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# U. S. S. HORNET (CV8)

## LOSS IN ACTION

SANTA CRUZ

26 OCTOBER, 1942

The Chief of Naval Operations directs that this report be shown only to those persons to whom the report would be of value in the performance of their duties.

Steps shall be taken accordingly to insure that this report will be seen by those persons responsible for design, construction and repair of naval vessels, as well as for their operation, but by no others.

8 July, 1943

Preliminary Design Branch  
Bureau of Ships  
Navy Department

WAR DAMAGE REPORT No. 30

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Loss in Action

Santa Cruz

26 October 1942

Class.....	Aircraft Carrier	Length (W.L.).....	770'
Launched.....	14 Dec. 1940	Beam (W.L.).....	83'-0"
Displacement.....	20,000 Tons	Draft (Prior to Damage)	
(standard)		Forward	25'-0"
		Aft	29'-0"

References:

- (a) C.O. HORNET ltr. CV8/A16-3(5), Serial 00100 of 30 October 1942 - (War Action Report).
- (b) Cincpac ltr. A16-3/SOL, Serial 00413 of 6 Jan. 1943 - (Cincpac Summary - Battle of Santa Cruz).

CONTENTS

<u>SECTION</u>	<u>PAGE</u>
I - Summary	1
II - Narrative	1
III - Structural Damage - Morning Attack - 26 October 1942.	3
A. Structural Damage Caused by Bomb Hit, Frame 80	3
B. Structural Damage Caused by Bomb Hit, Frame 151	4
C. Structural Damage Caused by Bomb Hit, Frame 155	5
D. Structural Damage Caused by Dive Bomber Crash into Island	5
E. Structural and Machinery Damage Caused by Aircraft Torpedo Hit, Frame 110 $\frac{1}{2}$	6
F. Structural Damage Caused by Aircraft Torpedo Hit, Frame 160	6
G. Structural Damage, Port Side, Caused by Dive Bomber Crash	7

<u>SECTION</u>	<u>PAGE</u>
IV - Fires, Flooding and Damage Control - Morning Attack	7
A. Bombs	7
B. Airplane Crashes	9
C. Torpedoes	9
V - Salvage Efforts After Morning Attack - 26 October 1942	10
A. Towing	10
B. Engineering	11
VI - Probable Damage - Afternoon Attacks - 26 October 1942	12
H. Probable Damage Caused by Aircraft Torpedo	12
I. Probable Damage Caused by Bomb Hit, After Starboard Corner of Flight Deck and Near-Misses	12
J. Probable Damage Caused by Bomb Hit, Late Afternoon Attack	12
VII - Discussion	13
A. Size of Bombs	13
B. Type of Torpedoes	13
C. Incendiary Pellets	14
D. Fires	14
E. Failure of Torpedo Defense System	14
F. Comments on Equipment	15
G. Comparison of HORNET and YORKTOWN Flooding	17
H. Damage Control	18
I. Conclusions	18

#### LIST OF PLATES

I - Bomb, Torpedo and Dive Bomber Crash Damage (General Arrangement) - Morning Attack - 26 October 1942
II - Bomb and Torpedo Damage (General Arrangement) - Afternoon Attacks - 26 October 1942
III - Details of Dive Bomber Crash and Bomb Damage, Inboard Profile, Decks and Sections
IV - Probable Torpedo Damage and Flooding - Morning and Afternoon Attacks

## LIST OF PHOTOGRAPHS

### Number

1. U.S.S. HORNET during morning attack. Note smoke on flight deck from the two bomb hits aft. Note "suicide" dive bomber about to crash into leading edge of stack.
2. U.S.S. HORNET during morning attack. "Suicide" dive bomber, in above picture, has just crashed into the leading edge of the stack. Note smoke coming from hangar deck due to bomb hits aft.
3. Port side view of damage to the stack as a result of enemy dive bomber crash.
4. Close-up view, port side, of damage to stack immediately after crash of enemy dive bomber. Note damage to stack walkway. Note destruction of signal bridge forward of stack.
5. Close-up view of flight deck in way of stack showing wreckage of enemy dive bomber.
6. U.S.S. HORNET during latter part of morning attack just after an enemy dive bomber has rounded bow and crashed into port side gallery deck just forward of No. 1 elevator. Note heavy smoke amidships from crash of first enemy dive bomber. Note starboard list as a result of the two torpedo hits.
7. U.S.S. HORNET dead in the water after morning attack. Note smoke forward from crash of second enemy dive bomber. List is about 7° to starboard.
8. U.S.S. RUSSELL, U.S.S. MUSTIN along port side and U.S.S. MORRIS along starboard side (only top of mast visible) assisting U.S.S. HORNET in fighting fires after the morning attack. U.S.S. NORTHAMPTON standing by to commence towing operations.
9. Aerial view of U.S.S. HORNET during lull between morning and afternoon attacks. Note hole in flight deck aft and damage to leading edge of stack. Note bucket brigades still fighting fires on flight deck near the stack.
10. Stern view of U.S.S. HORNET during abandoning some time before last attack.
11. Starboard side view of U.S.S. HORNET after abandoning and during last attack. Note smoke from bomb hit amidships. Note trim by stern.
12. Port side view of U.S.S. HORNET after last attack. Smoke is from fire amidships due to last bomb hit.

## SECTION I - SUMMARY

1. U. S. S. HORNET was hit by three bombs, two torpedoes and two dive bombers in "suicide dives" on the morning of 26 October, 1942. Numerous fires were started which were brought under control in about one hour. The two torpedoes produced flooding which resulted in the loss of all power and in a list of 7° to starboard after counterflooding. Two attempts were made, the latter successful, by NORTHAMPTON to take HORNET in tow. During the afternoon, after HORNET had been under tow for one hour, a second attack developed. As a result the tow had to be slipped. In this attack HORNET sustained another torpedo hit, starboard side. In addition, two more bombing attacks occurred resulting in a final bomb hit. The list gradually increased to 18° at which time HORNET was abandoned. Since enemy surface forces were in the vicinity and it was apparent that HORNET would not sink immediately, two destroyers attempted to sink her by torpedoes and gunfire. When last seen she was burning furiously and slowly sinking.

2. This action again demonstrates the power of survival from a hull point of view, of this class. It also again highlights deficiencies in the machinery arrangement which were discussed at length in YORKTOWN \* loss report. Although conjectural, it is quite possible that HORNET, with a machinery arrangement similar to ESSEX (CV9 Class), might not have lost power after being struck by the first two torpedoes. This would possibly have permitted clearing the area of action and certainly would have permitted much more effective defensive action against subsequent attacks.

3. Although the fires started during the morning attack on HORNET were extinguished in about two hours, they were very difficult to fight and required the efforts of a large number of the crew. These fires were fed by excess clothing, upholstered furniture, and excess material in squadron ready rooms. The program of removal of inflammable material was evidently not complete.

4. The Commanding Officer and heads of departments, in reference (a), made numerous suggestions for the improvement of the engineering and damage control facilities in this class of ships. Many of these improvements will be made in ENTERPRISE during first availability. Those which apply to all carriers are being incorporated in vessels now under construction as well as ships already in service.

## SECTION II - NARRATIVE

(Plates I and II - All Photos)

5. This report is based on the excellent data supplied with the references. Photographs were supplied by the four photographic units attached to the various ships of the task force. Unfortunately, photographs of the damage taken by HORNET Photographic Unit were lost with the ship. Plates were prepared by the Bureau from an analysis of reference (a).

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\* BuShips War Damage Report No. 25.

6. On the morning of 26 October, 1942, HORNET was operating north of Santa Cruz Islands as part of a task force. Enemy action during the day was expected and the ship was at General Quarters with condition "Afirm" set before and during the attacks. The weather was clear with low scattered clouds. Several small rain squalls passed over the area of action. In the afternoon the atmosphere became somewhat murky with reduced visibility. The sea was slight with a moderate swell.

7. At 0920 radar contact was made with enemy aircraft 60 miles distant. The combat air patrol was landed, fueled, and flown off again. This operation was completed by 0948. Immediately after servicing the last fighter, the gasoline system of the ship was completely blanketed with CO<sub>2</sub>. As the enemy approached, speed was built up to 28 knots and radical maneuvers were employed in an attempt to evade bombs and torpedoes.

8. At 1010 anti-aircraft fire was opened on a coordinated enemy dive bombing and torpedo plane attack. Two bombs fell at some distance off the starboard beam and in line with the bridge. No damage resulted from the detonation of these bombs. About 1012 a delayed-action bomb struck the flight deck at frame 80 near the centerline. It penetrated to the third deck and detonated in compartment A-310-1LM. A few moments after this, two more bombs struck the flight deck aft. The first, at frame 151, detonated upon contact blowing an 11-foot hole in the flight deck about 20 feet inboard of the starboard deck-edge. The other, a delayed-action bomb, hit at frame 155, penetrated to the third deck and detonated in compartment D-303-1L. At 1014 an enemy dive bomber, armed with three bombs, dove into the forward port corner of the stack, glanced off and crashed on the flight deck. One of the bombs detonated upon hitting the stack. The other two passed through the flight deck. One detonated in a squadron ready room and the other was a dud. About 30 seconds later the first of two aircraft torpedoes detonated against the starboard side. This torpedo, running quite shallow, struck at frame 112 in way of the forward engine room. Twenty seconds later the second torpedo, which was also running shallow, struck at frame 160 in way of the magazine group. About 1017 another dive bomber, unarmed and burning fiercely, came in from the port quarter and attempted to crash HORNET but initially overshot. The plane then rounded the bow and crashed into the port side in way of the forecastle deck just forward of No. 1 elevator. About a minute later an unarmed torpedo plane, coming from dead ahead, attempted a "suicide" crash but missed and crashed into the sea off the port bow.

9. As a result of this attack: the ship listed immediately 10-1/2° to starboard and then slowly righted to 7° starboard; the forward engine room was flooded; all propulsion was temporarily lost; all power was lost; all communication facilities were disrupted; fire main pressure was lost; and large fires were started on the signal bridge, flight deck, No. 2 ready room, C.P.O. quarters, GSK storeroom, forward messing compartment, No. 1 elevator pit, forward port side gallery deck, hangar deck amidships and hangar deck aft. At 1020 MORRIS and RUSSELL, and later MUSTIN, came alongside and passed fire hoses to HORNET. In addition to the facilities of these destroyers there were many bucket brigades which carried foamite and water to the fires. At 1100 all fires were under control, although those on the flight deck and in the C.P.O. quarters were still requiring a great deal of attention. At this time all excess personnel were transferred to assisting destroyers. During this time preparations were being made by

NORTHAMPTON to tow HORNET. At 1109 a single enemy dive bomber attacked. The destroyers cast off and NORTHAMPTON steered clear as the bomber started down. The bomb was a near-miss to starboard in way of the bridge. About 1134 NORTHAMPTON was again in a position to take HORNET in tow. This attempt failed, due to parting of the tow line.

10. At 1430 a second attempt was made by NORTHAMPTON to take HORNET in tow using a larger tow line. This was successful. Unfortunately, at 1620 a group of enemy torpedo planes approached from the starboard beam in a fast weaving glide. NORTHAMPTON immediately cast loose. At 1623 one shallow-running torpedo struck the starboard side at frame 115. This resulted in the immediate flooding of the after engine room and destroyed the possibility of restoring power aboard HORNET. The list slowly increased until it reached  $14-1/2^{\circ}$  at 1640. At this time the expected additional dive bombing attack developed. Only near-misses resulted, one of which shook the ship violently. After this action, at 1650, the list increased to  $18^{\circ}$  and the order to abandon ship was given. At 1655 a horizontal bombing attack of six planes at 8,000 feet developed. One bomb struck the after starboard corner of the flight deck; the others were near-misses in a pattern so small that it appeared as one splash. At 1802, when all but two rafts and two boatloads of survivors were picked up, four dive bombers attacked HORNET. One hit was sustained on the flight deck just forward of the island. Apparently the bomb exploded on the flight deck and started a large fire which was observed to die out in about 15 minutes.

