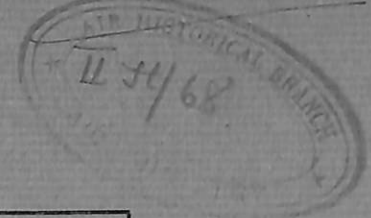


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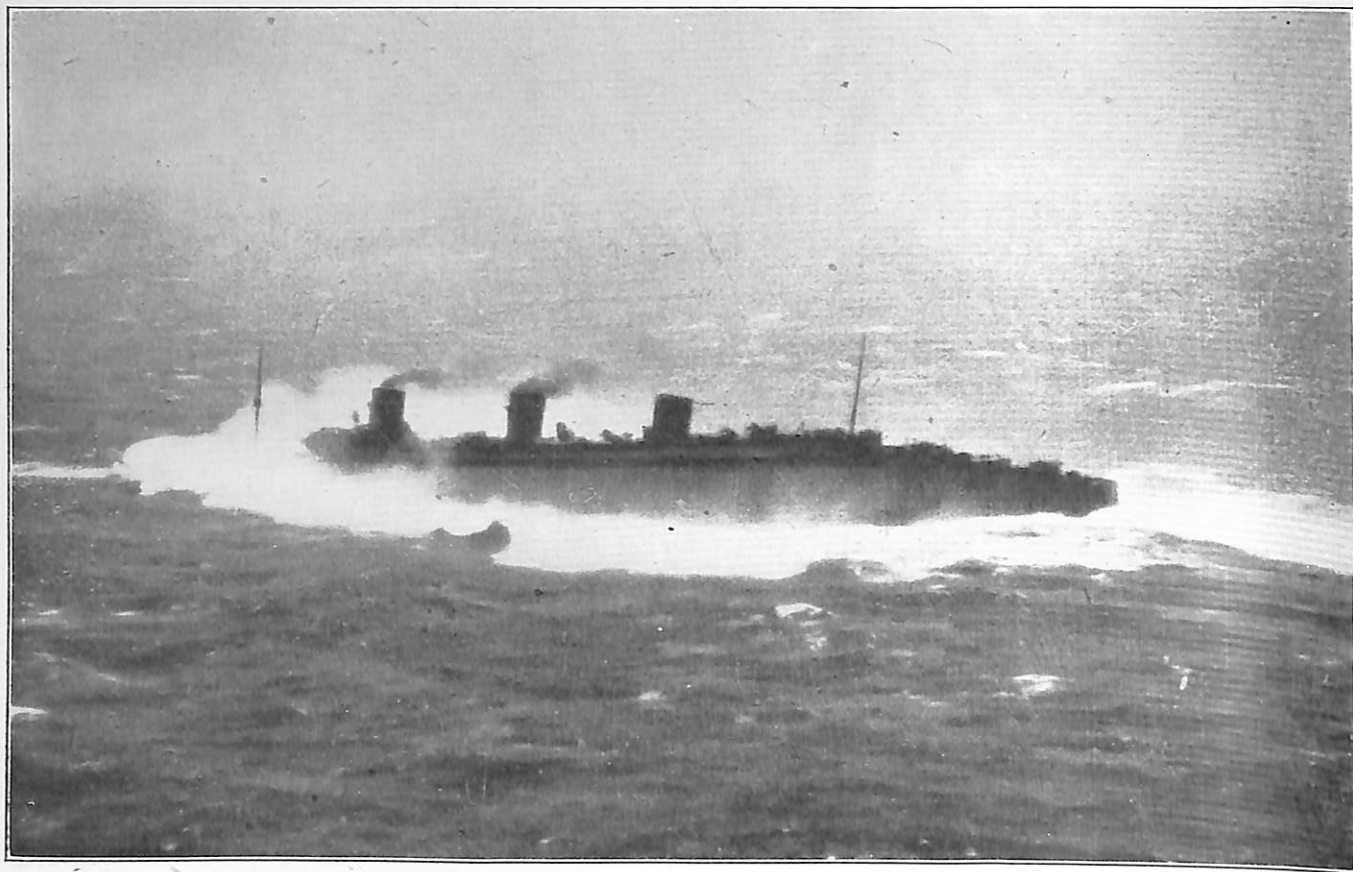
COASTAL COMMAND REVIEW

January, 1943

No. 9

**HEADQUARTERS,
COASTAL COMMAND
ROYAL AIR FORCE**

PLATE 1.



The " Queen Mary " in heavy weather. Photographed by 220 Squadron.



The difficulties of photographic reconnaissance by day have led to important progress in night photography. The above photograph of St. Valery-en-Caux, taken from 11,600 ft., shows that for interpretation purposes, night photographs can now almost equal those taken by day for quality of detail.

COASTAL COMMAND REVIEW

No. 9—January, 1943

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COASTAL COMMAND REVIEW

Editorial—January, 1943

The year 1943 has opened with a relatively quiet month so far as Coastal Command is concerned. There have been in the area no major operations and an almost total absence of spectacular incidents.

Along with the unusually mild weather for the time of the year, conditions have been even less favourable for operations than in December, being generally stormy and unsettled over almost the whole of the area covered by Coastal Command. The Iceland and Gibraltar regions have been the exception, where the weather for the most part has been fair. A constant succession of depressions gave frequent low cloud and rain over all the sea areas, and has interfered considerably with P.R. activities over the continent. In spite of this, the scale of effort was maintained at almost exactly the same level as last month. A total of 3,262 sorties (19,525 hours) was carried out, as compared with 3,270 (19,625 hours) in December. It may be of interest to cite, by way of comparison, the figures for January, 1942, when 1,414 sorties, involving 6,029 hours operational flying, were made.

Breaking down these figures into the various tasks of the Command, we get the following :—

	<i>January, 1943.</i>				<i>December, 1942.</i>
Anti-Submarine Patrols	1,430	1,506
Anti-Shipping Patrols	447	496
Interceptor Patrols	119	
Convoy Escort	401	386
Photographic Reconnaissance	265	192
Meteorological	420	458
Air/Sea Rescue	180	232

As regards anti-submarine and anti-shipping work, the results are reviewed in this issue. There can be little doubt that the very heavy drop in the number of U-Boat sightings can be attributed to two main causes :—

- (i) The success of our previous A/S efforts in the Gibraltar area, which resulted in the withdrawal by the enemy of the large majority of his U-Boats and the increased caution of those remaining in this region.
- (ii) The further development by the enemy of the " Wolf-pack " tactics in the central areas of the North Atlantic, beyond normal aircraft range, in such a way as to reduce for a period the number of U-Boats in transit through areas covered by our patrols.

Thus the reduced number of sightings due to the first cause can be viewed with a measure of satisfaction, and the part due to the second cause should not give rise to grave concern, as the change in tactics has not only failed to produce excessive losses on our side, but may also be expected to be temporary, and we may reasonably hope that the number of sightings and attacks will in due course rise to something like its former level.

In the matter of trade protection, there has been no incident of outstanding interest. Shipping losses in our area have been somewhat lighter than in recent months.

The expansion of our effort to protect our own A/S aircraft has given rise to a new category in the breaking down the types of task, and is now shown for the first time under the heading of Interceptor Patrols.

The number of P.R. sorties shows a satisfactory increase as compared with December, particularly as the light conditions remain little favourable for photography.

