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COASTAL COMMAND REVIEW

July and August, 1942

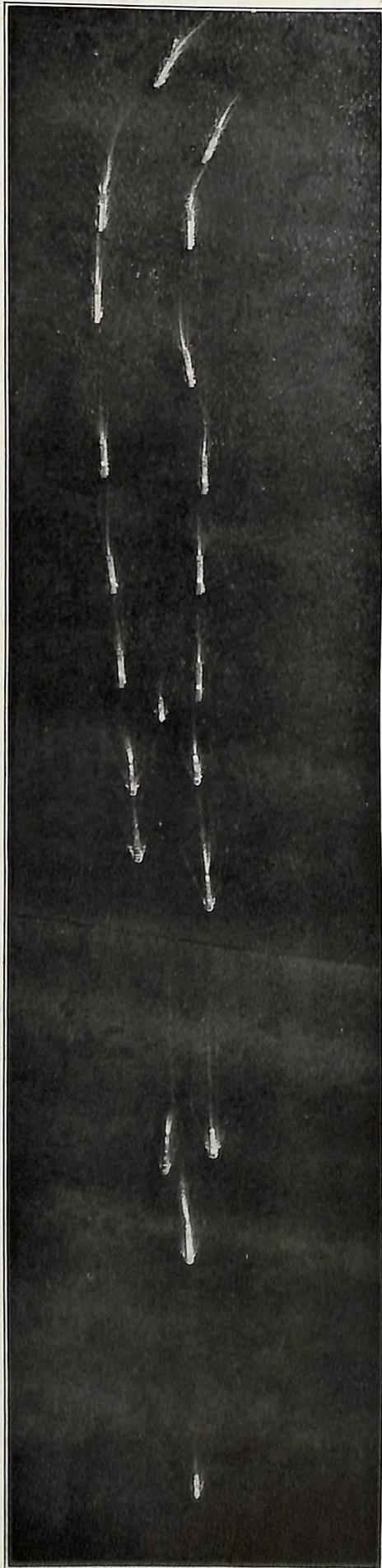
No. 4

**HEADQUARTERS,
COASTAL COMMAND
ROYAL AIR FORCE**

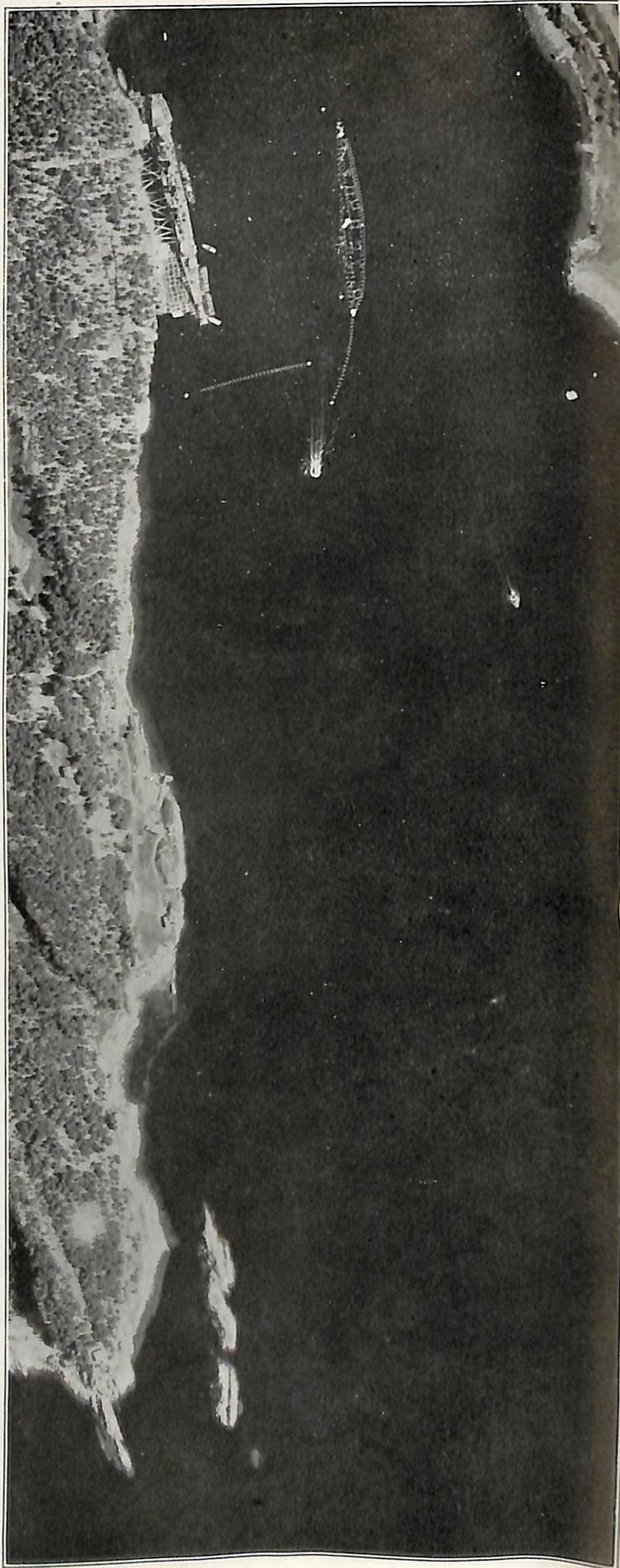
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*The Air Officer Commanding-in-Chief,
Coastal Command.*



Invasion armada near Gdynia, 1st August; 2 escort vessels, 7 invasion barges and 12 tank landing craft. (P.R.U.)



Cruiser *Köln* in Foetten Fiord, 19th July. She lies in the berth formerly occupied by the *Tirpitz*. A series of booms off shore is arranged as though to simulate a ship. (P.R.U.)

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CHARTS

Coastal Command in the Battle of the Atlantic :—

Chart

- I July-December, 1941.
- II January-June, 1942.
- III July and August, 1942.
- IV Effect of Air Escort on two attacked Convoys.

COASTAL COMMAND IN THE BATTLE OF THE ATLANTIC, JULY, 1941-JUNE, 1942

The *Review* for March and April (No. 2, p. 24) contained a survey of the air offensive against U-Boats, with special reference to the second half of 1941. This is illustrated by Chart I, which shows the distribution of attacks on U-Boats by aircraft, as well as the sinkings of ships by U-Boats, in the Western Approaches during that half-year. It will be seen that the U-Boats usually operated at a range of at least 300 miles from Coastal Command bases. Their unwillingness to attack closer in may be attributed largely to the great number of patrols flown within that radius and to the potential air striking force that could there be brought to bear.

Chart II shows the air attacks on U-Boats and their sinkings of shipping in the Western Approaches for the following six months, the first half of 1942. There were practically no ships sunk within ordinary patrol range of the Coastal Command bases. But U-Boat activity in the ocean had diminished; they were now busy in American waters, instead of attacking

convoys. Consequently practically all the U-Boats that we attacked were on passage, and the number of our attacks dwindled from about 100 to about 70 in these two half-years. But the month-symbols in Chart II show that the trend was rising again towards midsummer, with the intensification of the air offensive in the Bay of Biscay and its extension farther south to the north coast of Spain.

Since then the number of attacks has continued to rise; there were 88 in the Western Approaches during July and August, a record for any two-monthly period. Indeed, the total number of attacks in all areas from January to August, 1942, is 194, which is not much less than the number made in all the first 21 months of the war. In 1942 about 40 U-Boats have already been either sunk or seriously damaged. The use of torpex-filled shallow-set depth-charges has greatly increased the power of our attacks from the middle of May onwards.

ANTI-SUBMARINE ACTIVITIES, JULY AND AUGUST

These two months have seen a very large and constant increase in the number of U-Boats sighted and attacked by Coastal Command. There were 64 sightings and 34 attacks in July, 88 sightings and 62 attacks in August, including figures for Gibraltar, and 17 chance sightings by aircraft on passage and by P.R.U. (Chart III). This two-months' record of 152 sightings and 96 attacks exceeds the total results for the first six months of this year: 124 sightings and 88 attacks.

Three attacks caused the obvious sinking of two U-Boats; one was the joint victim of a Whitley of 502 Squadron and a Lancaster of 61 Squadron in the Bay in July, while the other was destroyed by a U.S.N. Catalina south of Iceland in August. Several more attacks probably led to sinkings. The results of these attacks have not all been officially assessed, but the improvement noted in the last issue has probably gone further.

The very large number of attacks has been due to three causes—the large scale of flying undertaken by the Command, the successful operations undertaken, largely by Iceland aircraft, against U-Boats passing Northern Scotland and Iceland en route from Germany to the Atlantic, and the return of the U-Boats to pack-attacks on this side of the Atlantic. Allowing for the increased effort put into it, our offensive in the Bay has had about the same results as the period covered in the last *Review*, May and June.

Convoys

In July and August 112 convoys and 38 independently routed ships were given aircraft protection, involving a total of 737 sorties, of which 532 were sent as close escort. Of the aircraft sent to the convoys 83 per cent. succeeded in finding them, and of those sent to independents, 66 per cent.

The "pack" attacks by U-Boats on convoys during August are worthy of special mention, as they seem to indicate a change in policy: the enemy are resorting to submerged attack in the daytime and carry out their attacks as far out

from our coasts as possible—a clear sign of the deterrent effect our aircraft have produced. The homebound Canadian convoy SC.94 was first attacked on 6th August, 540 miles north-west of St. John's, Newfoundland, and one ship sunk. In the afternoon of the 8th four ships were sunk. On the 9th, five Liberators of 120 Squadron were sent to escort this convoy; four succeeded in meeting it, though it was then about 700 miles west of Ireland; they sighted two U-Boats and attacked one of them. In the morning of the 10th four more ships were sunk. Close escort was provided from 1300 hours to midnight by four Liberators and one U.S.N. Catalina made a sweep from Iceland. During the 10th five sightings and four attacks were made by these aircraft. These operations broke up the U-Boats' attack, and the convoy steamed its last 500 or so miles unmolested, though probably it was still being shadowed by U-Boats on the 11th, when two Liberator escorts were sent—one of which did not meet the convoy.

The other two "pack" attacks, on OS.37 and SL.118, were in the south of the Bay; again the escorting aircraft had considerable success in attacking U-Boats, and only one ship was lost. These operations are summarised in the following table, showing the results achieved by aircraft and the sinkings of merchant vessels on the days when U-Boats and our aircraft were in contact with the convoys.

	Escorts which met convoy.	Escorts which did not meet convoy.	Sorties on protective sweeps.	U-Boats seen.	U-Boats attacked.	Merchant vessels sunk.
S.C. 94— August 9-11	10	2	4	7	5	4
O.S. 37— August 16-18	4	0	0	2	2	0
S.L. 118— August 19-22	2	2	3	4	3*	1
	16	4	7	13	10*	5
		27				

(* One attack was by cannon only.)

U-Boats in Transit from Germany

From 20th July to 31st August the operations between Iceland and Scotland led to 38 sightings, of which 30 resulted in attacks. The attacks in the Scotland-Faroes channel at the end of May (mentioned in the previous issue) seem to have driven the U-Boats further north. No sightings were made in this channel in June or August, and only one in July. The Squadrons operating from Iceland therefore obtained the best results: the Hudson squadron No. 269 made 16 sightings (14 attacks), and the U.S.N. Catalinas of No. 73 Squadron nine sightings (nine attacks).

These operations show a striking resemblance to those of exactly a year ago, when several U-Boats were moving through this area, and No. 269 Squadron made several attacks—one of which led to the capture of U.570 (H.M.S. *Graph*). History has almost repeated itself (page 6).

A Combat on Anti-submarine Patrol

Wellington J/172, was attacked at very close range by two Arados, when a hundred miles south of the Scillies, at 0615 hours on 15th July. The Wellington jettisoned its depth-charges and dived to sea-level, with its starboard aileron control shot away and the port aileron badly damaged. The intercom. was out of action and the wireless operator wounded in the leg in the first attack. The Wellington replied with cannon and machine-gun fire. One Arado broke away, with flames and black smoke pouring from it, and was last seen sitting on the sea with dense smoke coming from it. The other Arado flew away to investigate. The Wellington, with one leg of its undercarriage unserviceable and the engines damaged, set course for base. It crash-landed at Portreath, and four of the crew were injured.

Sightings and Attacks by Squadrons, July and August

Squadron.	Sightings.	Attacks by gun.	Attacks with depth-charges, bombs.
19 Group			
10 Sunderlands, Mount Batten ..	11	0	6
51 Whitleys, Chivenor	4	0	4
58 Whitleys, St. Eval	5	1	3
61 Lancasters, St. Eval	3	0	3
77 Whitleys, Chivenor	1	0	1
172 Searchlight Wellingtons, Chivenor and Wick	6	0	4
304 (Polish) Wellingtons, Dale ..	9	0	8
311 (Czech) Wellingtons, Talbenny..	8	0	8
461 Sunderlands, Mount Batten ..	3	0	1
502 Whitleys, St. Eval	4	0	4
10 O.T.U. Whitleys, St. Eval ..	3	0	1
15 Group			
120 Liberators, Ballykelly (and Pre-dannock)	14	1	7
224 Hudsons, Tiree	2	0	1
500 Hudsons, Stornoway	6	0	4
1406 Met. Hudsons, Aldergrove ..	1	0	1
18 Group			
48 Hudsons, Sumburgh	2	0	2
240 Catalinas, Sullom Voe	2	0	0
248 Beaufighters, Wick	1	0	0
608 Hudsons, Wick	2	0	2
Iceland			
73 U.S.N. Catalinas (P.B.Y.) ..	16	0	9
289 Hudsons	16	0	14
330 (Norwegian) Catalinas, Northrops	6	0	2
612 Whitleys	5	0	2
1407 Met. Hudsons	1	0	1
Gibraltar			
202 Sunderlands, Catalinas	5	0	3
210 Catalinas	2	0	2
233 Hudsons	4	0	3
P.R.U.	5	0	0
Chance sightings by transit, ferry, civil aircraft, etc.	12	0	0
	152	2	96

THE MOST REMARKABLE ATTACKS ON SUBMARINES, JULY AND AUGUST

Two Searchlight Attacks

At 0455 hours on 6th July, Wellington H/172, flying at 1,000 ft., received a Special Equipment contact at a range of seven miles. The aircraft homed, and switching on the Leigh searchlight when one mile away, sighted a U-Boat making 10 knots. The attack was made from the U-Boat's starboard quarter, four depth-charges being released while the U-Boat was diving and the conning tower still visible.

All the depth-charges exploded, the spray completely enveloping the U-Boat and making it difficult to see where each had fallen. When the spray subsided, a large swirling mass of water, 50-75 yards across, could be seen clearly as the aircraft flew down moon. This mass later grew to 150 yards in diameter, and had a sharply defined ring of foam round the edge, enclosing water appreciably darker than the ordinary sea, suggesting the presence of a large quantity of diesel oil. From the nature of these searchlight attacks, no accurate "after evidence" can be expected, and even a rough assessment can rarely be attempted because of the limited opportunities for observation during the attack. (compare Pl. 3) (46° 10' N., 06° 40' W.)

At 0100 hours on 13th July, the same Wellington flying at 1,000 ft., obtained a Special Equipment contact seven miles ahead. At $\frac{3}{4}$ mile range, and flying at 300 ft., the searchlight was switched on, and a U-Boat was sighted making 12 knots. The U-Boat immediately opened up with cannon fire from the rear end of the bridge, but ceased when the aircraft was $\frac{1}{4}$ mile away.

An attack was carried out from the U-Boat's port quarter with four torpex depth-charges, released while the U-Boat was still on the surface. The explosions completely obscured it, making it difficult to estimate where each depth-charge exploded. The rear gunner, who fired 400 rounds into the explosions, saw a red glow appear through them. It is possible that the searchlight so dazzled the gun's crew and bridge personnel, that they lost their nerve and got down the conning tower preparatory to crash diving. From the estimated position of the explosions, the depth-charges probably fell just out of lethal range ahead of the pressure hull. (46° 42' N., 04° 55' W.)

A Joint Kill

At 1235 hours on 17th July, Whitley H/502, flying at 500 ft., sighted a U-boat two miles away

making 8-10 knots. The aircraft lost height, and attacked from the U-Boat's port beam at an angle of 90° to the track, releasing from 50 ft. six torpex depth charges (set to 25 ft., spaced to 40 ft.), while the conning-tower and stern were still above water. The stick straddled the U-Boat, depth-charges falling on either side of it just forward of the conning-tower, which was completely hidden by the spray. The tip of the stern was plainly seen close to the explosions.