11. After dark, about 1905, the destroyers MUSTIN and ANDERSON returned to sink HORNET in order to prevent her from falling into the hands of an enemy cruiser-destroyer force rapidly approaching this area. Nine torpedo hits were reported to have been made on the port side. Apparently not all of the torpedoes detonated. In addition, a total of 369 rounds of 5" ammunition was fired. When they ceased firing at 2140 HORNET was burning fiercely and slowly sinking.

### SECTION III - STRUCTURAL DAMAGE - MORNING ATTACK -

26 OCTOBER 1942

(Plate I)

#### A. Structural Damage Caused by Bomb Hit, Frame 80

(Plate III, Panel 2)

12. The bomb which hit at frame 80 came from the starboard quarter. It struck the flight deck just to starboard of the centerline, and traveled forward and to port detonating just above the third deck at frame 72, about 20 feet from the port side in the crew's mess room, compartment A-310-11M. Total travel after striking flight deck to point of detonation was about 56 feet. The detonation was of high order.

13. The impact on the flight deck resulted in a hole about 12 inches in diameter. Holes of about the same size were probably left in the gallery and main decks. No structural damage resulted to the main deck other than an athwartship ridge about 10 inches high and two feet wide at frame 75 which extended from

side to side. Most of the area on the port side of the second deck between frame 71 and frame 78 was either destroyed or badly ruptured. Undoubtedly, the deck in the wardroom pantry immediately above the point of detonation was holed and deflected upwards. Battle dressing station V, which was in the small wardroom mess room, was badly wrecked.

14. On the third deck, compartments between bulkheads 64 and 83 and port side compartments between bulkheads 83 and 90 were badly ruptured. Quite probably a large hole was blown in the third deck in way of the bomb detonation. Most of the bulkheads within this area were badly warped and in a few instances destroyed. The inboard bulkhead of the mess attendants' wash-room, compartment A-310-2L, was blown outboard against the skin of the ship. The quick-acting doors on bulkhead 64 were either jammed by wreckage from joiner bulkheads or were warped by the blast from the bomb detonation. At frame 82 the quick-acting door on the starboard side leading from the laundry to the crew's mess room was blown off. At frame 90 the watertight door on the port side was jammed. Most of the ladders leading from the third to the second deck in this area were either destroyed or badly twisted. Battle dressing station IV, which is in crew's mess room B-302-L, was completely demolished by the blast of the detonation. The post office which adjoins this compartment was also destroyed. The intakes to the forward three boiler rooms on the third deck which are located between frames 82 and 85 were so badly holed by fragments that smoke from the fire on the second and third decks was drawn down into these three compartments. The ventilation supply duct to the forward generator room, which passes down through the crew's mess room, compartment A-310-1LM, was destroyed. All ventilation ducts attached to the overhead of this same compartment were blown down by the blast from the explosion. The constant-service steam line in this compartment was out by fragments. Although normally cut off during battle, they were apparently supplying steam to the battle dressing stations located on the second deck.

15. On the fourth deck bulkhead 71 in way of the explosion was probably destroyed. Bulkhead 64 might have been deflected slightly. The armored fourth deck above the plotting room was deflected downward as the forward bulkhead of the plotting room was buckled, and most of the instruments in this control space were damaged or destroyed. Steam piping in the forward generator room was also ruptured. Reference (a) reported that a steam-driven blower in No. 2 fireroom was damaged. This apparently occurred as the result of fragments from this bomb.

#### B. Structural Damage Caused by Bomb Hit - Frame 151

(Plate III, Panel 4 - Photo 9)

16. The bomb which hit at frame 151 struck the flight deck about 22 feet to starboard of the centerline and detonated just below the flight deck, blowing a hole about 7 x 11 feet in the deck. Although fragments killed a great number of topside and hangar deck personnel, the structural damage below decks was of a minor nature. Fragments penetrated the hangar deck and the second deck into compartment D-302-1LM and one fragment even penetrated the third deck into compartment D-409-A. Some piping in this area was also cut by fragments. A fragment from the bomb cut the hoisting sling of an SBD-3 airplane at frame 150 causing it to fall onto the hangar deck. Four F4F-4 airplanes immediately forward of the bomb hit, which were also triced to the overhead, were undisturbed.



### C. Structural Damage Caused by Bomb Hit - Frame 155

(Plate III, Panel 4)

17. This bomb which came from dead ahead hit at frame 155 on the centerline. It passed aft and slightly to port. A 12-inch hole was left in the flight deck and hangar deck. Probably this bomb detonated on the third deck at about frame 161, six or eight feet to port of the centerline in C.P.O. mess room, compartment D-303-1L. This cannot be definitely established because a torpedo struck this same general area about two minutes later. Assuming the above point of detonation, the bomb traveled about 53 feet from point of impact to point of detonation. The detonation was of high order.

18. The main deck above the explosion was bulged slightly over a large area. The second deck was also probably ruptured and bulged over a considerable area. The stanchions and bulkheads between the main and the second decks were undoubtedly buckled to a limited extent. On the third deck the area from frame 152 to frame 173 was badly wrecked. A large area of the third deck between frames 158 and 168 was destroyed, part by the detonation of the bomb and the remainder by the torpedo explosion. Joiner bulkheads in this area were almost invariably collapsed or badly distorted by the blast of the detonation. The centerline bulkhead in compartment D-303-1L was blown out, and peacoat lockers located on this bulkhead were completely destroyed. Five-inch ammunition hoists passing through the C.P.O. mess room were probably destroyed by the detonation because of the proximity of the hoists to the point of detonation. The constant-service steam line in the C.P.O. mess room was cut by a fragment. It is impossible to tell what part of the damage on the fourth deck was caused by the bomb and what by the torpedo. Probably most of the damage was done by the torpedo. What bomb damage did result was probably less than that on the third deck. The armored transverse bulkhead at frame 162 and fourth deck limited the damage from blast and fragments from both the bomb and torpedo "E".

### D. Structural Damage Caused by Dive Bomber Crash into Island

(Plate III, Panel 3 - Photos 1,2,3,4 and 5)

19. This plane, with its bombs aboard, crashed into the island, struck the port leading edge of the stack, glanced off and imbedded itself into the flight deck at frame 84, about 15 feet to port of the island structure. This plane was apparently armed with two 60 Kg. G.P. bombs and one 250 Kg. S.A.P. bomb. One of the 60 Kg. bombs exploded upon hitting the stack, destroying the signal bridge enclosure. The crash of the plane itself demolished the port leading edge of the stack. The steam line leading to the steam whistle was cut and the whistle itself was destroyed by the plane upon crashing. The island walkway was also badly twisted and distorted.

20. Upon hitting the flight deck, the motor and cockpit of the plane were imbedded in the flight deck. A hole was left in the deck as a result of the crash and the detonation of the other 60 Kg. bomb. The 250 Kg. bomb was a dud and dropped to the gallery deck in the passageway outside of No. 3 ready room. The bulkheads of No. 2 and No. 3 ready rooms were disrupted by the plane crash. Around the forward edge of the hole in the flight deck there was a pile of pellets which were reported in reference (a) to be of a phosphorus incendiary type.

## E. Structural and Machinery Damage

Caused by Aircraft Torpedo Hit, Frame 110-1/2

(Plate IV)

21. From the references it is estimated that this torpedo struck about frame 110-1/2 starboard on the armor belt, about 6-1/2 feet below the waterline. As is usual with torpedo hits in the middle body no appreciable shock damage resulted. The torpedo defense system in way of the engine rooms is a four-bulkhead system. The outboard layer of tanks was filled with liquid in accordance with the latest liquid loading practice as recommended by the Bureau. Fuel oil service tanks in the second and third layers were filled (see Plate IV). From a study of previous damage to this type of system by Japanese aircraft torpedoes, it is quite probable that the outboard row of tanks from frame 99 to frame 123, the second row of tanks from frames 101 to 123, the third row from frames 103 to 118, and the fourth row from frames 106 to 120, were ruptured and in free communication with the sea. Undoubtedly the shell plating, No. 1 and No. 2 bulkheads were destroyed in way of the explosion and one or more plates of 4-inch special treatment steel armor blown off; No. 3 bulkhead was dished and holed; and No. 4, the holding bulkhead, was ruptured between frames 110 and 112. An eyewitness estimates that the hole was 5-6 feet long and 3-4 feet high. Probably the after starboard corner of No. 9 boiler room was weakened or damaged by the torpedo explosion, as this compartment is reported to have partially flooded. Probably the 60 lb. special treatment steel deck in the crew's space, C-403-L, was ruptured and blown upwards by the force of the explosion. The 25 lb. special treatment steel inboard bulkhead of this compartment must have remained intact inasmuch as no flooding was reported into the aviation storeroom, C-402-A.

22. The Chief Engineer, in reference (a), reported that in the after engine room No. 2 main condenser had "collapsed internally" and the turbines filled with salt water. He also reported that No. 3 unit had lost vacuum apparently due to condenser damage. It is not clear how "internal collapse" could take place as the shock does not appear to have been unusually severe and no other machinery derangements were reported. It is possible, however, that some tubes could have been jarred sufficiently to cause leakage through the tube sheet and from there to the turbines. This is the first such case noted of internal damage to condensers resulting from torpedoes. Main and auxiliary steam lines remained intact as were feed lines, fuel oil lines, port service tanks and fuel oil transfer pump.

## F. Structural Damage Caused by Aircraft Torpedo Hit,

Frame 160

(Plate IV)

23. This torpedo, which struck about 20 seconds after torpedo "E", is reported to have struck the starboard side about frame 160, probably on the armor belt about six feet below the waterline. Apparently there was very little shock. The hole

blown in the ship's side was reported to be about 30 feet long and 15 feet deep, of which some of the damaged area was above the waterline. The torpedo defense system in way of the hit is a four-bulkhead system which ends just eight feet abaft the estimated point of impact. The starboard fuel oil tanks and damage control voids aft of frame 150 were probably ruptured. Undoubtedly the four-inch special treatment steel armored bulkhead at frame 162 was disrupted or deflected aft sufficiently to cause leakage at the junction of this bulkhead with the holding bulkhead. As stated in paragraph 17, this torpedo struck about two minutes after the bomb hit at frame 155, making it extremely difficult to determine which explosion was the cause of the damage on the third and fourth decks. It is quite probable, however, that most of the third deck was damaged by the bomb detonation, whereas the damage to the fourth deck in D-415-L and D-417-A was a result of the torpedo. Although damage to the fourth deck in this vicinity was not reported, it must have been extensive because the shell above the fourth deck was ruptured for a distance of about 30 feet. Bulkhead 165 was ruptured by either the bomb or torpedo explosion as flooding was reported in D-419-A.

24. The No. 2 (inboard starboard) shaft alignment must have been disturbed by this torpedo detonation as its bearings ran quite hot (180°F) for the short time that it continued to rotate after the torpedo hit. The rudder was reported jammed 30° left as a result of this hit.

