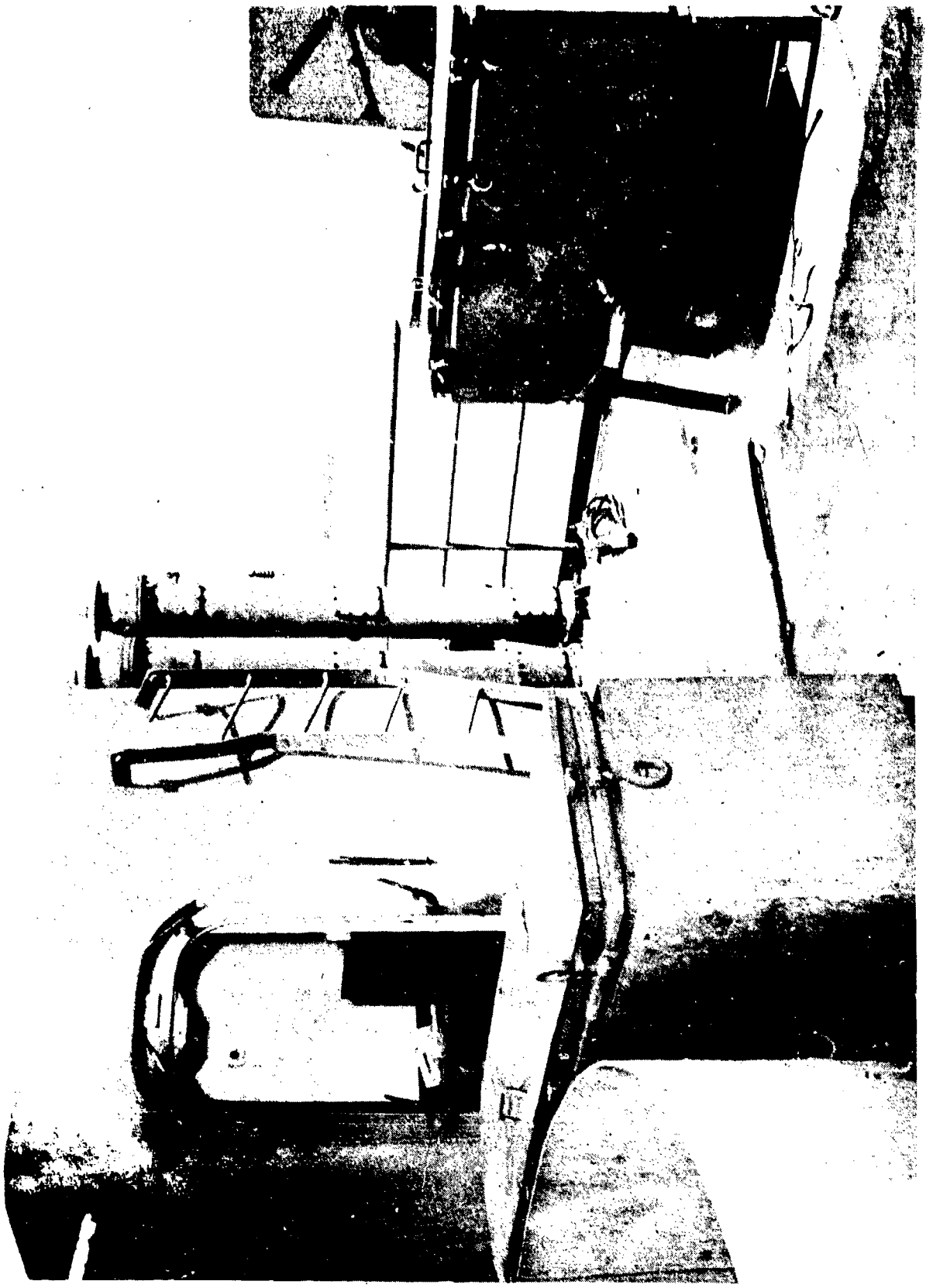
AA-CR-62-2172-11. Starboard side of after stack from navigating deck.



AA-CR-82-1828-4. Tear at connection of starboard side of base of after stack to top of house.

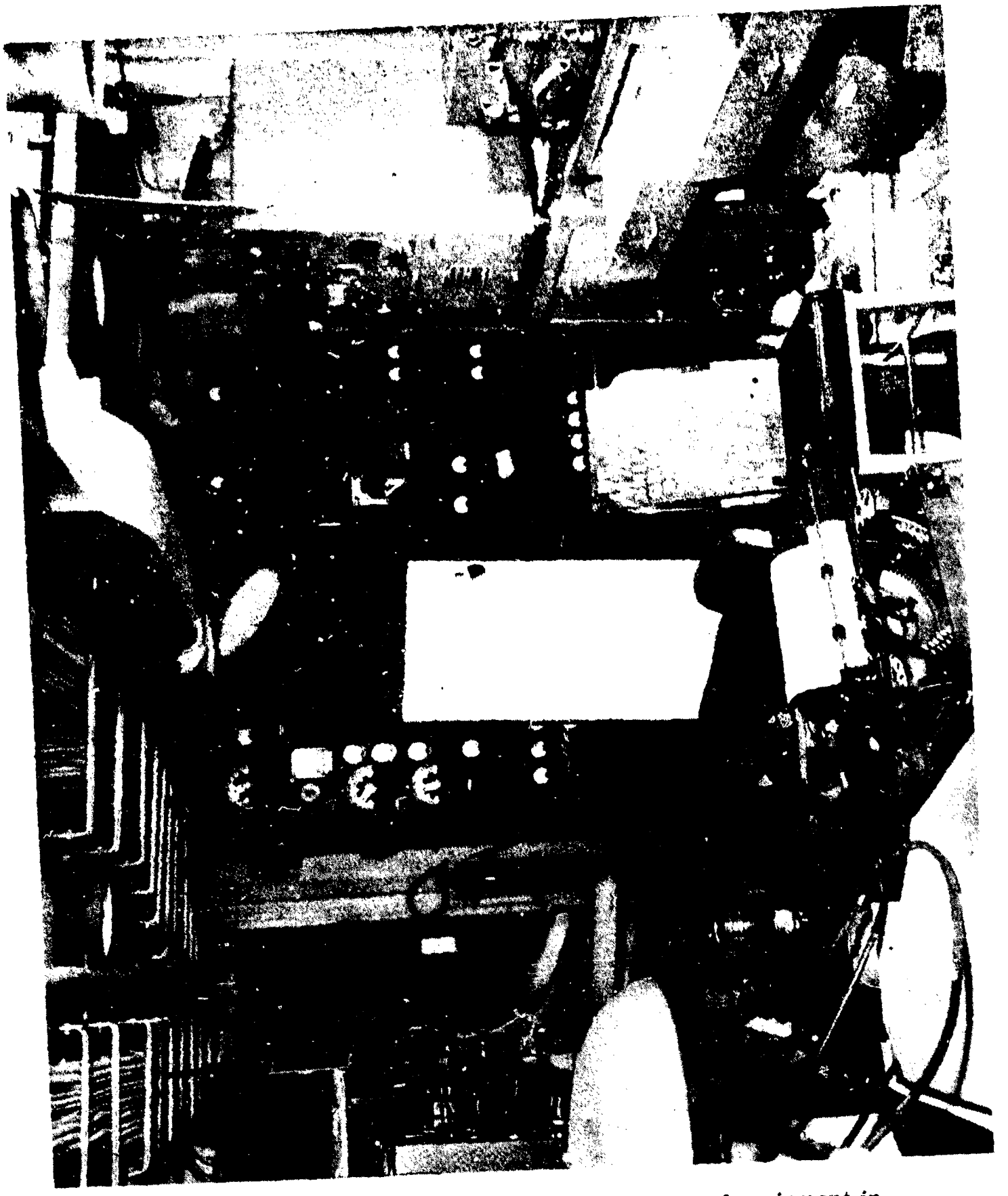


AA-CR-62-2172-10. Tear at connection of outer casing of after stack to 04 deck (top of house).



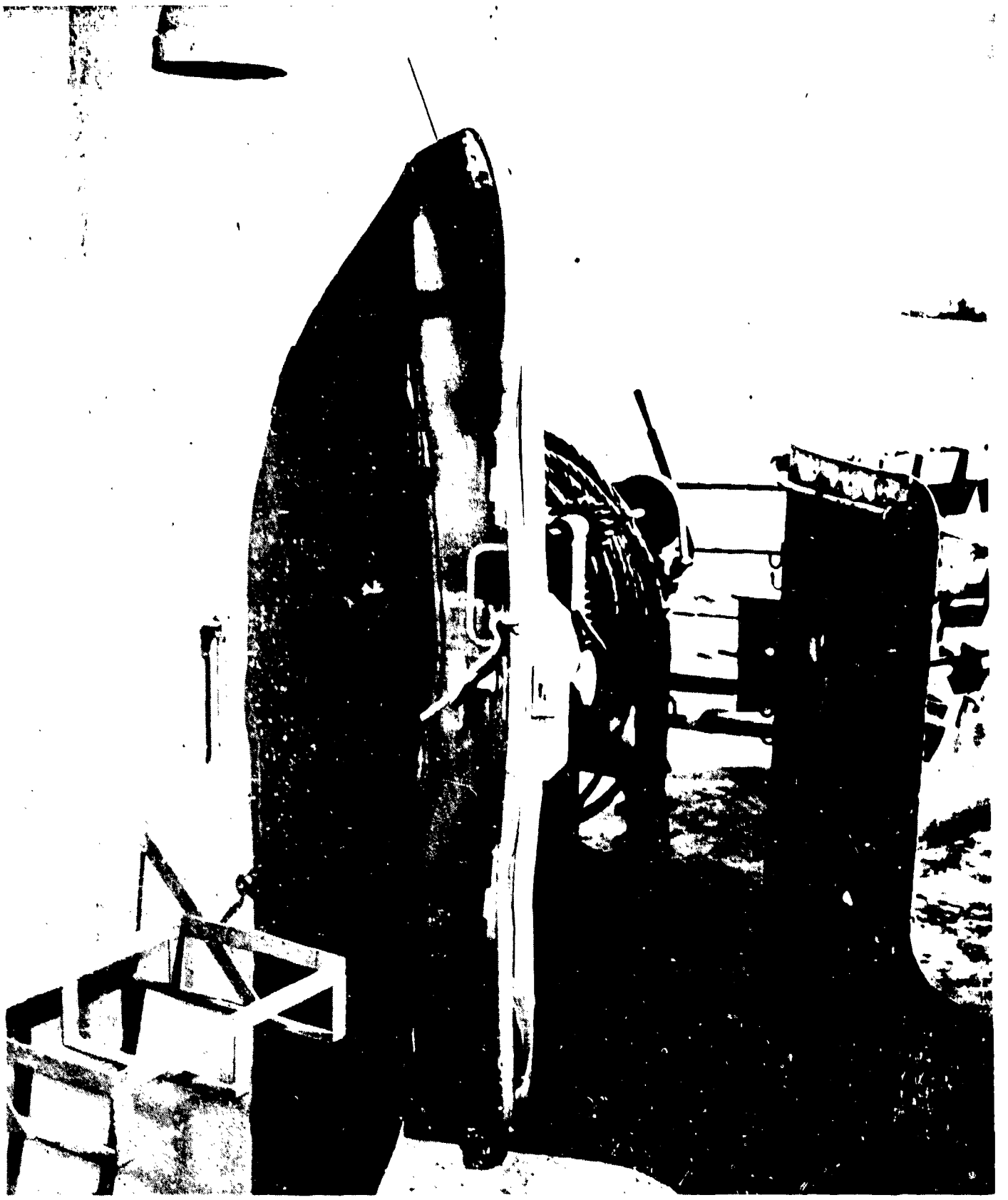
AA-CR-82-1827-4. Looking aft at forward bulkhead of RDF station showing missing door and bent ladder.