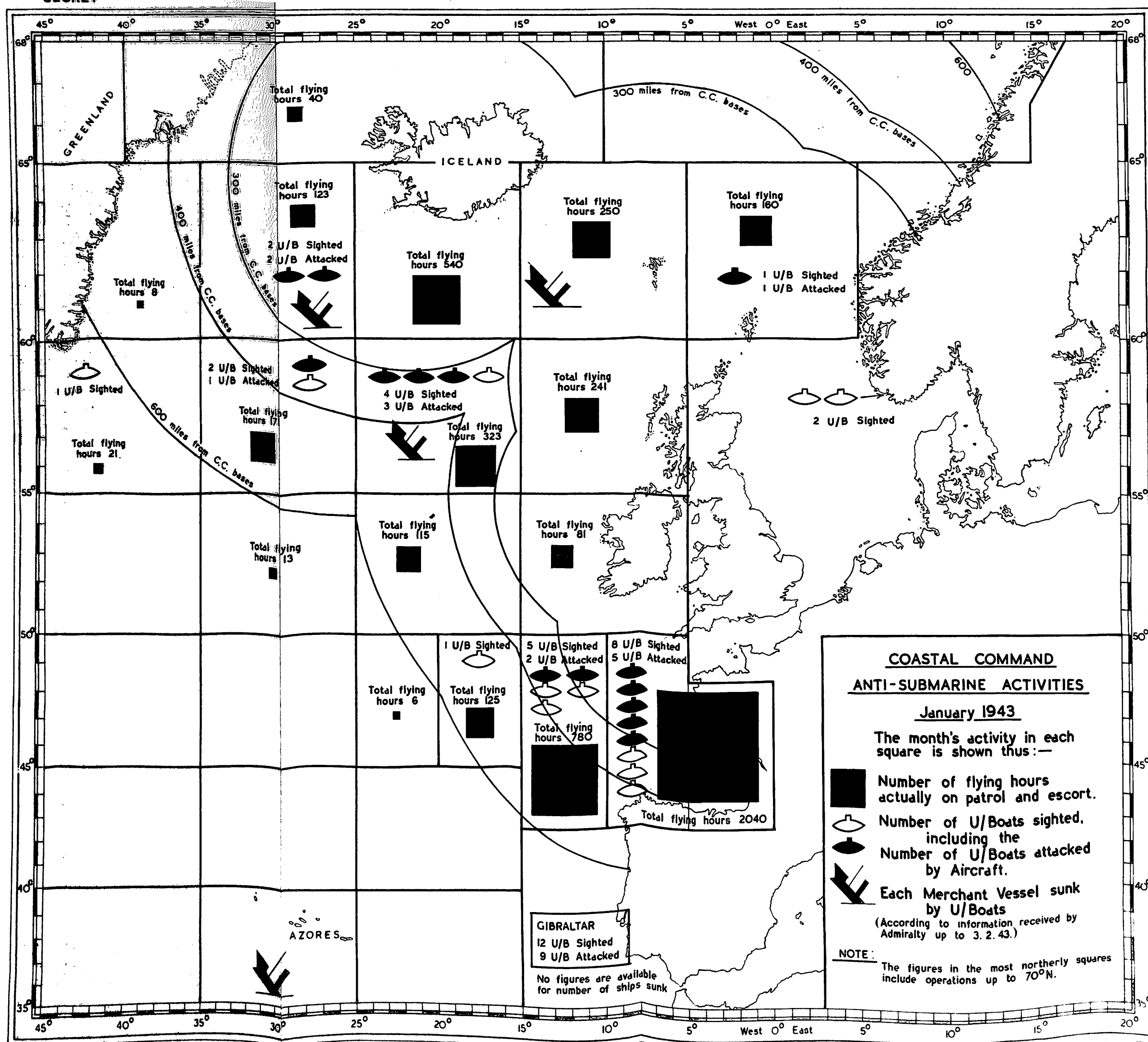
The small decrease in Met. flights is thought to be only temporary and due to reasons beyond our control, which it is hoped will shortly be overcome.

The Air/Sea Rescue effort is conditioned mainly by the total effort of all home-based aircraft as well as by the amount of successful interference by the enemy.

Certain organisation changes within the Command have occurred during the month.

R.A.F. Station, Detling, has been surrendered by the Command.

Two new U.S. squadrons have come into being at St. Eval for A/S work. No. 53 Squadron and No. 330 Norwegian Squadron are returning from overseas. No. 404 Squadron has moved from Dyce to Chivenor, No. 235 from Chivenor to Leuchars, No. 248 from Talbenny to Predannock (on a lodger basis) and No. 547 temporarily from Chivenor to Tain. No. 5 O.T.U. has moved from Turnberry to Long Kesh. Other changes are in progress.



I.—ANTI-SUBMARINE SECTION

Anti-Submarine Operations in January, 1943

(See Chart facing p. 3)

In January 38 U-Boats were sighted and 23 attacked by Coastal Command aircraft, including Gibraltar.

The month has been characterised by exceptionally bad weather, which has curtailed operations considerably below the number originally planned. The weather has probably been a major cause of the failure of the U-Boats in the North Atlantic. Throughout the month, as far as present information goes, only three ships were sunk between Newfoundland and Great Britain, and no large pack attacks developed like those on HX 218 and ON 153 and 154 in the previous month. As a result of this, Coastal Command have had no rich hunting grounds in the Western Approaches or South of Iceland, the number of U-Boats sighted there has fallen to nine, of which six were attacked. No U-Boats have been sighted in the Scotland/Iceland channel throughout the month, though three were sighted near the Norwegian Coast. One of these was unsuccessfully attacked by torpedo.

In the Bay of Biscay area escort was again given to most of the North African convoys. No U-Boats were sighted on these operations except for one sighted by an escort which did not find its convoy. The normal Bay offensive operations led to ten sightings and seven attacks, and a further three sightings made by transit aircraft. Six of these Bay sightings were by

day, five of these were in areas where some night A.S.V. operations had been carried out in the preceding 36 hours. In the Gibraltar area 12 U-Boats were sighted, yielding nine attacks. Nine of the sightings followed by seven attacks were made by Searchlight Wellingtons of 179 Squadron.

Shipping Protection

The following table shows the amount of shipping passing through the Coastal Command area and the air protection given to it :—

Type of shipping.	Number of sailings.	Number protected.
Convoys and Naval Forces..	55	45
Independents ..	60	3

This protection was given by 327 sorties divided as follows :—

Type of shipping.	Escorts. Met.	Failed to meet.	Sweeps and convoy tracks.
Naval Forces and convoys	91	61	} 175
Independents ..	—	—	

Analysis of Operations

This table analyses U-Boat sightings in terms of the different types of duty engaged in by aircraft, excluding aircraft based on Gibraltar, and the average duration of the sorties in the area of operations.

	All Anti-Submarine Escorts.	OFFENSIVE OPERATIONS			Chance.	Coastal Command Total on Anti-Submarine Work.
		Around Convoy Tracks.	Bay of Biscay.	Elsewhere.		
U-Boats sighted	3	3	10	4	6	20
U-Boats attacked	—	3	7	3	1	13
Sorties	152	175	500	196	—	1,023
Average No. sorties per sighting	50	58	50	49	—	51
Hours actually on patrol ..	253	840	2,950	1,070	—	—
Average duration of sorties actually on patrol	1½ hrs.	4½ hrs.	6 hrs.	5½ hrs.	—	5 hrs.