#### G. Structural Damage, Port Side,

Caused by Dive Bomber Crash

(Plate III, Panel 1)

25. A burning dive bomber, which was unarmed, struck the port gallery walkway just forward of the 5" A.A. battery probably about frame 20. It apparently crashed through the light metal partition bulkheads, through the gallery deck, and into No. 1 elevator pit. Part of the gallery walkway was torn up by the plane. On the gallery deck, bulkheads of wardroom staterooms 0206, 0208, and 0212 were probably destroyed by the passage of the plane. On the forecastle deck, bulkheads of wardroom stateroom 0116 and a locker room were probably destroyed. The plane in falling into the elevator pit threw flaming fragments as far aft as frame 60 on the hangar deck. Although the structural damage from this crash was not nearly as great as that resulting from the bomb detonations, the fires which were started were as serious as those started by the bombs. Just as in plane crash "D", numerous pellets, reported to be incendiary, were found on the flight deck, gun gallery and the forecastle passageway.

### SECTION IV - FIRES, FLOODING AND DAMAGE CONTROL -

#### MORNING ATTACK

##### A. Bombs

(Plate III - Photo 8)

26. Bomb "A", which detonated in the crew's mess room, started a fire in the wardroom mess room, A-211-1L. This space contained a great deal of upholstered furniture. The dense smoke

from this fire plus the steam from the ruptured steam line in the crew's mess room passed up into the hangar where conditions were made extremely difficult for the repair parties to bring other fires under control. There was little if any fire in the crew's mess room, A-310-1LM, where the bomb exploded as the space had no combustible material present. The damage to the intake to boilers 1, 2 and 3 on the third deck resulted in the drawing of smoke into these three firerooms, which seriously interfered with boiler operation. Central station was also filled with smoke through the ventilation system which was undoubtedly damaged on the third deck. The ventilation supply duct to the forward generator room at frame 76, which was destroyed on the third deck, carried the flash from the bomb detonation into the generator room where the distribution board was put out of commission. The after bulkhead of the plotting room, frame 76, was red-hot from the heat of this flash. Steam from the ruptured constant-service lines in the messing compartment and the generator room filled the damaged spaces on the second, third and fourth decks and the generator room. It appears that the steam assisted in the smothering of the fire on the second deck in the wardroom mess room. This fire, with others, was fought by bucket brigades and hoses passed over from the destroyers MORRIS, RUSSELL and MUSTIN.

27. Immediately after the detonation of the bomb, Nos. 4, 5 and 6 magazine groups were flooded to prevent any possibility of heat from this fire passing down into these spaces and exploding the bombs or ammunition (see plate IV). A short time later, the Commanding Officer ordered the 5" powder magazines (group 1) sprinkled. Due to power failure the damage control pumps stopped and sprinkling ceased. The depth of water on the decks of the powder magazines had reached about one foot by this time.

28. Bomb "B", which detonated immediately below the flight deck at frame 151, did not start a fire. The hole in the flight deck was not repaired inasmuch as the fires required the attention of all personnel not engaged in attempting repairs to main machinery.

29. Bomb "C", which detonated in the C.P.O. mess room, D-303-1L, started a fire in this compartment and the storeroom, D-417-A, on the fourth deck. This fire filled the damaged area with smoke and necessitated the abandoning of the sick bay area. To permit the repair party to fight the fire, the smoke was "vented" topside by opening hatches on the second and main decks. Mattresses, clothing and upholstered furniture contributed greatly to the tenacity of the fire and prevented it from being brought under control early in the action. Steam from the constant-service steam line, which was cut by a fragment, filled D-303-1L before the supply valve was closed. This added to the difficulty of fighting the fire. Since there was no water pressure available on the fire mains, the fire was fought by a bucket brigade. It was finally extinguished by a "handy billy" set up on the main deck.

30. In addition to the fires, reference (a) reports that the "flash" of the bomb killed several persons in the 5" handling rooms on the first platform deck. This "flash" undoubtedly came from the 5" hoist inasmuch as these hoists on the third deck were probably badly damaged if not destroyed. Previous war experience\* and tests conducted by the Bureau of Ordnance on hoists carrying filled powder containers indicate that the setting of one container

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\* U.S.S. BOISE - BuShips War Damage Report No. 24.

on fire by fragments or heat usually results in most of the others burning. This can cause a "flash" at the end of the hoist of sufficient intensity and duration to kill personnel.

## B. Airplane Crashes

(Plate III - Photos 3, 4, 5 and 8)

31. Plane "D", which struck the leading edge of the stack, started fires which required the efforts of a large number of men to bring under control. Gasoline from the plane, which sprayed on the forward and port sides of the stack and the signal bridge enclosure, was set on fire by the detonation of the 60 Kg. bomb. This fire was brought under control by the use of water, foamite, and CO<sub>2</sub> extinguishers. As the plane imbedded itself into the flight deck, gasoline was sprayed on the deck and into No. 3 ready room. A persistent fire was started which was further fed by upholstered furniture in No. 3 ready room and bedding in the armory spaces. It was extinguished in about one hour by fire hoses led from the destroyer MORRIS and the constant efforts of a bucket brigade of 200 men, some of whom carried foamite to the scene.

32. Plane "G", which crashed into the port gallery walkway, was burning furiously as it rounded the bow. After it plunged through the officers' country and landed in the No. 1 elevator pit, fires were started in these spaces. Flaming fragments from the plane were thrown as far aft as frame 60. These flaming fragments burned the fabric on planes stowed under the flight deck. The fires were fought by bucket brigades and fire hoses led from the destroyers RUSSELL and MORRIS. The hangar water curtain, which functioned for five minutes, also helped to extinguish the fire in No. 1 elevator pit. These fire fighting activities were hampered by dense smoke in the hangar and by exploding ammunition in the wreckage of the enemy airplane.

## C. Torpedoes

(Plate IV)

33. Torpedo hit "E", which exploded in way of the forward engine room, did not start any fires. Fuel oil which was blown inward struck superheated steam lines which resulted in the engine room filling with gas and smoke.

34. This torpedo explosion resulted in the immediate flooding of the forward engine room and crew's space C-403-L. There was slow flooding into the after engine room through cable stuffing boxes. There was no leakage through No. 1 and No. 4 shaft stuffing boxes. Boiler room No. 9 was probably flooded through structural damage to the starboard after corner as a result of damage to the torpedo defense system in this area. No flooding took place in the aviation storeroom, C-402-A, as the starboard longitudinal special treatment steel bulkhead withstood the blast of the torpedo explosion.

35. Torpedo hit "F", which exploded in way of the after end of the torpedo protection system, did not start any fires. The fire in that area had already been started by bomb hit "C".

36. This torpedo explosion caused the immediate flooding up to the waterline of D-417-A and D-415-L through the rupture in the shell. D-419-A also flooded immediately, probably through a rupture in bulkhead 165. D-414-A flooded slowly, probably through a weakened bulkhead. Below the fourth deck the flooding is much more uncertain. However, the dry provision rooms, D-521-A and D-520-A, which are aft of the torpedo protection system, were probably flooded. Starboard void tanks of the torpedo protection system aft of frame 150 were probably flooded.

37. Reference (a) does not report in detail the events which occurred in the 5" and the bomb magazines because most of the personnel were lost. Two minutes before torpedo "F" struck the ship the flash from the 5" powder hoist killed the crew of the 5" handling room. Because of this it is possible that surviving members of magazine groups 8 and 9 may have tried to escape from the magazines, through the 5" handling room. This may have resulted in some open watertight doors at the time of the torpedo hit. The starboard 5" handling room, D-519-M, was probably flooded through failure of the joint where the holding bulkhead joins the transverse 4-inch special treatment steel bulkhead at frame 162, or through the damaged hoists from the fourth deck. Other spaces in group 9 magazines could have flooded from the handling room if, as probably happened, watertight doors were open for escape. D-619-M also probably flooded by failure of the joint between the transverse armored bulkhead and the holding bulkhead. Group 8 magazines, on the second platform, possibly flooded from D-619-M through open doors.

38. HORNET listed 10-1/2° to starboard as a result of the flooding from these two torpedo hits. The forward port voids were flooded by Repair II upon order of the Damage Control Officer in order to reduce the list and trim by the stern. This reduced the list to 7° within a few minutes. List then remained constant until the afternoon attack.

## SECTION V - SALVAGE EFFORTS AFTER MORNING ATTACK -

26 OCTOBER 1942

### A. Towing

39. Immediately after the morning attack, when the fires were under control, salvage efforts were started. NORTHAMPTON was designated to take HORNET in tow until part of the machinery could be put back into operation. It was decided to pass NORTHAMPTON's tow line to HORNET where it would be made fast to the port anchor chain.

40. Before the towing cable could be attached, the port anchor had to be disconnected and the chain prepared for towing. The 1-3/4-inch steel wire towing cable was hauled aboard HORNET by hand as no power was available. The cable was then secured with a shackle to the port anchor chain. After the connection was made, NORTHAMPTON took up the slack and gradually built up speed to 3 or 4 knots.

41. About 60 fathoms of anchor chain were veered when the pelican hook on NORTHAMPTON parted. This towing arrangement would have been satisfactory except for the weakness of the pelican hook. Since the cable parted on NORTHAMPTON, none of the towing cable could be retrieved aboard HORNET due to lack of power. It was then decided to make another attempt - this time using the 2-inch steel wire towing cable on HORNET. This cable was stowed in No. 2 elevator pit. It was roused out and dragged to the forecastle where one end was passed to NORTHAMPTON and the other was shackled to the starboard anchor chain. This task was completed by 1600 and towing commenced.

42. This arrangement was quite substantial and could have gone on indefinitely. Unfortunately, a second attack developed shortly thereafter, necessitating the cutting of the cable by NORTHAMPTON to prevent her from being struck by enemy aircraft torpedoes.

### B. Engineering

43. Immediately after the morning torpedo attack, the forward engine room was completely flooded and boiler room 9 was flooding slowly, prohibiting the use of one superheated boiler. Flash from the bomb hit at frame 80 had permanently damaged the forward main switchboard. The after generator room was intact and supplied power from the emergency diesel generator throughout the action and during the salvage period. Power for lighting and steering were thus available. About 20 minutes after the action, attempts were made to raise steam in boilers 1, 2, and 4 with the hope of putting No. 3 power unit into operation. Steam on these three boilers could be raised as high as 150 pounds, when spurts of water in the fuel oil lines caused the fires to die out. At about 1200 a portable electric lead from the after diesel generator was led to No. 4 fireroom in order to operate the electric fuel oil service pump and port-use electric blower. Suction was tried on various fuel tanks until an uncontaminated tank was located. Steam was then raised to 300 pounds on No. 4 boiler at about 1545. This saturated steam was routed aft through the auxiliary superheat line into the after generator room. This was done probably because of damage to the auxiliary saturated steam line in the forward engine room. The check valve in the cross connection between the superheat and saturated auxiliary steam lines was made inoperative. This allowed saturated steam to pass directly to the turbo-generators and also allowed steam to back through the saturated auxiliary line into the after engine room where it could be used to drive the turbines of No. 3 unit. Stops were closed on this line to prevent the steam from backing into the flooded forward engine room. About 1610 one of the generators was being warmed up and the switches lined up to start when the second attack developed. This resulted in another torpedo hit in way of the machinery spaces, and destroyed all hope of re-establishing power.