AA-CR-82-1828-6. Looking aft at blast damage to gear locker on starboard wing of navigation deck, frame 66.



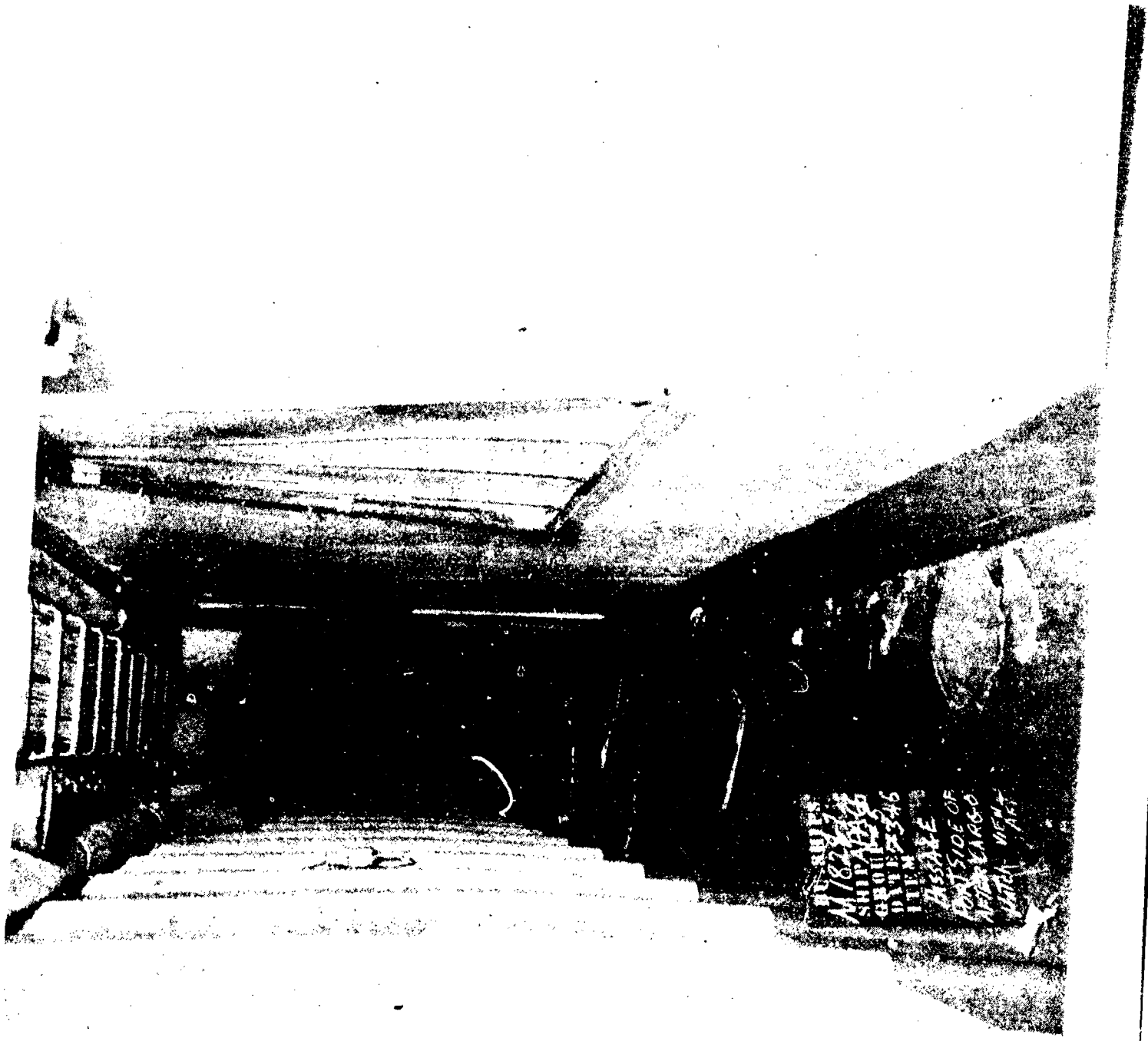
AA-CR-82-1828-2. Looking aft at disarrangement of equipment in radio 1.

AA-CR-66-152-5. Test A damage to bulwark around look-out station on top of forward deck house. Port side.



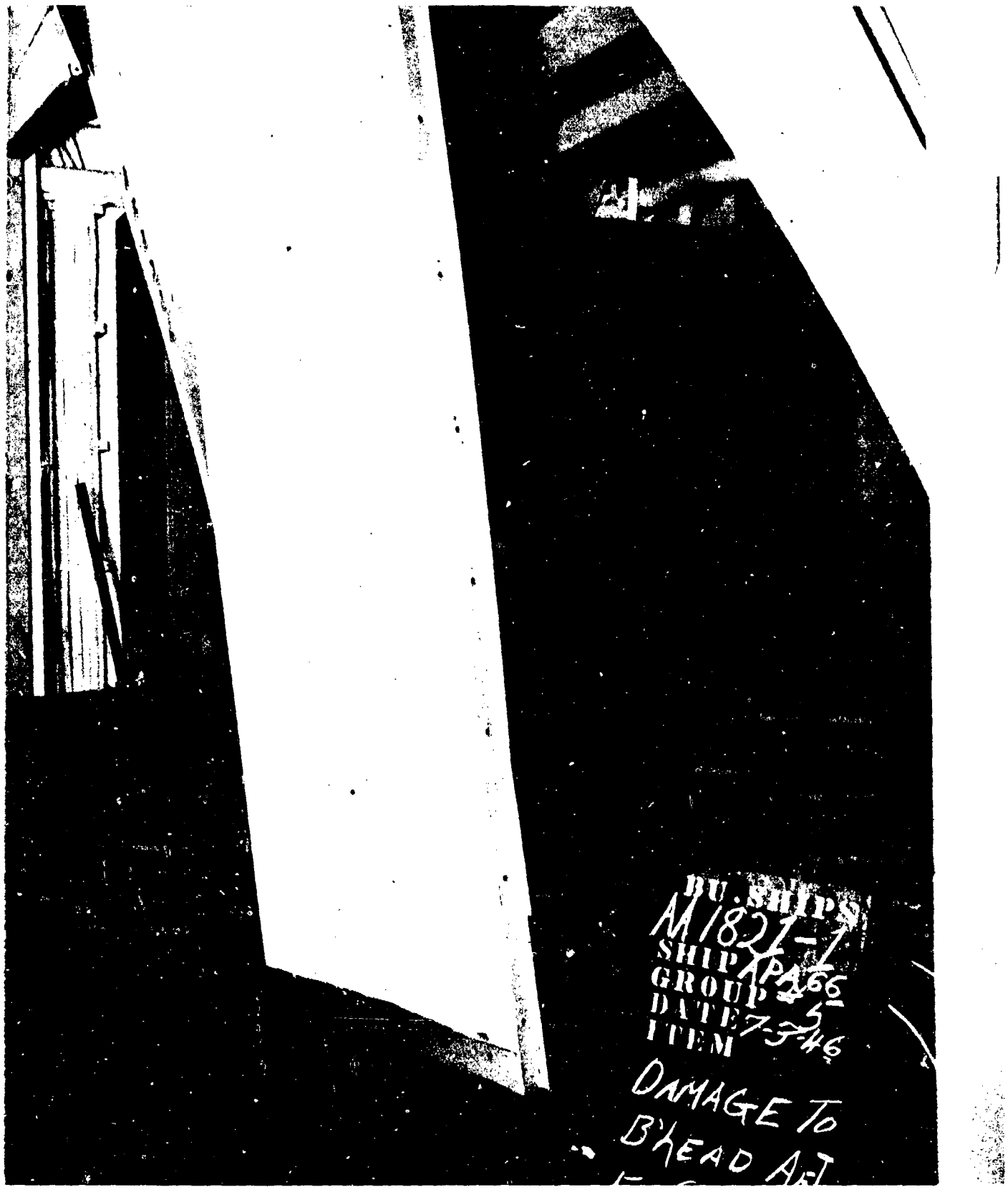
AA-CR-65-1819-10. Damaged door and broken door hook, upper deck, frame 27, port.

AA-CR-82-1827-8. A-104LT. Passageway to port of cargo hatch 1, showing deflection of light structural bulkhead adjacent hatch and failure of connections of metal joiner bulkhead.

