SEARCH FOR WRECK OF 350-TON FLOATING CRANE IN NORTH SEA

From Report of *Ingénieur Hydrographe Principal* GROUSSON,
Head of Wire Dragging Operations along French and North African Coasts
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During a towage operation a 350-ton floating crane sank in heavy weather off the West coast of Denmark in 34 metres of water. The wreck constituted a possible navigational hazard: it was 62 metres long and 33 metres wide, had a 90-metre boom and displaced approximately 5,000 tons. The state of the sea was such at the time that the tugs could supply only a very approximate fix of the location of the accident. A Swedish ship, the « Nordic », spotted the wreck shortly thereafter on the surface and provided a rather different position. A search was finally made within a circle of 12-mile radius with its centre at:

$$\varphi = 56°30' \text{ N.}$$
$$G = 7°15' \text{ E.}$$

The area of uncertainty covered approximately 450 square miles.

As far as the condition of the wreck was concerned, it was known that the boom had collapsed onto the pontoon and that the crew had dropped anchor before abandoning ship.

I. — METHOD OF SEARCH

The method of search applied was one devised and perfected by *Ingénieur Hydrographe en Chef* d'Erceville and used for the past three years in wire dragging operations along French and North African coasts; but a few changes were made on account of the difficulties involved in this particular operation, which finally consisted of five separate phases including:

1. Systematic investigation of the area of uncertainty with Asdic equipment, followed by the plotting of an echo-chart;

2. A detailed study of each echo. This ends with the buoying of the position, if it shows that a possible contact has been established with the wreck;

3. Hydrographic sweeping. This is to establish physical contact by striking the wreck with the wire drag. If no strike occurs, a margin of safety over the wreck allegedly present is ensured;

4. Diving. As soon as the wire drag strikes the wreck, divers (equipped with Cousteau self-contained apparatus) explore the wreck with the help of the drag and take depth measurements;

5. Additional hydrographic survey. This includes buoying the wreck, determining its position and topography, and a security check by sweeping.

1. Systematic Investigation.

One of the main difficulties was due to the fact that the area to be explored was far from the coast, which was moreover inaccessible due to the existence of an extensive minefield. It was thought that the most rapid method involving a sufficient degree of accuracy with respect to Asdic range consisted in anchoring a survey buoy at the central point of the area and in conducting operations along runs radiating from the buoy 5° apart and 12 miles long. This represented a total distance of 900 miles to be covered, which could be done by three ships making 10 knots, especially as the long daylight at that latitude made it possible to work 20 hours a day. The operational method adopted was as follows: the ship began its run along one of the radii from the centre buoy, proceeded along its course for 12 miles, then came over to the right (or left) for about 1 mile, and finally came back to the centre along the adjacent radius. Great care had to be exercised in effecting closure of the estimate.

Asdic investigations were carried out in the standard manner by sweeping from starboard 100° to port 10°, then from port 100° to starboard 10°. The temperature of the water obtained by bathythermograph remained fairly steady throughout: it was 13°.5 on the surface and remained constant for 17 metres or so; it then fell very rapidly until 20 metres were attained; from 20 to 35 metres it was a constant 8°.5. Propagation conditions along a surface layer at 20 metres, where the uppermost part of the wreck was likely to be located, were therefore expected to prove extremely satisfactory. Since the runs were 1 mile apart at the outer edge of the circle, the method guaranteed efficient coverage of the entire area, due allowance being made for unavoidable errors in adjusting the reckoning.

These investigations resulted in an Asdic echo-chart on the scale of 1:75 000. The total number of echoes in the area was 132. Many of the echoes, probably the majority, were certainly obtained from shoals of fish, which abound in the area.

2. Detailed Study.

This consisted in returning to the position of an echo according to its distance and bearing from the central survey buoy, in examining it while sailing around it, and if it seemed interesting, in marking it with buoys. A buoying method by reckoning was used, which consisted in anchoring 6 buoys in the shape of a rectangle centred on the assumed position of the wreck. The rectangle was 900 metres wide and 1,800 metres long (with 3 buoys on each long side); the long side was in the direction that appeared most suitable for sweeping purposes. Dan-Buoys of German make were used, which proved completely satisfactory as regards convenience in anchoring, visibility, and holding qualities.

3. Hydrographic Sweeping.

The usual technique was followed in hydrographic sweeping. The tugs navigated, however, by sighting along the 3 buoys on each long side of the rectangle.

4. Diving.

As soon as the wire drag struck the wreck, two divers followed the buoy rope nearest the contact point down to the wire drag cable, and the latter until they reached the wreck, which they explored. They used manometers to measure what appeared to be the highest point according to their investigations. The information obtained by them enabled identification of the wreck and determination of the nature of its position on the bottom.

5. Additional hydrographic survey.

This includes buoying, so that the wreck may be easily located; determining the wreck's position by every available means; sounding over the wreck, enabling a kind of chart to be made of it; and finally a check as to the possible existence of a lower figure than that supplied by the divers, obtained by sweeping.

II. — CARRYING OUT OF SEARCH OPERATIONS

The « I. H. Nicolas » left Cherbourg on June 30 at 1330 hours and made for the anchorage position of the « Ailette » and « Spahi ». Plans for the operation were decided upon by radiotelephonic conversation between the three vessels' commanding officers.