SECTION VI - PROBABLE DAMAGE - AFTERNOON ATTACKS -

26 OCTOBER 1942

H. Probable Damage Caused by Aircraft Torpedo

(Plate IV)

44. The aircraft torpedo which hit at frame 115 on the starboard side was also a shallow-running torpedo. It hit just aft and above torpedo hit "E". Since the ship was listing 7° to starboard, the torpedo probably hit just above the armor belt, the top of which is in line with the fourth deck. Survivors on the third deck reported a sickly green "flash".

45. It is definitely known that the forward bulkhead of the after engine room was ruptured. Both feed water heaters in the after engine room were knocked over. The port side of the third deck was cracked open in way of the crew's mess room, C-301-1L. Apparently damage resulted to the after generator room; however, it is doubtful that this space flooded except through damaged piping or leaky cable stuffing boxes. The damage enumerated above resulted in the immediate flooding of the after engine room and the fourth deck in way of the explosion. Although not reported, undoubtedly crew space C-409-L and refrigerating compartments C-408-1A to C-408-8A on the fourth deck were flooded. An electrical cable in D-301-1LM was severed and a fire was started which was quickly extinguished by Repair V personnel.

I. Probable Damage Caused by Bomb Hit, After Starboard Corner of Flight Deck and Near-Misses

46. Since HORNET was being abandoned at the time of the high level attack, the structural damage as a result of the near-misses and the bomb aft is unknown. These bombs were probably S.A.P. inasmuch as they detonated after traveling underwater and produced an effect similar to that of a mine explosion. If this assumption is correct, then the bomb hit on the after starboard corner of the flight deck must have passed through the flight deck, leaving a small hole, and detonated underwater with the other near-misses. The skin was probably dished in the general area of the explosion. Possibly the hull was ruptured, permitting flooding in some of the after compartments on the second platform or hold.

J. Probable Damage Caused by Bomb Hit,

Late Afternoon Attack

47. After HORNET was abandoned, a further dive bombing attack resulted in a direct hit just forward of the bridge. The Commanding Officer, in reference (a), reported that a fire was started in the hangar deck which burned for about 15 minutes. This bomb was probably a G.P. bomb which exploded upon contact with the flight deck and set planes or other combustible materials in the general area below on fire.



## SECTION VII - DISCUSSION

### A. Size of Bombs

48. The Commanding Officer, in reference (a), estimated that each enemy dive bomber in the morning attack was armed with one 500 lb. and two 100 lb. bombs. The dive bomber which crashed into the stack was also estimated to be armed with the same bombs. The dud recovered from this plane crash was about a 500 lb. bomb. These bombs were probably the Japanese 250 Kg. (550 lbs.) S.A.P. delayed-action fuzed bombs of the type recovered at Schofield Barracks and the 60 Kg. (141 lbs.) G.P. instantaneously fuzed bomb which has been used before against U.S. Naval vessels.\* These estimates are further substantiated by the damage resulting from the bomb hits. The holes in the flight deck from bombs "A" and "C" were about 12 inches in diameter - the diameter of the bomb. The length of travel from point of impact and the fuse performance compare well with that observed on U.S.S. CALIFORNIA\*\*, U.S.S. CURTISS\*\*\* and U.S.S. YORKTOWN\*\*\*\* (Coral Sea). The damage in the above three cases was concluded to have been caused by 250 Kg. S.A.P. bombs. The hole in the flight deck which was caused by bomb "B" compares closely to the damage suffered by CHESTER\*. On HORNET a hole estimated to be 7 x 11 feet was blown in a deck composed of 3-1/2 inches of teak laid over 5 lb. medium steel plating. On CHESTER a 6-foot hole was blown in a deck composed of 2 inches of teak laid over 10 lb. plating. The damage in the latter case was concluded to have been caused by a 60 Kg. G.P. bomb with instantaneous fuze.

49. The bombs used by the enemy in the afternoon high-level bombing attack were probably at least 250 Kg. S.A.P. bombs inasmuch as reference (a) reports that the detonation occurred underwater. The cumulative effect of the detonation of the six near-misses was that of a mine explosion. It also appears doubtful that high level bombers would carry bombs of a smaller size than 250 Kg.

50. The last bomb hit, which came from an enemy dive bomber, probably was a light G.P. bomb inasmuch as a fire on the hangar or flight deck was seen by surviving personnel. This fire is reported to have lasted about 15 minutes. If an S.A.P. bomb had been used, it would probably have exploded deep in the interior and the fire would not have been so apparent.

### B. Types of Torpedoes

51. The weight of the charge in the torpedoes used against HORNET cannot be definitely established inasmuch as the information concerning the structural damage caused is too conjectural

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\* U.S.S. CHESTER - BuShips War Damage Report No. 10  
\*\* U.S.S. CALIFORNIA - BuShips War Damage Report No. 21  
\*\*\* U.S.S. CURTISS - BuShips War Damage Report No. 11  
\*\*\*\* U.S.S. YORKTOWN - BuShips War Damage Report No. 23

to permit an accurate estimate. Information from various sources indicates that the Japanese have three types of aircraft torpedoes: type 91, with 337.5 pounds of hexa; type 92, with 452 pounds of hexa; and the "New Kure", with 661 pounds of hexa. Damage to holding bulkhead was unusually severe inasmuch as this is the first case reported of rupture of the holding bulkhead of a four bulkhead torpedo defense system by an aircraft torpedo. Therefore it may be possible that the "New Kure" was used.

### C. Incendiary Pellets

52. It will be noted in paragraphs 20 and 25 that phosphorus incendiary pellets were found in the immediate vicinity of the two plane crashes. The Damage Control Officer reported that they came from incendiary bombs attached to the ends of the wings. Although not the first time this phenomenon has been reported\*, it is unusual and is evidence of the determination of the Japanese to inflict the maximum possible damage.

### D. Fires

53. Directives issued by the various commands have established a comprehensive program for the reduction of fire hazards aboard ship. Apparently this program had not been completed on HORNET. Upholstered furniture, excess clothing, excess material in squadron ready rooms, etc., contributed to the intensity of the fires started by the bomb hits and plane crashes. This action again sharply emphasizes the immediate necessity for removing or reducing all combustible materials to the absolute minimum.

### E. Failure of Torpedo Defense System

(Plate IV)

54. It will be noted that the holding bulkhead in the forward engine room ruptured as a result of the detonation of torpedo "E". This is the first case reported of rupture of a holding bulkhead of a four bulkhead torpedo defense system, in the U.S. Navy. At the time of the design of this class of aircraft carrier, naval treaties imposed a limitation on size which forced some sacrifices in torpedo protection, as compared with battleships, in order to gain other characteristics desired by the Department. The transverse depth of the torpedo protection system in way of this hit was considerably less than is now considered necessary for protection against modern torpedoes. Exact evaluation of the protection afforded by any given system is only possible by means of full scale tests in which the weight of the charge is accurately known. In the absence of such tests, extrapolations from 1/2 scale or smaller model tests is necessary, with considerable doubt, in our present state of

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\* The transport GEORGE F. ELLIOTT was struck by an enemy suicide torpedo plane on 8 August 1942. Incendiaries were reported scattered over most of the ship starting intense fires which eventually resulted in the loss of the vessel.

knowledge, as to the scale factor. All of the information available to the Bureau, however, indicates that this system should have withstood a charge of about 500 pounds of T.N.T. The indication therefore is that the particular Jap torpedo used in this case carried a larger charge, or a more powerful explosive, or both.

55. As shown on plate IV, torpedo "E" is believed to have struck and detonated on the 4-inch special treatment steel side armor about two feet above the bottom of the plate. This conclusion is based on the location of the rupture in the holding bulkhead as reported by an eyewitness. If this location is correct, the armor belt apparently did not have any very great effect in reducing the damage from the explosion.

56. The Bureau has little information on the resisting qualities of light armor when struck by a torpedo. The indications are that light armor will be broken off without offering very good resistance to torpedo explosions. This is substantiated by torpedo damage to the British cruiser H.M.S. NIGERIA. The armor plate in way of the torpedo explosion was blown into the ship and was later found lying on the second deck. The two adjacent plates were bent into the ship but remained fastened to the shell plating. It is to be noted, however, that on British construction the armor plates are not fastened together by either keys or welding.

57. On HORNET the armor plates in way of the machinery spaces are 9 feet by 24 feet and are keyed at the butts. Torpedo "E" struck near the end of a plate - about six feet from the after butt. The plate on which the torpedo struck and the one immediately aft were probably blown off or were deflected inboard offering little resistance to the explosion.

58. Heavy armor, such as that on battleships, may be quite effective in deflecting the effects of the explosion and preventing blast from entering the hull. This is substantiated by two of the torpedo hits on the armor belt of WEST VIRGINIA, 7 December 1941. These were isolated hits and the structural damage to the torpedo protection system was materially less than from hits below armor in similar locations on CALIFORNIA. It should be recognized, however, that armor of this thickness (about 13-1/2 inches) is very much heavier per square foot than the total weight per square foot of all the torpedo bulkheads.

#### F. Comments on Equipment

59. The Commanding Officer, in reference (a), furnished some notes and recommendations of which some are briefly discussed below.

(a) "The salvage and rescue work was seriously handicapped by absence of light."

All aircraft carriers now in operation and all new construction are to be provided with "portable sealed beam lights". These lights are designed to produce beams which will penetrate smoke-filled compartments. About 40 to 60 are supplied to each ship. These lights are in addition to the JR-1S relay controlled hand lanterns already provided for emergency use.

- (b) "Four or more diesel driven auxiliary fire pumps should be standard equipment on all carriers."

Diesel driven fire pumps are being installed in all carriers now in service. Two of these pumps are supplied - one is located forward and the other aft of the machinery spaces well below the waterline. CV9 (ESSEX) Class will have four of these pumps - two forward and two aft. CVL22 (PRINCETON) Class will have two electrically driven fire pumps instead of diesel driven pumps because of the diverse distribution of auxiliary electrical power on this class.

- (c) "Diesel electric generators should be distributed throughout the ship in such places that some source of power would be always available."

This recommendation is under study by the Bureau. In the meantime, a casualty power system is being provided. This system provides portable leads from the main steam generators and from the auxiliary diesel generators to the particular machinery desired.

- (d) "Although no difficulty was encountered with fires in the ship's system, it is recommended that future construction include an efficient means of draining gasoline quickly from aircraft spotted on the hangar deck."

Defueling connections are being fitted on the flight and hangar decks of all carriers in service. This defueling system consists of a small air driven pump with various flexible connections which are used to drain the tanks of the planes.

- (e) "Install distant control reach rods from all steam root valves so that they may be operated from the third deck."

Hydraulically operated valves or valves operated by flexible shafts have been installed where considered necessary. The Bureau is eliminating the use of reach rods wherever possible. Action damage has often resulted in reach rods jamming when decks are deflected by bomb detonations, or other damage.

- (f) "Install cross-connection fuel oil piping between each group of firerooms in order that firerooms 1, 4 or 7 can supply all other firerooms."

This recommendation now applies only to ENTERPRISE. This will be done during first availability.

- (g) "Install additional hand fuel oil pumps in firerooms."

Small hand fuel oil pumps are authorized on all ships.