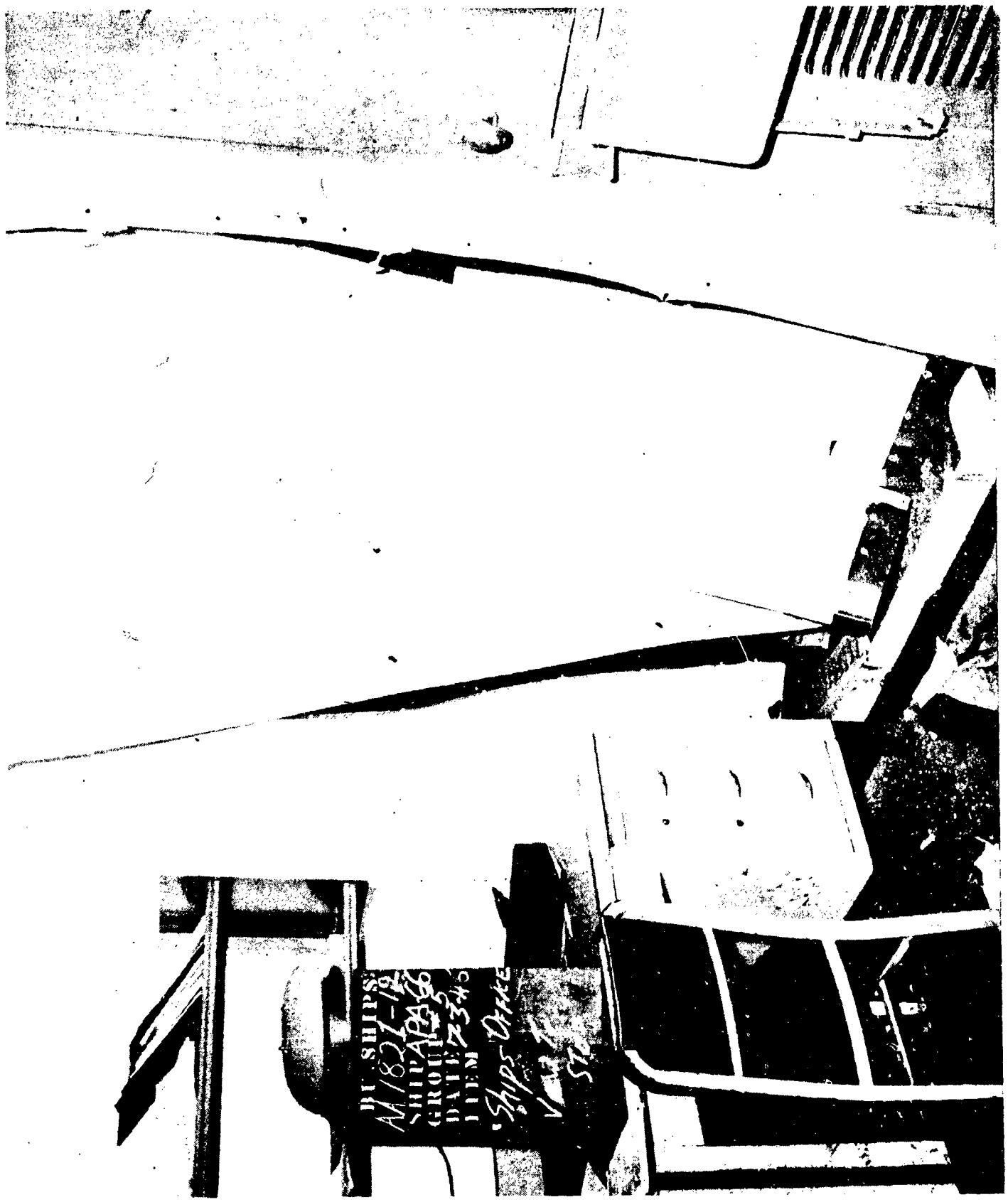


AA-CR-82-1828-1. Looking aft in passageway, main deck, port, adjacent cargo hatch 2. Showing deflection of light structural bulkhead and damage to metal joiner bulkhead.

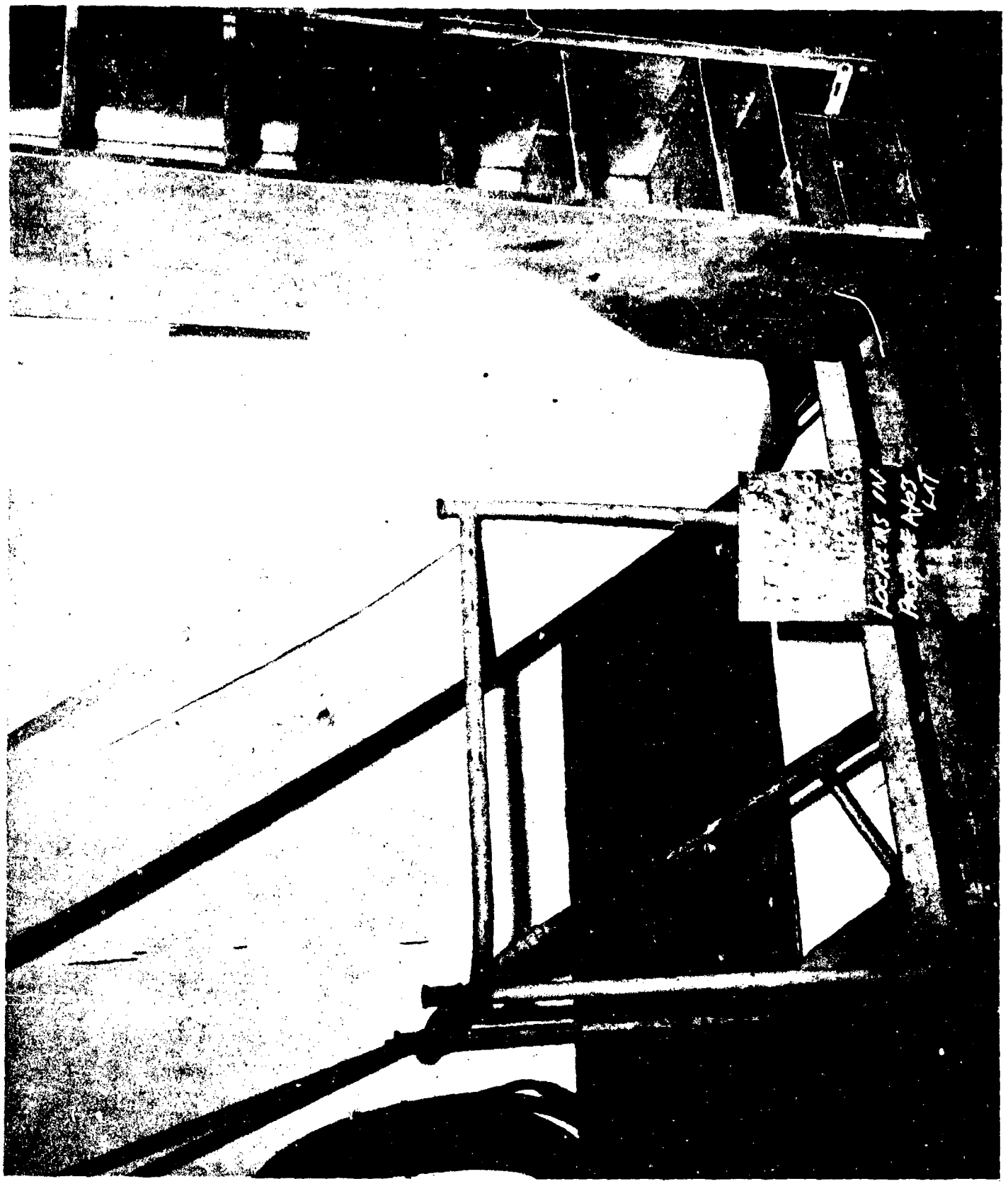
SECRET



AA-CR-82-1827-1. Looking to starboard at damage to metal joiner bulkhead in transverse passageway, upper deck frame 63, port.

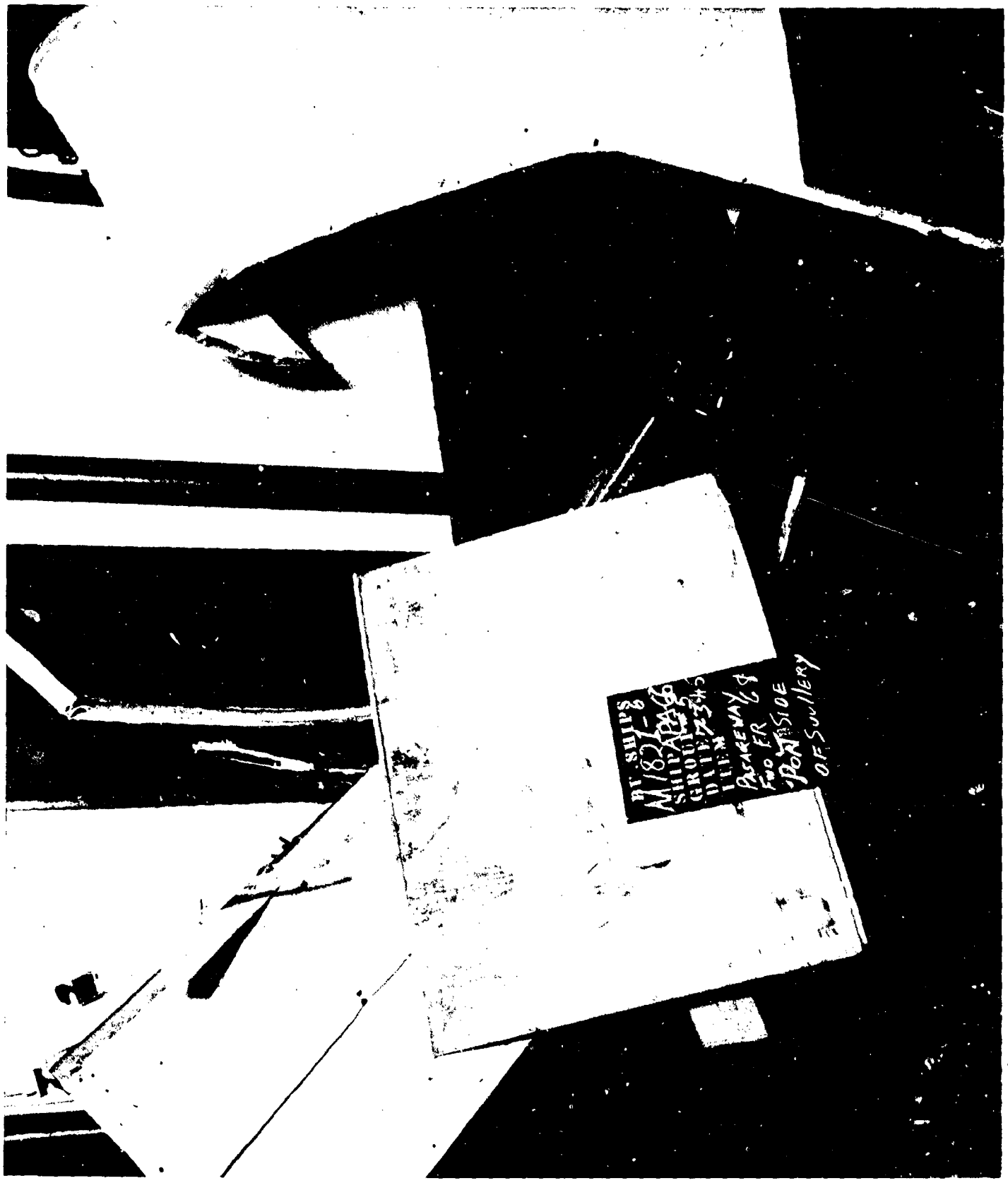


AA-CR-82-1827-12. Ship's office, main deck, frame 98, port, looking forward and to starboard. Blast damage to metal joiner bulkhead.