Sightings and Attacks by Squadrons

U.K. and Iceland

(i) Aircraft on A/S Work.	Sightings.	Attacks.
172 Searchlight Wellingtons (Chivenor).	4	3
304 Polish Wellingtons (Talbenney)	3	2
502 Whitleys (St. Eval) ..	2	2
No. 1 U.S.A. Liberators (St. Eval) ..	1	0
405 Halifaxes	1	0
84 U.S.N. Catalinas (Iceland) ..	2	2
120 Liberators (Iceland and Ballykelly).	2	0
269 Hudsons (Iceland)	3	3
	18	12

(ii) Aircraft not on A/S Work.

210 Catalinas	} Transit in the Bay.	1	0
No. 2 U.S.A. Liberators		1	0
? Transit in the Bay ..		1	0
455 Hampdens (anti-shipping) ..		1	1
236 Beaufighters		2	0
		6	1
From Gibraltar			
179 Searchlight Wellingtons ..		9	7
233 Hudsons		2	1
48 Hudsons		1	1
		12	9

Recent Attacks on Submarines

Z and X of 179 attack same U-Boat

At 1856 hours on 7th January, **Searchlight Wellington Z/179** was flying on anti-submarine patrol, on track 089° at 1,500 ft., in weather 4/10 cloud, base 2,000 ft., sea moderate, poorish visibility, with slight drizzle, when it got an S/E contact 90° to port, distant 6 miles. The aircraft turned to port, losing height, and picked up contact on homing aerials at 4½ miles. It continued to home and at half a mile range, from 125 ft., switched on searchlight illuminating a U-Boat on the surface right ahead, in position 37° 21' N., 05° 36' E., course 225°, 12 knots.

The U-Boat was Italian type. It appeared to be very large and painted light grey, with brown camouflage stripes. It had a long squat conning-tower.

The aircraft attacked from the U-Boat's port bow at 55° to track, releasing from 70 ft. 4 Mark XI Torpex depth-charges, set to shallow depth, spaced actually 34 ft., while the U-Boat was still on the surface. After release, the aircraft tracked right over the U-Boat's conning-tower and it did not appear to take any evasive action. The depth-charges were heard to explode and the rear gunner felt the bump of the explosion. He did not see them enter the water but states that he saw one big explosion in the wake of the U-Boat, about 30 ft. dead astern, and apparently missing the stern. Both flame floats functioned correctly.

The aircraft turned sharply to port and tracked over the scene of the attack, switching on searchlight. But no signs of the U-Boat were seen and no contacts obtained. The aircraft remained in the area for 26 minutes, then dropped a 2-hour flame float, set course along the U-Boat's supposed line of advance, returning to the flame float at 2004 hours and remaining in the area until 2012 hours. No S/E contacts obtained and nothing was sighted, so the aircraft set course for base.

Result

On evidence it appears that the stick was a very near miss across the stern of the U-Boat. Although not inflicting damage to the pressure hull, it probably shook up the boat severely. Although the description does not exactly tally with that of the U-Boat attacked 5 hours later by X/179 and described below, it is possible that these two were the same.

At 2356 hours on 7th January, **Searchlight Wellington X/179** was flying on anti-submarine patrol on track 087° at 1,500 ft., in weather 9/10 cloud, base 2,000 ft., sea moderate, with few white caps, visibility 1-2 miles in fine drizzle, when it got an S/E contact on homing aerials, 1 mile right ahead. The aircraft held on course, losing height. Almost immediately the rear gunner saw a slight wake. The aircraft still held on course until a back blip was obtained at

2½ miles, then it turned left hand on to reciprocal course, obtaining contact on homing aerials at 3 miles. The aircraft homed on and, at three quarters of a mile range, from 500 ft., switched on searchlight and illuminated a U-Boat on the surface, 5° to port, in position 37° 20' N., 05° 50' E., course 190°, 3 knots.

The very short range of the initial S/E contact was thought to be because the U-Boat had only just surfaced. It was of Italian type, similar to the Galileo Ferrari, light grey in colour, with two short periscope standards. It appeared to be broad in the beam, with a long, squat conning-tower. There was one gun forward and one abaft the conning-tower, both about 3 in. in size.

The aircraft attacked from the U-Boat's port quarter at 70° to track, firing from the fixed gun in the nose of the aircraft at the bridge and obtaining hits on the base of the conning-tower, releasing from 50-100 ft., 2 Mark XI Torpex depth-charges, set to shallow depth and spaced actually at 75 ft., while the U-Boat was still on the surface.

Numbers 1 and 3 depth-charges failed to release. The rear gunner saw the second depth-charge enter the water on the edge of the U-Boat's bow wave abreast of the conning-tower, port side. He saw the first depth-charge explode well to port of the U-Boat. Then the second depth-charge exploded on the near side (starboard), completely obscuring the U-Boat.

The two flame floats, dropped at either end of the stick, functioned correctly. The aircraft turned to port and tracked back over the explosion area, illuminating with searchlight. Nothing unusual was sighted and no S/E contacts were made. A 2-hour flame float was dropped and, after a further 10 minutes' search in the area the aircraft left on a southerly course, returning to the scene at 0055 hours without having got any S/E contacts. Searchlight was again switched on, but nothing was seen and so the aircraft set course for base at 0100.

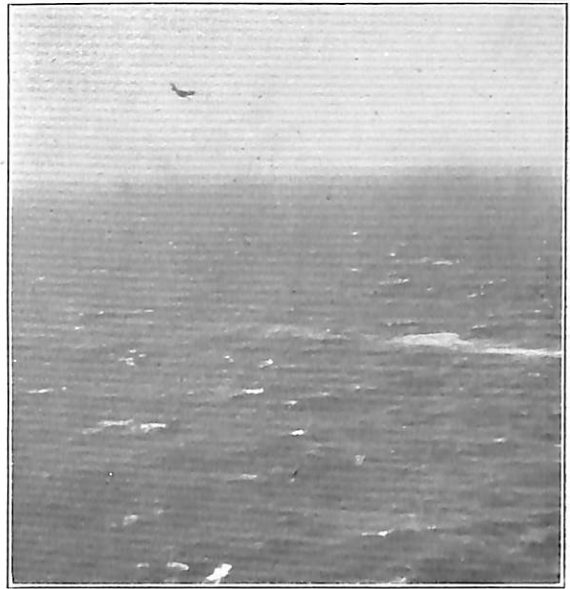
Analysis

It is interesting that the rear gunner saw the position of the entry of the second depth-charge on the port side of the U-Boat. The 35 ft. underwater travel obviously carried the depth-charge to the starboard side where it exploded and therefore must have been within lethal distance.