About one minute later, the U-Boat resurfaced, bows first, just clear of the leading edge of the explosion mark. The conning-tower then broke surface, and the U-Boat moved very slowly in a circle to port. There was a thick patch of oil, at least 100 yards in diameter, around it and more oil in the area of the explosion mark. The Whitley attacked again with two A/S bombs, which fell short, and the rear gunner fired two bursts as he passed over the U-Boat. It continued turning slowly until at 1248 it gradually disappeared stern down. As a result of H/502's excellent depth-charge attack this U-Boat was so disabled that F/61 was able to finish it off two hours later. This Lancaster flying at 1,500 ft., sighted an oil-patch several hundred yards long and about 100 yards wide, six to eight miles away. The pilot altered course to investigate, and at 1422 hours a track was sighted about four miles off, about half a mile from the oil-patch. A moment later, the conning-tower of a U-Boat was seen moving very slowly. The pilot immediately climbed into cloud, altering course to get on to the U-Boat's starboard beam. The Lancaster broke cloud at 2,000 ft. a little later, and found the U-Boat one mile away on its port beam. The pilot dived to attack, circling to port, but as the U-Boat was altering course to port he extended his own track forward. The final run up was made at an angle of 45° to the U-Boat's course from its starboard bow, and ten 250-lb. depth-charges were released from 100 ft. (set to 25 ft., spaced to 35 ft.) while the U-Boat was on the surface.

The stick straddled the U-Boat half-way between the bows and the conning-tower. When the foam and spray which completely hid the U-Boat, had settled, it had stopped, so the Lancaster climbed to 800 ft., and approached to make a bombing attack. The U-Boat's gun opened fire and tracer passed fairly close to the aircraft, whose front-gunner immediately replied, hitting some of the U-Boat's gun's crew. At 1430 hours two 250-lb. A/S bombs were released from 800 ft., and they appeared to fall very near the starboard side of the conning-tower. The pilot circled and attacked again but the two remaining bombs hung up. All three gunners fired heavily at the U-Boat, which did not reply. The U-Boat was now very low in the water, and members of the crew jumped or fell overboard. The Lancaster circled again and made a further attack with the two bombs which overshot by about 20 yards. At 1444 the crew abandoned ship; a minute later the bow lifted slightly and the U-Boat foundered stern first.

F/61 had been lent to Coastal by Bomber Command, and its crew were new to anti-submarine warfare. Their T.N.T. depth-charges could not be lethal to a U-Boat on the surface, and a close miss by an A/S bomb is also not lethal in itself. But the first two attacks by F/61 on a

U-Boat already damaged badly by H.502 undoubtedly completed the collapse of the strained pressure hull. (44° 57' N., 13° 02' W.)

Attacked Two U-Boats and Bombed Himself

At 1013 hours on 26th July, Hudson E/269, flying at 6,000 ft., sighted a wake 20 miles ahead in extreme visibility. The aircraft set course towards the wake, maintaining cloud cover, and on emerging into a clear patch of sky identified a U-Boat twelve miles ahead, making ten knots. The aircraft dived to sea-level, approached from dead astern, and attacked the U-Boat, which submerged when still 1½ miles away. About half a minute after it disappeared, four depth-charges were released and the fourth burst over the stern of the U-Boat, which, however, was already too deep to sustain more than a shaking. But in the unfavourable weather conditions E/269 put up a very creditable showing. (59° 56' N., 19° 24' W.)

Twenty minutes later E/269 sighted another U-Boat 15 miles away. The aircraft dived through cloud, attacking from the U-Boat's starboard bow, and from 200 ft. released two A/S bombs, tail-fused instantaneous, while the stern and the conning tower were still above the water. The resulting explosion was so violent that the aircraft rose considerably, and both main-planes, the fuel tanks and the bomb doors were holed by splinters. This was probably due to the bombs detonating on hitting the water. No member of the crew saw where the bombs actually fell; a large area of white foam about 200 yards long was seen afterwards, but its injuries and the loss of petrol forced the Hudson to set course for base immediately. (59° 56' N., 18° 44' W.)

An Ingenious Attack

At 1723 hours on 10th August, Wellington H/311, flying at 1,500 ft., sighted a U-Boat making eight knots, eight miles away on its starboard beam. The aircraft turned sharply to starboard with the sun behind it, and gained the cover of a small patch of cloud. Emerging from the cloud two miles from the U-Boat, the aircraft dived to attack down sun from its port quarter at an angle of 30° to its track. Realising that he might overshoot, the pilot only released three of his torpex depth-charges (set to 25 ft., spaced to 40-45 ft.) from 30 ft., while the U-Boat was still on the surface. This stick straddled the target, No. 1 exploding about 10 ft. from its port bow.

After the explosions the U-Boat slowed down considerably. During the run up the front gunner had opened fire at three men on the U-Boat's bridge. The U-Boat replied with twin light machine-guns, mounted immediately forward of the bridge casing.

The Wellington turned to port, and attacked again from ahead on track, releasing the three remaining depth-charges from 30 ft. while the conning-tower and part of the stern were still above water. No. 3 of this stick fell right on the estimated position of the U-Boat's bows. Soon after, an oil patch 100 yards across was seen on the site of the attack; half was light in colour and the rest dark brown. In the centre of this patch a succession of large bubbles persisted for five minutes, so that it looked as though the surface were boiling. Thirty-five minutes later the oil-patch had grown to about 150 yards in diameter.

The extremely good approach, making use of limited cloud cover and the sun, completely surprised the U-Boat, and was followed by an unorthodox but intelligent attack, which straddled the U-Boat the first time and scored a hit the second time. The oil and bubbles show that the U-Boat was damaged, probably extensively, while the crew must have been very severely shaken. (45° 59' N., 07° 44' W.)

A Salvo Attack

At 0900 hours on 12th August, Wellington W/311, flying at 2,000 ft., sighted the conning-tower of a U-Boat making ten knots, five miles ahead. The aircraft dived to attack from the U-Boat's port quarter at 30° to the track, and released six torpex depth-charges (set to 25 ft., spaced to 36 ft.) from 50 ft., while the periscope with a marked wake was still visible. The first four depth-charges exploded in a salvo right on the periscope, and resulted half a minute later in an oil-patch as large as 400-500 yards across, with dirty brown eddies in the centre. This oil-patch was still churning when the aircraft had to return to base at 0915 hours. This was a most unorthodox attack in that four depth-charges were released together in a salvo, but fully justified for the very large quantity of oil points to the U-Boat having been very seriously damaged, if not destroyed. (46° 20' N., 06° 30' W.)

Unusual Eruptions

At 0939 hours on 13th August, Wellington R/304, flying at 1,500 ft., sighted a fully surfaced U-Boat two miles away on the starboard bow, making 8-10 knots. The aircraft turned to starboard, but when it was still a mile away the U-Boat altered course to port, apparently under full helm, and then submerged. The pilot increased his turn, and attacked from the U-Boat's starboard quarter at 30° to its track, releasing six depth-charges (set to 25 ft., maximum spacing) from 50 ft., 20 seconds after the U-Boat had disappeared. Immediately before the release either the periscope or the gallows (which support the jumping wire at the after end of the U-Boat) could be seen moving about 30 yards ahead of the swirl. The stick straddled the U-Boat's line of advance about the same distance ahead of the swirl.

A sea-marker was dropped, and five minutes after the attack a patch of foam, about three yards across, appeared about 150 yards ahead of the explosion mark, growing rapidly till it was 30 yards across and circular in shape, with continuous bubbles rising in the middle. The whole patch looked as white as paper in contrast to the sea. The aircraft released an A/S bomb two minutes, and another five minutes after the appearance of the foam patch; the first missed, the second fell two or three yards from the edge of the patch, which was still boiling. The explosion of the second bomb was twice as large as that of the first, and immediately after it the boiling increased, and black objects began to come to the surface in the middle of the foam patch. Some of these objects were circular, looking not unlike human heads, others were large and triangular and others oblong. This went on for about a minute, but the objects could not be identified owing to the turbulent surface of the foam patch, which kept bringing

them to the surface and submerging them again. Most of the black objects came up on the edge of the patch nearest the explosion mark, where there was also a very marked light green streak under water.

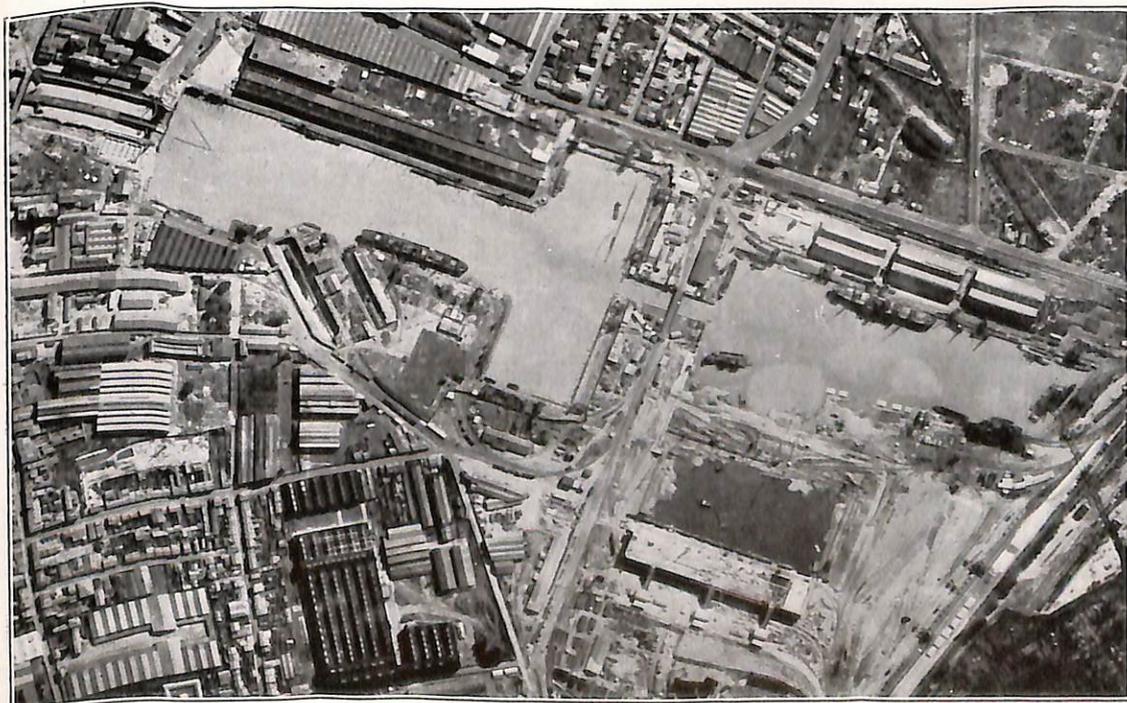
After the second bomb explosion a large quantity of oil spread round the foam patch, first as a ring, and finally in a large patch which reached nearly as far as the explosion mark. The foam patch was still 30 yards in diameter when the aircraft had to return to base 38 minutes after the depth-charge explosions. There is no question but that the U-Boat must have been very severely shaken and damaged, if not destroyed. (46° 08' N., 13° 28' W.)

A U-Boat Sunk and Crew Captured

At dawn on 20th August, PBV (Catalina) P/73 of the U.S.N. was flying off Iceland when a vessel was seen a mile and a half away, at 0510 hours. "At first sight it appeared to be a destroyer, so a recognition signal was fired from the port blister. As we closed to a mile, it was apparent that the object was a submarine, doing less than four knots on a course at right angles to ours. At the time, we were flying at about 500 ft. As we dived, the U-Boat ignited a flare fixed to the conning tower, which showed a white to yellow light. There were three men on the conning-tower, and as we came close they waved at us. We carried four 325-lb. depth-bombs on the port wing and two on the starboard; one hung up, five were released. Two columns of water between 75 and 100 ft. high rose on either side of the U-Boat, and about eight ft. abaft of its conning tower. The men on our after station saw the greater portion of the U-Boat lifted clear out of the water. We made two runs, firing both our guns, the U-Boat replying with machine-gun and cannon. By this time it was listing heavily to starboard. Well aft, and apparently on the port side, a powerful column of dirty white appearance was shooting into the air at a height of some 75 ft.; probably this was a mixture of compressed air, oil and water. The U-Boat was leaving a very clear oil slick, 30 to 40 ft. wide, behind, as it dodged very sharply at short intervals.

We withdrew to a distance of several miles, just below the clouds, and circled the submarine, broadcasting to all ships in the vicinity for assistance in finishing the battle. The sky was completely overcast, and there were numerous rain squalls. At about 0600 hours one squall settled over the U-Boat, and we lost contact. We searched the area as well as we could for about one half-hour, and finally bumped into the naval force and convoy we had been assigned to cover, in whose path, some five miles ahead, the U-Boat had obviously been waiting. We notified them of our attack. Then we started a creeping line of search ahead with no results. Our next move was a sector search aft, about two hours after our attack.

On the first leg of this search we sighted a huge oil slick. It must have been at least a mile by a half-mile, and very definite. We flew over it, and then sighted our U-Boat close aboard an Icelandic fishing vessel. The U-Boat lay well over on its side, with men all about in the water

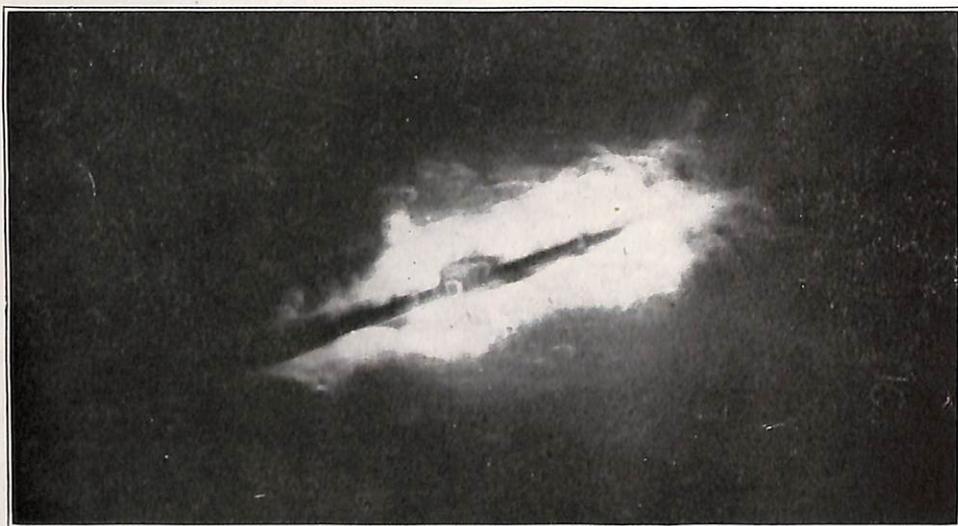


←
Pens
building
in Basin

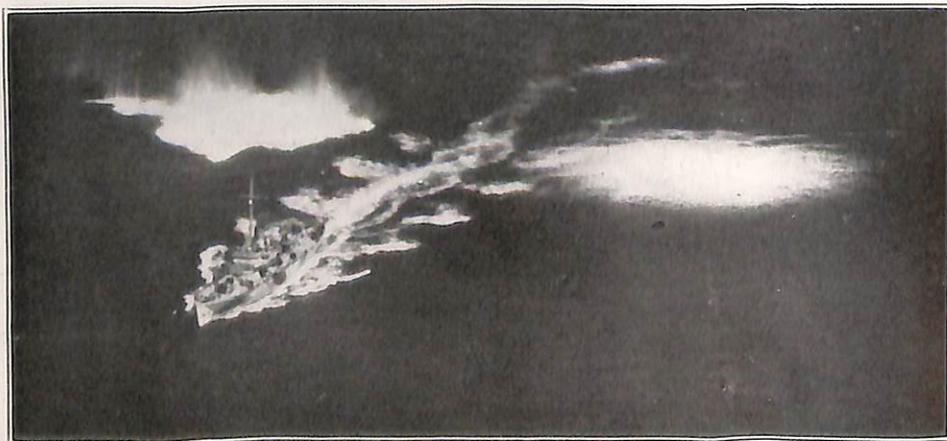
U-Boats :—Above, stern in a crash dive, 16th August. (R/58.)
Middle, swirl at the time of attack, 5th July. (T/58, see page 7.)
Below, the base at Bordeaux, 16th August; four U-Boats can be seen, one of which is in dry dock; work is in progress on covered U-Boat pens; compare issue No. 2, Plate 4. (P.R.U.)



