U.S.S. HELM

BOMB DAMAGE

Dec. 7, 1941

Pearl Harbor

Class.	Destroyer (DD388)	Length (W.L.). . .	334'
		Beam	35'-5"
Launched	May 1937	Draft (before	
Displacement (std.).	1500 tons	damage)	12'-7"

References:

(a) C.O. HELM conf. ltr. to Buships, DD388/A12-1, Serial 29, of February 8, 1942.

(b) Combatfor conf. ltr. to Buships, L11-1/(50), Serial 076, of February 10, 1942.

Narrative

1. U.S.S. HELM was operating in the approaches to Pearl Harbor on the morning of December 7, 1941. The weather was clear, sea calm, visibility excellent.

2. The ship was attacked by a Japanese fighter plane at 0915, which dropped two bombs. Both were near-misses. The plane approached in a shallow dive from the southeast (direction of the sun) and dropped its bombs from an altitude of about 1000 feet.

3. The position at this time was 5 miles southwest of Aloha Tower (Honolulu Harbor) in 150 fathoms of water. The ship was making 25 knots and swinging rapidly to port under full rudder. The attack caused no appreciable reduction in speed.

4. The bombs were small and had delayed-action fuzes. From the size of the plane and the general effects of the explosion, reference (a) places the weight at about 100 lbs.

5. One bomb exploded well below the surface about 30 feet to starboard abreast frame 10. The other fell 100

to 150 feet off the port bow. No flash or smoke was seen. The column of water thrown up by the nearest bomb struck the gun director and deluged the entire forward part of the ship. There was no damage from fragments and none were seen.

6. The ship whipped and shook violently, but no general flexural vibration of the ship as a whole was noted although, from the nature of the damage, it must have occurred.

7. Operations at high speeds and in moderately rough seas continued until about noon the next day. It was found that the damage to the director foundation had increased to an extent which endangered the director. Speed was reduced and the director was shored up. The ship was ordered to return to port.

Shock Effects

8. The "A" phase relay bar on the steering engine transfer switch panel was shaken loose and short-circuited the main power lines. Shift to hand steering was necessary until the diesel generator could be connected directly to the steering motor. Most of the switch panel was damaged beyond immediate repair.*

9. The main circuit breakers opened, causing loss of power and light for about one minute.

10. The starting relay for the TBS (high-frequency voice radio) was broken. This is located in the bridge structure.

11. The gyro compass tumbled. This was probably

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*This panel had just been repaired, having been previously short-circuited by the shock of A.A. gunfire and vibration caused by backing at high power.

caused by failure of the follow-up system, following interruption of ship's power supply.

12. Rivets sheared in the framework supporting rectifier units in Radio Central (on the forecastle deck under the bridge).

13. Power stacks - i.e., rectifier and transmitting units - in the QCB equipment burned out, rendering the echo-ranging feature inoperative. This casualty may not have been a consequence of shock, however. The equipment generates a good deal of heat and would burn itself out if the ventilation blower failed.

14. The gun director whipped considerably, due to its relatively great mass and light surrounding structure. The deck over the pilot house was torn in way of the director pedestal and the welded connection between the pedestal and director tube was cracked. This damage increased during the next 24 hours, as noted in paragraph 7.

Structural Damage

15. The shell was wrinkled forward of bulkhead 14, below the waterline; see Plate I and Photo 1. This wrinkling was at about 45 degrees to the keel, and was more severe on the starboard than on the port side. The keel was sharply buckled at about frame 12. Plating just abaft the stem was dished in on both port and starboard sides, as shown by Photo 2. Small tears in the welded seams on the starboard side caused leakage into the peak tank.

16. The watertight collision bulkhead at frame 6 buckled between the first and second platform decks. The

watertight bulkhead at frame 14 buckled below the second platform deck and ruptured just under that deck. The second platform deck buckled longitudinally between frames 14 and 25, causing cracks in the after starboard corner of the hatch coaming at about frame 18. The starboard bracket which joins frame 18 to the second platform deck was cracked.

18. Longitudinals in A-401-W were deflected inward on the starboard side and outward on the port side. A second platform deck beam broke through the plating at about frame 12. There was minor damage to floors and brackets forward.