AA-CR-82-1827-11. Passage A-102LAT. Blast damage to lockers and apron under ladder. Lockers were displaced from foundation.

AA-CR-82-1827-5. Main deck, frame 68, starboard. Damage to metal joiner bulkhead around ladder 1-68-1. Note damage to electric controller for dish washer secured to bulkhead.

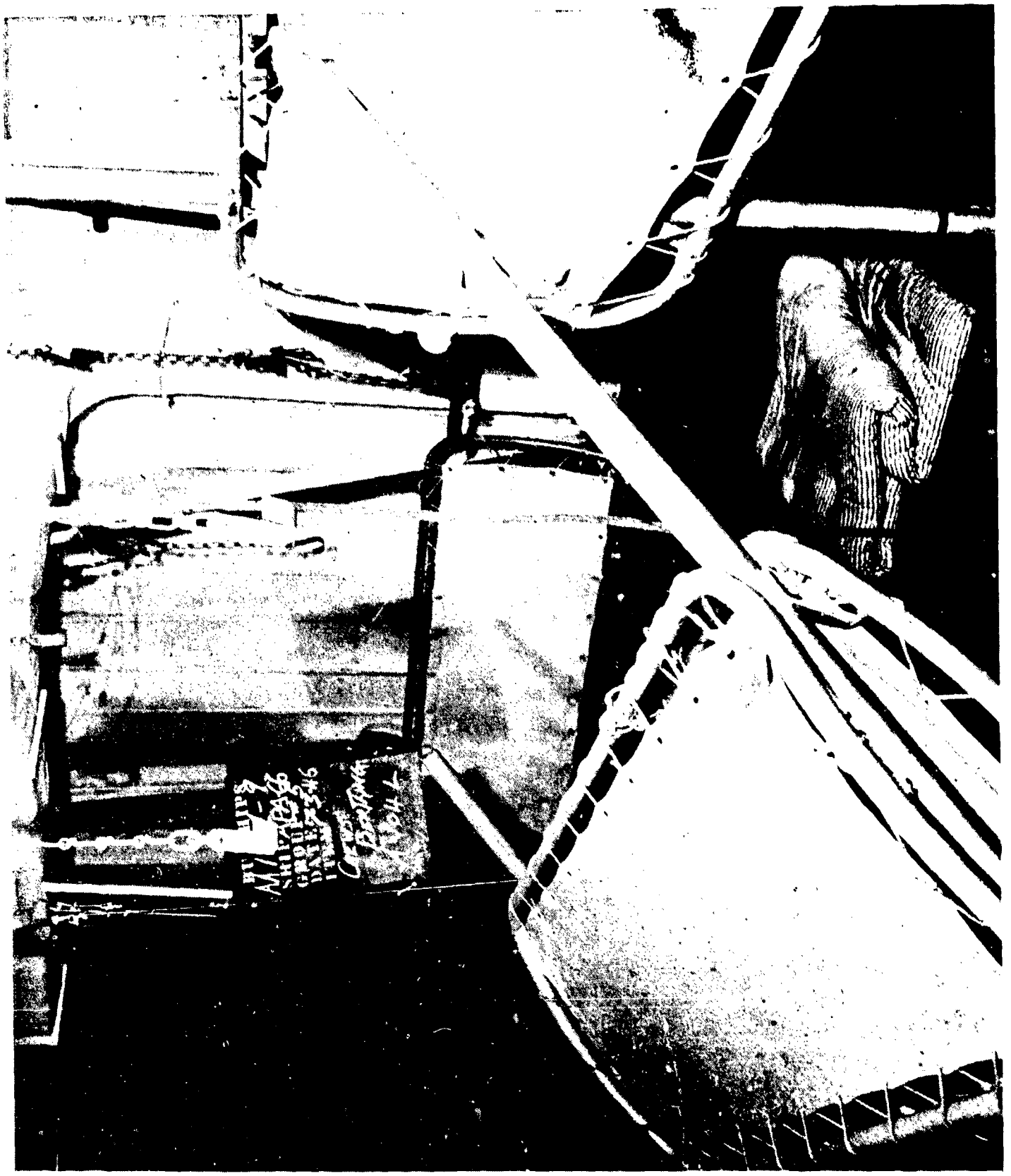


AA-CR-82-1827-6. Main deck, frame 68, port. Damage to metal joiner bulkhead around ladder 1-68-2.

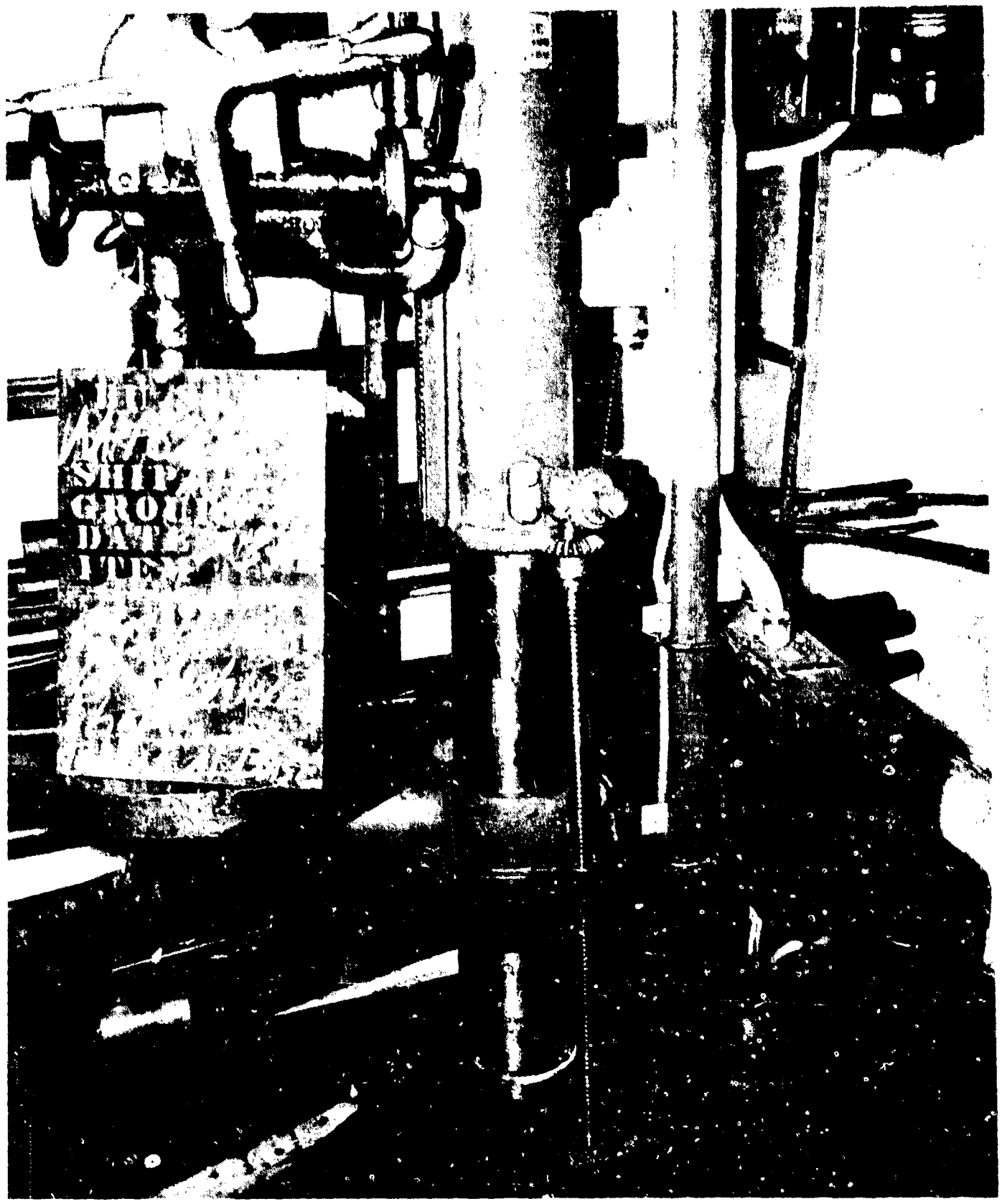
AA-CR-82-1828-12. Main deck, frame 87, starboard. Damage to metal joiner, light lock around ladder 1-87-1.

AA-CR-82-1829-4. Main deck, frame 87, port. Damage to metal joiner light lock around ladder 1-87-2.