Dropping leaflets on a tunnyman in the Bay of Biscay, 29th July (461 Squadron). French fishermen were warned to leave the sea clear for us outside their coastal waters under pain of attack. One fisherman was so frightened by the leaflet he received that he went straight to England rather than face the journey home.



British submarine seen by Leigh searchlight from 500 feet. (C.C.D.U.)



A corvette's depth-charge attack, 17th August. (B/210.)

with life-jackets, some on the Icelander's deck and a few on their own deck. Just after we flew over, we were fired on again. We did not return fire, for fear of danger to the Icelandic vessel, but set course for the naval force. As soon as we sighted it, we opened up on blinker requesting a destroyer to come and pick up prisoners. Permission was granted, and the destroyer blinked, asking us to lead her to it. We blinked a course,

then kept contact with the U-Boat, returning every few minutes to check the destroyer's course. When the destroyer came within five miles and we headed back the third time, the U-Boat had sunk—three hours after the attack. All the survivors were on the trawler, off which the destroyer took 52 prisoners." When they are interrogated, it should become known whether the U-Boat was scuttled. (61° 25' N., 14° 40' W.)

OTHER ATTACKS ON SUBMARINES, JULY AND AUGUST

It has not been possible to include all the very good or unusual attacks on U-Boats made in July and August, as many of the complete returns had not arrived at the time of going to press, especially those from Iceland and Gibraltar.

Failure of depth-charges to release has spoilt some promising attacks; others might have been lethal if torpex had been available.

From a few instances, it seems that one tactical point is not clearly appreciated. When a U-Boat dives before it can be certain that the aircraft has seen it, the aircraft, unless nearing P.L.E., should wait for it to resurface instead of dropping depth-charges which can only get it by a fluke.

* * *

On 5th July Whitley T/58, flying at 3,000 ft., sighted a U-Boat four miles away making eight knots, at 1732 hours. The aircraft turned to port, and attacked from the U-Boat's starboard bow at an angle of 15° to its track, releasing from 50 ft. three torpex and three T.N.T. depth-charges (set to 25 ft., spaced to 36 ft.), three seconds after it had disappeared (Plate 2). No. 2 depth-charge exploded 50 yards ahead of the swirl, and the remainder exploded as spaced. Some of the depth-charge plumes were almost black, suggesting that oil was mixed with the spray, and this may have been due to one or more of the blister tanks being burst open. Immediately afterwards a patch of oil arose, 80 ft. across, and five minutes later it had spread to 150 yards.

Six minutes after the explosions the bows of the U-Boat came up at an extremely steep angle and protruded about 15 ft. out of the water for one minute, after which it went down a little, then came up again and finally disappeared at the same steep angle. On analysis it appears that four of the depth-charges (Nos. 2, 3, 4 and 5) were correct for range and line and thus lethal in plan and depth, so that there is no doubt that this U-Boat was seriously damaged and it may well have been destroyed. (46° 02' N., 08° 58' W.)

* * *

On 6th July, at 0820 hours, Hudson S/500, flying at 3,000 ft. in visibility 3 miles, sighted a U-Boat making 8 knots $2\frac{1}{2}$ miles away. The aircraft attacked from the U-Boat's starboard beam, releasing four torpex depth-charges (set to 25 ft., spaced to 40 ft.) from 50 ft., while it was still on the surface. Nos. 1 and 2 depth-charges straddled the U-Boat just in front of its gun and abaft the conning-tower. The Hudson circled to port and saw the explosion mark, 200 yards across with a white foam edge and dark-coloured water in the centre. Many air bubbles came to the surface at the western edge of this mark, and 30 seconds later the conning-tower reappeared among them and remained visible half out of the

water for about 45 seconds. It then slowly disappeared with no forward movement, and air bubbles became more numerous for nearly a minute, after which they gradually ceased. The dark colour of the water in the centre of the explosion mark suggests oil, and the large quantities of air bubbles point to emergency blowing of tanks. Superficially at least, this attack resembles the one made by V/58 in May, which sank the submarine. (*Coastal Command Review*, No. 3, p. 11.) (59° 36' N., 8° 34' W.)

* * *

At 0848 hours on 15th July, Whitley B/502, flying at 3,400 ft., sighted a U-Boat making 8 knots, 4 miles away on the port bow. The aircraft circled to port, keeping up sun, and dived to attack from almost astern of the U-Boat, achieving complete surprise. Six torpex depth-charges (set to 25 ft., spaced to 36 ft.) were released from 40 ft., while the stern was still above the water; it disappeared in the interval between the entry and the explosion of the depth-charges. The first depth-charge fell about 30 yards ahead and slightly to port of the swirl, while the remainder straddled the U-Boat at a very fine angle.

The aircraft dropped a smoke-float, and then climbed to 1,000 ft., so as to be able to drop A/S bombs if the U-Boat resurfaced. It didn't, but 5–10 minutes after the attack an oblong patch of oil, 150 yards long, was seen about 30 yards ahead of the explosion mark. Although the approach tactics were very good, the stick appears to have been correct for range, and the oil-patch points to some damage in the fuel tanks, the line of the depth-charges was probably slightly to port of the U-Boat's line of advance, thus putting them just out of lethal range. (45° 08' N., 10° 53' W.)

* * *

At 1438 hours on 15th July Wellington T/311, flying at 2,000 ft., sighted a U-Boat 15–20 miles away. It dived immediately. The aircraft dropped a sea marker and went away up sun. Seven minutes later T/311 returned and found the U-Boat had resurfaced and was travelling at 8 knots. The aircraft attacked from the U-Boat's starboard bow at an angle of 15° to the track, releasing six torpex depth-charges (set to 25 ft., spaced to 45 ft.) from 50 ft. while the stern and conning-tower were still above water. The first three depth-charges undershot, but the remainder straddled the U-Boat and their explosions enveloped it in spray. The pilot then did a tight turn to port, and was back over the site of the attack 30 seconds later. Two underwater explosions were seen, the foam rising some feet above the surface at the leading edge of the explosion mark; these were probably the visual

effects of the blowing of the U-Boat's tanks with high-pressure air. At the same time a red gleam could be seen under the water and in the spray.

The aircraft dropped another sea marker and circled for 20 minutes, during which time air bubbles rose to the surface intermittently. Ten minutes after the attack a series of large gouts of oil, about three yards in diameter, rose to the surface and burst, forming a circular oil-patch, which when last seen was 60 yards across. Nothing further of interest was seen by the time the Wellington had to return to base at 1530 hours.

This was a highly creditable attack, though it is impossible to say whether it sank the U-Boat. The look-out must have been very good to have sighted the U-Boat in the first place, and when it dived the right tactics were adopted. The intermittent air bubbles and the large gouts of oil point to very serious damage. (44° 55' N., 12° 00' W.)

* * *

At 0530 hours on 26th July Hudson B/269, flying at 2,000 ft., sighted a U-Boat making 10 knots 3 miles away. The U-Boat, which was probably of the 700-ton class, was painted brown with grey wavy streaks. It had two periscopes up and carried guns forward and abaft the conning-tower casing, besides the usual light cannon at the after end of the bridge. The aircraft turned towards the U-Boat, flying into the sun, and dived to 30 ft., finally turning slightly to starboard and attacking from the starboard bow. Four depth-charges (set to 25 ft., spaced to 36 ft.) were released while the U-Boat was still on the surface. The stick straddled the target, No. 2 falling 10-15 ft. to starboard and No. 3 being either a direct hit near the base of the conning-tower or a very near miss alongside the port beam. The turret-gunner claimed a good many hits near the conning-tower.

The U-Boat appeared to lift slightly, and then disappeared in 5 seconds without any forward movement. A quarter of a minute later a large swirl was seen at the spot where the U-Boat had disappeared, and within 5 minutes an oil-patch had spread about 50 yards across about 150 yards ahead of the swirl. A little later another smaller patch was seen about 550 yards ahead of the swirl. Undoubtedly this excellent attack severely shook the crew and probably damaged the U-Boat in the oil-tanks. (60° 27' N., 18° 37' W.)

* * *

At 1530 hours on 27th July Wellington A/311, flying at 1,500 ft., sighted a U-Boat making ten knots, two miles away on its starboard beam. The U-Boat was of the German type, painted light grey, and had a fish-like U-shaped emblem painted on the side of the conning-tower casing. At the moment of sighting the aircraft was over three tunnymen—one of which altered course towards the U-Boat immediately after the first attack. The Wellington turned to starboard to attack, whereupon the U-Boat altered course from 270° to 180°, but made no attempt to submerge as the aircraft approached. The Wellington attacked from the U-Boat's starboard beam, and released four torpex depth-charges (set to 25 ft., spaced to 40-50 ft.) from 40-50 ft. As the aircraft attacked, the U-Boat opened fire

from twin guns abaft the conning-tower. The aircraft replied with the front gun, scoring hits on some of the crew of the twin guns. The depth-charges exploded across the U-Boat, No. 2 falling within two or three yards of its port beam, after which the U-Boat stayed on the surface almost stationary with a slight list.

The aircraft circled and made a second attack from the U-Boat's port beam, releasing the two remaining depth-charges from 10 ft. The first of these exploded right alongside the U-Boat's port side, and the second just overshot. The U-Boat immediately listed heavily to starboard, and a few seconds later went under without any forward motion. The conning-tower hatch was still open, but the lower lid must have been closed, otherwise masses of air and some bodies would have come up. Forty seconds after the explosions of the second stick, a large seething patch of green and grey oil was seen; it did not get bigger and was thought to be depth-charge residue, but the colour would be unusual with torpex; it might have been the visual effect of the iridescence which is typical of diesel oil. These two excellent attacks, coupled with a good approach and good shooting, are evidence of team-work of a high order; there is no doubt that the crew of the U-Boat were badly shaken, and almost certainly the U-Boat itself suffered serious damage. (46° 25' N., 09° 28' W.)

* * *

At 0802 hours on 31st July Hudson K/269, flying at 1,700 ft., sighted five miles away what was thought to be a fast motor launch. At a distance of 2½ miles, however, it turned out to be a U-Boat, which dived when the aircraft was still two-thirds of a mile away. The Hudson attacked from the U-Boat's starboard quarter at 30° to the track, releasing four 250 lb. depth-charges (set to 25 ft., spaced to 36 ft.) from 100 ft. 15 seconds after the U-Boat had disappeared. The first three depth-charges exploded 50 yards ahead and across the line of advance, but the fourth must have partly hung up, for it burst 30-40 yards beyond the other three. As K/269 circled to port, two brown circular patches, 30-50 yards across, were seen where the depth-charges had exploded. Hudson Y/269, which had observed the explosions of the depth-charges, came and joined K/269 in circling the position. At 0822 K left and carried out baiting tactics, but on returning at 0857 found Y still circling.

At 0916 K left for base, but Y remained, and at 0920 sighted a large swirl and wake 3-4 miles away, which it attacked, releasing four depth-charges from 20 ft. The centre of this stick was about 25 yards ahead of the swirl, but no results were seen. At 1057 Y saw another swirl about four miles away, but when it arrived over the spot the swirl had subsided, leaving an oil-patch measuring about 200 yards by 50 yards and a smaller one about 50 yards across. Shortly afterwards the aircraft reached P.L.E. and set course for base.

The first of these two attacks, the one made by K/269, was an excellent one, the explosions taking place within lethal range of the pressure hull. The oil-patches point to the U-Boat being damaged, and its crew were undoubtedly severely shaken. It is unfortunate that the baiting tactics adopted by K/269 were defeated by the

continuous presence in the area of Y/269, especially since the two partial sightings by Y prove that the U-Boat was anxious to surface. If only Y had gone right away for an hour or two it would have got a real chance on a fully-surfaced U-Boat instead of the inconclusive result actually obtained (60° 18' N., 17° 34' W.)

* * *

At 1753 hours on 3rd August, Wellington O/304, flying at 2,000 ft., sighted a U-Boat making 8 knots 5 miles away. The aircraft dived, and at 50 ft. released six 250 lb. depth-charges (set to 25 ft., spaced to 40-45 ft.) at an angle of 40° to the track of the U-Boat, which had submerged 20 seconds before the attack. The centre of the stick exploded 50 yards ahead of the swirl. As the aircraft circled, it saw between the residue of the second and third depth-charges an oil-patch about 10 yards across, round the edge of which rose air bubbles 3 ft. across. They were still coming to the surface when the Wellington had to return to base ten minutes later. This was a very good attack. The third and fourth depth-charges should have been right on the U-Boat's tail, and at the correct depth, and the oil and bubbles point to damage to the U-Boat as well as a severe shaking for its crew. (46° 08' N., 06° 20' W.)

* * *

At 1508 hours on 5th August, Wellington P/311, flying at 2,500 ft., sighted a U-Boat making 15 knots, three miles on its starboard beam. The aircraft turned sharply to starboard, but the U-Boat zig-zagged, and then dived when still a mile and a half away. The aircraft countered by turning slightly to port, and attacked from the U-Boat's port quarter at an angle of 20° to its track, releasing six torpex depth-charges (set to 25 ft., spaced to 40-45 ft.) from 200 ft., 10-15 seconds after the U-Boat had disappeared.

The stick exploded with No. 2 depth-charge about 100 yards ahead of the swirl. No. 4 threw up five times as much water as the others, and a green flash lit the base of the explosion. Two or three minutes later a reddish-brown patch of oil, 200 yards across and with small air bubbles in the centre, appeared on the scene of the attack. The aircraft dropped a sea-marker and adopted baiting tactics, but nothing fresh was seen when it returned half an hour later. The stick had fallen rather too far ahead for a really lethal straddle, but the oil points to a near miss that must at least have shaken up the crew and may have inflicted minor damage on the U-Boat. (45° 40' N., 05° 20' W.)

* * *

On 9th August, Liberator W/120 was escorting a convoy when a wake, believed to be a U-Boat's was sighted, and at 1908 hours the aircraft arrived over a swirl, which it did not attack, not knowing how long the U-Boat had submerged. At 1942 hours another wake was sighted in the same position and on the same course; one of the escort vessels was making for the position, but the U-Boat dived. At 2108 hours the Liberator resumed distant convoy escort, and at 2322 hours, when flying at 800 ft., sighted

(C46406)

an object three miles away, at first thought to be an escort vessel, but discovered at two miles range to be a fully surfaced U-Boat making 8-10 knots in a position 29 miles from the convoy.

The aircraft attacked from the starboard beam of the U-Boat, and released six torpex depth-charges 10 seconds after it disappeared. The stick fell 50-70 yards' ahead of the swirl, straddling the U-Boat between the conning-tower and bows with the fourth and fifth depth-charges, which would be about right for depth. Although it was too dark for accurate observation, a brown patch was seen on the surface, with a column of water in the neighbourhood of the attack. This attack should at the least have very severely shaken the U-Boat. (56° 56' N., 26° 18' W.)

* * *

At 1413 hours on 10th August, Sunderland E/461, flying at 2,500 ft., sighted a U-Boat on the surface five miles away on the port quarter, making ten knots. The U-Boat left a definite oil-streak about ten yards wide and a mile and a half long. The aircraft turned towards the U-Boat, which submerged 2½ miles away, but when the aircraft was about 600 yards from the swirl the conning-tower and stern reappeared for a short time.

The aircraft attacked from the U-Boat's port beam at right angles to its track, and released six torpex depth-charges (set to 25 ft., spaced to 35 ft.) from 50 ft., 12 seconds after the second disappearance of the conning-tower. The depth-charges straddled the line of advance at the point of aim, about 60 yards ahead of the swirl, which should have been the actual position of the conning-tower. Five minutes after the attack, an oil bubble of 60 yards by 25 yards and two large air bubbles were seen 200 yards ahead of the explosion mark. The well executed attack certainly shook the crew severely, and probably caused a certain amount of damage. (44° 39' N., 12° 21' W.)