60. The Commanding Officer, in reference (a), reported that the rudder was jammed at 30° left. Since the point of detonation of torpedo "F" was 84 feet from the rudder, it is more probable that the rudder was stopped as a result of the severing of the power supply cables to the steering gear motors. This is apparently confirmed by the Engineering Officer, in reference (a), as he reported that the emergency diesel generator supplied power to the steering gear motors while under tow. Since steering failed temporarily on HORNET, further emergency rudder control gear will be installed in ENTERPRISE during early availability. The emergency steering arrangement being provided consists of a small electrical submersible pump unit which hydraulically actuates the rams. This unit provides sufficient

power to control the rudder at slow speeds. The submersible pump feature permits operation of this unit in the event that the steering gear compartment is flooded. In the event of failure of all electrical power, ENTERPRISE will have installed a "manually-operated" rudder positioning gear. This gear comprises two sets of tackle installed in the steering gear room. These control the rudder through a removable tiller fastened to the top of the rudder stock. This gear may be used in an emergency to position the rudder at any angle between  $10^{\circ}$  right and  $10^{\circ}$  left. The rudder can then be locked into position by jacks and blocks to permit towing or steering by the propellers.

#### G. Comparison of HORNET and YORKTOWN\* Flooding

(Plate IV)

61. Although HORNET and YORKTOWN were constructed at different times, HORNET was essentially a duplicate of YORKTOWN. In the actions which resulted in the loss of these ships, they were both initially struck by two Japanese aircraft torpedoes. It will be noted, however, that the list resulting from these two hits was considerably different on the two ships. YORKTOWN listed initially to  $17^{\circ}$  and then to  $24^{\circ}$  through slow flooding, whereas HORNET listed initially  $10-1/2^{\circ}$  and remained there momentarily until counterflooding reduced the list to  $7^{\circ}$ . Although YORKTOWN took aboard more water, the difference in quantity was negligible and does not account for the difference in list assumed by the two vessels.

62. The most important reason for the difference is the fact that YORKTOWN was struck by two torpedoes in the most vulnerable section of the ship - the firerooms. In this section the torpedo defense system consists of only three bulkheads. The immediate flooding of the generator room and the outboard firerooms produced about  $13^{\circ}$  of list. The flooding of the voids in the torpedo protection system and the four crew's spaces above the hits produced the remainder of the  $17^{\circ}$  initial list. HORNET, on the other hand, was struck in way of the forward engine room - a more adequately protected section of the ship. The flooding of this space resulted in no list because no longitudinal bulkheads were present. The flooding of No. 9 fireroom and torpedo protection spaces produced about  $5-1/2^{\circ}$  of list. The other hit aft struck in a section minutely subdivided which was near the centerline. These spaces in themselves probably produced about  $5^{\circ}$  of list.

63. The second reason for the difference in list was the large amount of slow flooding on YORKTOWN. Most of the port side of the third deck was flooded due to blast damage to some of the watertight doors and incomplete closure of additional doors. This off-center flooding extended over a large area and was the major contributing factor in increasing list beyond the initial  $17^{\circ}$ . The only slow flooding reported on HORNET occurred in spaces structurally damaged by torpedoes and in the small magazines aft.

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\* BuShips War Damage Report No. 25.

## H. Damage Control

64. The improvement in damage control measures as the war progresses is notable. Although HORNET and YORKTOWN received about the same amount of damage, damage control and salvage measures were put into effect immediately on HORNET. The fires, which were more extensive than those on YORKTOWN, were brought under control in one hour and completely extinguished in two hours. Although power was lost on both ships, HORNET immediately flooded voids through the drain system reducing the list about 30°. Although actual reduction in list was minor in this case the psychological benefit to the crew must have been immediate in that it reduced anxiety that the ship might capsize. The last but most important improvement was in the immediate attempt to salvage the vessel. After the action, NORTHAMPTON made preparations to take HORNET in tow. The second attempt was successful, and at the time of the afternoon torpedo attack HORNET was under tow at three knots. In addition to the attempt to tow HORNET from the scene of action, part of the propulsive machinery was almost ready for operation. Success was in sight when the afternoon torpedo attack destroyed all such possibility.

## I. Conclusions

65. HORNET did, in spite of admitted deficiencies in machinery arrangement, survive extreme punishment to the hull. The fact that damage from three torpedo hits, four bombs and two plane crashes did not result in sinking is impressive. Despite such punishment, the hull was still in condition to allow towing from the scene of action if the tactical situation had permitted. In an attempt to sink HORNET, destroyers fired 369 rounds of 5" ammunition into the hull and a number of torpedoes. This still did not result in immediate sinking and HORNET was left "blazing furiously and in a slowly sinking condition". HORNET's resistance to damage, as well as YORKTOWN's, exceeded reasonable expectations.

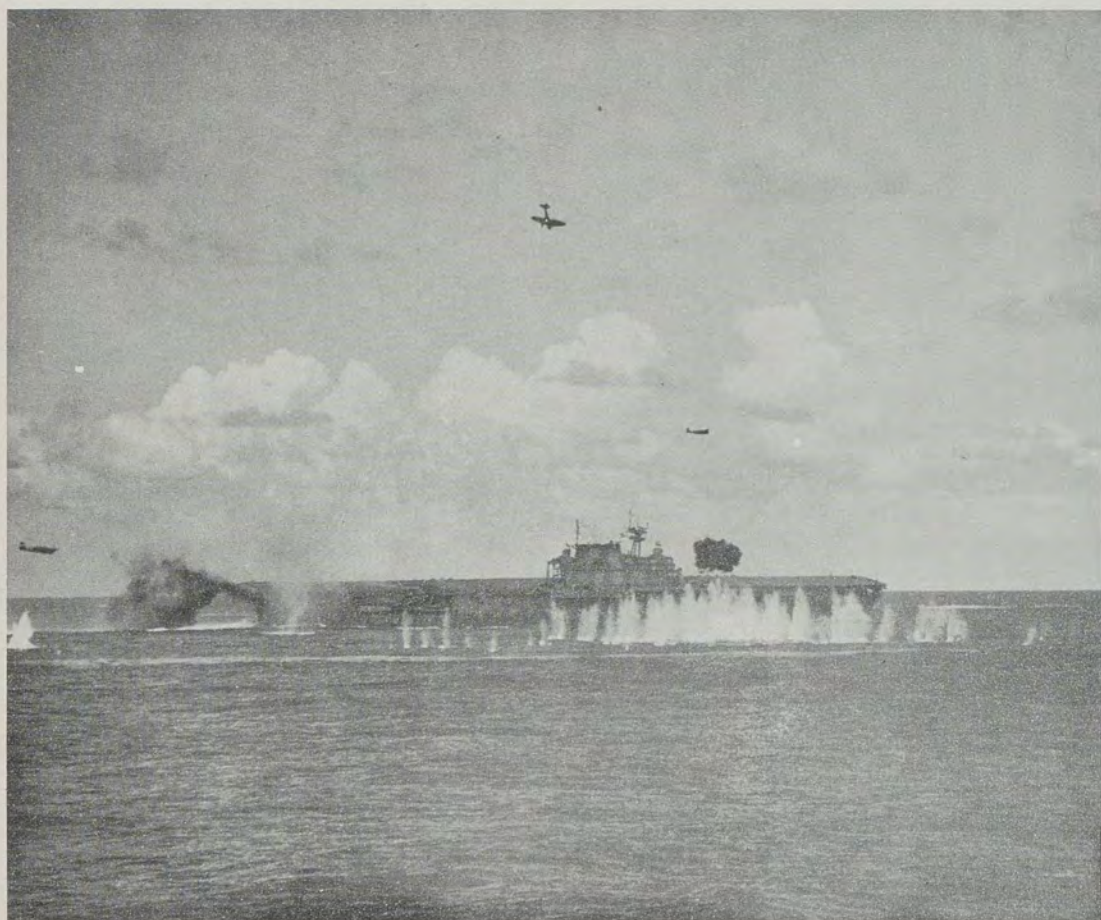


Photo 1: U.S.S. HORNET during morning attack. Note smoke on flight deck from the two bomb hits aft. Note "suicide" dive bomber about to crash into leading edge of stack.

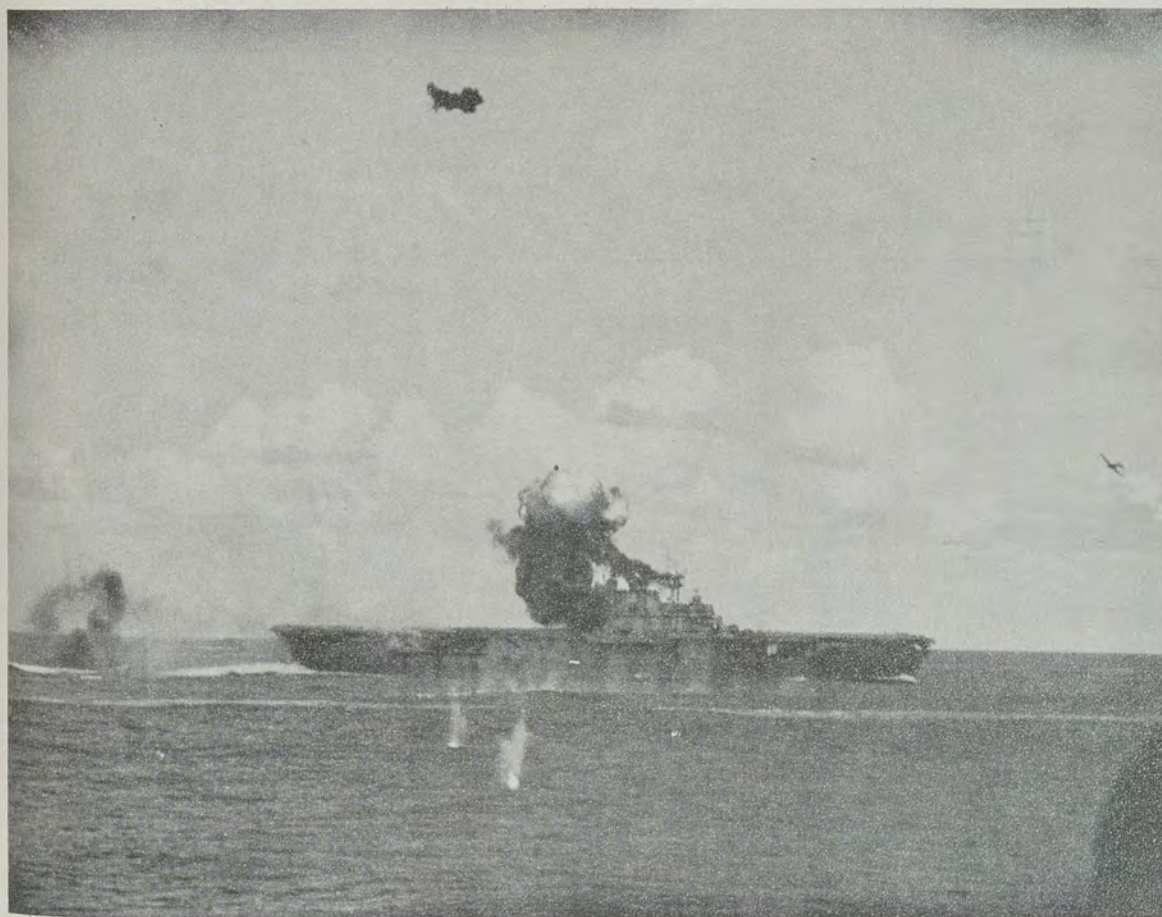


Photo 2: U.S.S. HORNET during morning attack. "Suicide" dive bomber, in photo No. 1, has just crashed into the leading edge of the stack. Note smoke coming from hanger deck due to bomb hits aft.