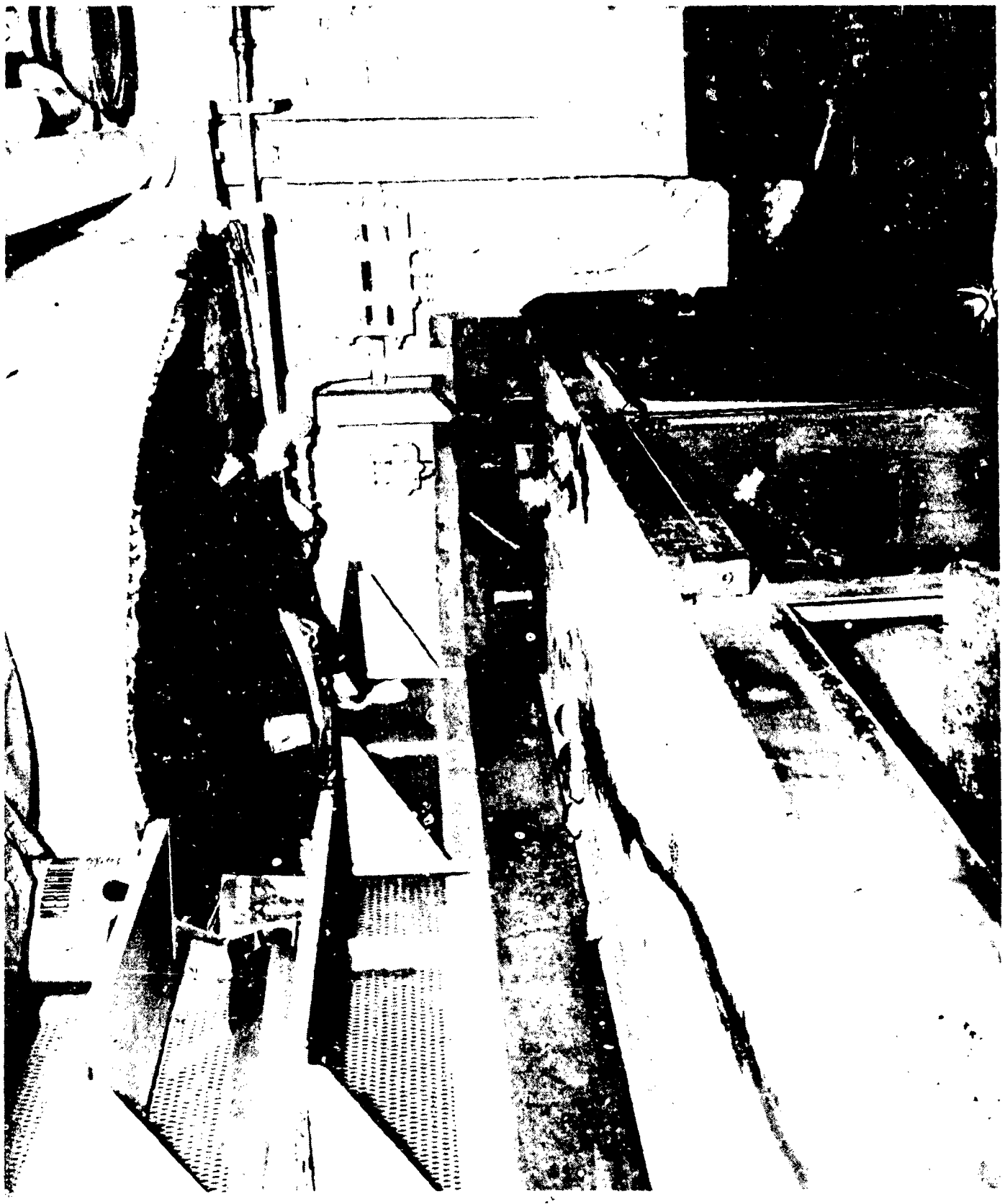
AA-CR-82-1827-10. Passage A-102LAT. Blast damage to lockers.



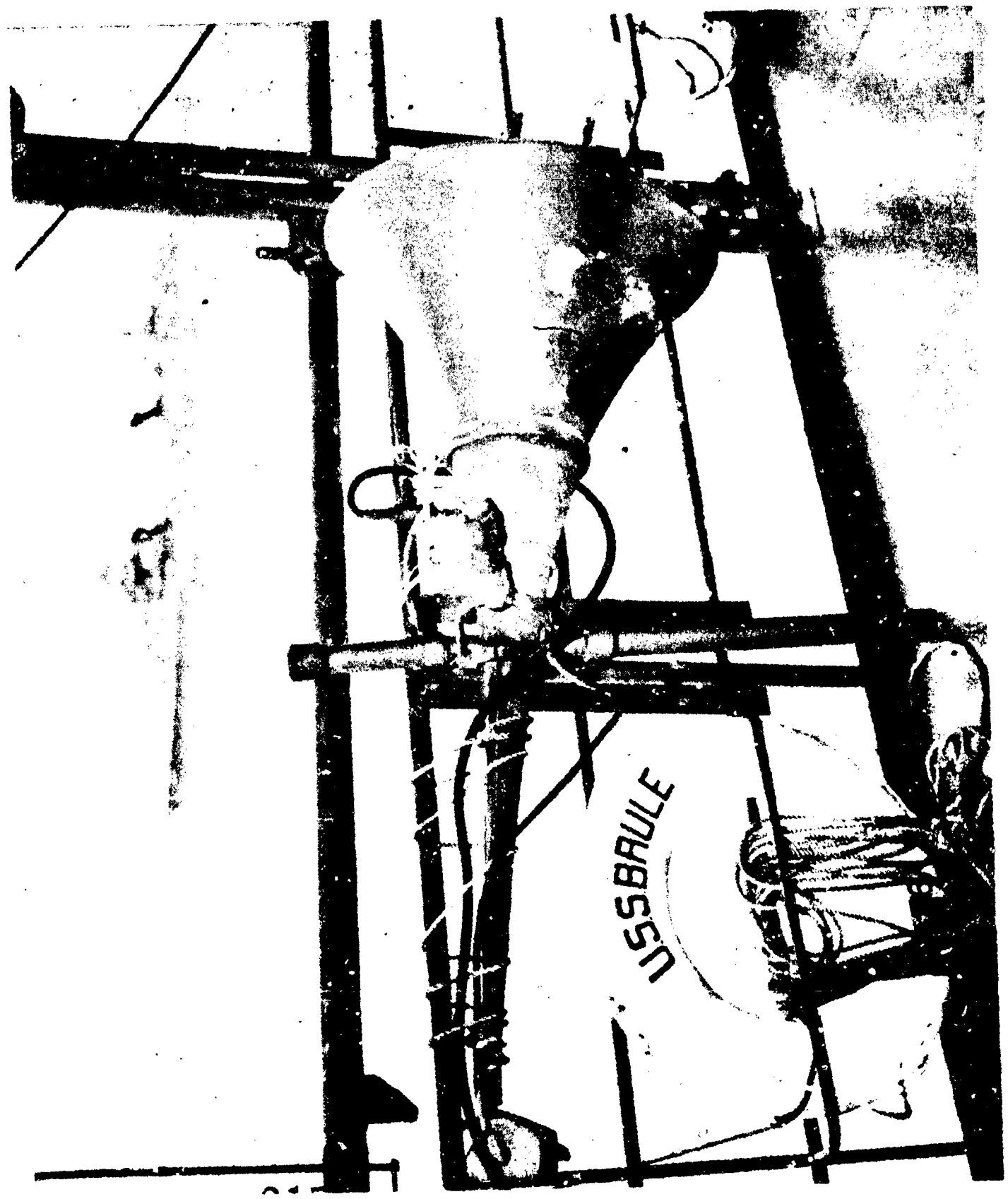
AA-CR-82-1827-9. A-104L. Disarrangement of bunk stanchions and bunks.



AA-CR-82-1828-5. Fractured pedestal of drill press in machine shop.

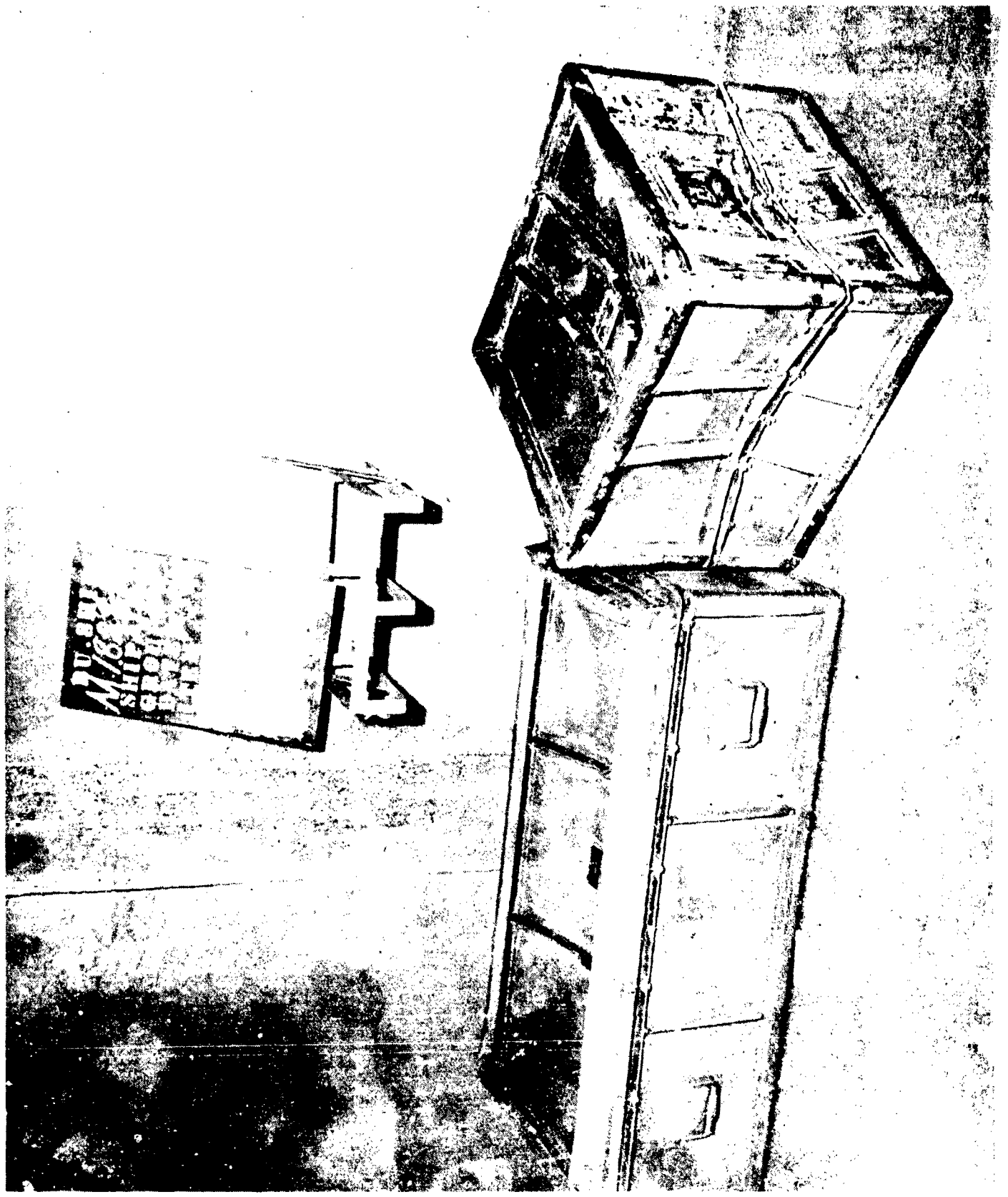


AB-CR-100-2992-6. Test A damage to vent duct in bakery.



