

U.S.S. WAKEFIELD

BOMB DAMAGE

January 30, 1942

Singapore

Class. . . . .	Transport (ex-MANHATTAN)	Length (W.L.) . . . .	685'
Launched . . . . .	December 1931	Beam (molded) . . . .	86'
Gross Tonnage. . . .	24,289	Draft (mean) at time of damage . . . . .	27'2"

References:

- (a) C.O. WAKEFIELD conf. ltr. to Buships L11-1/A9-8, Feb. 13, 1942.
- (b) Comdt. Navy Yard Phila. conf. ltr. to Buships L11-1(conf.):AP22/L11(E3-4), April 29, 1942.

NARRATIVE

1. U.S.S. WAKEFIELD began fueling alongside a dock in Keppel Harbor, Singapore, at about 0845 on January 30, 1942. She was heading 238° (T), starboard side to the dock, in 35 feet of water. The weather was clear and bright with a high haze and a calm sea.

2. The air raid alarm sounded at 0940, when a lone enemy raider was seen flying very high. Three English fighters went up to intercept him and remained in the air until approximately 1050. Ten minutes later, two formations of 27 planes each approached the dock area from the direction of the sun, 103° (T), as shown on Plate I. They were at about 20000 feet altitude, and were consequently not fired at by shore batteries or ships. Bombs began falling at the harbor entrance and continued along the dock line. Two near-misses occurred in the vicinity of WAKEFIELD, one about fifty yards off the port quarter and one about forty feet off the port beam. Both exploded under water and neither was near enough to cause damage. About 1105 WAKEFIELD was hit on the port side forward abreast No. 2 hatch.

3. The 0940 alarm was still in effect, and when it was seen that the planes would cross the WAKEFIELD those who were on open decks sought such shelter as was available. No one on deck was injured.

4. The bomb penetrated B deck and exploded in the sick bay on C deck, where it blew a hole in the deck, demolished three bulkheads, and damaged others as described in the next section. Five men in sick bay were blown into No. 2 hatch and found dead at the bottom. Nine others in the vicinity were injured by flash and shock. The explosion started various fires which were brought under control about 1125.

5. Passengers began coming aboard at 1330, and at 1717, with fueling completed and all passengers aboard, WAKEFIELD took departure from Singapore for Bombay. She arrived there without further incident on February 10, and temporary repairs were undertaken. These consisted of clearing away wreckage, cutting away jagged sections of steel at the trunk boundary, installing vertical shoring between B and C decks, and tying side and deck framing with gusset plates at B and C deck levels. These repairs are visible in many of the pictures. Final repairs were made at the Navy Yard, Philadelphia.

#### STRUCTURAL DAMAGE

6. Blast caused most of the damage. B deck bulged upward. C deck, where most of the damage occurred, had a hole blown in it. Bulkheads were demolished and torn loose at the deck, and the hatch trunk was blown in. D deck was dished slightly and two bulkheads torn loose at the foot. The shell was bulged out about 18 inches. Very little fragment damage was done.

- B Deck -

7. The bomb hit to port of No. 2 hatch just forward of frame 52 as shown on Plates I and II. It penetrated the deck, which consists of 30-lb. plate covered by 4 inches of wood, and made a hole about 10 by 15 inches. It probably exploded before it hit C deck as explained in paragraph 21, and B deck bulged upward a maximum of 25 inches between frames 43 and 57. The hatch coaming buckled outward and tore. Deck beam brackets between frames 47 and 56 tore from the frames through rivet holes and the bulwark plating was torn away from the stringer angle for about 27 feet. It was forced outward a maximum of about 8 inches. The paravane davit was torn from its pedestal and damaged and the ready ammunition box was broken open. Damage to this deck is shown in Photos 2 and 3.

- C Deck -

8. A hole roughly 15 x 6 feet was blown in C deck as shown in Photos 4 and 5 and Plate II. The deck was dished down evenly between frames 44 and 58 to a depth of about 10 inches in way of the hole. Two 7-1/2-lb. transverse bulkheads were demolished. A 7-1/2-lb. bulkhead 15 feet forward of the explosion was torn loose at C deck and blown forward and up against B deck and the next bulkhead forward (Photo 8). Bulkhead 57, which was about 18 feet aft of the explosion, may be seen in Photo 10 to be blown loose at the bottom and split open along the seam at mid-height. Both failures were by shearing rivets. This bulkhead was also torn in one place and pierced by small fragments in a few others, but considering the fact that there was only a 7-1/2-lb. bulkhead between it and the explosion the fragment effect is unusually slight. This is true of all the surrounding areas.

9. Shell plating was torn from the frames at C deck bounding angle for about 30 feet and bulged outward a maximum

of 18 inches between B and C decks. The frames, which are 8-inch channels riveted to the shell, were twisted and bent between frames 43 and 64. At frame 53 the riveted connection pulled out and separated the frame from the shell. The deck beam attached to this frame pulled a three foot piece out of a 13-inch inverted T longitudinal under B deck. This is marked with an arrow on Photo 6.

10. The 12-1/2 lb. outboard bulkhead of the port passageway was demolished for about 24 feet abreast the explosion and was buckled and twisted for about 20 feet further aft. The inboard bulkhead of this passageway, where it forms the port side of the hatch trunk, was torn loose at C deck and blown up and into the hatch to about the level of B deck. Aft of the hatch trunk it was buckled inboard. Two 18-inch I beams (portable hatch beams) lying one on top of the other in the trunk, were driven through the starboard side of the hatch trunk for about 6 inches, making a hole about 10 x 28 inches.