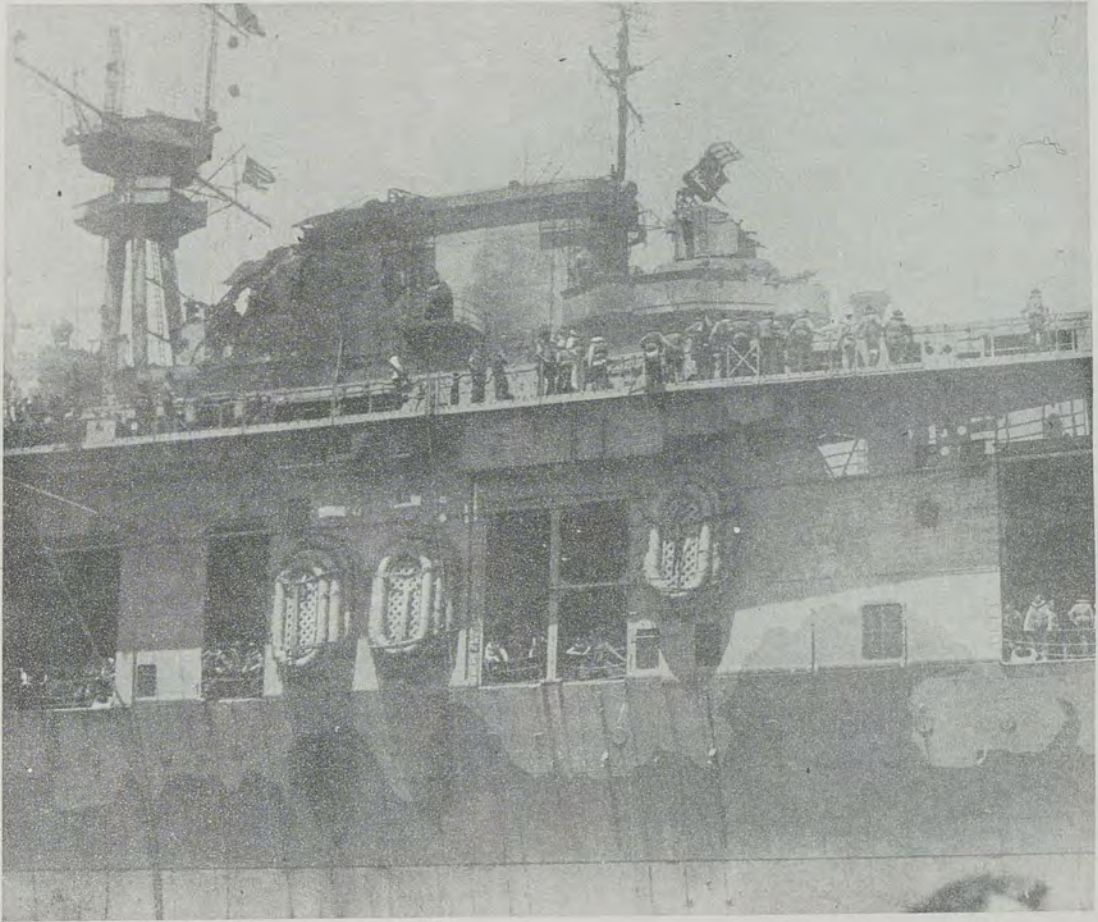


Photo 3: Port side view of damage to the stack as a result of enemy dive bomber crash.

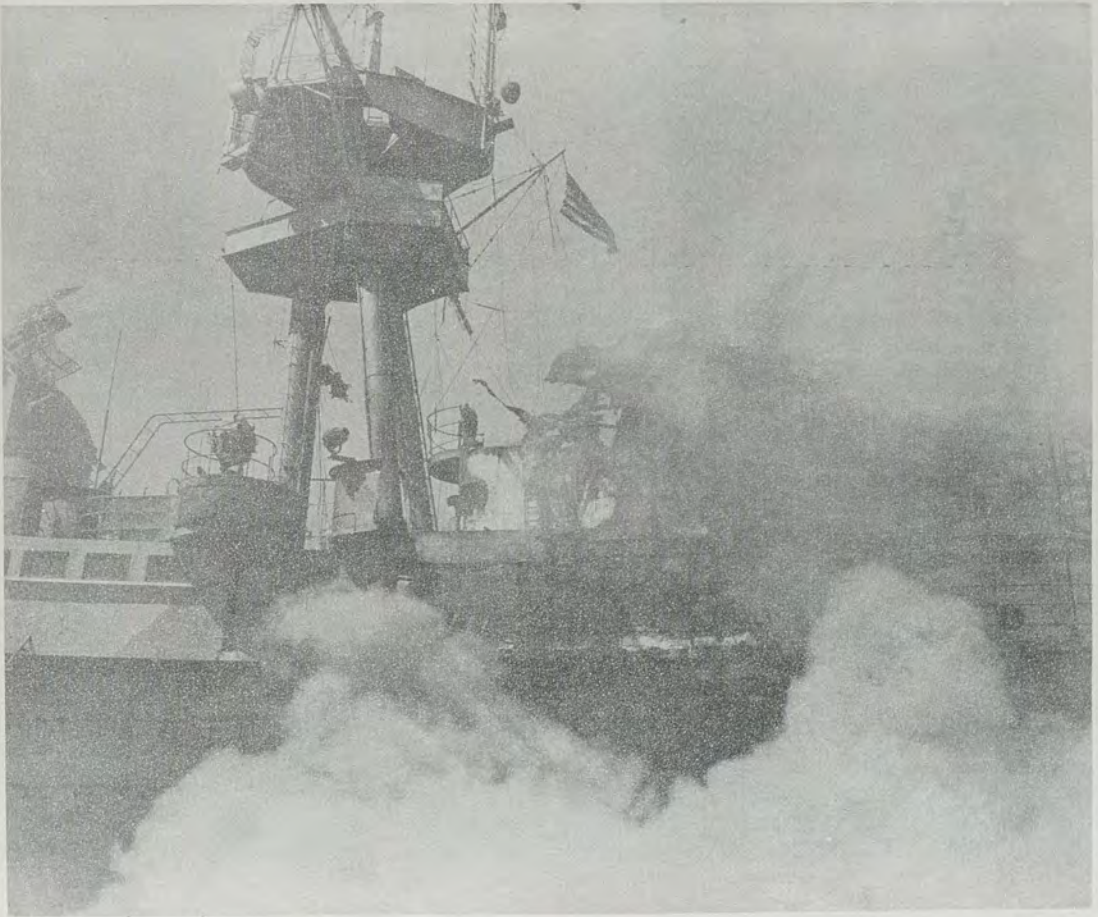


Photo 4: Close-up view, port side, of damage to stack immediately after crash of enemy dive bomber. Note damage to stack walkway. Note destruction of signal forward of stack.





Photo 5: Close-up view of flight deck in way of stack showing wreckage of enemy dive bomber.

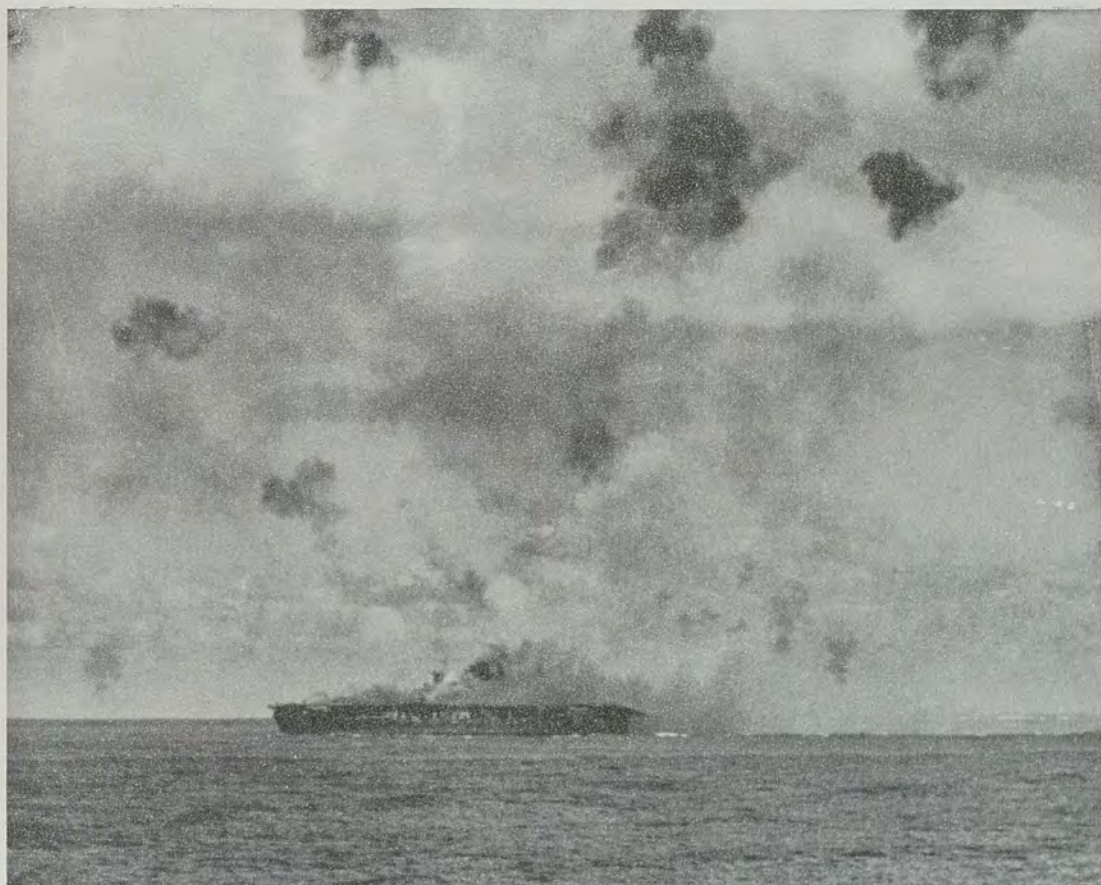


Photo 6: U.S.S. HORNET during latter part of morning attack just after an enemy dive bomber has rounded bow and crashed into port side gallery deck just forward of No.1 elevator. Note heavy smoke amidships from crash of first enemy dive bomber. Note starboard list as a result of the two torpedo hits.