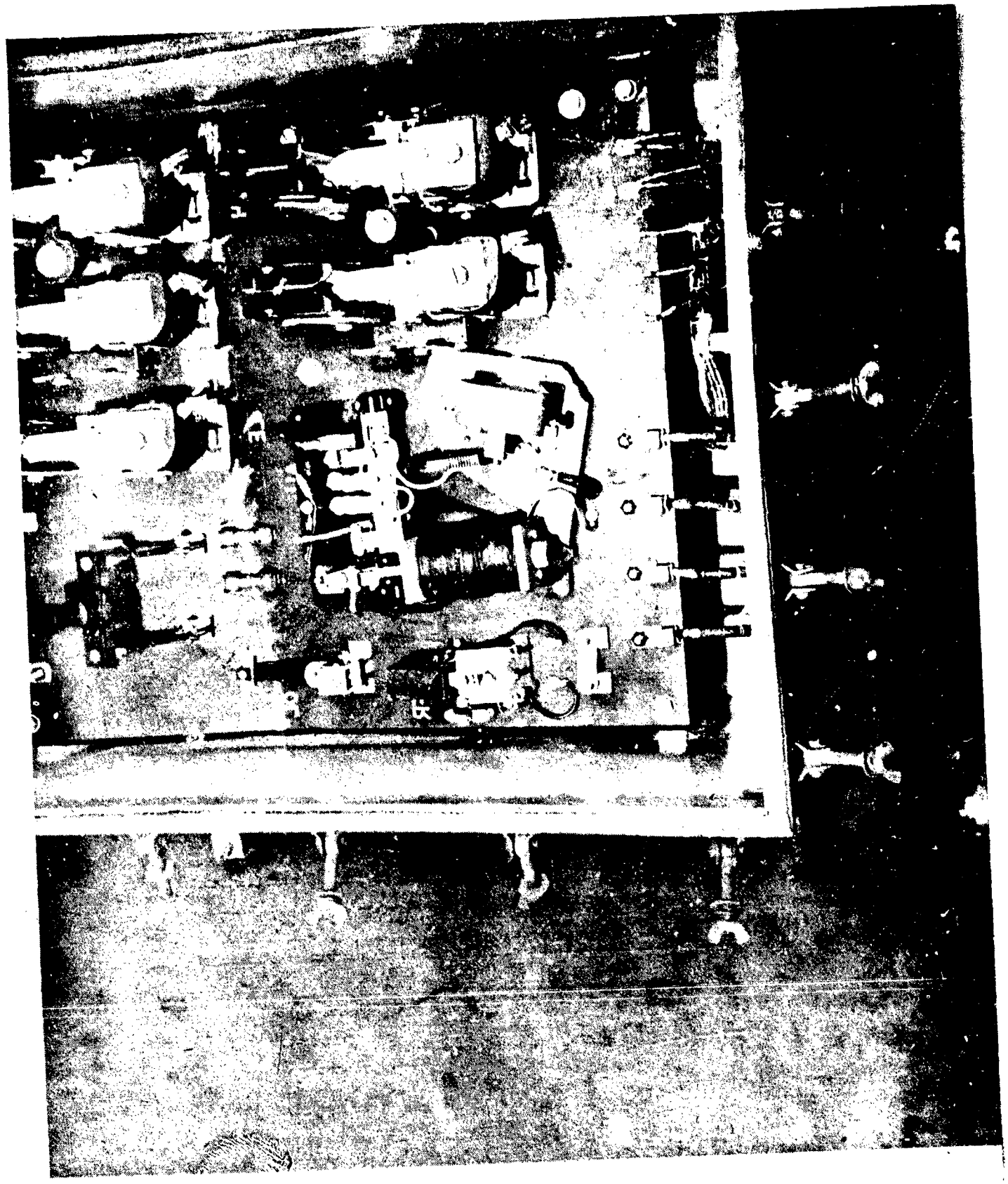
AA-CR-175-2157-5. Air blast bull horn Photo shows horn broken. from pedestal.

AA-CR-175-2157-4. Cable to bull horn on bridge. Photo shows beads of insulation protruding through armor. Cable was scorched by heat blast.

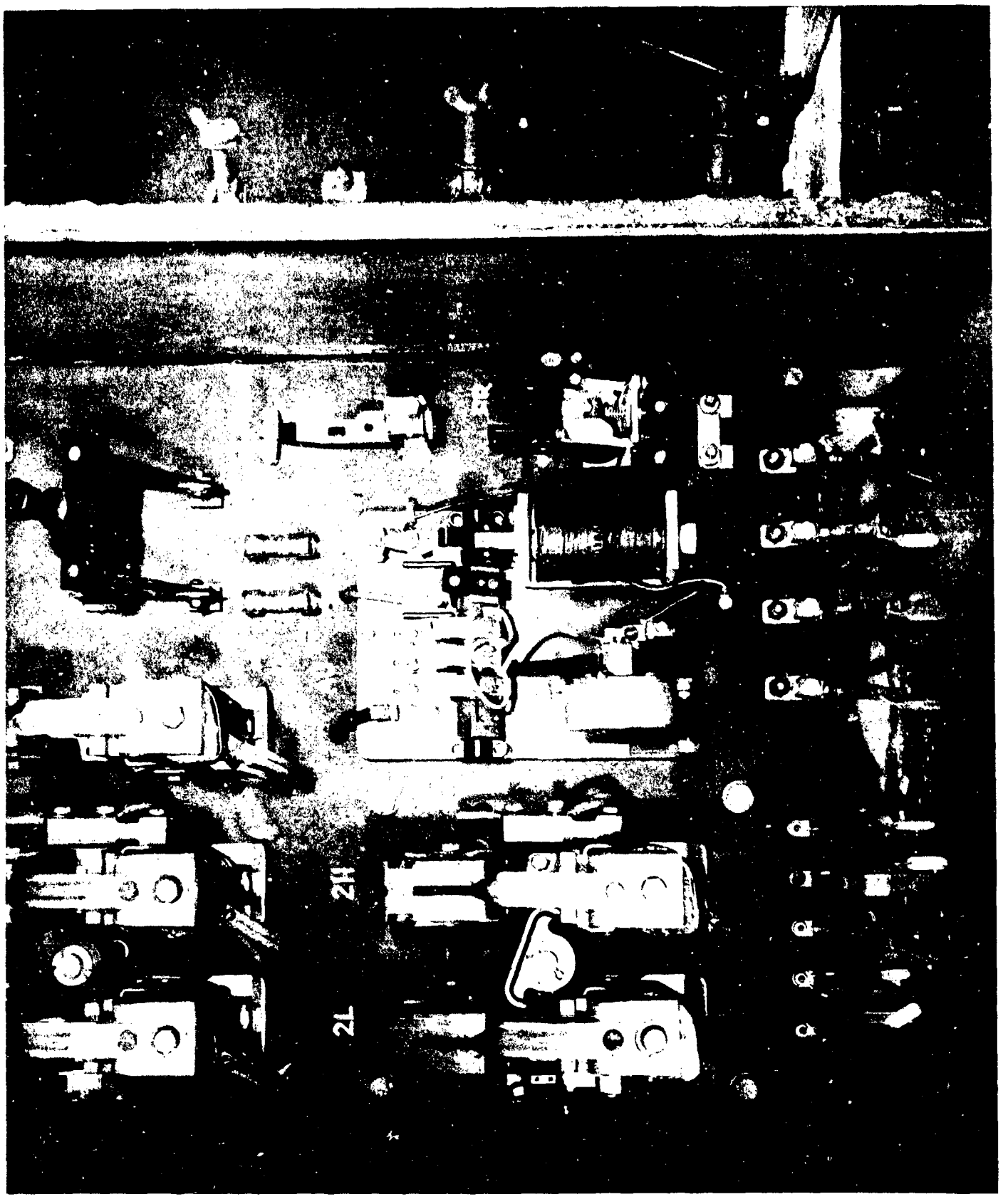


AA-CR-82-1828-7. Spare parts boxes for P.A.B. speaker. Dished in sides and top show effect of pressure on bridge level.

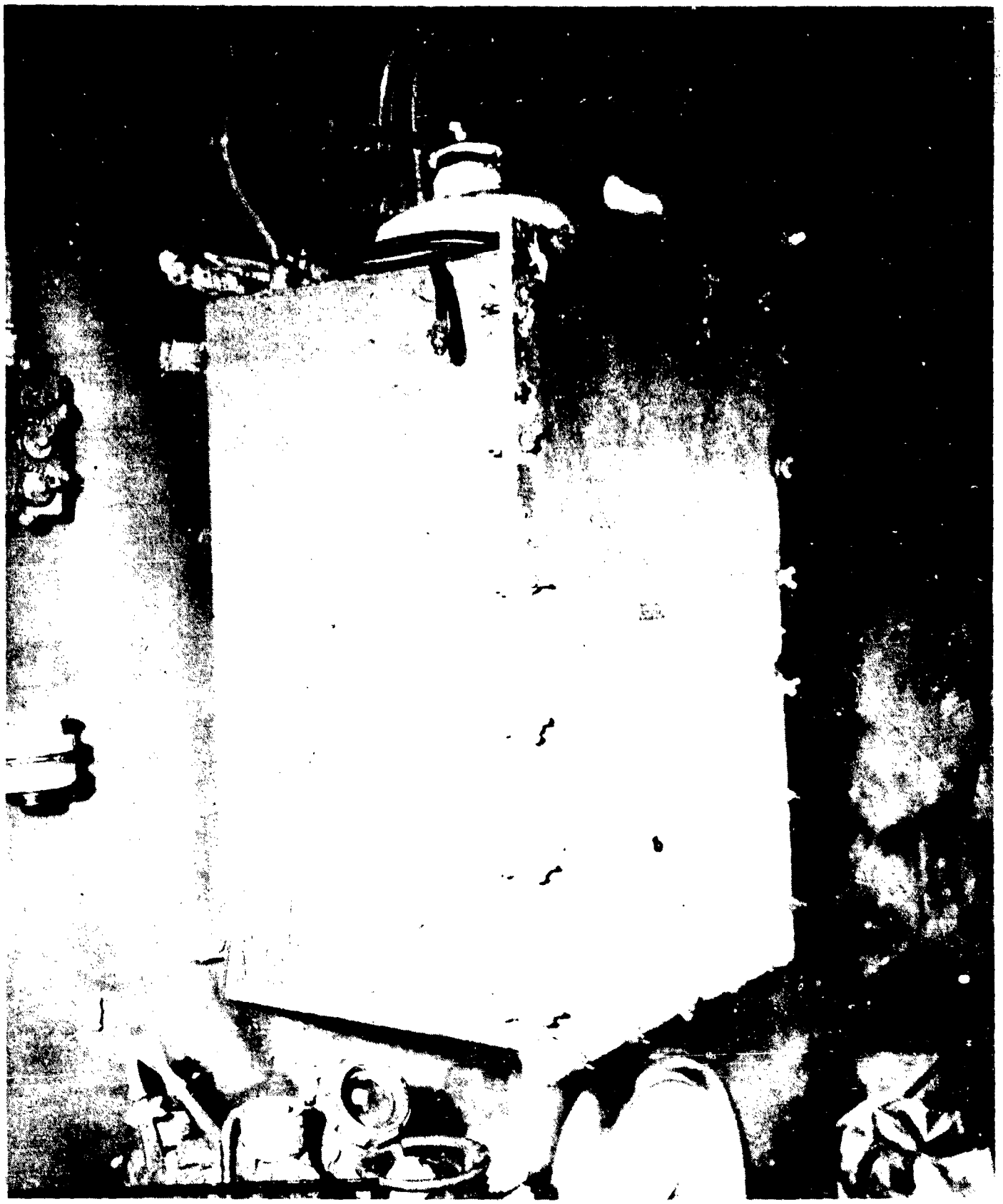
AA-CR-82-1828-10. Support for P.A.B. speaker Photo shows support damaged due to blast.