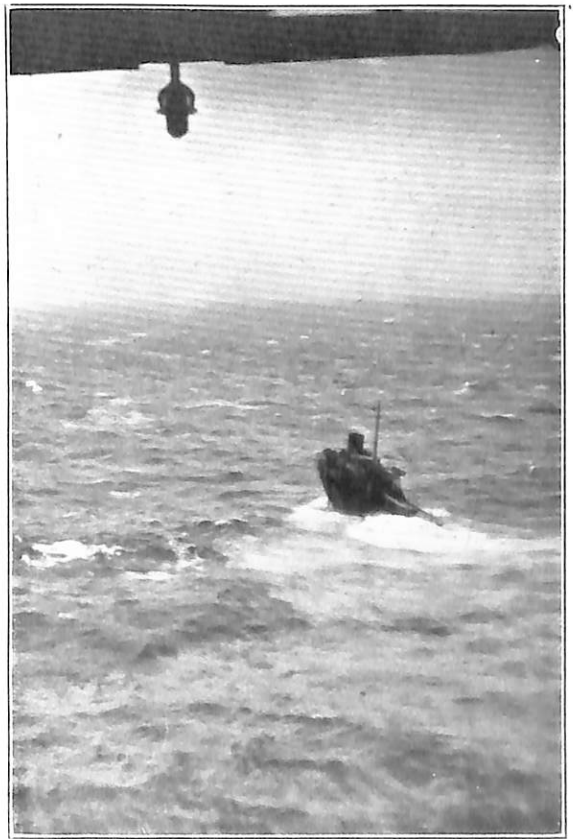
Result

A very good approach and an excellent attack which undoubtedly should have been lethal if the whole armament had released. As it was, it seems that the second depth charge was within lethal range, both for plan and depth. But as is the general experience of searchlight aircraft, it is seldom that any positive after evidence can be obtained and no definite assessment of damage can be given.

PLATE 2.



End of a Combat in the Bay of Biscay. A burning Ju.88, shot down by 248 Squadron.
(See letterpress, "Combats with Enemy Aircraft," page 6.)



The tanker "Vardefjell" (Norwegian) half submerged, with a trail of oil in her wake. The crew of twenty-nine were rescued after the tanker had been sighted, on Christmas Eve, by a Coastal Command pilot engaged in a transit flight in a Liberator. The crew had survived for a week, during a violent storm. The vessel was 200 miles from land when the Liberator signalled its position. After being lost and sighted again, by a big number of additional aircraft, and drifting into a surface minefield, the crew were at last taken off by a small ship when the "Vardefjell" the tanker, had drifted to within six miles of Allied territory.

PLATE 3.



H.M.S. "Scylla," steaming towards the German blockade runner "Rhakotis." See letterpress, "Attacks on Enemy Shipping," page 6.



The Road to Casablanca

Attack by L/502

At 2331 hours on 14th January, **Whitley L/502** was on anti-submarine patrol, flying on track 091°, at 1,500 ft., just below the base of 5/10-7/10 cloud, 4,000-5,000 ft. thick. The sea was choppy. Visibility was fair in moonlight conditions, but the moon was mostly obscured by cloud. The Whitley got an S/E contact ahead, range 5 miles. At 4 miles, contact was lost in sea return and the pilot set course on reciprocal track for two minutes. Contact was again obtained, range 5 miles. When at 1½ miles, at 400 ft., a U-Boat was sighted on the surface, bearing 5-10° Red, in position 46° 17' N., 10° 25' W., course 336°, eight to ten knots. No details of the U-Boat were observed.

The sea was choppy but a very marked wake was visible. The pilot veered to starboard making a turn to port, losing height and passing astern of the U-Boat which began to dive. The attack was made from four points abaft the U-Boat's starboard beam, releasing from 50 ft. six Mark XI Torpex depth-charges, set to 25 ft. depth, spaced actually at 27 ft., as the conning-tower was just submerging. As the aircraft flew over, a dark patch was seen in the wake. The crew presumed this to be the conning-tower. But observation was very difficult as, at the moment of attack, a big cloud was obscuring the moon. Depth-charges were aimed 100 ft. ahead of the wake. The rear gunner and navigator saw the depth-charges explode with a blue flash and both are of the opinion that they straddled the U-Boat's track. But the distance ahead of the wake could not be estimated accurately, although the rear gunner considered it to be two-thirds of the length of the visible wake. The rear gunner fired approximately 300 rounds at the head of the wake. No after results were observed. After releasing the flame float, the aircraft set course on baiting procedure. It returned to the scene of attack at 0102 hours and sighted the flame float. A further search of the area was carried out, but nothing more was seen. At 0131 hours, having reached P.L.E., the aircraft set course for base.

Analysis

If the conning-tower was seen at the head of the swirl at release and was just disappearing, it would have advanced 50 ft. ahead of the swirl when the depth-charges exploded. The rear gunner's estimate of distance ahead is two-thirds of visible swirl, which might be 70 ft. The pilot aimed 100 ft. ahead, so it is fair to assume that if the stick straddled the track, it was either on, or just before, the conning-tower and should therefore have been lethal for plan and depth.

Result

A very well-executed attack by a most efficient crew. However, the poor visibility prevented any positive evidence of after effects and it is impossible to say whether the result of the attack was fatal to the U-Boat.

Unusual After Effects

At 0201 hours on 16th January, **Searchlight Wellington N/172** was on anti-submarine patrol, flying on track 136° at 500-700 ft., in weather 2/10 cloud, base 4,000 ft., sea moderate and visibility 15 miles, when it got an S/E contact on beam aerals at 5 miles to starboard.

The aircraft altered course 90° to starboard and homed to attack. The searchlight turret would not come down so it was decided to attack without the light. The aircraft was in an ideal position for an attack, which was down moon of the target. When the aircraft was at half a mile, a partially submerged submarine was seen, i.e., the top half of the conning-tower. Italian Brind type periscope standards were seen 30° to port in position 46° 17' N., 02° 25' W.; course 290°, 8 knots.

The U-Boat was in the act of diving. The aircraft made a diving attack from the U-Boat's starboard quarter at 30° to track, releasing from 50-100 ft. four Mark XI Torpex depth-charges, set to shallow depth, spaced 36 ft. for 150 knots, as the U-Boat was diving with the top of the conning-tower and the periscope still visible. By the time the depth-charges exploded, the rear gunner reported that the U-Boat had submerged to periscope depth. The first depth-charge exploded 60 ft. ahead of the conning-tower swirl, dead on the track of the U-Boat. The other three depth-charges exploded to port of the U-Boat's track. The rear gunner fired 100 rounds at the conning-tower. The aircraft then circled to port and when it was at approximately 1 mile contact was obtained on the port beam aerals, and the rear gunner saw the conning-tower and periscope re-surface in the path of the moon.

The aircraft homed on the blip, but it disappeared as the aircraft approached.

Nothing was seen when the area of contact was reached except three oil patches between the first two-flame floats. The aircraft continued to circle and each time when it approached the scene of attack, it obtained small blips which were then homed on to and on each occasion the oil was sighted. The oil gradually expanded and after 15 minutes the patches had merged into one big area, approximately 100 yards in diameter.

These blips continued for 47 minutes until the aircraft left, and on each occasion they led to the oil patches.

After a little time the crew were able to lower the searchlight, which was switched on. But they were unable to see anything. The original blip obtained was similar to blips from an S/E beacon, i.e., the same shape but slightly rounded at the ends.

Result

A very well-executed attack, with interesting after evidence. It is not possible, however, to give a positive assessment.