* * *

At 1925 hours on 16th August, Wellington G/311, flying at 1,500 ft., sighted a grey-green U-Boat travelling at five knots 3-4 miles away. The aircraft made a steep turn to starboard, and as it did so, the U-Boat altered course about 30 degrees to port and began to dive. To counter this move the pilot altered his own course slightly to port and attacked the U-Boat from its starboard quarter at 15 degrees to the track, releasing from 30 ft. six torpex depth-charges (spaced 35 ft.) while the periscope was still visible just ahead of the swirl.

The first two depth-charges appeared to straddle the point where the periscope was last seen. The explosion of the third depth-charge produced a black column of water, which may have been due to a disrupted oil-tank. A quarter of a minute later an oil patch, 30-40 yards across, with air bubbles in the centre, appeared for 3-4 minutes. The Wellington adopted baiting tactics, and a quarter of an hour later returned and found the oil patch much larger and greenish-brown in colour. The amount of damage inflicted cannot be estimated; no camera was fitted to the aircraft. (46° 35' N., 06° 58' W.)

ASSESSING ATTACKS ON U-BOATS

Some notes on the method of analysing and assessing U-Boat attacks, to explain the system in use, may be of interest. The object of the procedure is not mere curiosity. Analysis enables a tab to be kept on technical weakness and of the state of training; it is the thermometer which shows the first symptoms of waning efficiency. Tactics in anti-U-Boat warfare must necessarily be in a state of flux. A certain set of tactics produces counter-tactics and new methods of evasion, the first signs of which will be noted by the operational squadrons. Study of their reports will disclose a similarity in the conditions which lead to success or failure and enable the most profitable to be adopted. For example, the decision to fly above cloud and up to heights of 5,000 ft. was the outcome of analysis of the methods of the Officer Commanding 1404 Met. Flight, which obtained an outstanding number of sightings that resulted in surface attacks.

The First Interrogation

The aircraft having sighted and attacked a U-Boat, and returned to base, the crew are interrogated by the Intelligence Officer. As the crew are tired, this interrogation is restricted to the bare minimum sufficient for a preliminary report, the Form Orange. This is sent to Headquarters so that the Naval and Air Staff at Command can sketch out the attack. If the attack appears to be a good one, a tantalising period of suspense intervenes until a more detailed report is available, when the crew have rested, for it is very rarely that the Form Orange gives all the information needed for the full evaluation of the attack.

The sighting and attack of a U-Boat happens in a period of seconds, or at most minutes, and as a rule no one member of the crew sees it in all its phases. The complete picture can only be built up by piecing together the recollections and impressions of individual members of the crew. And often its final composition depends on what appear to be unimportant details with no direct bearing on the final result, except to those thoroughly versed in the ways of submarines and the records of scores of previous attacks. Every attack includes some new features or variations of the factors which make it up, and each has its own lessons which, if correctly drawn, are invaluable to aircrews and to the staff alike.

The Second Interrogation

Having rested, the aircrew assemble for a discussion on the attack, and Form C.C.A.U.B. recalls the results of this further meeting. While the Form Orange is exclusively a report drawn up by the Intelligence Officer, the Form A.U.B. is intended to provide fuller details of an operational nature. Its completion is therefore the result of an investigation made by the Squadron and Flight Commanders, and its aim is to give the full picture of the attack. No detail is too small, nor can it be too precise. The positioning of the depth-charges; any unusual observations on the detonations; the appearance of oil, giving its approximate time, colour, texture and extent; air bubbles, with their nature and, above all, time of appearance; the re-surfacing of the U-Boat and

its behaviour; these are only a few of the points which shed light on what really took place on or under the sea.

Accurate assessment depends on the accurate recording both of the time between sighting and attack and of the point in relation to the swirl where the depth-charges are dropped. Judging of distance over water is notoriously difficult at the best of times, so that photographs are indispensable to check the (often divergent) impressions of the crew. Sometimes they have proved that an attack was far more favourable than visual observation would suggest.

The Third Interrogation

The written word never tells the whole story. Often enough the Form Orange and A.U.B. leave doubts which can only be resolved by personal contact. Therefore the aircrew, whenever possible, comes to Coastal Command Headquarters to be interviewed in person by the Naval and Air Staff concerned with anti-submarine warfare.

This procedure has now been running long enough to gauge its value. The crew, from direct access to those responsible for summing up their action, find how much thought is expended on each individual attack. The staff are brought in touch with the realities of operations and have the opportunity to explain current orders, to clear away misconceptions which may have arisen about them, and to hear the crew's reaction to them. The causes of poor attacks can be elucidated and the crew set upon the right track. The difficulties of this form of warfare are so great that they scarcely ever merit censure, but often call for discussion and understanding of the circumstances surrounding them. Staff and crew alike learn from studying the attacks, whether good or bad, from every aspect. Finally, the visit to Headquarters is designed to give the crew a chance of seeing the work of the Command as a whole and of the broader implications of the particular work on which they are engaged, and to widen their appreciation of problems from which stations and squadrons are generally free.

It may seem that the aircrews are subjected to a third degree of no mean order. If so, they submit to it so cheerfully that Headquarters conclude they find it as worth while as the staff certainly do.

Judgment by the Admiralty

The last stage in assessment is the submission of the report to the Admiralty. Here all attacks on U-Boats, by naval vessels and aircraft, are judged by a final tribunal, which takes a strictly impartial view of evidence that is often affected by wishful thinking and uncorroborated statements. If the decisions (now published in the *Monthly Summary of Anti-Submarine Warfare*) are sometimes less optimistic than it would be pleasant to believe, it can be taken that they are only reached after the careful consideration of all the available information on the subject. Where aircraft are concerned, the total destruction of a U-Boat can only be claimed on very rare occasions, since they cannot often provide tangible evidence in the shape of bodies or wreckage, unless a surface

ship is nearby. Further, time may throw light on the ultimate fate of a U-Boat; when this happens, the assessment will be upgraded.

Unassessable Results

The object of the anti-U-Boat war is to kill U-Boats; but if the number put out of action appears small in relation with the number of attacks, it does not mean that the hours flown over the sea in all weathers have been of no avail. The harassing of the U-Boat has not been without marked effect. During the latter half of 1941 the U-Boats were pushed further and further out into the Atlantic, till practically all the attacks they could make took place outside the 600-mile limit of Coastal Command escort range. That this was, in fact, due to Coastal Command patrols, and not to any other factor, is shown by the circumstances in which inward-bound convoys have recently been attacked by packs containing up to six or more U-Boats. When the convoys were out of range, losses resulted, but in each case as soon as Coastal Command aircraft made contact, although the U-Boats remained in the vicinity, they hesitated to approach near enough to attack, and the convoys reached port without being further molested (Chart IV).

This in itself, taking all the circumstances into account, is no mean achievement. Prisoners of war from U-Boats have frequently complained of the way they have been hunted by our aircraft while on passage in the Atlantic and forced to dive, often several times a day. With better armament, more training, and tactics developed

to meet the ever changing situation there is reason to believe that the sinkings will increase and that the U-Boats will show even more respect for the aircraft of the Command.

One final point is perhaps worth mentioning here. Psychology enters largely into both U-Boat and anti-U-Boat warfare. At the end of 1941 the morale of the U-Boat crews was undoubtedly waning. The profits of the business were low, and such few as were gathered in meant hard work, considerable damage and incessant strain. With the extension of the war to the other side of the Atlantic, the firm has prospered, and is able to put over a satisfactory balance-sheet; and the members are well on the way to regaining confidence. On the other hand, anti-submarine patrols are apt to seem to crews a somewhat dreary occupation, much like searching for the proverbial needle in the haystack, devoid of the glamour of the other forms of flying. It is therefore of the utmost importance for aircrews to take a real interest in U-Boat hunting, and all its implications, so that they are as fully armed as the enemy in the daily battle of wits over the seas.

It is therefore essential to make a close study of both the planning and the execution of each sortie and each attack, and a detailed analysis of all the circumstances surrounding them. The operational staff of squadrons, stations, and groups, and the specialist staff at the Headquarters, can only achieve this if there is a spirit of co-operation and understanding between them and the aircrews on the job, as between equal partners.

COASTAL COMMAND IN RUSSIA

Early in July Coastal Command operated for the first time in North Russian waters, for the benefit of a convoy going from Iceland to Russia, and another making the passage in the opposite direction. Both these started on 27th June. The Germans had concentrated a strong bomber force in northern Norway (including some torpedo-bombers) and had a considerable number of U-Boats cruising between Jan Mayen Island and the Barents Sea, while four of their major naval units moved northwards up the coast of Norway. On our side, effective air escort could be given within range of our bases in the north. However, when this convoy reached waters north of 70 degrees it would have no support other than the British and Russian submarines in the Barents Sea and the small Russian air forces based in the Murmansk area.

It was therefore decided, in consultation with the Mission to Russia, to despatch a force of Catalinas to operate from the Russian flying-boat base on a lake near Archangel. The Soviet authorities agreed to supply facilities for up to six Catalinas to be based there and to use a forward re-fuelling station on the Kola Inlet.

The first two, belonging to 210 Squadron, left Sullom Voe early on 1st July, flew round North Cape, carrying out a reconnaissance on their way, and landed on the lake after more than 16 hours in the air. The remainder—two Catalinas of 210 and two of 240 Squadron—went on the 3rd and 4th. Some of these made cross-over patrols during the journey, in one case prolonging it to such an extent that an aircraft flying from Sullom Voe to Kola Inlet was airborne 19½ hours.

On their transit flights the Catalinas sighted several enemy aircraft and two periscopes.

After their arrival in Russia the main duty of the Catalinas was to carry out an unceasing search for the German naval units and give all possible protection to the inward-bound convoy. To cover its advance, the patrols moved inward on the arc of a circle. But on the night of the 4th-5th the German warships advanced northwards to attack and the Admiralty recalled the escort and ordered the convoy to scatter. The aircraft could deal with this complication only by estimating the probable line of advance of the enemy ships and placing a cross-over patrol across it. On the 5th reports from both a Russian and a British submarine showed that the *Tirpitz* and either the *Hipper* or the *Scheer* were heading for the convoy, but the Russian commander had fired two torpedoes at the *Tirpitz* and heard the explosions. Whatever the results of his attack, by midday on the 6th the warships were known to be returning to harbour.

Shortly after the convoy scattered, the enemy subjected it to intense air and U-Boat attack, damaging or sinking a number of vessels. One U-Boat was machine-gunned by a Catalina and forced to dive, while three others crash-dived before attacks could be made. One of the aircraft flying near Novaya Zemlya saw several burning ships. On the following day, the 8th, another found a boatload of survivors, dropped them a bag of biscuits and corned beef, and directed rescue vessels to their position. By the 10th, all but one of the Catalinas had returned to their home bases, and the last soon followed them.

The Russians made the crews most welcome, and did everything to make them comfortable. Life on the Station is definitely communal. The British crews lived in communal houses, ate Russian food and drank locally produced beer, large canisters of which appeared on the table at most meals. The wives and families of the Russian flying officers mostly work in the gardens and fields all day and dance to a gramophone in the evenings. A major's wife acts as the station barber, in which capacity she shaved off a good deal of the face of one member of the expedition who had been badly bitten by mosquitoes. The mosquitoes were the one thing the crew complained about; the regular air raids gave only trifling inconvenience compared with them.

The outstanding interest of the whole operation lies in the fact that the aircraft carried out a fairly effective reconnaissance in an area more than a thousand miles from their base. No such thing has ever before been attempted, and even

a short while ago it would have been considered impossible. Apart from the trip back, the Catalinas carried out 360 hours of operational flying over the Arctic Ocean, up to latitude 77° North. One went so far north that it met the ice pack. It must be appreciated that no W/T could be used and all flying had to be done entirely on D.R. and astro-navigation. Sea fog covered great areas, and in clear stretches the mirage tricked the crews with bogus ships or clouds. No mechanical failures developed, only one sortie had to be curtailed because of engine trouble, and the aircraft were maintained at full serviceability throughout. Obviously the flying and ground crews of Squadrons 210 and 240 deserve the greatest credit. The improvised ground organisation was extremely effective. The Russian ground crews worked well, and the re-fuelling arrangements were all that could be desired; no serious difficulties of any kind were experienced.

WHALES, NOT SUBMARINES

The shape and size of objects seen at sea are notoriously deceptive to the eye, as their appearance differs according to the angle of view, the weather conditions and other factors. Therefore, although there are many differences between submarines, whales and sharks, there is enough superficial resemblance to give rise to confusion.

Most whales inhabit the open ocean, and are likely to be seen, especially in summer, some distance out from the coasts of Ireland, the Hebrides, the Shetlands and the Faroes. They are very rare in the North Sea and the English Channel; basking sharks, however, are sometimes common in northern British coastal waters and some small whales may be seen there also. Little is known of the density of the whale population, but the average can hardly be more than two or three to ten square miles of ocean.

The group of animals which includes whales, porpoises and dolphins is known as the Cetacea. They have an outward fishlike appearance and spend their whole life in the water, but are distinguished from fish by numerous fundamental characters. They are warm-blooded and air-breathing; round the mouth are a few scattered hairs, the last remnant of the typical covering of all mammals; the fore-limb has in its skeleton all the elements which are found in a typical mammal fore-limb. The hinder limb has completely disappeared, leaving no external trace. The tail is in the horizontal plane, whereas in all fishes it is vertical.

Cetaceans, like other mammals, give birth to live young, which accompany the mother for several months and are suckled by her.

Existing Cetacea are divided into two sub-orders (whalebone whales and toothed whales) based on the presence or absence of teeth in the adult.

To the whalebone whales belong all the species which are of very large size except the Sperm. They are characterized by absence of teeth, the possession of whalebone, and nostrils opening to the exterior by two longitudinal slits—the blowhole—situated far behind the tip of the snout.

Whalebone is not bone in the accepted sense of the word; it consists of a series of some hundreds of triangular horny plates in the mouth,

attached, one behind the other, to each side of the upper jaw. The inner edges are frayed, and form a very efficient straining mechanism for catching the small shrimps and other organisms on which these whales feed.

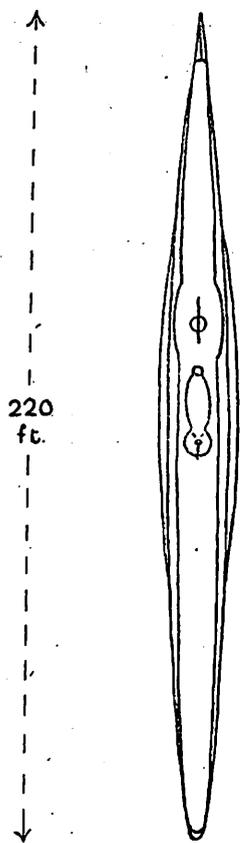
The toothed whales, as their name indicates, are characterized by the possession of teeth and the absence of whalebone. The number of teeth varies greatly; for instance, the Common Dolphin has about forty on each side of upper and lower jaws, but the Bottle-nosed whale has a single pair at the extreme tip of the lower jaw, which have no obvious functional importance whatsoever.

These whales feed on squids, octopuses and fishes; and the Killer whale may eat seals and even other Cetaceans.

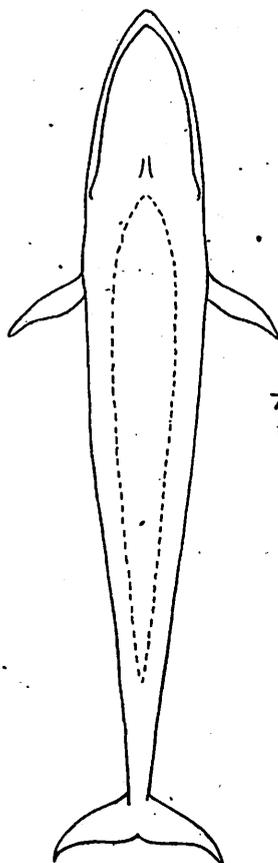
The outer opening of the nostrils, or blowhole, of the toothed whales is a single aperture; in the Sperm whale it is situated at the extreme end of the snout, but in all the remaining members of the sub-order it is some distance behind.

The whalebone whales which might be suggestive of U-Boats or parts of U-Boats are the Biscayan and Greenland Right whales, the Blue whale (maximum size 100 ft.), the Fin whale (up to 60 ft.), the lesser Rorqual (up to 30 ft.) and the Humpback (up to 50 ft.). The Right whales are now rare, especially the Greenland Right—which is confined to the Arctic. The most important are the Rorquals which include the Blue, Fin, Sei and Lesser Rorqual. Of these the Fin whale is probably much the commonest, but they are not easily distinguished from one another. Blue and Fin whales generally keep to the open ocean but the Lesser Rorqual is not uncommon in northern coastal waters, and Sei whales sometimes form unexpected local concentrations. Humpbacks, which are near relatives of the Rorquals, keep to more definite migration routes which may be close to the land in warmer latitudes.