AA-CR-175-2156-12. Controller for forward starboard boat davits. Photo shows cracked main panel of ebony asbestos and broken and sub panel of molded pheuolic. Damage was due to whipping of bulkhead due to blast.



AA-CR-175-2156-11. Controller for after starboard boat davit. Photo shows cracked main panel of ebony asbestos and sub panel of molded pheuolic. Damage was due to whipping of bulkhead due to blast.



AA-CR-175-2157-1. Controller for forward starboard boat davit. Photo shows method of mounting on bulkhead. See photo 2156-12 for internal damage.

APPENDIX

SHIP MEASUREMENT DIAGRAM

TEST ABLE

SHIP MEASUREMENT DATA

Deck deflection scratch gages were installed to record relative movement between the upper and main decks. A tabulation of gage locations and readings is given on Page 123.

DECK DEFLECTION GAGES

SHIP APA 66 TEST A

LOCATION			MAXIMUM	MAXIMUM	PERMANENT SET		REMARKS
FR. NO.	DECK	DIST. OFF ℄	COMP.	EXP.	DISTANCE	EXP./COMP.	
128	MAIN	℄	1/4"	1/8"	1/8"	EXP.	
128	MAIN	14'-6" PORT	15/16"	1/4"	3/16"	COMP.	
128	MAIN	14'-10" STB'D.	5/8"	3/4"	1/2"	EXP.	STB'D. BHD. BENT IN-BOARD CAUSING EXP.
140	MAIN	℄	0	0	0	0	
140	MAIN	15'-0" STB'D.	7/8"	1/4"	0	0	
140	MAIN	15'-0" PORT	3/8"	1/8"	0	0	

APPENDIX

COMMANDING OFFICERS REPORT

TEST ABLE

REPORT #11

COMMANDING OFFICERS REPORT

Explosion took place about 1200 yards on ship's starboard quarter. Damage is as described below:

TOPSIDE DOORS AND BULKHEADS

Starboard wing of bridge dished.

All doors and vent covers on starboard warped to varying degrees, some carried away. A few doors bent on port side as well.

Light sheet metal partitions throughout superstructure were torn and distorted.

Hatch coamings on main deck aft were crushed.

TOPSIDE DECKS

Slight dimple in main deck near frame 25, starboard side.
Number 1 and main hatches very slightly warped.
Both stacks dished in - #2 stack slightly torn.

MASTS AND BOOMS

Seventy-five ton cargo boom bent but still useable.
Halyards and antenna carried away.

DAVITS

Control panels to starboard davits damaged by shock beyond capacity of ship's force to repair. These two davits therefore were out of commission.

BOATS AND RAFTS

No boats on board.
Five rafts disappeared or were badly damaged.

LOOKOUT TUBS AND GUN TUBS

Gun tubs undamaged but the lighter director tubs were crushed.

AMMUNITION AND GUNS

No apparent effects.

COMPASSES

Standard binnacle destroyed.
Gyro repeaters knocked off their gimbals but not hurt.

SEARCHLIGHTS AND SIGNAL LIGHTS

Undamaged.

ELECTRONICS

Damage slight except for antennas, which were destroyed.

PIPING AND TANKS

No damage.

RUDDER

No damage.

DECK RIGGING

Lifeline stanchions 75% bent or broken.
Jack and flagstaffs bent.
Davit and boom rigging undamaged except for starboard boat boom, which was destroyed.

COMMUNICATIONS

All communications out of commission because of damage to halyards and antennas.

FIRES

None, except for a few deck swabs which burned harmlessly on their racks.

RADIOACTIVITY

No special comment.

LIFE HAZARDS

Outside of the unknown effect of radiation, it is estimated that ship's company and troops would be not more than 10% effective for some time after the explosion. Casualties would have been high and probably would have prevented the ship from carrying out a war mission.

MACHINERY

Propelling machinery undamaged.

SUMMARY

The ship had been opened up at time of explosion except for ammunition storage and ports were hooked open and all hatches uncovered. This accounts in part for the large amount of minor damage. Virtually all doors opening on topside were at least bent by the blast and offices and troop officers country was thoroughly wrecked. The ship's structure and propelling machinery came through satisfactorily and there were no fires of consequence. Principal damages of a semi-permanent nature were (a) weakening of main cargo boom, (b) knocking out of both starboard davits and (c) general loss of topside watertight and light-tight integrity.

RECOMMENDATIONS

It is not feasible to build an attack transport of merchant ship type and expect it to function under attack from atomic bombs. The following points were noted, as worthy of interest and further study.

a. Antenna and signal halyards should have quick replacement features.

b. Stacks should either be reinforced or made lighter, with a view to their sacrifice to a near miss. Present strength is a useless compromise. The desirability of reducing sheet metal partitioning to a minimum is suggested.

c. Electrical fittings stood up well. Electric fans and blowers had zero casualties, light bulbs less than 25%

SECTION III

PART C - INSPECTION REPORT

SECTION A - HULL

A. General Description of Hull Damage.

a. 1. The overall appearance of this vessel indicates that the force of the explosion originated at a relative bearing of about 120° on the starboard quarter. Visual inspection disclosed no change in list, trim, or draft due to test and no flooding, either from sea or fire main occurred. Watertight integrity was not effected below the main deck. All paint exposed to the blast on the starboard side and stern was blistered. Light metal bulkheads in offices, ladder wells and staterooms collapsed. These bulkheads had no bearing on watertight integrity.

2. Considering seaworthiness and seagoing qualities of this vessel as affected by Test A and the effect on its usefulness to perform its functions as a troop transport it is noted that engines, boilers, and auxiliary machinery, maneuverability ordnance and gunnery installations were not affected in the test.

3. Messing facilities suffered no damage. Habitability was impaired in living quarters in A-102-L and C-104-L. All repairs were made by ship's force in one hour.

4. Fifteen ton cargo boom, frame 130, was bent but still in operative condition. All other cargo booms were intact and found in good working order. Cargo and boats can be handled with them.

5. It is estimated that blast damage would render unserviceable any boats nested or swung on davits on starboard side. Both starboard davits are inoperative due to electrical distribution board panels being cracked.

6. It is probable that boats nested or swinging in port davits would be operative and in good order. Davits on port side are in good working order.

7. Radio and flag signal hoists were damaged but some repairs were made to same by ship's force. Blinker lights on foremast and 24" searchlights were not damaged. It is considered that the most serious damage which would affect this vessel as a troop transport if subjected to a similar experience in operation, besides casualties to exposed personnel, is disabling of starboard boat davits and probable loss of boats nested and swinging in davits; also the considerable damage to officers' living spaces in superstructure country.

b. Hull was slightly dished starboard side between frames 110 and 147. Frame brackets in side hull bent.

c. Force of blast from outside hull plating.

d. No flooding.

e. Operability and buoyancy of ship was unaffected.

B. Superstructure and Weather Decks.

a. 1. Bridge, starboard wing, slightly dished in. Gyro repeaters, both wings, knocked out of binnacles. Plywood structure in wheel house damaged beyond repair.

2. Starboard flag bag torn off and missing; guard rails bent inboard; stanchions bent inboard; number one stack distorted and dished vent covers sprung and distorted. Thermometer case at frame 85 missing. Number two stack distorted and dished, vent covers sprung and distorted, dogs missing. Secondary Conn station intact except standard steering compass binnacle torn loose and wrecked. Antennas and signal halyards torn away and insulators broken; bulkheads and doors dished starboard side. All paintwork on starboard side blistered.

3. After deckhouse flag bag missing, vent covers missing. Starboard locker installed by ships force collapsed. Ladders twisted and broken off at bottom.

b. Cause of damage was due to blast.

c. Swabs in rack on after deck house, frame 147, caught fire and burned. Swab in rack at frame 85, starboard side of 03 deck, caught fire and burned. All fire hose and cordage exposed to blast was scorched but still in usable condition.

1. Any plating which withstood blast seemed to be sufficient protection against heat.

2. Shape of structure seemed to be of slight significance in comparison with thickness of material.

3. No stainless steel fittings on board.

4. No aluminum structure on board (except inner stack).

C. Turrets, Guns and Directors.

a. Not applicable.

b. 1. General condition good. All guns operative and in good order. Paint work scorched.

2. There are no crew shelters. Gun tubs not damaged.

c. 1. No directors on board.

2. Mark 14 sights on two twenty millimeter guns in good working order. Paint scorched. Ship's range finder was found in good order.

D. Torpedo Tubes and Appurtenances.

Not applicable.

E. Weather Decks.

a. The upper deck is dished about 6 inches on starboard side between frames 30 and 40. 02 superstructure deck dished on starboard side between frames 59 and 64. Also slight dishing of 03 deck between frames 59 and 64. There are no apparent cracks or leaks. Damage was due to blast.

b. All decks in usable condition.

c. 1. No apparent damage.