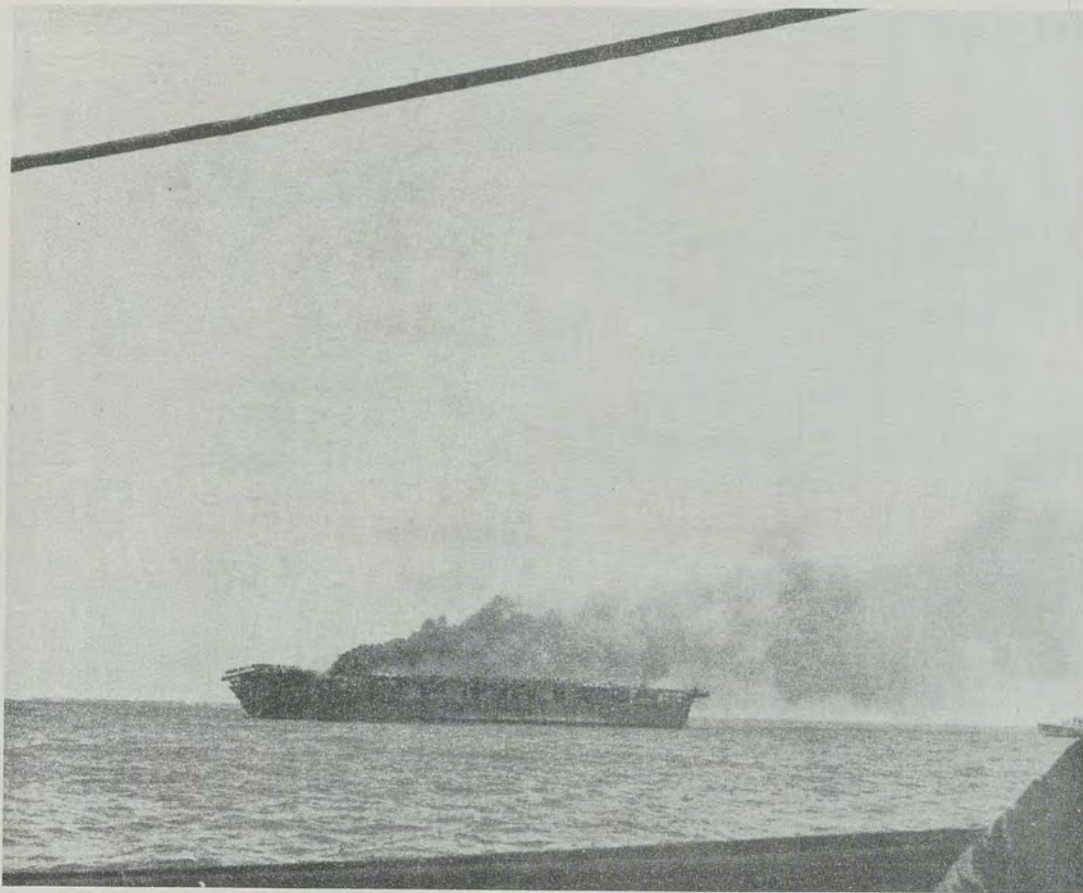


Photo 7: U.S.S. HORNET dead in the water after morning attack. Note smoke forward from crash of second enemy dive bomber. List is about  $7^{\circ}$  to starboard.

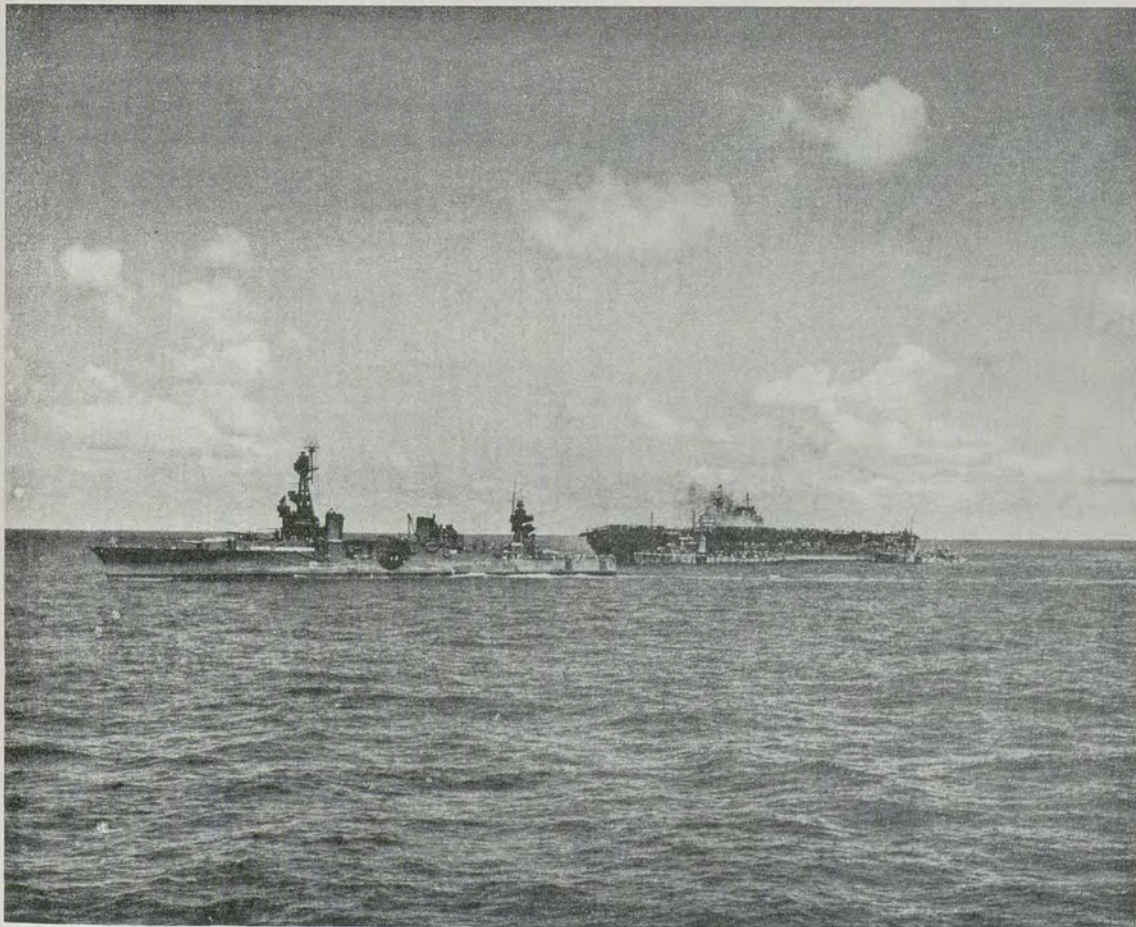


Photo 8: U.S.S. RUSSELL, U.S.S. MUSTIN along port side and U.S.S. MORRIS along starboard side (only top of mast visible) assisting U.S.S. HORNET in fighting fires after the morning attack. U.S.S. NORTHAMPTON standing by to commence towing operations.

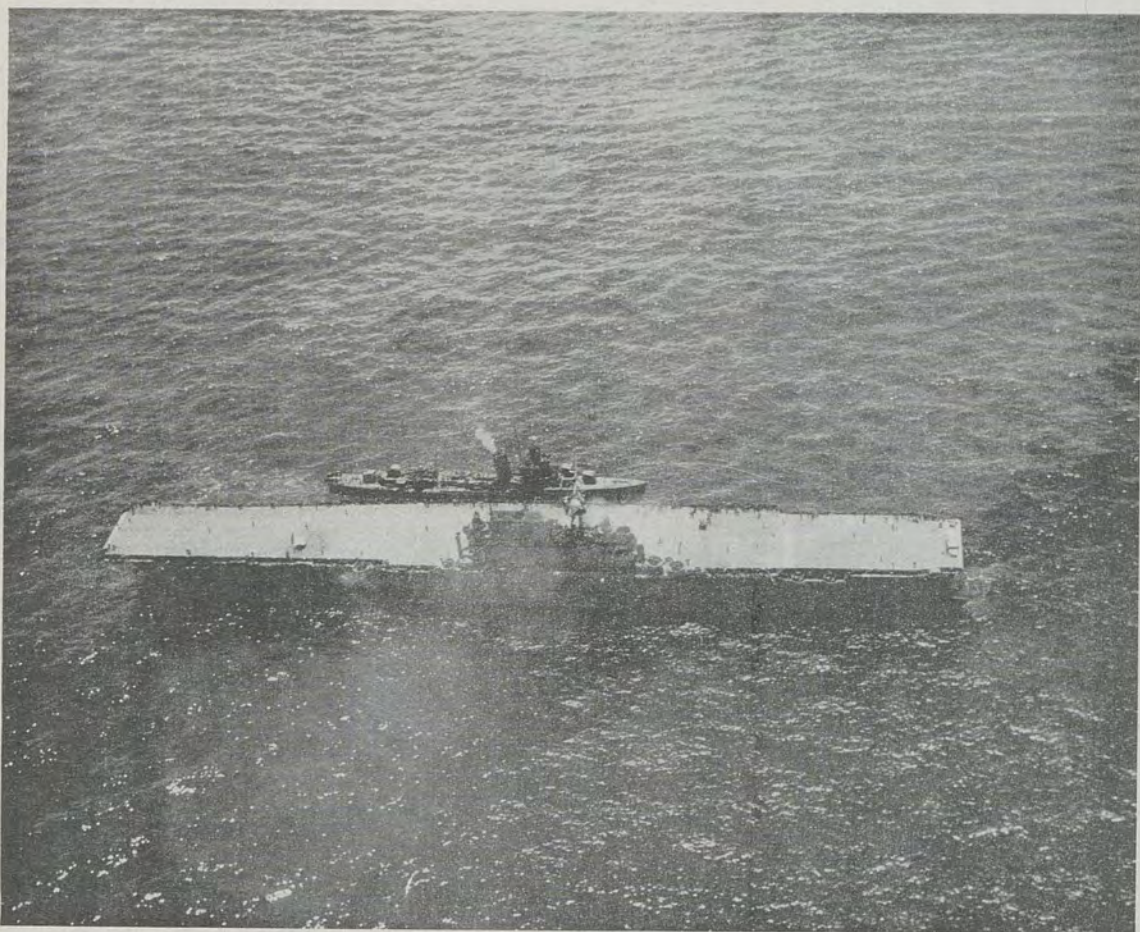


Photo 9: Aerial view of U.S.S. HORNET during lull between morning and afternoon attacks. Note hole in flight deck aft and damage to leading edge of stack. Note bucket brigades still fighting fires on flight deck near the stack.



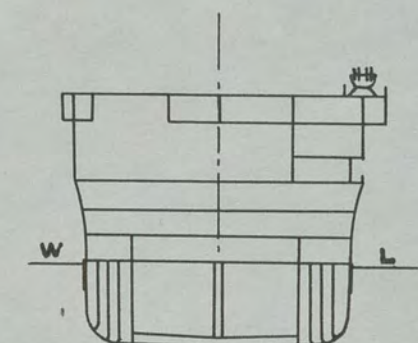
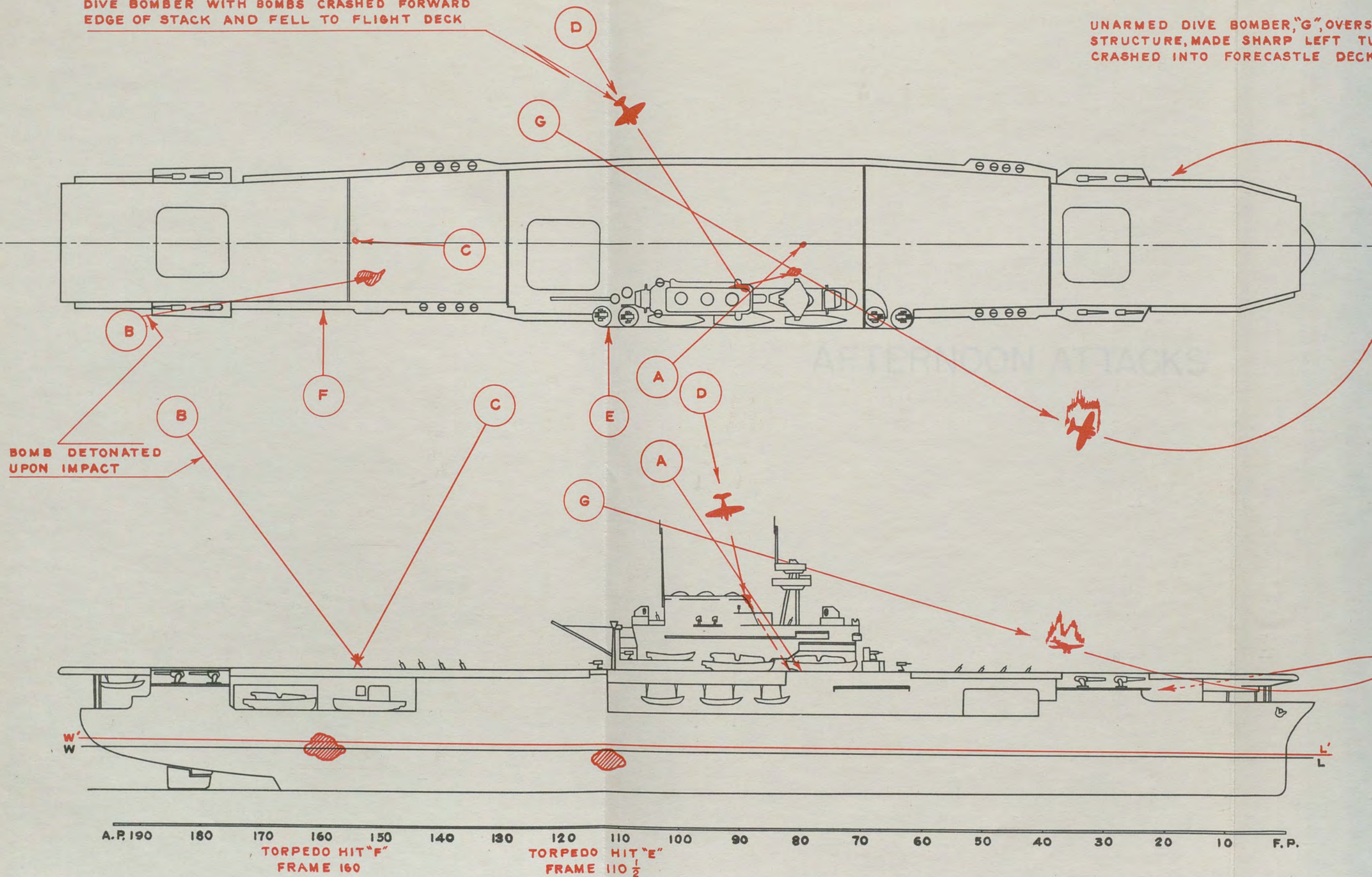
Photo 10: Stern view of U.S.S. HORNET during abandoning some time before last attack.