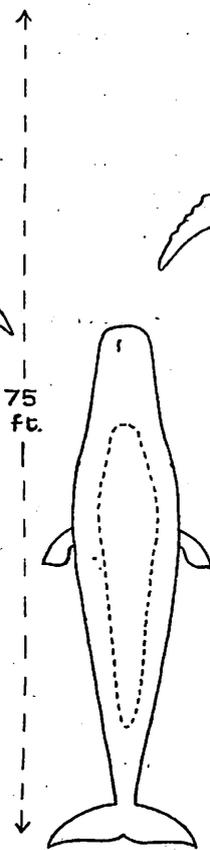
The Sperm whale is the only large toothed whale and is occasionally seen in British latitudes in the open ocean. There are various smaller toothed whales in British waters, but some are rare and many are small dolphin-like animals which may be neglected for our present purpose. However, the Bottlenose, Blackfish and Killers grow to 20-30 ft. (Plate 5.)



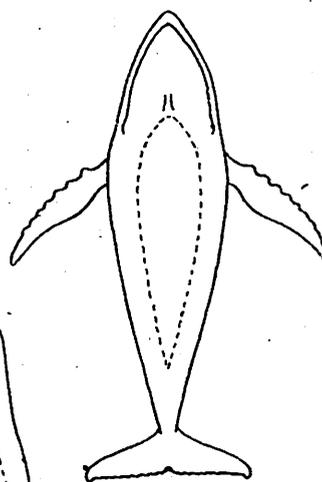
U-Boat, 517 ton class.



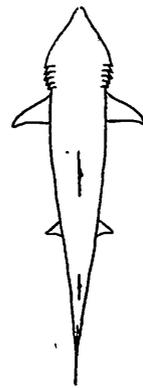
Rorqual, seen from above; the dotted line shows the approximate area exposed at the surface.



Sperm whale.



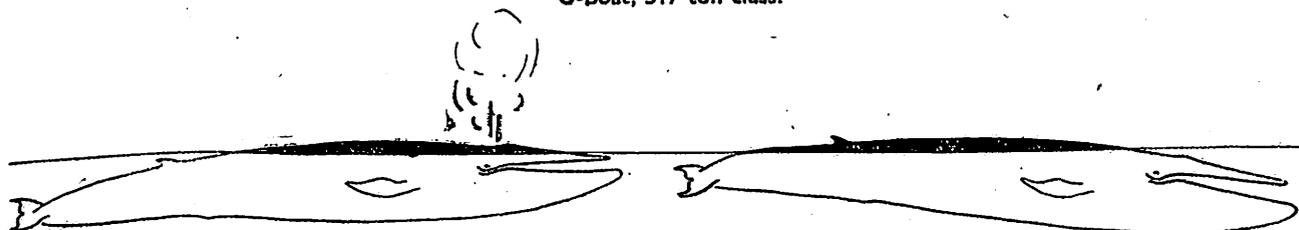
Humpback whale.



Basking shark.



U-Boat, 517 ton class.

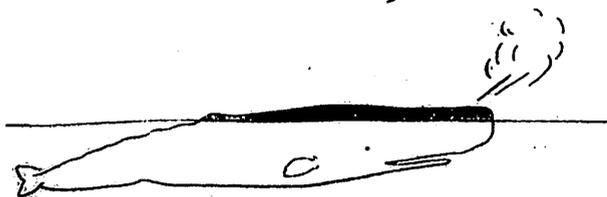


Typical view of a Rorqual breaking surface to 'blow'.

Rorqual immediately after blowing.



Rorqual about to dive after a series of blows; note arched back.

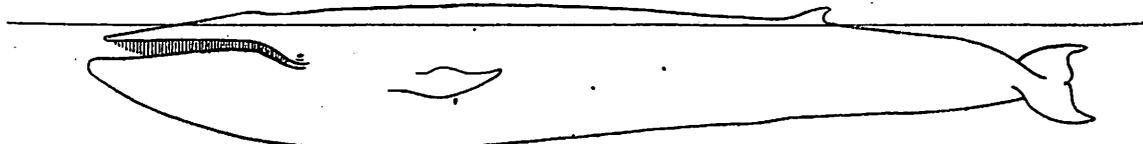
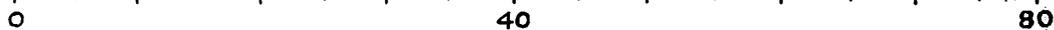


Sperm whale blowing. (Note that a Sperm whale at short range bears more resemblance to a U-Boat than a Rorqual.)

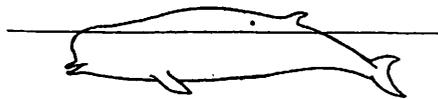


Humpback about to dive.

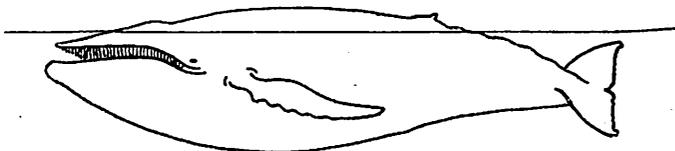
SCALE OF FEET



75ft. Fin whale (Blue whales similar but larger, Sei or Little Piked whale similar but smaller).



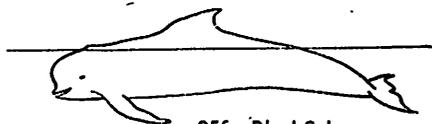
26ft. Bottlenose.



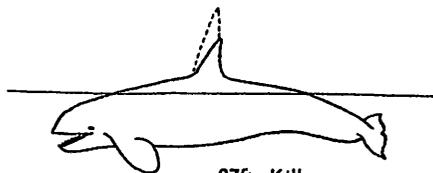
43ft. Humpback.



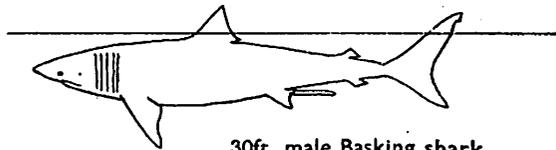
50ft. Sperm whale



25ft. Blackfish.



27ft. Killer.

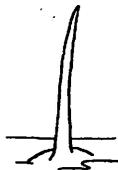


30ft. male Basking shark.

DORSAL FINS :



Dorsal fin of adult male Killer.

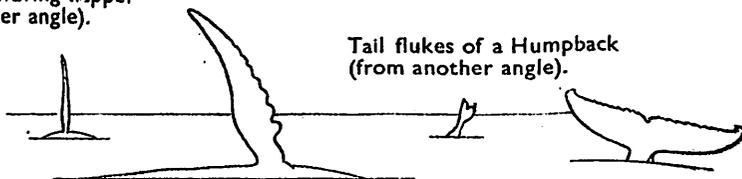


Dorsal fin of female Killer.

End-on view of dorsal fin of male Killer.

Humpback waving flipper (from another angle).

Tail flukes of a Humpback (from another angle).

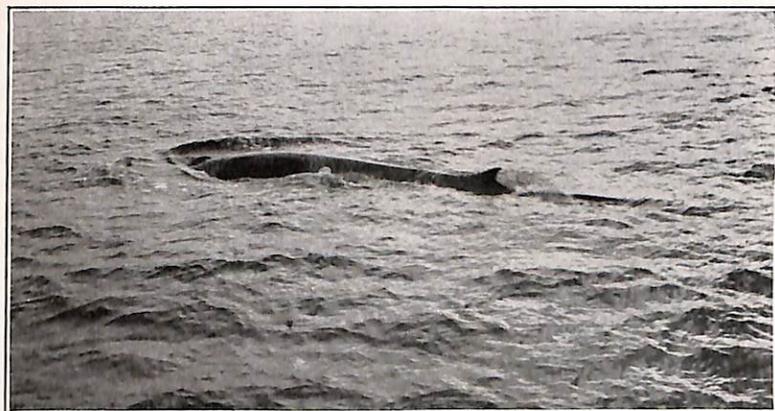


Humpback waving flipper.

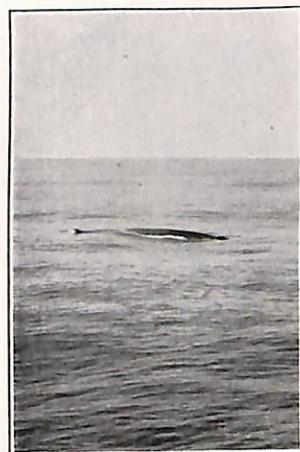
Tail flukes of a Humpback.



School of Large Rorquals; they might be Blue or Fin whales but since there are at least four together they are probably Fins. (209 Squadron).



Fin whale with blowhole about to submerge.



Fin whale in blowing position.



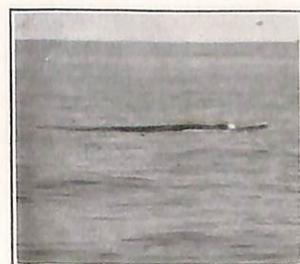
Fin whale immediately after blowing.



Slick.



A school of Fin whales and slick.
WHALES AT SEA



Fin whale.



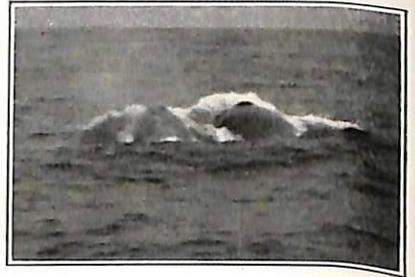
Killer whale ; note the tall dorsal fin, showing dark in white patch. (461 Squadron).



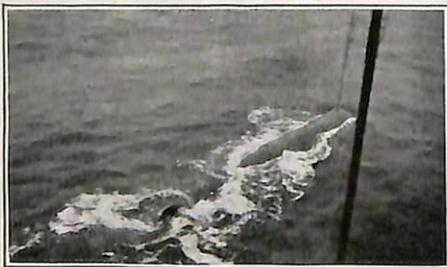
Blackfish.



Humpback "sounding" and turning to port; note flexibility of body.



Blue female and calf, running at over 10 knots; note distended blowholes.



Sperm whale in blowing position.



Sperm whale showing dorsal fin.



Fin whale about to dive after a series of blows; note arched back.



Fin whale.

WHALES AT SEA

The whale in the top left picture was first seen from 3 miles and taken for a U-boat.

Since whales are warm-blooded mammals and breathe air they can never leave the surface of the sea for long. They break surface in order to breathe, and this is normally the only time when they are seen. The blowhole is on top of the head and is the first part of the body to leave the water (Plate 4). The air is immediately expelled from the lungs, and the sudden reduction of pressure condenses the moisture in the breath to form the fountain-like spout. Air is quickly drawn in through the open blowhole, which then shuts as the head sinks below water. A considerable part of the back is exposed after the head has disappeared (Plates 4 and 6). In Fin whales the period of exposure is only about 3 to 6 seconds and is usually repeated five or six times at intervals averaging about 25 seconds. In these intervals the whale keeps close to the surface, but at the last "blow" the back is arched (Plates 4 and 6) and the whale dives (or "sounds") and does not reappear for about 2-10 minutes. At the next series of blows it may be swimming in quite a different direction. Other species behave in a similar way though the intervals may differ a little.

Fin whales swim alone or in schools of about two to eight (Plate 6). Blue whales are more solitary and it is very uncommon to see more than two in company. Several Humpbacks might be seen together, but of Sperm whales only solitary males would be seen in these latitudes.

Most whales have a gregarious tendency. A "school" consists of a small number swimming within a few feet of each other, but sometimes large numbers of schools and individuals are seen at the same time in an area of a few square miles, forming a herd of sorts. This is not uncommon with Fins and Humpbacks. Fin and Blue whales normally swim at something like 6-7 knots. When feeding they swim more slowly and frequently change direction. When they are travelling "on passage" the speed is greater (perhaps 8-9 knots) and they keep on a definite course. When scared they may reach a speed of 12-16 knots. The Sei and Lesser Rorqual are smaller whales but not much slower, and Humpback, Right and Sperm whales are rather slower than the Rorquals.

Whales are most easily seen in calm weather and the spout is most noticeable in cold weather. In rougher weather rather more of the body is exposed, but they are not easily spotted because the surface of the sea is broken up and in a strong wind the spout is flattened out.

Except when travelling at speed, a whale produces very little foam. The movement of the horizontal tail flukes, however, leaves a series of swirls at the surface. This is called the "slick" (Plate 6), and looks like an oily patch about 20 ft. across. Whales can often be followed by the slick when they are swimming a little way below the surface. *In no circumstances, however, does any living whale exude oil or leave a film of oil on the water.*

Whalebone whales feed mostly on small organisms, such as shrimps, for which they do not have to dive to any great depth. Sperm whales, however, feed principally on squids, and to find these they are believed to go to considerably greater depths.

Whales are migratory animals. Broadly speaking they travel northwards in summer into the

colder waters where their food is most abundant, and return southwards in winter towards the tropics, where they find little food, but where breeding takes place. To the west and north-west of the British Isles they should be commonest in summer, but might be seen at any time of year.

The Basking shark, though as large as a small whale can be distinguished by the *vertical* position of the tail-fin. It is a sluggish, surface-swimming fish with a habit of lying nearly motionless at the surface in fine weather with the back awash, as if "basking" in the sun. When moving at the surface, the tip of the triangular fin in the middle of the back and the upper tip of the powerful tail-fin characteristically project from the water (Plate 5) and, if the fish is engaged in feeding on plankton (small organisms in the water), the snout may also break the surface from time to time (*Coastal Command Review*, No. 3, Plate 6).

Little is known of the winter habits of this shark, which appears to retire then to deeper waters, and any information as to the movements of large shoals would be welcome to scientists.

In the top half of Plate 4, submarines, whales, and Basking sharks are compared as seen from above. In the bottom half they are compared in profile. A hundred feet may be taken as the maximum size of the largest species of whale, so that to look anything like a submarine, the whale must be considerably nearer. Note that the head of a Whalebone whale is broader than the bow of a U-Boat, but the head of a Sperm whale seen in profile is not unlike the bow of a U-Boat (*see also* Plate 7). Seen from above, the underwater parts of a whale may be visible in calm weather, and the flippers and tail flukes should then be distinctive. Since Basking sharks do not expose the body they should not easily be mistaken for U-Boats, but glimpses of the fin and tail from the end-on view might suggest a distant conning-tower or periscope. The dorsal fin of a Killer whale (Plate 5) can look very like a periscope. Humpbacks have a habit of rolling about at the surface and waving their limbs in the air, and here again a periscope might be suspected (Plate 5).

Possibly the most obvious difference between a U-Boat and a whale lies in the fact that *a U-Boat is exposed at the surface for some time, whereas a whale is never exposed for more than a few seconds at a time.*

The presence of birds at the surface may indicate a whale, but they might also be attracted by, say, the galley refuse from a U-Boat, and there is no reliable distinction here.

A large whale is not easily killed. The lethal range of a depth-charge is probably not great, and a near miss with a bomb might do no more than injure it. A direct hit would presumably kill it outright, but there would be no great flow of oil. Most of the oil in a whale is contained in the blubber and bones. The blubber is simply a layer of fat about 6 in. thick under the skin, and if much lacerated might possibly ooze a little oil. It is very unlikely that it would cause any extensive film of oil on the water, but the water might be discoloured by blood and guts in the immediate neighbourhood of the carcass.

A dead Rorqual sinks, but a dead Right whale or Sperm whale will usually float.

OIL-STREAKS

Oil-streaks and patches seen in the sea appear to have an irresistible attraction to air crews, yet practically every depth-charge dropped on them has been a depth-charge wasted. Orders have been issued that attacks are not to be made on oil-streaks, and, so that crews may appreciate the reasons for this order, some facts about oil and its peculiarities are given here.

The diesel oil used in U-Boats is very thin and very similar to paraffin. When it rises to the surface it has no marked colour and leaves no clear-cut edges. It resembles oil in a puddle, showing rainbow colours when the sunlight strikes it, but is chiefly noticeable by the way it smoothes out the surface of the sea. The other types of oil to be found at sea come from wrecks and are either crude or fuel oil. Both types are similar to look out. The oil is brown in colour but may vary in shade. It appears thick and viscous and has very clear-cut edges. It often comes to the surface in bubbles or gushes and is far more persistent than diesel oil.