2. Ship has ten life rafts. Three were damaged from blast. Two rafts were missing. Rings in tripping gear were broken. Number one and number three Welin Davits inoperative due to blast. There were no boats on board at the time of blast.

3. Not applicable.

4. Not applicable.

F. Exterior Hull(Above Waterline.)

a. Undamaged.

b. Undamaged except for starboard boat boom. Boom was broken off at goose neck fitting.

c. Undamaged.

d. Not applicable.

G. Interior Compartments.

a. Transverse bulkhead 59 slightly bulged, starboard side. Longitudinal bulkheads, starboard side, main deck up slightly dished. Longitudinal bulkhead, frame 59-64 on 02 deck bulged 4 inches. Transverse bulkhead 73 buckled, transverse bulkhead 109 slightly bulged, transverse bulkhead 106 slightly bulged. Frames and frame brackets dished and bent. Damage due to blast.

b. Joiner bulkheads collapsed and distorted. Damage due to blast.

c. All doors starboard side dished in, distorted, and four doors missing. Hatch to Bos'n stores distorted, dogs missing, vent covers damaged and missing.

d. All equipment within compartments apparently in good order except for SC4 Radar transmitter. Transmitter removed from ship for further inspection.

e. Swab caught on fire in rack at frame 147, port side and one in rack, 03 deck, starboard side, frame 85.

f. Piping was damaged at frame 63, main deck, joiner bulkhead broke hot water line as it collapsed. Steam line bent and distorted, frame 107, center line, upper deck. All other piping found in good order.

g. There is no water tight integrity above the main deck. All compartments are habitable.

H. Armor Decks.

Not applicable.

I. There was no damage below the water line whatsoever.

J. Underwater Hull.

There was apparently no damage to underwater hull.

K. Tanks.

There was no damage to tanks. There was no contamination of liquids and no effect on ship's operability.

L. Flooding.

No flooding at all.

M. Ventilation.

There was slight damage to ventilation system. Repairs made by ship's force.

1. Intake louvers starboard side damaged.

2. Closures sprang and distorted, four closures missing starboard side.

3. No effect on habitability and no evidence of conduction of heat or smoke.

N. Ship Control and Fire Control Stations.

1. Bridge area - no damage except for derangement of gyro repeaters.

2. No apparent damage.

3. No apparent damage.

4. No apparent damage.

5. No apparent damage.

O. a. 1. Not applicable.

2. Not applicable.

b. 1. Not applicable.

c. 1. Not applicable.

P. Ammunition Stowage.

a. 1. Not applicable.

2. Five inch 38 AA common stored in C-306 M. No evidence of heat or blast.

3. Forty MM stored in forward and after clipping rooms. No evidence of heat or blast damage.

4. Twenty MM stored in ready service boxes, frame 88, center line and frame 101, port and starboard. No evidence of heat or blast damage.

b. 1. Not applicable.

2. Not applicable.

3. Forty MM and 20 MM stored in magazines A-404-M, B-204-M, C-302-M, C-305-M. No evidence of heat or blast damage.

4. Not applicable.

c. Not applicable.

d. Good, no damage.

Q. Ammunition Handling.

a. 1. Not applicable.

2. In good order - no damage.

3. In good order - no damage.

4. Not applicable.

b. 1. No evidence of conduction of heat or blast or flooding.

c. 1. Not applicable.

R. Strength.

a. Permanent hog or sag.

1. None.

2. None.

3. None.

b. None.

c. None.

d. None.

e. None.

f. None.

S. Miscellaneous.

a. Ship painted with U.S. Navy 5N dark gray paint. All surfaces exposed to blast scorched but no visible discolorations.

SECTION III

PART C - INSPECTION REPORT

SECTION B - MACHINERY

A. General Description of Machinery Damage.

a. The overall condition of the machinery was very good.

b. No major damage was done.

c. Primary cause of damage was caused by blast.

d. The target test had very little effect on the machinery.

B. Boilers.

No damage.

C. Blowers.

No damage.

D. Fuel Oil Equipment.

No damage.

E. Boiler Feedwater Equipment.

No damage.

F. Main Propulsion Machinery.

No damage.

G. Reduction Gears.

No damage.

H. Shafting and Bearings.

No damage.

I. Lubrication System.

No damage.

J. Condensers and Air Ejectors.

No damage.

K. Pumps.

No damage.

L. Auxiliary Generator.

a. No damage.

b. No damage.

c. No damage.

d. No damage.

e. No damage.

f. Oil ring on ring oiled bearing on #1 ship's service generator in forward engine room was knocked out of its proper position. Bearing burned out due to lack of lubrication.

M. Propellers.

No damage.

N. Distilling Plant.

No damage.

O. Refrigerating and Air Conditioning Plants.

No damage.

P. Winches, Windlasses, and Capstans.

a. No damage.

b. No damage.

c. No damage.

d. No damage.

e. No damage.

f. Shafting apparently out of line on forward anchor windlass.

g. No damage.

Q. Steering and Diving.

No damage.

R. Elevators, Ammunition Hoists Etc..

No damage.

S. Ventilation (Machinery).

No damage.

T Compressed Air Plant.

No comment.

U. Diesels.

No comment.

V. Piping Systems.

a. No damage.

b. No damage.

c. No damage.

d. No damage.

e. No damage.

f. No damage.

g. No damage.

h. No damage.

i. No damage.

j. No damage.

k. No damage.

l. No damage.

m. Salt water and fresh water piping in officers' washroom. B L sheared off at couplings. Salt water and fresh water piping in officers' toilet and washroom. B L sheared off at couplings.

W. Hydraulic System.

Support column on drill press snapped off near the deck in machine shop due to shock.

SECTION III

PART C - INSPECTION REPORT

SECTION C - ELECTRICAL

A. General Description of Electrical Damage.

(a) Overall condition of the electrical equipment after test was good.

(b) Major damage was done to starboard side of main deck and above.

(c) Primary cause of damage was due to blast.

(d) The electrical plant was operable with a few exceptions listed in the following items.

B. Electric Propulsion Rotating Equipment.

No damage.

C. Electric Propulsion Control Equipment.

No damage.

D. Generators - Ships Service.

No damage.

E. Generators - Emergency.

No damage.

F. Switchboards, Distribution and Transfer Panels.

(a) Interior of control panels for #1 and #3 Welin Davit was shattered beyond repair.

(b) No damage.

(c) No damage

(d) No damage.

(e) No damage.

(f) No damage.

(g) No damage.

(h) No damage.

(i) No damage.

(j) No damage.

(k) No damage.

G. Wiring, Wiring Equipment, and Wireways.

(a) Wiring undamaged, except where bulkheads were blown away, taking lighting circuits with it.

(b) No damage.

(c) No damage.

H. Transformers.

No damage.

I. Submarine Propelling Batteries.

No damage.

J. Portable Batteries.

No damage.

K. Motors, Motor Generator Sets and Motor Controllers.

(a) Oil ring on ring oiled bearing on #1 ship's service generator in forward engine room was knocked out of its proper position. Bearing burned out due to lack of lubrication.

(b) Interior of control panels for #1 and #3 Welin Davits was shattered beyond repair.

L. Lighting Equipment.

(a) About 15% of rough service lamps throughout the ship were broken.

(b) No damage.

(c) No damage.

(d) No damage.

(e) No damage.

(f) No damage.

M. Searchlights.

(a) Framework and trunnion yoke on #1 24 inch searchlight was slightly bent. Number 2 12-inch searchlight was blown off the ship.

(b) No damage.

(c) Shutter on #1 12 inch searchlight was badly damaged.

(d) No damage.

(e) No damage.

(f) No damage.

(g) No damage.

N. Degaussing Equipment.

No damage.

O. Gyro Compass Equipment.

(a) No damage.

(b) Topside repeaters were knocked from the gimball rings.

(c) Dead reckoning tracer was shaken loose and glass top was broken.

P. Sound Powered Telephones.

No damage.

Q. Ship Service Telephones.

Not applicable.

R. Announcing Systems.

No damage.

S. Telegraphs.

No damage.

T. Indicating Systems.

No damage.

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

No damage.

V. F.C. Switchboards.

No damage.

SECTION III

PART C - INSPECTION REPORT

SECTION D - ELECTRONICS

A. General Description of Electronics Damage.

(a) Overall condition unaffected by explosion except as noted below.

(b) All antennas down except SG radar and IFF antenna, SC4 antenna removed before Test A.

(c) All damage caused by blast except SC4 PPI as described below.

(d) SG radar operative, all others operative except for lack of antennas.

1. Radar.
   (a) SG, intact and operative.
   (b) SC4 Inoperative - PPI scope discolored by radiation and tube broken. Driver stack damaged beyond repair.

2. Radio.
   (a) Operative except for antennas.

3. Sonar.
   (a) NMC operative.

4. Loran.
   (a) Operative except for antenna.

5. Other.

(e) Types of equipment most affected.

B. Fire Control Radar.

No damage.

C. Surface Search Radar.

No damage.

D. Air Search Radar.

No damage.

E. Radar Repeaters.

No damage.

F. Radar Counter Measures Equipment.

No damage.

G. Radar And Radio Beacons.

No damage.

H. IFF Equipment.

No damage.

I. Communication Transmitters (Radio).

No damage.

J. Communication Receivers (Radio)

No damage.

K. Communication Antennae (Radio)

No damage.

L. Radio Transceivers.

No damage.

M. Sonar Echo Ranging and Listening Equipment.

No damage.

N. Sonar Echo Sounding Equipment and Altimeters.

No damage.

O. Loran Navigation Equipment.

No damage.

P. Power Supplies (Motor Generators and Filters).

No damage.

Q. Not Applicable.

R. Test Equipment.

No damage.

S. Instrumentation.

No damage.

T. Telephone Equipment.

No damage.

U. Direction Finders (Radio).

No damage.

V. Spare Parts.

No damage.

Classification (~~Cancelled~~) (Changed to CONFIDENTIAL)
By Authority of Joint Chiefs of Staff Action SE-12 April 1949
By [illegible] Capt Date 24 Sept 51
AFSWP

[redacted]

CONFIDENTIAL

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

TRC

9 April 1997

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

SUBJECT: Declassification of Reports

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

+ ST-H

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

TRC 9 April 1997

SUBJECT: Declassification of Reports

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

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

Ardith Jarrett
ARDITH JARRETT
Chief, Technical Resource Center

Completed
1 mar 2000
B.W