CORRECTION

A mistake was made in describing the oil bubbles in the photograph reproduced on Plate 3, Coastal Command Review, No. 8. It has since been pointed out that the bubbles were from a sunken tanker, not from a damaged or sunken U-Boat.

Photographs of typical Diesel oil bubbles will probably be published in a later number of the Review.

II.—OTHER OPERATIONAL FLYING

Attacks on Enemy Shipping, January, 1943

It might have been expected that the winter months would reduce the successes in attacks on enemy shipping. But the reverse was true in January, 1943, when there were a number of encouraging results. With one notable exception, they were obtained by direct attack.

The exception was on New Year's Day when, through excellent co-operation between air and surface craft, the inward bound German blockade runner *Rhakotis*, 6,800 tons, was sunk in the Bay of Biscay by gunfire and torpedo from the cruiser *Scylla*.

A vessel was sighted before daylight by two Whitleys of 502 Squadron. One of these was damaged when approaching to investigate, but sufficient detail was obtained by the light of flares for a description to be sent to base. A little later a Wellington of 172 Squadron attacked the same vessel, with results which were not observed.

Two Sunderlands of 10 Squadron (R.A.A.F.), were despatched to shadow, and surface craft in the area were advised of the situation. In the early afternoon, one of the Sunderlands contacted H.M.S. *Scylla*, and after exchanging signals, the search continued. At 1630 hours a ship was sighted. The aircraft returned to the cruiser, and with the help of smoke floats, directed her towards the enemy. Half an hour later the ship was seen again, but as P.L.E. had been reached, and as the cruiser was well on her way towards

the enemy, the *Sunderland* was forced to return. The crew were therefore unable to see the results of the action.

The cargo of the *Rhakotis* consisted of some 4,000 tons of rubber, vegetable oils, fats, quinine bark, tin, tea, rice, and possibly wolfram. The loss of this was a severe blow to the enemy.

The other successes of the month were all the result of direct attacks. On 13th January, a combined attack by five Hudsons of 320 Squadron, and three of 407, off Den Helder, resulted in two hits being obtained; one on the stern of a 3,000-ton vessel, and the other just forward of amidships on another, of similar size.

Two days later, a small passenger-type vessel was bombed and sunk off Korsfjord, by a Hampden of 489 Squadron. On 18th January another joint attack off Terschelling by six Hudsons, three from each of 320 and 407 Squadrons, resulted in hits on three ships, of 2,500, 2,000 and 1,500 tons respectively.

The final success of the month was obtained in an attack off Egero, by three torpedo-carrying Hampdens of 455 Squadron and four of 489 Squadron. They were escorted by ten Beaufighters of 235 Squadron. Possibly as many as six torpedo hits were obtained on the ship. Photographs indicate that she was of between 3,500 and 4,000 tons, of modern design, and heavily armed. She was seen by one of the Beaufighters to sink.

Combats with Enemy Aircraft

Four Beaufighters of 248 Squadron on patrol in the Bay of Biscay, sighted two Ju.88's about two miles astern and slightly to starboard, flying on the same course.

Aircraft D, followed by K, turned and attacked No. 2 enemy aircraft from dead astern, giving a long burst of cannon and registering hits on the fuselage and the cockpit. D fired at the starboard engine, which immediately caught fire. D then broke away to port and saw aircraft K attack and break away to starboard. The enemy aircraft was now just above the water, apparently flying on one engine. Aircraft D dived down, firing at the port engine, which also caught fire. The enemy aircraft dropped its port wing and slid into the sea. Aircraft B, followed by L, selected and attacked No. 1 enemy aircraft, carrying out a full port beam attack at 500 ft., opening fire at 700 yards and closing to 350 yards. The port engine of the aircraft was hit and white smoke appeared. The enemy aircraft then dived to sea level and the rear gunner replied with accurate fire, scoring hits on aircraft B. Aircraft B then dived from the port quarter and gave a short burst of cannon from 400 yards, which set the starboard engine on fire. The enemy aircraft then struck the water and broke up.

A Wellington Aircraft, S of 311 Czech Squadron, on anti-submarine patrol in the Bay of Biscay, while flying at 3,000 ft. was attacked by seven Ju.88's and one unidentified aircraft resembling a B.R.20. S jettisoned its bombs and the gunners replied to the enemy fire with short bursts whenever the aircraft came into range. One white Ju.88 did not take part in the initial phases of the combat, but hovered in the background and seemed to be directing the attacks of the others. The unidentified aircraft did not appear to take part in the attacks at all. At this stage of the combat, the front gunner of S got in a burst at a Ju.88 which had appeared 250 yards on the starboard bow. The enemy aircraft swerved and when last seen it was enveloped in smoke and losing height rapidly. Three other Ju.88's were lost shortly after this first one. It was assumed by the crew of S that they had exhausted their ammunition. Of the remaining three Ju.88's, the white one carried out most of the effective further 9-12 attacks, which were mostly from below on the starboard bow. Aircraft S took evasive action, climbing and diving in conjunction with corkscrew tactics. Aircraft S was now approaching cloud and, just before reaching the cloud base, the front gunner and the



U-Boat Base at Lorient Keroman

The installations at Keroman are the most interesting in the French west coast bases.

They consist of two large shelter blocks (A and B) distinctive because they are on dry land. Block A consists of 5 pens, and Block B of 7. These are reached through entrance D, where there is probably a lock, where the U-Boat is placed in a cradle and then hauled up a ramp into the centre open space C, where there is a series of transverse rails, allowing the cradle to be moved to the entrance of the appropriate pen, where the U-Boat is then placed.

A further block of the orthodox wet type is under construction nearby (Block D), and is now almost complete. It will probably provide 11 further pens.

Nearby are the radial slips, begun by the French and adapted by the Germans. As can clearly be seen, U-Boats can be hauled up and put into either of the two completed shelters with ease.

PLATE 5.



Lorient
Port Militaire

With a number of U-Boats in the harbour.

mid-upper gunner got in a long burst on the white Ju. 88. The enemy aircraft was last seen making a steep climbing turn to port at 5,000 ft. Aircraft S then escaped into cloud. The combat had lasted about 25 minutes, at heights varying from 3,000-5,000 ft. A total of about 25 attacks were made by the enemy aircraft. Aircraft S was slightly damaged but none of the crew was injured.

A Hudson Aircraft, D of 1406 Squadron, Long Range Met. Flight, off the coast of Norway, sighted a Heinkel 138 approaching from the starboard bow. Aircraft D made a feint turn to port, then swept round on to the tail of the enemy aircraft. The enemy fired 4-star red cartridge, but D fired a sighting burst from 650 yards,

corrected aim and then fired several long bursts by front guns as the range closed. The enemy aircraft began to turn to port, at the same time returning cannon fire from the rear turret. When at 200 yards range, aircraft D slid to the starboard of the enemy aircraft and formed to starboard and, using the enemy aircraft's tail boom as cover from the rear gunner, he gave his own side and rear gunners a good target. The enemy aircraft's starboard engine was then seen to be in flames and the aircraft tried to carry out a forced landing on the sea. The rear of the enemy aircraft's hull hit the sea first and the machine nosed over on to its back, breaking up as it did so. D circled the spot and took photographs of the wreckage.