Flooding and Damage Control

18. The peak tanks A-1-W and A-401-W, and the boatswain's store compartment A-301-A, flooded immediately. A-402-A flooded through the rupture in bulkhead 14. All these compartments flooded completely before an effective pumping system could be rigged. Two drainage lines in A-401-W were ruptured.

19. This ship has an independent drainage system forward of frame 28, with a semi-portable submersible pump and suction manifold in A-301-A. The suction manifold was out of alignment. There was trouble with short circuits. The pump became airbound before flooding covered the broken pipes in A-401-A. The repair party was driven out of A-301-A by rising water before the pump could be put in operation.

20. Two portable submersible pumps for use in damage control are allowed this ship. Reference (a) states that only one was carried, and that it was then under repair on the tender and consequently not aboard. The only other pump available was the semi-portable submersible pump in the

steering room serving the independent drainage system aft. This heavy pump was brought forward with great difficulty and lowered into the flooded compartments. When pumping uncovered the drain lines in A-401-W, these were repaired and the forward drainage system was again placed in commission.

Comments

21. Pump allowances: Destroyers of this class should have two portable submersible pumps for general use, and the lack of one on HELM indicates that the allowance list had not been filled. The value of these pumps is recognized, and the Bureau is now increasing the allowance to three such pumps per ship.

22. Power leads to pump: Power leads to the semi-portable pump in A-301-A are run from A-102-E, two decks above, through hatches. This prevented the hatches from being closed and compartments A-1-W and A-401-W kept filling up and required intermittent pumping. The Commanding Officer in reference (a) recommended the permanent installation of power leads terminating near the pump. This had been previously authorized by the Bureau for both the forward and after pumps, and will be accomplished as opportunity permits.

23. Operating rods to manifold: The Commanding Officer recommended the installation of operating rods on the valves of the manifold in A-301-A. This is now under consideration.

24. Priming lines: The semi-portable submersible pumps must be primed, and connections from the firemain are provided to the permanent positions forward and aft. If such a pump is moved (as was the after one in this case) it will

not function without priming, but it will prime itself if submerged. The Commanding Officer recommended that a flexible hose be supplied with suitable connections for priming these pumps if moved to other locations. No action is contemplated on this recommendation, because (a) the pumps do function if submerged, which is the most likely manner of use in emergencies, and (b) it is unlikely that the pumps will have to be moved for use elsewhere in view of the availability of the portable pumps mentioned in paragraph 21.

25. Strengthening of director foundation: The Bureau is taking steps to strengthen the support of the gun director on this class of ships. This is recognized as a serious weakness.

26. The director foundation on U.S.S. SHAW, by comparison, stood up very well, although most of the surrounding structure was destroyed when the forward magazines exploded.* These two incidents illustrate the different character of damage which may be expected, generally speaking, from (a) contact explosions which cause extensive structural damage in the region of the explosion, and (b) non-contact explosions which cause less damage adjacent to the explosion but produce more damage by shock and vibration in distant parts of the ship. The case of SHAW was, of course, an extreme example, but numerous other incidents, particularly in the British Navy, emphasize these differences between contact and non-contact effects.

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*See Photo 7 of the report of damage to SHAW at Pearl Harbor, December 7, 1941.

27. Wrinkling of the hull: The angle of the wrinkles as seen in Photo 1 indicate that the bow was lifted by the explosions and that the portion forward of bulkhead 14 tended to shear off. Reference (b) states that shear strain lines were clearly evident on the plating. This is an unusual case. Wrinkling generally appears at the quarter points when the ship is thrown into flexural vibration by an underwater explosion, and plating opposite the explosion is dimpled and dished, not wrinkled. Here, however, it seems clear that the explosions exerted a violent lifting force centered at about frame 12. The ship lifted appreciably, according to reports, and the bow forward of the center of the explosion must have dropped relative to the portion aft of this point. This explanation accounts both for the direction of the wrinkles and the evident droop of the bow shown in Photo 1. Two conclusions are possible: (1) that the bombs were heavier than estimated in paragraph 4, or (2) the nearest explosion was more nearly under the ship, as illustrated on Plate I.