11. Forward of the hatch an athwartship passage carried the flash and blast effect around to the starboard passageway. In this athwartship passage it tore down a ventilation trunk (Photo 9) and destroyed the medical refrigerator on the centerline aft of bulkhead #43. The bulkheads in this passage and in the starboard passageway were all bulged outward as shown in the plan of C deck, and wooden doors and door frames were splintered and torn out. Tile walls in the dressing room to starboard of frame 58 were shattered.

12. The watertight doors in bulkhead 43 were both bulged forward. Photo 8 shows the port door which buckled forward 6 inches with the bulkhead. No attempt was made to open it. The starboard door (Photo 9) was bulged forward about 1-1/2 inches by the explosion, and could be operated though no longer watertight. As both these doors seat on the side of the explosion it was not a test of the fastenings.

- D Deck -

13. Damage to D deck was less extensive. The composition deck covering was broken in a few places by falling debris, and the deck was dished about 3/4 of an inch outboard of the hole in C deck (Plate III). The ventilating system was demolished (Photo 11). Gusset plates at C deck level sheared from the frames, and the 6-inch pipe stanchion outboard at frame 50 buckled and then tore loose at the upper end as the deck rebounded from the explosion.

14. A 10-lb. transverse bulkhead about 20 feet forward of the hole in C deck sheared the rivets in the angle at D deck and moved forward 8 inches at the deck. Connections to C deck and plate seam connections held. A 10-lb. transverse partition only 3 feet aft of the hole buckled aft a maximum of 8 inches between C and D decks, but all joints held. The blast on this deck was apparently directed forward by this partition, as the greatest bulkhead distortion was about 10 feet forward of the hole in C deck.

15. The outboard bulkhead of the port passageway tore loose from D deck for about 24 feet forward of the hole and buckled inboard 24 inches at the deck (Photo 11). This apparently absorbed most of the blast energy, for the inboard bulkhead of the passageway (the lower part of the hatch trunk) was only very slightly deflected.

#### MISCELLANEOUS DAMAGE

16. Fire damage was extensive. The entire area on the port side of C deck from frame 43 to frame 57 was afire immediately following the explosion. The athwartship passage forward of the hatch was scorched by the flash, and the flash traveling aft along the port passageway started a fire in the medical storeroom which completely destroyed the contents and the wooden door. Insulation on cables which were subjected to fire was completely destroyed. The fires were under control in about twenty minutes.

17. There was no disturbance or damage at the main switchboard, and power panels, control equipment, lighting fixtures, etc., not in the immediate vicinity of the explosion were not damaged. Light bulbs and glass globes were shattered only in the immediate vicinity of the explosion.

18. Cables feeding the electrical equipment in the forward part of the ship were near the explosion. All power cables, however, were de-energized except those for two vent systems and the forward ammunition hoist motor. The explosion drove metal splinters into the cables causing short circuits which resulted in blowing the circuit fuzes of the energized circuits. Test showed the other circuits to be shorted also. This removed all power from B deck winches and forced abandonment of a tank lighter which could not be brought aboard.

19. Cables running in wire ways in the immediate vicinity of the explosion were torn loose from hangars and ruptured in some cases. Those in the explosion area that passed through a non-tight bulkhead and were not fitted with bushings were sheared by the edges of the drilled holes.

20. The explosion also ruptured the air lines to the forward guns, but this damage had no immediate consequences as the guns were not in use.

#### DISCUSSION

21. Officers aboard the WAKEFIELD were of the opinion that the bomb struck C deck at the small seven-inch hole, failed to penetrate, and toppled over forward before exploding. Investigation of the circumstances of the attack, however, reveals that the bomb must have been traveling slightly forward and to starboard at an angle with the vertical of about  $10^{\circ}$ . This means that the bomb should have hit C deck in the neighborhood of frame 51 instead of aft of frame 52, where the small hole is. Also, having been dropped from 20,000 feet, it is virtually impossible that B deck could have slowed the bomb sufficiently to allow C deck to stop it. It seems probable that B deck initiated a short delay fuze action which exploded the bomb just above C deck as shown on Plate I and that a fragment of the nose cut the clean 7" hole in C deck aft of frame 52 (Photos 4 and 5).

22. The best available U.S. Army and Chinese information indicates that the Japanese use several bombs weighing about 60 Kg. From the size of the hole in "B" deck and the extent of the blast damage it seems probable that this bomb was one

which weighs about 140 lbs., has a diameter of 9.4 inches, and a charge weighing 86 lbs. The almost complete lack of fragment damage is most unusual and as yet no satisfactory explanation for it has been found.

23. No. 2 hatch was open and considerable material and flash were exhausted upward through it. This led many to believe that the open hatch prevented greater structural damage. There has been a great deal of effort directed toward the effective venting of explosions, and the most definite conclusion reached from tests and actual war experience is that a vent opening must be very large and quite near the explosion to have any appreciable effect. In order for this explosion to reach the hatch opening it had to blow through the 12-1/2 lb. port passageway bulkhead and the 15-lb. hatch trunk. The latter was blown up into the hatch as pointed out in paragraph 10, but not clear out. It is probable that the major destructive effort of the explosion had been expended by the time it reached the opening, and while it probably lessened the damage to the starboard side of the trunk itself it is doubtful if the open hatch had any appreciable effect on the rest of the damage. If the bomb had exploded in the open hatch trunk there might have been an appreciable venting effect, but not otherwise.

24. It is well recognized that wood furniture and fittings do not offer good resistance to explosive attack and also that wood contributes materially to fires which almost invariably follow bomb explosions inside ships. The case of WAKEFIELD illustrates both of these points. It should be noted that in spite of the large quantity of wood in this case the fire was brought under control in less than half an hour.

25. Non-watertight ventilation ducts, lockers, and other articles made of light plating or sheet metal are severely damaged by blast from explosions. Photos 9 and 11 show typical examples of blast damage to non-watertight ventilation ducts.