WAR AGAINST U-BOATS

Lorient and St. Nazaire

There are several ways in which war may be waged against the U-Boat. The first is to attack the slips or shipbuilding yards while the U-Boats are under construction. The second way is to attack the U-Boat while it is in its operational base and the third is to attack it while it is at sea.

It is by the last of these three means that Coastal Command wages its war on the U-Boat. Increased successes have been obtained by these aircraft attacks at sea and, of course, by surface craft of the Allied Navies. But the output of the enemy building yards has more than kept up with the sinkings. In the fourth year of the war, for all their success in the past, the Allied Air Forces and Navies are faced with a bigger number of U-Boats than before.

We already know that the most effective way of destroying U-Boats is by attack at sea. We know then that the vessel is permanently destroyed and that a skilled crew has also been removed, or captured. But it has not been possible to sink a sufficient number of U-Boats to minimise their attacks on our shipping. There is an added way, therefore, in which the enemy's fleet may be depleted . . . by attacks on the bases from which they operate, on the West Coast of France.

Coastal Command's war against the U-Boats at sea has recently been supported by aircraft of Bomber Command and of the 8th United States Army Air Force attacking the U-Boats at their bases. These attacks have continued for some months and they were greatly increased during the month of January. Extremely heavy attacks were made on Lorient and, to a lesser extent, on St. Nazaire. Lorient is the biggest of the U-Boat

bases in France. It was attacked on five nights by Bomber Command during the month, and by day, on one occasion, by the U.S.A.A.F. Heavy loads of high explosives and even heavier loads of incendiary bombs were released there. St. Nazaire was visited on only one occasion in January, by our Allies. Their activity was limited by the bad weather which prevailed on many days during January.

The photographic cover and Intelligence do not yet reveal the full results of the damage and no reliable estimate of the damage at Lorient can yet be given. But the best evidence of the effect of the attacks is in the announcement by the enemy that the town has been evacuated. Only those civilians directly connected with the maintenance of the U-Boat bases are allowed to remain.

The photographs reproduced on Plates 4 and 5 show the town and port, before the attacks were made. It is certain that workshops have been destroyed and that power and water supplies have been cut off. And it is almost certain that many of the barracks and rest houses, used by the German submarine crews when on shore, have been devastated. This is an important aspect of the attack. It means that crews who have been subjected to attacks while at sea have been the victims of a further bombardment while recuperating between voyages.

It is yet to be discovered what effect these attacks on the bases will have on the dimensions of the U-Boat attacks on our shipping. But the results of January have encouraged us to carry the attack into February, and it would seem that the pressure is to be maintained.

III.—SPECIALIST AND GENERAL ARTICLES

On Staff Work and Administration

"Which is best—an unexplained victory or a complete record of how we lost it?"

From an office at Wright Field, Dayton, Ohio.

"I shall see to it that no officer under my Command is debarred, by attending to the futile drivelling of some quill drivers in your Lordship's Offices, from attending to his first duty—which is, always to train and direct men under his command."

Duke of Wellington in Spain to Lord Bradford, 1810.

It is somewhat strange that these quotations should have been specially printed and posted up in more than one administrative office. Perhaps they provide some form of escapism; or are regarded as a sort of absolution which will wipe out the daily sins of omission; or, again, maybe they act merely as conscience-soothers to those who are administratively lazy.

No doubt they also contain more than a grain of truth: without it they would lose much of their appeal. But each also contains a condition which may be overlooked. In the first you must achieve your victory to justify the administrative muddle which preceded it: in the second all may be well—and the emphasis is on "may"—if the time saved is genuinely spent in training and direction.

Historically, it is a little difficult to understand why the Duke of Wellington was so het up over the scratchings of the quills in Whitehall. It is true that Nelson had the advantage of a blind eye: but the chances of the Secretary of War's despatches going adrift intentionally or otherwise, could not have been inconsiderable when the hazards of communications between England and Spain at that period are taken into account; while the time taken in transit must have provided unlimited opportunities for delaying replies. However it happened Lord Bradford's staff appear to have hit a sore spot and to have drawn from the Duke this letter of irritation which has been preserved for posterity.

Both quotations invite speculation as to the proper place of the pen in the armoury of modern war. Life is no longer so simple as it was some hundred and fifty years ago, and war is infinitely more complicated. In those days relatively small forces were under the personal leadership of the officer in command. It was possible to live largely off the country, and the equipment of war was still to a great extent in a primitive state of development. The machine age had scarcely dawned; there might still be some truth in the saying that an Englishman was the equal of any other four comers. Today arms count nearly as much as, and sometimes more than, the man, even though much depends upon his wielding of them. The age of the individualist is past when a stout heart was the primary requisite for winning a battle. That is needed as much as ever, but it must be backed up with the right weapons. It is true that the problem is still to train the man and direct him, but added to this is the further problem of supplying him with the implements of modern warfare.

It is inevitable, therefore, that those who command, whether they do so in a big way or whether they have the smallest force under them, must, to a greater or less degree, come into contact with the administrative machine which

organises, regulates and supplies. They must make their needs known, not just at the last moment but well in advance. They must anticipate their requirements, to prevent the system of production and distribution becoming clogged with the result that the equipment or whatever else may be needed is not available on time or is spread unequally throughout the force. Administration in the broadest sense is part and parcel of command; whether you like it or not, it is essential to the smooth and continuous operation of any unit. Moreover, since armies and air forces are but collections of units, it is an essential to the planning and conduct of large-scale operations and whole campaigns.

From the Station and Squadron point of view, administration falls into two divisions, one concerning the individual and the other concerning things. The first duty of an officer or N.C.O. is the care of the men, of whatever rank, in his charge, whether they are flying personnel or ground staff, highly skilled tradesmen or the last joined A.C.H. Questions of accommodation, feeding, welfare and comfort within the framework of wartime possibilities are of immediate importance; their organisation and improvement must be constantly in the minds of officers and N.C.O.s, and, where necessary, cases must be referred to responsible authority as high up the scale as need be. It is surprising how often some slight inconvenience or even hardship is accepted simply because those who have it in their power to ease the situation are not clearly informed of the facts. On the other hand, particularly in war, some inconveniences and hardships are inevitable, a state of affairs which does not, however, justify inaction.

So far as things—spares, equipment, maintenance, accommodation and so forth—are concerned, more often than not their supply, if they are available, is merely a question of filling in the appropriate form in time, and looking forward to probable consumption: a tedious process, and one too frequently postponed, or, once begun, left to simmer and not stirred from time to time. Demands as well as letters can die for want of hasteners, while the original writer fondly imagines that something is happening. He who keeps the simplest progressing section—it need be no more than a list kept up to date and checked daily—will reap his harvest in the long run, for in the end his importunity, like the widow's, will get its just, or unjust, rewards. If this were a more general practice, life would be almost intolerable at first until everybody had fallen into line, but in due course the whole machine would gain a quicker rhythm and only the inevitable hold-ups and delays would remain. Isolated, they would stand out, and all efforts could be bent to their solution.

Much the same applies to suggestions for operational requirements, some of which are sound, some impracticable and some with at least the germ of a good idea. Too often they are only heard round the Mess fire or in the crew room, because no one has the energy or the confidence to put pen to paper.