PLATE I

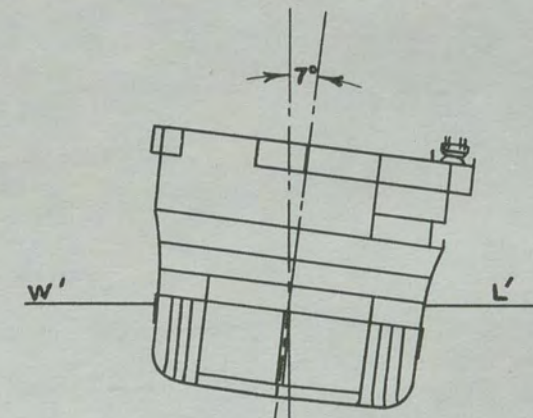
MORNING ATTACK

DIVE BOMBER WITH BOMBS CRASHED FORWARD  
EDGE OF STACK AND FELL TO FLIGHT DECK

UNARMED DIVE BOMBER, "G", OVERSHOT SUPER-  
STRUCTURE, MADE SHARP LEFT TURN AND  
CRASHED INTO FORECASTLE DECK, PORT SIDE



CONDITION BEFORE ATTACK  
FR. 112 - LOOKING FOR'D  
MEAN DRAFT ~ 27 FT.



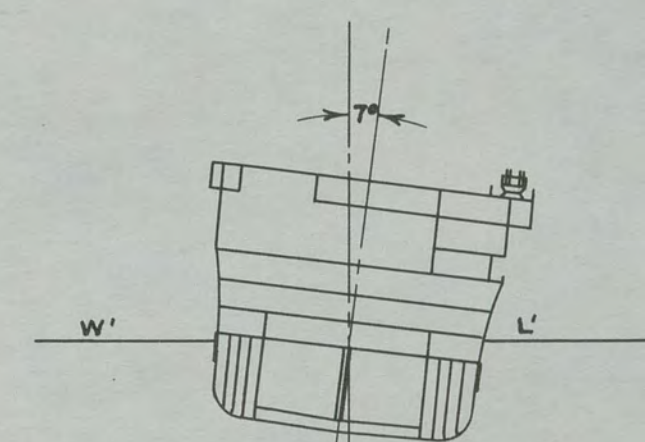
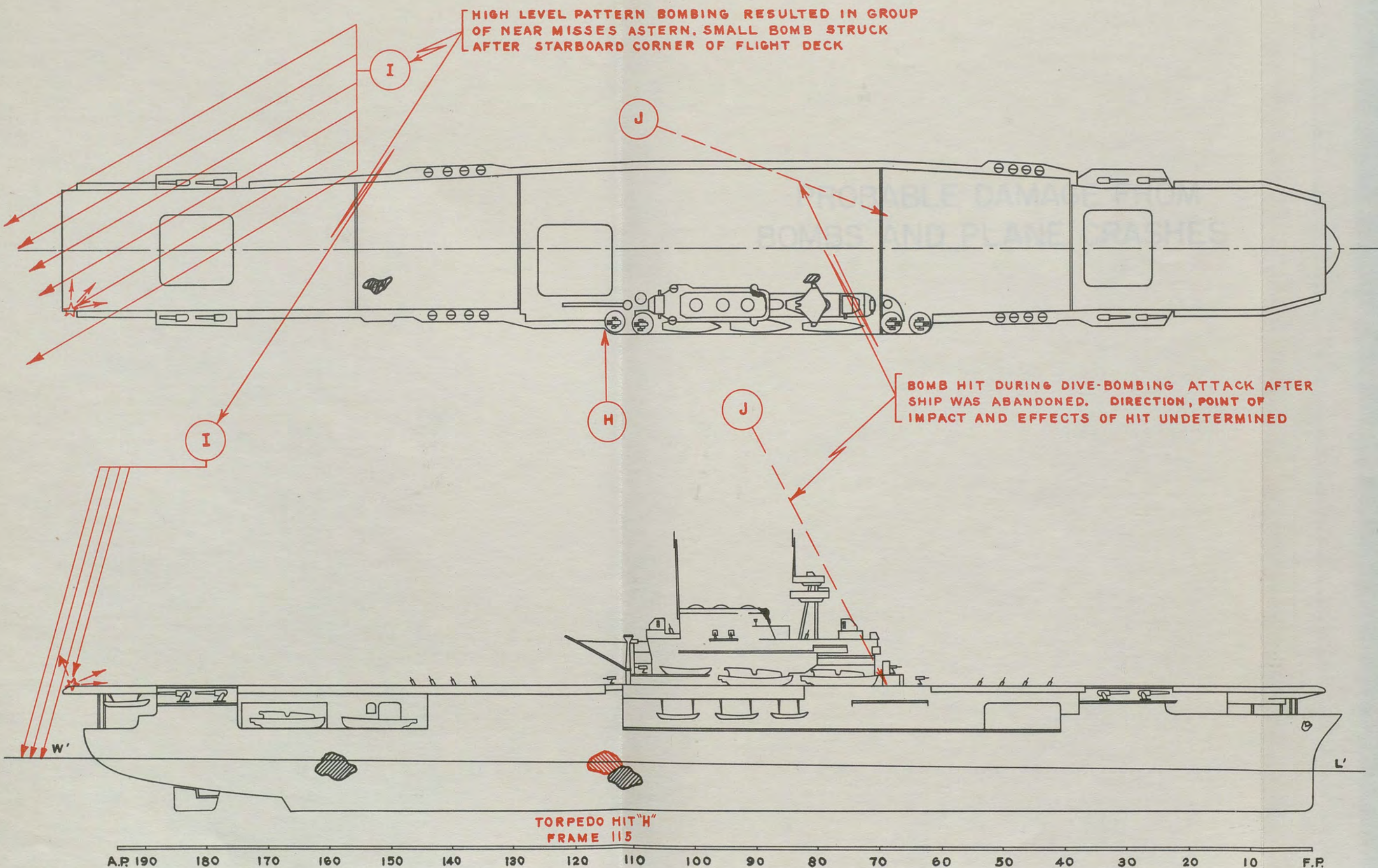
CONDITION AFTER ATTACK  
FR. 112 - LOOKING FOR'D  
MEAN DRAFT ~ 30.5 FT. HEEL ~ 7°

NOTES

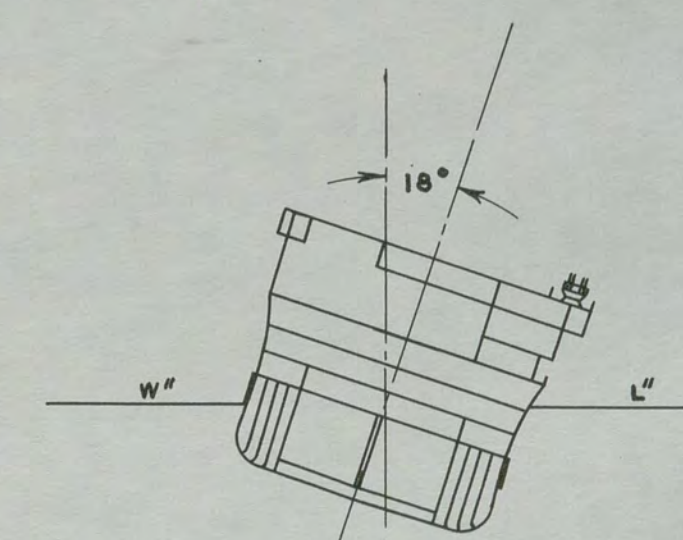
LETTERS IN CIRCLES INDICATE SEQUENCE OF  
EVENTS AND REFER TO SECTIONS IN TEXT  
WL IS WATERLINE BEFORE MORNING ATTACK  
W'L IS WATERLINE AFTER MORNING ATTACK  
ARROWS FROM CIRCLES INDICATE ESTIMATED  
PATH OF BOMBS, PLANES AND TORPEDOES TO  
POINT OF IMPACT.

U.S.S. HORNET CV-8  
SANTA CRUZ 26 OCT., 1942  
MORNING ATTACK  
NAVY DEPT. BUREAU OF SHIPS  
j.B.H. *CD Wheeler*

AFTERNOON ATTACKS



CONDITION BEFORE ATTACKS  
FRAME 112 ↪ LOOKING FORWARD  
MEAN DRAFT-30.5' ↪ HEEL-7°



CONDITION AFTER ATTACKS  
FRAME 112 ↪ LOOKING FOR'D  
DRAFT UNDETERMINED  
HEEL AT 1650 ↪ 18°

**NOTES**

LETTERS IN CIRCLES INDICATE SEQUENCE OF EVENTS AND REFER TO SECTIONS IN TEXT

ARROWS FROM CIRCLES INDICATE ESTIMATED PATH OF BOMBS AND TORPEDO TO POINT OF IMPACT

W'L IS WATERLINE BEFORE ATTACKS  
W"L" IS WATERLINE AFTER ATTACKS (W"L") UNDETERMINED

U.S.S. HORNET CV-8  
SANTA CRUZ 26 OCT., 1942  
AFTERNOON ATTACKS  
NAVY DEPT. BUREAU OF SHIPS  
J.B.H. *C.D. Wheelock*

PROBABLE DAMAGE FROM  
BOMBS AND PLANE CRASHES





PROBABLE FLOODING AND  
TORPEDO DAMAGE