Oil comes to the surface from a U-Boat either because the blast of a depth-charge forces some out of the saddle tanks, which are always open to the sea, or because of a punctured tank. In neither case does it rise in bubbles, except immediately after an attack when the U-Boat is gravely damaged. On the other hand, oil from a wreck only comes to the surface when corrosion or wear has made a hole in the tanks. Then oil and bubbles will come up together, and if the hole is small they may continue to rise for many hours or even days.

Reports are frequently received of oil-streaks moving in a certain direction. Though they may appear to do so, the *head* of the streak does not in fact move appreciably. If there is no tidal stream, but only a surface set caused by the

wind, a bubble of oil rises straight to the surface and then trails off down the surface 'current, giving the appearance of a streak (Plate 8, top left). If a smoke float is dropped at the head of the streak, it also drifts down with the current, giving the impression that the streak is moving ahead.

Another feature which makes a pilot believe that a U-Boat is present is that the streak may appear to alter course or zig-zag. This phenomenon too has a simple explanation. If the rising stream of oil is gently displaced on its way by an under-water current or other means, the point where it reaches the surface will also move sideways. But as the oil on the surface is drifting continually down the current, this displacement on the surface will not appear as a streak at right angles to the original one, but as a gentle curve (Plate 8, top right).

Suppose, for instance, that a depth-charge is dropped in the vicinity of the rising oil. The blast of the explosion may break up the stream for a short time, and at the same time may shake the wreck and cause more oil and bubbles to rise to the surface. But the effect of this disturbance under water will persist for some time. Until the water has finally settled down currents will sway the uprising stream of oil from side to side, giving the impression that the supposed U-Boat is changing course. (Plate 8, top right.)

In fact, the whole performance will be most realistic. First the oil-streak apparently moves steadily. Next, the attack is followed by gushes of oil and bubbles, and large alterations of course as though avoiding action were being taken, and finally the streak steadies on its course again. But there is one thing wrong: the type of oil.

ANTI-SHIPING OPERATIONS, JULY AND AUGUST

A reduction in the results obtained against enemy shipping occurred during the past few months, due to other commitments necessitating a slackening of our effort and some change of tactics.

It was possible only to give results of assessments for May in the previous issue of this Review, and that month's as amended by some upgrading and together with those for June and July, can now be given:—

May (amended)	10 ships of 28,162 tons, 9 ships of 27,500 tons, 29 of 106,927 tons.
June	3 ships of 3,297 tons, 3 ships of 5,500 tons, 1 ship of 6,000 tons.
July	1 ship of 4,000 tons, 2 ships of 6,000 tons, 4 ships of 14,000 tons.

The following aggregate results by Coastal Command have been achieved between 1st March, 1941 and 31st July, 1942:—

52 ships sunk, of a total 147,388 tons.

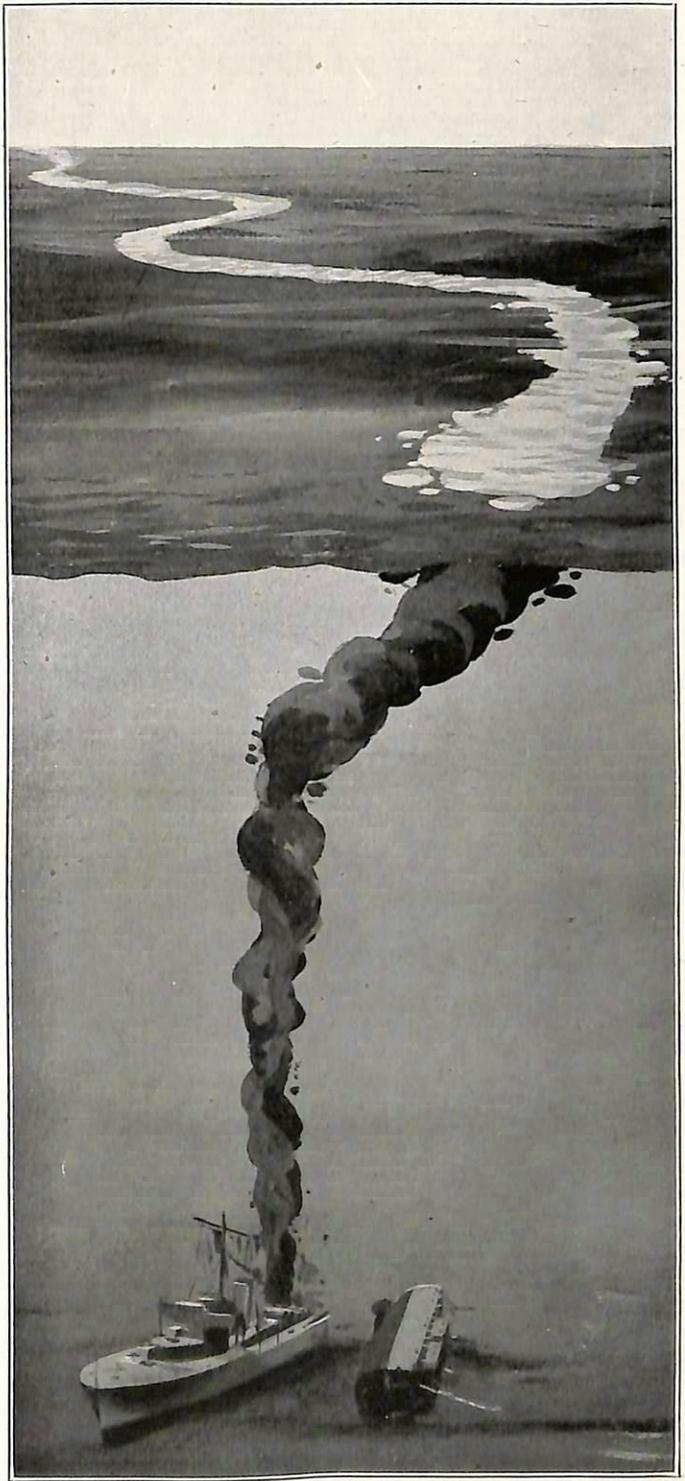
53 ships seriously damaged, of a total 135,655 tons.

130 ships damaged, of a total 445,473 tons.

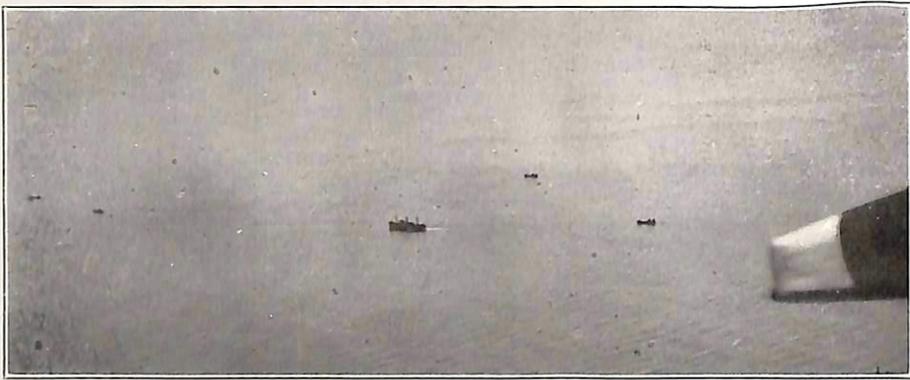
Bay of Biscay and 19 Group

Traffic in the Bay of Biscay did not show much change from previous months. The small vessels engaged in the iron-ore trade between Bilbao and Bayonne carried out their trips with regularity. It seems possible that they may be reinforced with some more Dutch coaster-type vessels.

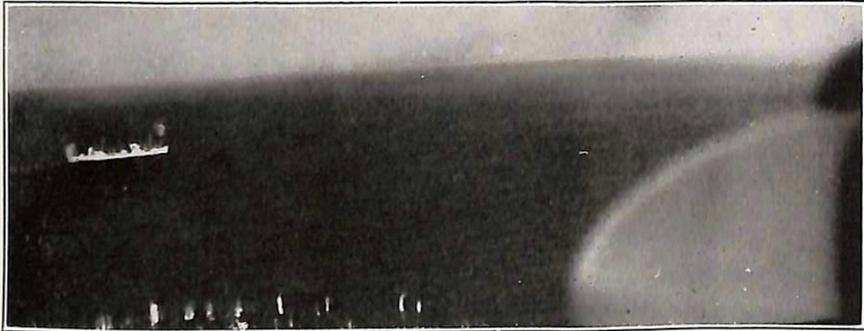
The larger vessels continued to make comparatively regular trips from Bilbao, and these probably unload their ore cargoes at Bordeaux. Some of the original vessels engaged in this trade have now apparently dropped out and at least one is known to have foundered after striking a rock. Two, possibly three, as mentioned below, were traced up the Channel and are now in Rotterdam. However, at least five of these larger ships of tonnages ranging from about 2,700 to 6,200 probably remain in the Bilbao-Bordeaux trade. One was seen and attacked north of San Sebastian on 26th July by a Sunderland, A/461 (Plate 9). From the photographs she was probably the *Drepanum*, a vessel of 2,730 tons known to be in this trade. She was escorted by five armed trawlers and all vessels opened fire. Unfortunately, the depth-charges that were dropped undershot, and she appears to have escaped.



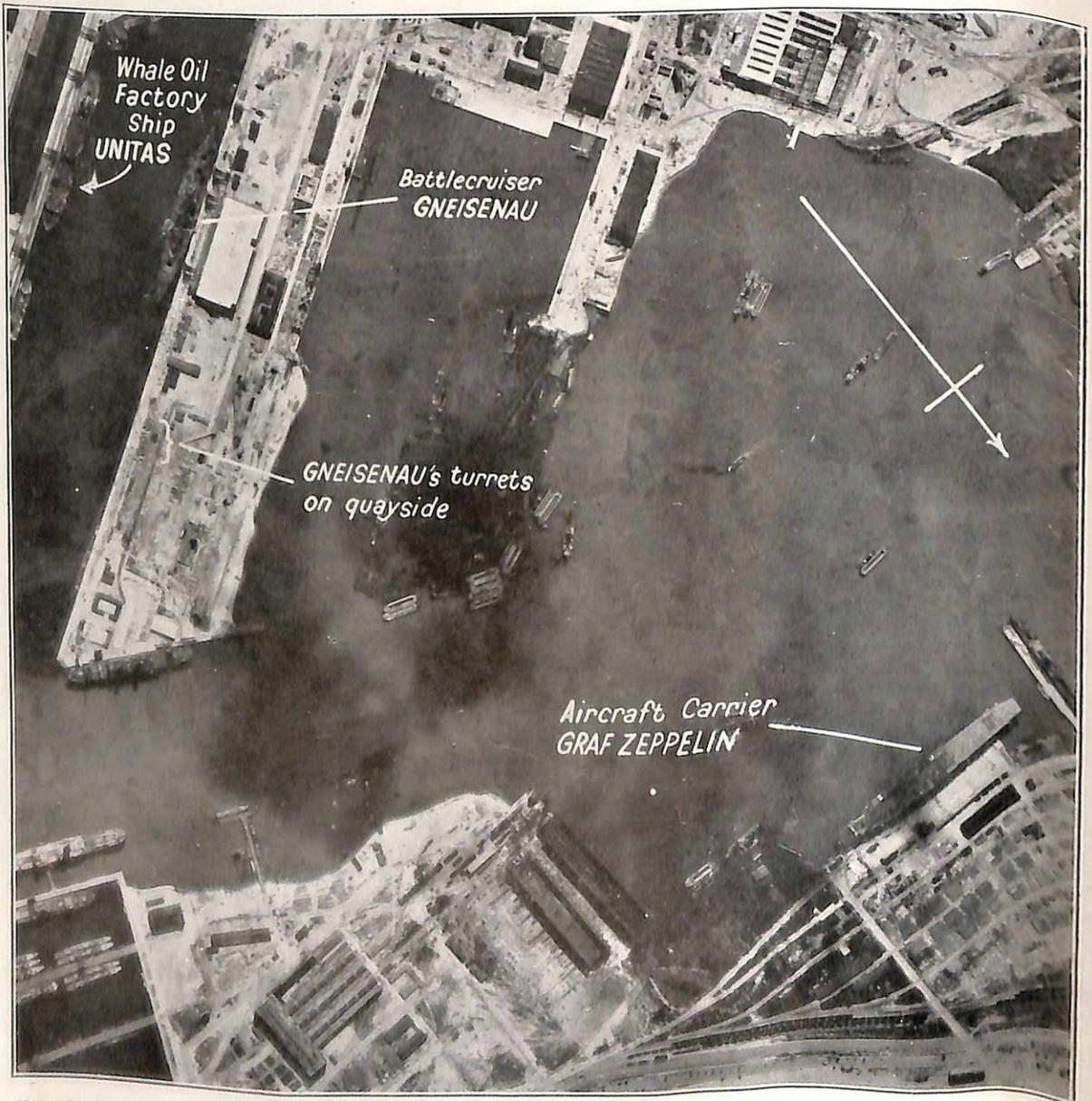
Oil-streaks from wrecks. (see page 16.)



Iron ore ship on the Bilbao-Bordeaux route escorted by armed trawlers, before attack, 26th July. (461 Squadron). See page 16.



Allmark-type tanker in the Bay of Biscay, firing, flak dropping in foreground, 19th August. (51 Squadron). See page 17.



Gdynia harbour, 1st August. *Gneisenau* under repair: portions of the superstructure lying on the quay, and some 120 feet of the foredeck cut away; camouflage netting over the stern. (P.R.U.)

There has been a considerable movement of merchant vessels and tankers between ports on the French west coast, but few definite arrivals or departures have been noted.

An attempt to send out a blockade-runner, probably to Japan, is indicated by the sighting off the north coast of Spain on 19th August, of an *Ermland* class vessel (6,528 tons), westward bound. She was sighted twice on that day by aircraft engaged in a search for an *Altmark* class tanker, which had previously been reported, and from her proximity to the tanker, may easily have been in company with her.

The tanker, one of two that have long been in French west coast ports, was eventually located and attacked off the north coast of Spain, by a mixed force of Lancasters of 61 Squadron/Bomber Command, Whitleys of 51 and 58 Squadrons, and a Sunderland of 10 Squadron (Plate 9). One of the Lancasters obtained a hit with a 500-lb. G.P. bomb on the bows, from which black smoke was seen to rise, and later Sunderland T/10 obtained a hit with a 250-lb. S.A.P. bomb near the bridge, from which white smoke belched.

These two hits seemed to have caused the vessel to alter plan. She was seen moving eastwards and was located a few days later at La Pallice with camouflage over bow and stern. Here, on 25th-26th August, it was the target of a strike; of the ten aircraft involved, at least six bombed the harbour, with results which could not be observed on account of cloud, flak and search-lights.

It is of interest to note that a vessel, almost certainly the *Ermland* type ship referred to above, was seen at Bordeaux a few days later, so it may be inferred that if these attacks did not dispose of these two vessels, they at least forced them to abandon their voyages for the time being.

Large numbers of tankers and vessels suitable for blockade-running remain in French ports, principally St. Nazaire and Bordeaux. One important factor cannot be lost sight of: Germany has precision machinery, radiolocation equipment, etc., badly needed by Japan, and Japan has many commodities, such as rubber and tin, needed by Germany. Consequently blockade-runners will certainly try to slip in and out of ports like Bordeaux during the next few months and their destruction presents an important problem.

There were altogether 31 patrols in the Bay of Biscay area, mainly searching for shipping, of which 19 were in search of the *Altmark* type tanker. These resulted in 28 sightings of large ships, some of them neutral, and 13 attacks.

Finally, French and Spanish fishing-vessels received warnings to keep to the coastal areas of the Bay, it having been found that they were hindering anti-submarine operations. A novel form of leaflet-dropping was undertaken, in the hope that the French fishermen would appreciate the reasons for avoiding drastic action against them (Plate 3).

Denmark to the Channel Islands

Activity along the west coast of Denmark remained small and limited to coastal traffic. There is little likelihood of any marked increase until freezing in the Baltic again forces convoys to use the outer route.