And what of the quill drivers, the Staff Officers who adorn the staffs of Group, Command and the higher constellations? Their job is to serve those who bear the heat and burden of the day in the operational squadrons. They are in no sense superior beings, although their work may be every bit as important as that of the squadron staffs. In an ever widening sphere of responsibility it is for them to strive to give the best possible in any given circumstances. If they make a plan it must be a practicable one, and based on a thorough knowledge of what aircraft can and cannot be expected to do. If it is a technical requirement it must be founded on both user and technical knowledge. The Specialist must always seek to make the operational job easier and simpler. Training must turn out a higher standard of proficiency for the good of the Squadron.

The price of civilisation, or as some would prefer to say, progress, has been a high one. The desk has become a prison, a welcome prison to some who seem to think that to be chained to it for a number of hours a day, writing industriously, is the be-all and end-all of existence. But civilisation has brought benefits as well; rapid transport and the telephone have led to the advantage of

frequent personal contact, a proper utilisation of which can often save much paper work. A really short and business-like discussion between the parties concerned will very often result in a single memorandum of the points of agreement, and so save a lengthy and perhaps inconclusive correspondence. A visit will show both parties what is in the other's mind, and lead to a better understanding of what is possible and what is not.

But the meeting, the visit, the "mug of beer in the Mess," will be of little value if no record of it is kept, and if no action follows. It is not feasible to lay down hard and fast rules. The acid test is whether progress is being made, and being made as rapidly as possible. Those who inhabit offices should ask themselves whether by their efforts they are moving mountains, or just masses of paper; and those who spend their days in the open on the stations and in the squadrons should ask themselves whether their neglect of necessary paper work may not be adding to the task of their less fortunate brethren at the same time as it deprives themselves of much valuable guidance and help that might otherwise be theirs.

But both parties should rise up in their wrath, and set their faces resolutely against clearly unnecessary paper work, which is at once the bane and the joy of the age. The Staff and the Squadrons are a team working to the common advantage and with one aim only, greater efficiency and thereby a quicker victory.

The Art of Occupation

When the British occupied Iceland, members of Coastal Command who went there had to be propagandists as well as pilots for the initial reaction of the inhabitants seemed to be one of sullen resentment. It is a tribute to the example set by these first service personnel that the Icelanders are now tolerant and even friendly. In a letter recently received from Iceland one of the pilots writes:—

The importance of Iceland for Coastal Command makes it all the more desirable that officers and airmen posted here should understand sufficient of the country's background to appreciate the better points in the Icelander's character as well as the less good. At times this becomes of great practical importance since the stationing of small R.A.F. units in isolated places brings our personnel into daily contact with Icelanders, or an aircraft may have to force-land on one of the many flat, sandy deserts, with nothing for miles around except an Icelandic farm.

The record of the Danes during their long period of control was not good and there is little wonder that the modern Icelander is suspicious of all foreigners who come in power to his country. He therefore tends to withdraw into his shell and to become more independent and nationalist in thought. This explains in a great measure the early coolness of the Icelanders to the British occupation . . . they were not anti-British but extremely pro-Icelandic. Since 1941, however, relations between the Icelanders and the garrison have improved immensely and many who were previously only pro-Allied in private now exhibit their sympathies in public.

If one does see a dour look on the face of an Icelander one meets, it is not because he dislikes us or the colour of our uniform, but because he is disappointed that his newly-won independence has received a set-back through our occupation. Most Icelanders take an intelligent interest in the war and they have a clear impression of the general situation. And most of them appreciate our efforts more than they make out in public.

Only the other day an old Icelandic professor was heard to say, "I like the clean, fast sound of your aeroplanes taking off in the morning."

Improvements in our relationships with inhabitants of other countries may similarly be achieved by a realisation that, after all, the other fellow has his own point of view, and by trying to understand it. Our arrival in places strange to us is probably even more strange to them, bringing with it new habits and customs which we should be apt to resist just as strongly if not more so. The fact that it probably brings in more money is inevitably accompanied by changes in local values and the inevitable interference with their normal ways of life strikes home more readily than the benefits which will sooner or later be derived from the presence of uninvited strangers.

A study of local conditions and manners will bring about, not only this desirable cultivation of new friends, but also a far pleasanter and more enjoyable time for ourselves.

Landing at Gibraltar

In peace-time, when the personnel of the Royal Air Force was measured in thousands instead of beyond a million, Gibraltar belonged mostly to the Navy and Army. We had little more than a few flying-boat moorings in the harbour. Now the island fortress is as much identified with the R.A.F. as with the senior services. The achievement has not been simple. Most of our aerodromes have been obtained by negotiation, but in Gibraltar some of the land for our purposes had to be created out of the sea.

Gibraltar is such an important station in connection with our operations in North Africa and the Mediterranean that some facts may be of interest to those likely to go there, to remain or on their way to the battle zones.

Gibraltar is only 3 miles long and from 600 yards to $1\frac{1}{2}$ miles wide. There are over 30 miles of road within this cramped area. The Rock is joined to the mainland of Spain by a narrow neck of land. More than three-fifths of the area is lofty rock, tunnelled for military defence and useless for aerodrome purposes. The highest point is 1,400 ft., with the escarpment almost vertical in places. But there are some cultivated areas where fruit and crops grow with surprising profusion.

The Service had to adapt this forbidding terrain to its needs when the war began. The development of the flying-boat base was difficult enough, but the construction of an aerodrome, with an adequate runway extending out to sea, was one of the most difficult and interesting tasks ever undertaken for the Service.

A pilot's view of the island will explain the difficulties. Looking down at the peninsula, he sees the rock sloping steadily from Europa Point and Windmill Flats in the south, up to the "island's" highest peak. From here his eye follows the contours as far as the sheer facade which forms the North Front. Below this is the sandy plain, a few feet above sea level, connecting Gibraltar to La Linea, the nearest town in Spanish territory. Here one may imagine the German observers on the roof of a building, as near to our bases, naval vessels and convoys as possible, and closely watching our activities.

Our interest is in the sandy plain, which was a race-course in the old days. Fortunately, Britain has always claimed the sandy stretch as her own and it was therefore possible to make a landing-ground where horses had cantered in the days of peace. Liberators, Halifaxes, Lancasters and Spitfires: all the latest types of aircraft are the thoroughbreds on the race-course of to-day.

Landing on the sandy plain was difficult at the beginning of the war and pilots did not enjoy the prospect. Gibraltar got a bad name, far worse than it deserved. The runway was short and improperly surfaced, with the sea at either end. A good pilot was able to land safely with medium-type bombers, and Fleet Air Arm aircraft used the runway with ease. But heavy types landed only in emergency.

The winds were the pilots' ally. The prevailing direction was either easterly or westerly, in the same direction as the present runway.

The New Runway

The building of a longer and better surfaced runway was begun at the beginning of the war. It was to be a tarmac strip running into Algeciras Bay on the western side of the peninsula.

The tunnelling of the island heights by the Royal Engineers provided the metal, sand and stone necessary for the work, and very soon, as pilots approached the island, they looked down on a changing scene. The runway grew so that bigger and faster aircraft could be accepted, until the splendid day when the first Liberator was warned in.