The « I. H. Nicolas » immediately anchored a survey buoy at the centre position of search. This position was obtained by dead reckoning from Buoy A, previously anchored by the « Ailette ». Search operations were thereupon begun, each ship investigating the particular sector assigned to it:

« Ailette »	30° to 90° and 210° to 270°
« Spahi »	330° to 30° and 150° to 210°
« I. H. Nicolas »	90° to 150° and 270° to 330°

Search activities continued the following day (July 4) from 0500 to 1730, when heavy weather intervened. A northwesterly gale, force 8, compelled all three ships to heave to and head west until the day following. During the night the « Ailette » made for Ijmuiden and the « Spahi » was put in charge of operations. The « Spahi » and « I. H. Nicolas » joined forces again at 1330 on July 5, but did not reach the centre buoy until about 1930. The weather continued poor and it was decided to make for Esbjerg to take on supplies. The two ships reached port during the forenoon of Friday July 6.

The « I. H. Nicolas » left Esbjerg on July 7, but as the « Spahi » had damaged one of its main engines she was not able to sail until the following day. Systematic operations were resumed at the rate of 18 to 20 hours per day. Conditions at sea, however, prevented work being done otherwise than by Asdic.

On July 10 at 1000, the weather having improved and the search nearing completion, an examination was made of one of the Asdic echo-records.

Three or four of the echoes obtained by the « I. H. Nicolas » deserved consideration, first because they had occurred twice on two different runs, and secondly because of their clarity. Investigation began with the one 40° and 2.8 miles from the centre buoy.

The contact was easily located; strong echoes in all azimuths were an almost positive indication of an obstruction of considerable size. Buoying it proved easy and boats were lowered. A sudden shift in the wind prevented sweeping, however, and the boats had to be taken up again with some difficulty.

During the night of July 10-11, the centre buoy lost its mast. The « I. H. Nicolas » anchored another one near by. Search operations were completed during the day, and the « Spahi » began examination of its Asdic echoes. The « I. H. Nicolas » was unable to lower its boats until about 1400 for sweeping purposes. The weights on the sweep were set at 23 metres, and a strike occurred at 1600 hours; two divers went down, but with no result, as they had erred in following the wire sweep cable (instead of making for the point of contact, they had gone away from it), and the temperature of the water (8°.5) certainly lowered their physical stamina. Two others were sent down immediately and brought back information proving that the wreck actually was the one being sought. Its highest point, according to the divers' manometer indications, was 17 metres below LLW.

A small buoy was left to mark the wreck, and on the following day a survey buoy was anchored about 200 metres west of the wreck. The two survey buoys anchored at centre and the buoys previously anchored by the « Ailette » and « Spahi » were picked up by the « Spahi » and « I.H. Nicolas », except for Buoy D, which in spite of efforts could not be found and must be considered as lost.

On July 13 the « Spahi » took soundings over the wreck, then headed for Thyboron. Data obtained through adjustment of its dead reckoning and from astronomical sights taken at the same time on board the « I. H. Nicolas » enabled

fixing the wreck's position. The discrepancy between the position of the wreck as determined by the « Spahi » and evaluated by the « I. H. Nicolas » amounted to half a mile.

Additional diving operations were undertaken by the « I. H. Nicolas », which confirmed results already obtained, and sweeping was carried out at 16 metres in order to check that no part of the wreck, after its measurement by divers and sounding lead, might be dangerous for surface navigation.

On the evening of July 13, the « I. H. Nicolas » made for Esbjerg in order to take on supplies while the « Spahi » sailed back to Cherbourg. After supplies had been taken on, the « I. H. Nicolas », following orders, returned to the wreck and picked up the survey buoy anchored at that position, then made for Cherbourg, arriving there on the evening of July 18.

III. — RESULTS

The position of the wreck (to within 1/2 mile) is as follows:

φ = 56°31' N.
G = 7°15'5 E.

It is 17 metres below LLW, and this figure has been checked by sweeping at a depth of 16 metres.

The wreck is lying on its port side, its boom pointing towards the bottom. The divers distinctly made out the letters DEM, the first letters of the trade-mark DEMAG appearing on the pivot below the cabin (the letter D is nearest the surface). The fresh paint is grey on the boom-pivot, and dark (black) on the underside of the pontoon. The anchor chains were seen. The wreck is in a definite North-South position, and the soundings of the « Spahi » should provide excellent detailed information as to the wreck's topography.

IV. — CONCLUSIONS

The wreck was located on July 11, only eight days after operations were begun in accordance with the plan described in this report. The problem was a difficult one, however, owing to the extensive area of uncertainty, the distance away from and inaccessibility of the nearest coast, and the very severe conditions prevailing at sea off a rugged coast offering no anchorage possibilities. Factors contributing to the successful conclusion of operations may be worth enumerating:

1. The method used is a good one. Three years' experience on board the « I. H. Nicolas », while guaranteeing the effective outcome of this test, only confirm in a spectacular manner what was known already. It is clear, however, that the final phase of operations necessitates the use of equipment and highly trained personnel that at present is only available to the Wire Drag Survey on board the « I. H. Nicolas ».

2. Co-operation between the « Spahi » and « I. H. Nicolas » was excellent, and although the final result was obtained by the « I. H. Nicolas », both ships should be given credit for it. The fact that the Asdic echo of the wreck happened to be in the area explored by the « I. H. Nicolas » is only due to chance. The sweeping and diving operations that followed could only be undertaken by a specialized vessel,

3. Chance also is responsible for the fact that, among the three or four echo-records that seemed most worthy of consideration, the first one should have been the right one. Work was appreciably shortened on this account.

But it is only fair to say that all the personnel deserved this chance. In spite of having to work twenty hours a day in a rough sea, all hands retained their liveliness and cheerful spirits, and carried on with unremitting effort. The outstanding professional qualities and enthusiasm of all were essential factors in the successful outcome of this assignment.