Danish fishing vessels, among which there may have been some reporting vessels (though direct evidence of this is still lacking), were warned by the broadcasting of an Admiralty signal not to fish outside coastal waters, and neutral vessels warned of a danger area which covers most of the North Sea.

The port of Rotterdam reached its annual time of maximum activity during these two months, with a considerable shipping turnover, and much barge transshipment. It is of interest to note that there has recently been much dissatisfaction among Swedish crews, who protested against sailing to Rotterdam and demanded and obtained increases in pay. The arrival of two vessels that have been traced up the Channel from French west coast ports may be connected with this, as they were of the type suitable for ore carrying, and there is little doubt that air attack and sea mining have taken a substantial toll recently on shipping on the Baltic-Hook route. A further factor influencing the iron ore trade with Sweden is that the cargoes of coal, with which vessels return from Rotterdam, appear to be falling far short of those promised (possibly owing to railway dislocation due to R.A.F. raids), and reports speak of ships leaving Rotterdam in ballast.

Delfzijl remains very active, the timber trade and export of chemicals accounting for this. Shipping has quite frequently been seen at anchor off IJmuiden, as though convoys were being formed, but reconnaissance has produced no evidence of extensive use of the North Sea Canal to Amsterdam, which presumably is not too active.

The changed sailing timetables referred to in the summary for May and June appear to have continued, and it is no longer possible to forecast any fixed sailing time from the Hook. Far the greater number of the convoys which arrive at the Hook still do so in the afternoon.

There seems to have been little, if any, change in convoy formations, and undoubtedly there has been no increase in the number of escort vessels. Balloons flying at heights ranging from 400-1,000 ft. have been frequently reported, and occasionally a vessel has been seen flying two. A report, the author of which has sailed in these convoys several times, puts the average height of balloons at 250 ft., and states that this is seldom varied. The balloons are secured to the deck aft and manned by three men.

In the area Hook-Channel there has been a number of movements, chiefly eastbound, and the custom of making short stages from port to port has continued. The ex-Lufthansa tender *Schwabenland* was one of the vessels to make the west to east passage, leaving Havre around 6th August, and after a stay of some months it called at Boulogne and Dunkirk and was last located in Hamburg. It was escorted by numerous E/R boats and auxiliaries while in the Channel, where attacks by naval coastal craft were unsuccessful. Two vessels probably engaged in the Spanish iron ore trade were among others that followed a similar procedure.

Local traffic between the Channel Islands and the mainland has not diminished. The identification of further defences in the islands gives a clue to the nature of its cargoes.

16 Group

In the two months the total number of patrols, excluding searches and meteorological patrols, was 84.

Forty-eight patrols produced sightings of ships (excluding fishing vessels). Attacks were made by 72 aircraft.

18 Group and Norway

The primary concern of 18 Group still continues to be German naval units; but its aircraft sighted some 30 ships over 1,000 tons in convoy, and 16 others sailing independently, besides 24 smaller craft.

On the 110 patrols aircraft made four attacks on merchant vessels, and two aircraft on strikes found their target.

Little additional intelligence is available regarding the movement of shipping along this coast. There are still no signs of any fixed time tables. While convoys may proceed at night, many certainly spend at least part of the night at the various anchorages along the route.

There is little slackening in the importance and activity at Oslo, where troops and war stores especially continue unloading for transmission by train to the north. Considerable movements of war stores by ship by the coastal route undoubtedly continue.

A COMBINED BOMBING AND TORPEDO STRIKE

In a strike by eight Hudsons of 59 Squadron and four Hampdens of 415 Squadron on a convoy off Ameland in the early hours of 31st July, three almost certain direct hits, one possible hit and a near miss that probably did severe damage, were obtained. Hampden D/415 attacked a 3,000-ton merchant vessel at 0122 hours with its one torpedo, and claimed a direct hit. Shortly afterwards a large cloud of smoke and spray rose and covered half the target. K/415 claimed a hit from a torpedo released at 0125 hours, and A/59 bombed

a 5,000-7,000-ton merchant vessel and saw a hit followed by clouds of smoke. Other aircraft saw columns of smoke at 0127 hours, a ship on fire at 0131 hours, and a dull orange flash followed by sparks at 0141 hours, all of which may have been connected with these three attacks. V/59 attacked a 3,000-4,000-ton merchant vessel with bombs which fell so close that the bows and fore part of the target were illuminated by the flash. D/59 also claimed a very near miss on a 4,000-ton merchant vessel.

FLYING BOAT CREW TRAINING

To man the increasing number of flying boats now becoming available, only one experienced pilot can be allotted to each crew. He is the captain of the aircraft, and is assisted by a second pilot posted direct to the squadron from the School of General Reconnaissance, and trained to the standard required in the squadron. After a second pilot has gained experience in the squadron, he can expect to be withdrawn and sent to No. 4 O.T.U., after which he will be posted to a squadron with a crew of his own. On passing out of the O.T.U. these crews, like those from the landplane O.T.U.'s, spend the first month working up to the operational role.

Some squadron commanders doubt whether crews trained in this way will be sufficiently experienced to carry out squadron work. They therefore split up new crews, which is not only discouraging to the crews, who in many cases have learnt to think as a team; it also prevents the Command from building up an urgently needed reserve of crews. An arduous flight from England to Aboukir via Gibraltar and West Africa, was recently undertaken by one of the first crews trained in this way. The Captain's story shows what freshman crews can do.

"I had been serving as second pilot in a Sunderland squadron for 13 months, and saw no prospects of being made a captain for some months to come, when the procedure for second pilots being posted to the O.T.U. for training as captains came into operation. My Commanding Officer would not, at first, recommend me for this training, but after repeated requests I was allowed to go.

On completion of my O.T.U. training I was detailed, with my crew, to fly a Sunderland out to the Mediterranean. We collected it at

Pembroke Dock, and after checking it and swinging the compass and loop aerial, flew it to Mount Batten.

The first leg of the trip, to Gibraltar, was made by night. The navigator set about his task with calm confidence. The thick weather encountered made it difficult to get astro sights, but those he was able to obtain were accurate, and the courses given brought the boat to the Straits of Gibraltar by dawn.

After three long oversea flights around West Africa, the route led overland along the Congo to Lake Victoria, down the Nile Valley, and on to Aboukir. For most of the journey, the wireless operator had to contend with commercial radio organisations, including an extensive use of the Q code in French, and a dust storm code over the desert.

Two inspections became due on the way out. We had ground staff for the first, but the "90-hour" we carried out ourselves on Lake Victoria, checking the engines, air-frame, equipment and instruments. Finally we joined our squadron at Aboukir without mishap.

After all the difficulties we had encountered and overcome in nearly 100 hours flying, we had acquired a very keen crew spirit, and confidence in each other. We were therefore very disappointed when we found that it was the practice of this squadron to split up new crews amongst the others. I was given command of another crew, and we began night operations and anti-submarine patrols. The spirit in this crew—all strangers to me—did not compare with that of my previous crew, who, when separated as subordinates in other crews, soon lost the keenness and self-confidence they had acquired."

Why isn't the same viewpoint held at HQ CC on the keen spirit in squadrons which are always being split up.

HOW SQUADRON PHOTOGRAPHS ARE USED

During the three months ending 30th June, 1942, just under a quarter of a million photographic exposures were made by aircraft of Coastal Command, including 109,712 operational exposures, of which some 98,000 were made by the P.R.U. (whose activities were described in the second issue of this *Review*). Roughly 10,500 exposures were made by operational squadrons of the Command during the course of many varied tasks. Although these form only 10 per cent. of all the operational photographs, they constitute a most useful adjunct to those by the more professional P.R.U.

It may not always be appreciated what a vital part is played by these operational "action" photographs, nor how widely they are distributed and used.

The Central Interpretation Unit

Every successful photograph from an operational sortie is sent to the Central Interpretation Unit for several phases of expert examination, which may disclose topographical and technical information of value to specialist departments. Our G.R. squadrons fly over enemy coastline, and inland, far less than they used to do, but their photographs still supply facts concerning beaches and coasts, from Kirkenes to Spain, and low oblique photographs obtained on such sorties supplement the vertical photographs taken at great altitudes by P.R.U. aircraft.

Experts in enemy naval building constantly learn a lot from the P.R.U.'s high altitude photographs, but these obviously lack the sort of details that can be seen in a "close-up" of a surfaced or diving U-Boat. Squadrons' photographs of enemy convoys and warships, especially U-Boats, can and do disclose new developments.

Many hundreds of photographs of fishing vessels have been taken in the past year, and a study of them gives some idea of possible changes in their habits under the stress of war. It may, for instance, disclose details about those bugbears of aircraft and submarines, the *Vorposten* or reporting vessels, which look like local fishing boats and behave almost like them, but actually wait and watch for British aircraft to report to the enemy.

In the C.I.U. our photographs pass through innumerable other hands, all scrutinising them for technical developments of one sort or another, ever on the look-out for new wireless stations, shore or A.A. batteries, flak towers, and the like. The information goes to the specialist branches of the Air, Naval, and Military Intelligence, the Ministry of Economic Warfare, and other Departments.

The Admiralty

Our photographs are also examined with great interest in the Admiralty. Among the various services they render there are the identification, and consequent notification, of blockade runners, either inward or outward bound—for example a supply ship bound to the Caribbean with oil and torpedoes for U-Boats. Once the vessel has been recognised the necessary counter-measures can be planned; and a photograph often provides conclusive evidence. In recent months, aircraft or anti-submarine and anti-shipping patrols have several times succeeded in photographing a

blockade runner nearing the end of its long trip from the East, thus producing valuable evidence of the type of vessel engaged in this trade, and also its habits and disguises. The identification of one of these vessels also helps the Ministry of Economic Warfare to estimate how far the enemy is getting round our blockade; so photographs of suspect ships, and sometimes of quite innocent-looking ones, can provide first-class intelligence, which in the end will lead to measures for outwitting them.

Oblique photographs of the enemy coastline, taken from low altitudes, are often of the greatest help to our patrolling submarines in recognising landmarks. Obviously no aircraft can ever produce a photograph that will show a promontory, inlet, or beach exactly as it is seen through the periscope of a submarine; but low-flying aircraft do quite often obtain the next best thing, which is a series of photographs of a strip of coast that may have to be patrolled by a British submarine.

In an article on ice, in the third number of this *Review*, it was explained why and how a knowledge of ice conditions is useful to the Navy, and of course the photographs implementing reports of ice reconnaissances have proved extremely useful to the Naval Meteorological Service.

The Interservice Topographical Section (a branch of the Naval Intelligence Division) produces, among other things, profusely illustrated geographical handbooks. The volumes on the countries of Northern Europe (which are still in course of production) contain many photographs by G.R. aircraft of this Command, and any photographs of topographical interest they may take are most eagerly sought after.

Assessing Attacks

Another important use of photographs is to help in the assessment of attacks on U-Boats and surface vessels. As explained elsewhere in this issue, assessment is a complicated and tricky procedure, which can be considerably helped by good, or even indifferent, photographs. The positions where depth-charges have fallen in relation to a U-Boat, either surfaced or diving, can be ascertained, with a high degree of accuracy from photographs, provided of course they show both the U-Boat and the depth-charge marks in the same picture. In the hurried seconds of an attack, accurate measurement of distances by eye is obviously a most difficult feat, but a camera can produce evidence that enables a reliable estimate of the probability of damage to be made. To those who plan the anti-U-Boat war, it is just as important to know if a U-Boat was not damaged in an attack (and therefore is still at sea) as to know that it has probably been sunk or sufficiently damaged to force it back to port.

A photograph taken before an attack on a merchant vessel is useful to show what sort of ship it is, and no one will dispute that it is always difficult to describe accurately the type and tonnage of the attacked vessel. In attacks on merchant vessels, or for that matter surface vessels of any kind, it is rare for an aircraft's crew to be able to return with conclusive evidence that the attacked ship has sunk, or even with any

definite information about the hits obtained, because the modern defensive armament of shipping makes it most hazardous to wait about after an attack. A photograph taken during or after the attack will show whether any hits were obtained, and what part of the ship was hit. From the knowledge gained from attacks by the enemy on our own shipping, the expert can make a very reliable guess as to whether that ship got home again or not. As in the case of U-Boat attacks, it is almost equally important to know that an attack has failed to sink a ship as the reverse, because to plan the war on the enemy's lifelines the Ministry of Economic Warfare must know where shortages of certain types of ship are occurring. So the accurate assessment of shipping attacks is vitally important, and photographs play an invaluable part on the deliberations of

the Air Ministry and Admiralty Assessment Committees.

* * *

Coastal Command photographs are also used by the map-making and various survey departments, by other commands in the R.A.F. and by the War Office.

These are some of the many users of our photographs, and some of the more obvious uses to which they are put. Less obvious—and more secret—are the lessons learned from them, and their value in training of one sort and another.

In consequence, it is no exaggeration to say that there can never be enough operational photographs. The appetite of the many who use them in the various services at home and abroad will never be satisfied.

RESCUE FROM THE SEA

Among the aircraft that ditched between 4th May and 9th July, 1942, were ten which illustrate this point: **In each case the crew carried out the correct W/T and ditching procedure, and in each case they were saved with the minimum delay and discomfort.** None of the aircraft was nearer than 50 miles to the British coast; many were further. One was 200 miles from the British and only 10 from the Dutch coast. Another was 400 miles west of Ireland.

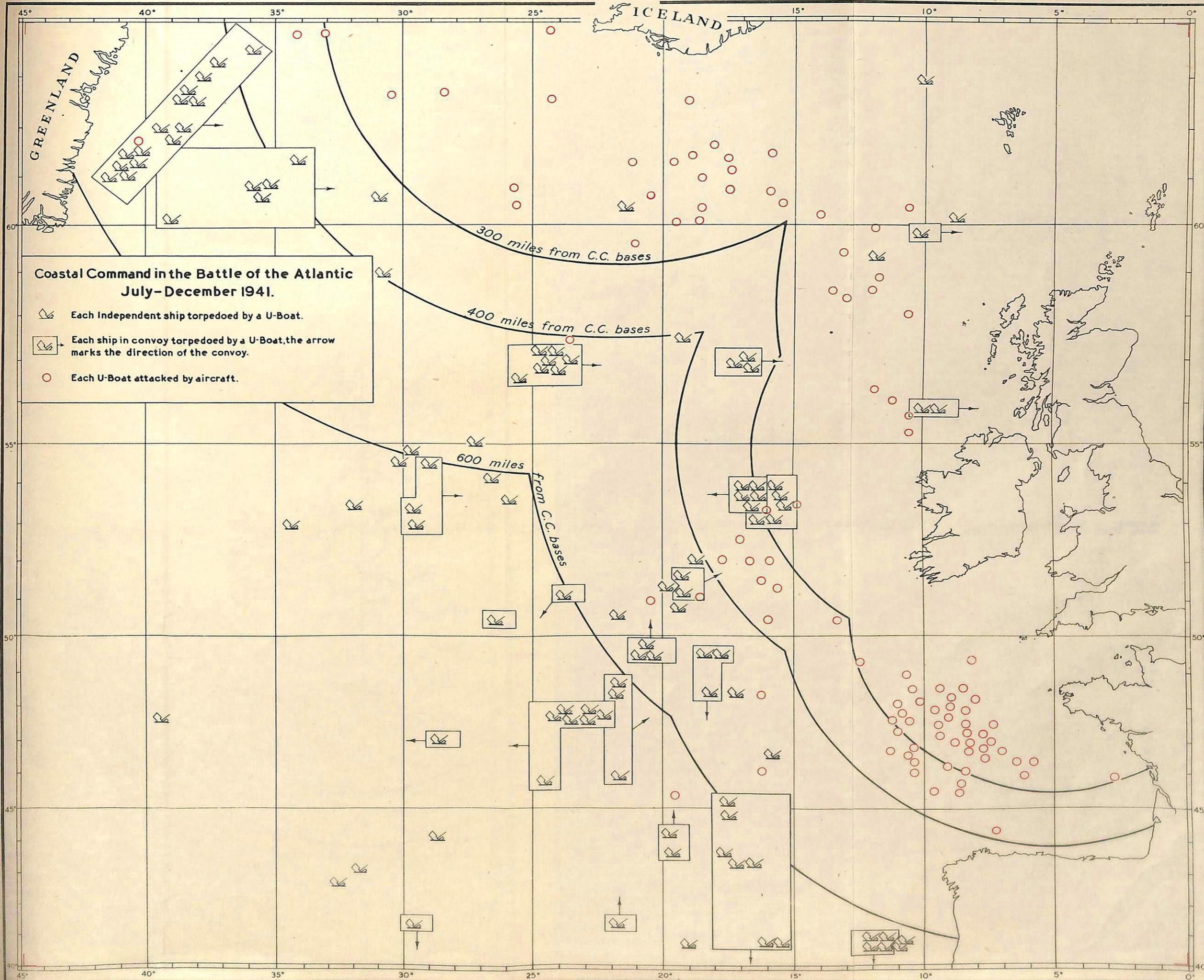
Yet:

- (a) the average time the searching aircraft took to locate the dinghies was 4 hours

46 minutes—in one case it took only 59 minutes; and

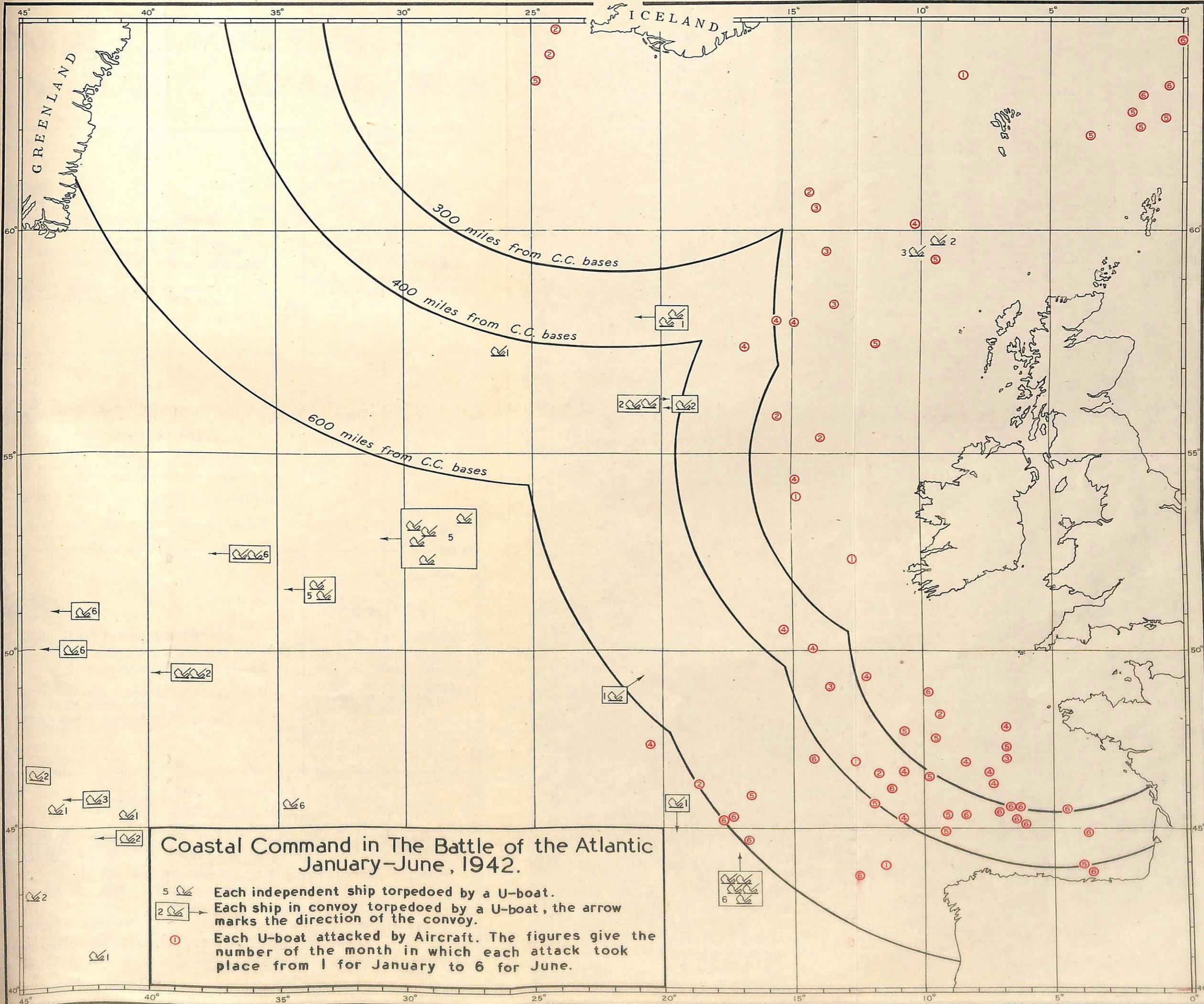
- (b) the average time between ditching and rescue was 6 hours 50 minutes—in one case it took only 1 hour 24 minutes.

The moral is, the Air/Sea Rescue Squadrons are standing by at all times to do their job, but they can only do it as efficiently as they did in these ten cases if you meet them half-way by carrying out the correct procedure strictly as laid down. **And it is to your own advantage to do so.**



**Coastal Command in the Battle of the Atlantic
July-December 1941.**

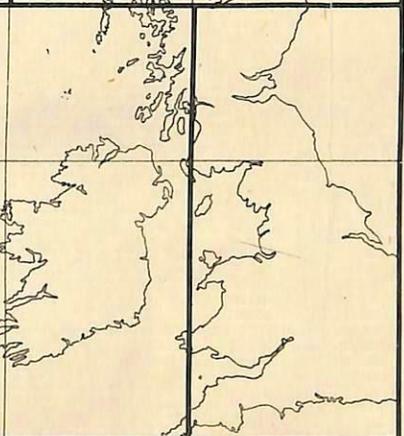
-  Each Independent ship torpedoes by a U-Boat.
-  Each ship in convoy torpedoes by a U-Boat, the arrow marks the direction of the convoy.
-  Each U-Boat attacked by aircraft.



**Coastal Command in The Battle of the Atlantic
January-June, 1942.**

- 5 Each independent ship torpedoed by a U-boat.
- 2 Each ship in convoy torpedoed by a U-boat, the arrow marks the direction of the convoy.
- ① Each U-boat attacked by Aircraft. The figures give the number of the month in which each attack took place from 1 for January to 6 for June.

COASTAL COMMAND in the BATTLE of the ATLANTIC JULY & AUG: 1942

<p>SECRET.</p> <p>2679</p> <p>Total flying hours on Patrol.</p> <p>OF WHICH { 816 HOURS ON CONVOY ESCORT. 358 HOURS ON PROTECTIVE SWEEPS. 1505 HOURS ON OFFENSIVE OPERATIONS.</p>		<p>2673</p> <p>Total flying hours on Patrol.</p> <p>OF WHICH { 230 HOURS ON CONVOY. 89 HOURS ON PROTECTIVE SWEEPS. 2354 HOURS ON OFFENSIVE OPERATIONS.</p> <p>AIRCRAFT SIGHTED NINE U/BOATS OF WHICH SEVEN WERE ATTACKED.</p>
<p>1233</p> <p>Total flying hours on Patrol.</p> <p>OF WHICH { 597 HOURS ON CONVOY ESCORT. 402 HOURS ON PROTECTIVE SWEEPS. 234 HOURS ON OFFENSIVE OPERATIONS.</p> <p>AIRCRAFT SIGHTED EIGHT U/BOATS OF WHICH FOUR WERE ATTACKED.</p> <p>FIVE MERCHANT VESSELS WERE SUNK BY U/BOATS.</p>		
<p>2429</p> <p>Total flying hours on Patrol.</p> <p>{ 164 HOURS ON CONVOY ESCORT. 2265 HOURS ON OFFENSIVE OPERATIONS.</p> <p>AIRCRAFT SIGHTED THIRTYFIVE U/BOATS OF WHICH TWENTYFIVE WERE ATTACKED.</p> <p>ONE MERCHANT VESSEL SUNK BY U/BOAT.</p>		<p>4850</p> <p>Total flying hours on Patrol.</p> <p>ALL ON OFFENSIVE OPERATIONS.</p> <p>AIRCRAFT SIGHTED THIRTYFOUR U/BOATS OF WHICH TWENTY-FIVE WERE ATTACKED.</p>

GRAND TOTAL

13,864. Total flying hours on Patrol.

1807. Hours on Convoy Escort.
of which 849. Hours on Protective Sweeps.
11,208. Hours on offensive Operations.
Aircraft sighted 123 U/Boats of which 89 were attacked.
6. Merchant Vessels were sunk by U/Boats.

S.L. 89.
21st-25th Oct: 1941.

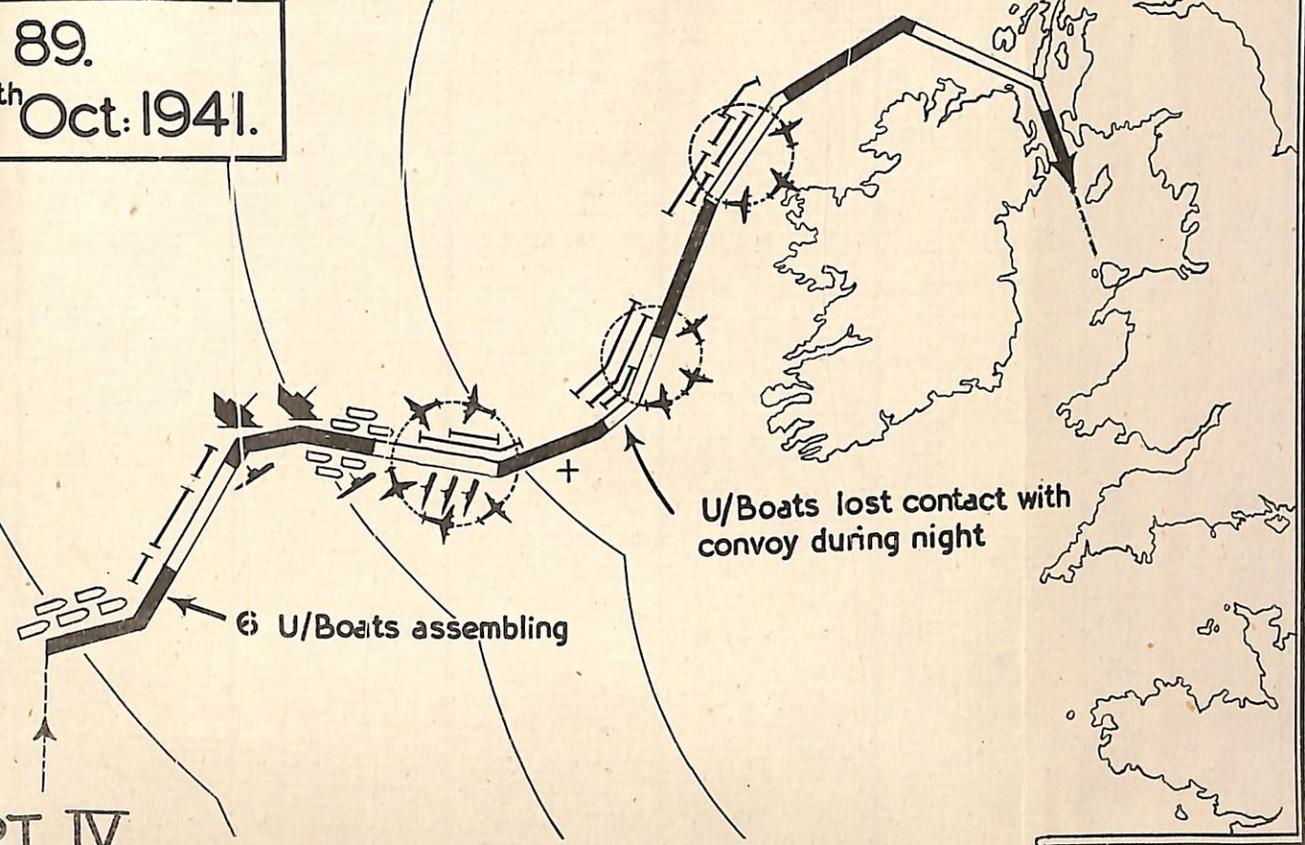
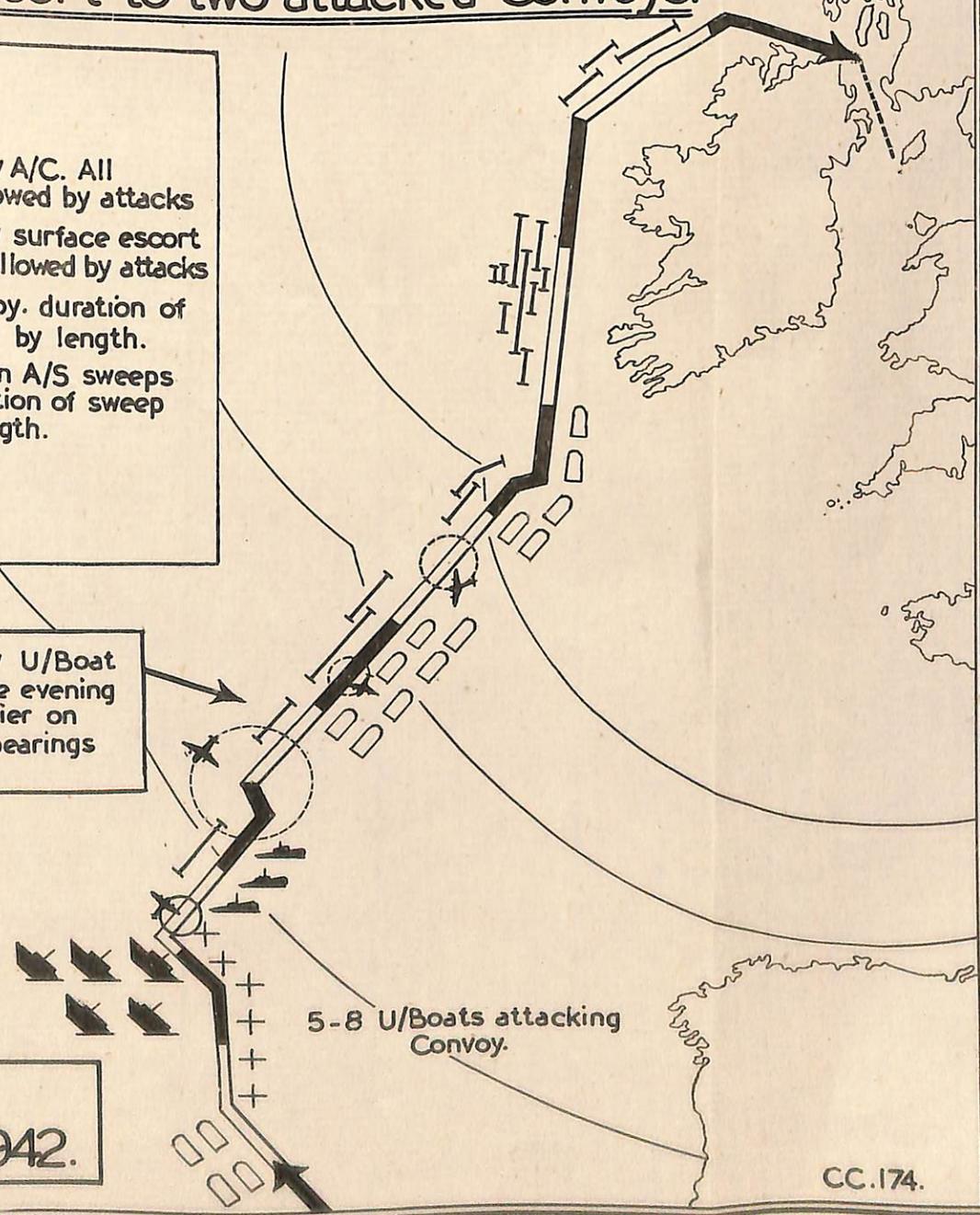


CHART IV Effect of Air Escort to two attacked Convoys.

KEY

- Ships torpedoed
- U/Boats sighted by A/C. All sightings were followed by attacks
- U/Boats sighted by surface escort. All sightings were followed by attacks
- A/C escorting Convoy. duration of escort is indicated by length.
- Average of 3 A/C on A/S sweeps near convoy. duration of sweep is indicated by length.
- Surface escort.
- Day Night Track.

There was no sign of any U/Boat near the Convoy after the evening of the 16th though earlier on that day numerous D/F bearings were taken.



H.G. 84.
13th-20th JUNE 1942.