A pilot of experience wrote of the event:—

"The excitement was intense and everyone at North Front stopped work to watch the Liberator land. The Army and Navy were well represented and the Spanish labourers downed tools to look on. It was a red letter day for the Rock when that first Liberator landed, with ample room to spare. The subsequent take-off went off with similar ease and safety. The runway was then only 1,150 yards long, and Wellingtons, Hudsons and similar types still damaged themselves occasionally, not because there was insufficient runway, but because pilots were a bit intimidated by the stories they had heard. Their imagination made it difficult for them to act naturally during their approach and landing."

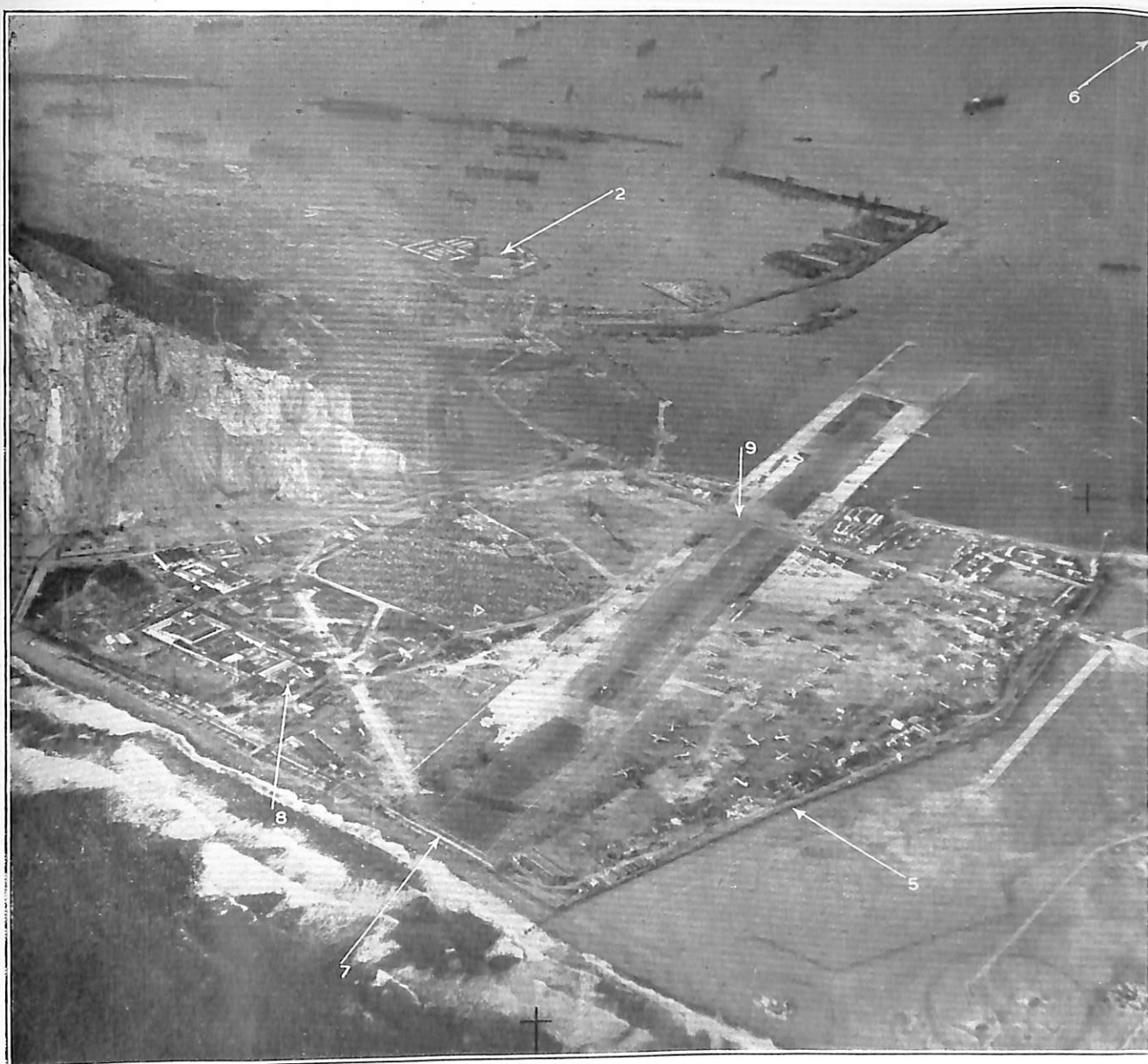
Officers responsible for the dispatch of aircraft from parent stations flew out to Gibraltar themselves to test its landing arrangements. Photographs of the progress in building the runway were taken each month and sent back for briefing in Britain and experienced flying control personnel were posted to the Rock. (One squadron, operating day and night, recently flew an average of 950 hours a month for six months without one accident.)

So the earlier, rather inadequate landing strip has since become one of the most important R.A.F. stations in the world to-day. The runway now measures 1,500 yards and it is 150 yards wide. It will eventually be 2,000 yards when the present work is finished. It cuts across the isthmus and forms a regular breakwater where it runs into the sea, dividing the multitude of ships in Algeciras Bay.

A pilot who recently landed at Gibraltar has written:—

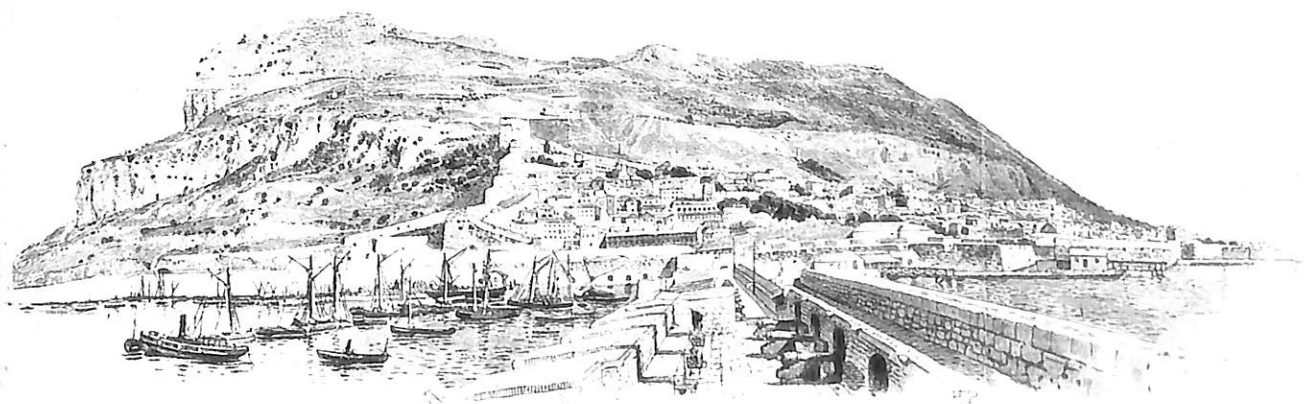
"If approaching to land from the east, you will notice buoys moored in the sea in line with the runway, which give a good line and serve to show the glassy surface of the Mediterranean in a flat calm. There is a black and yellow chequered strip bordering the eastern sea wall, thus marking the beginning of the runway. When approaching from the west, the height of the ships' masts and buildings will help you to judge your relative height. The Admiralty forbids ships moored in the bay to lie in line with, or within 15 degrees each side of the runway. Thus, from east and west the approach is without obstruction.

There is no wind sock on the aerodrome, but there is a smoke generator and a big direction- or landing-light in the signals square, immediately

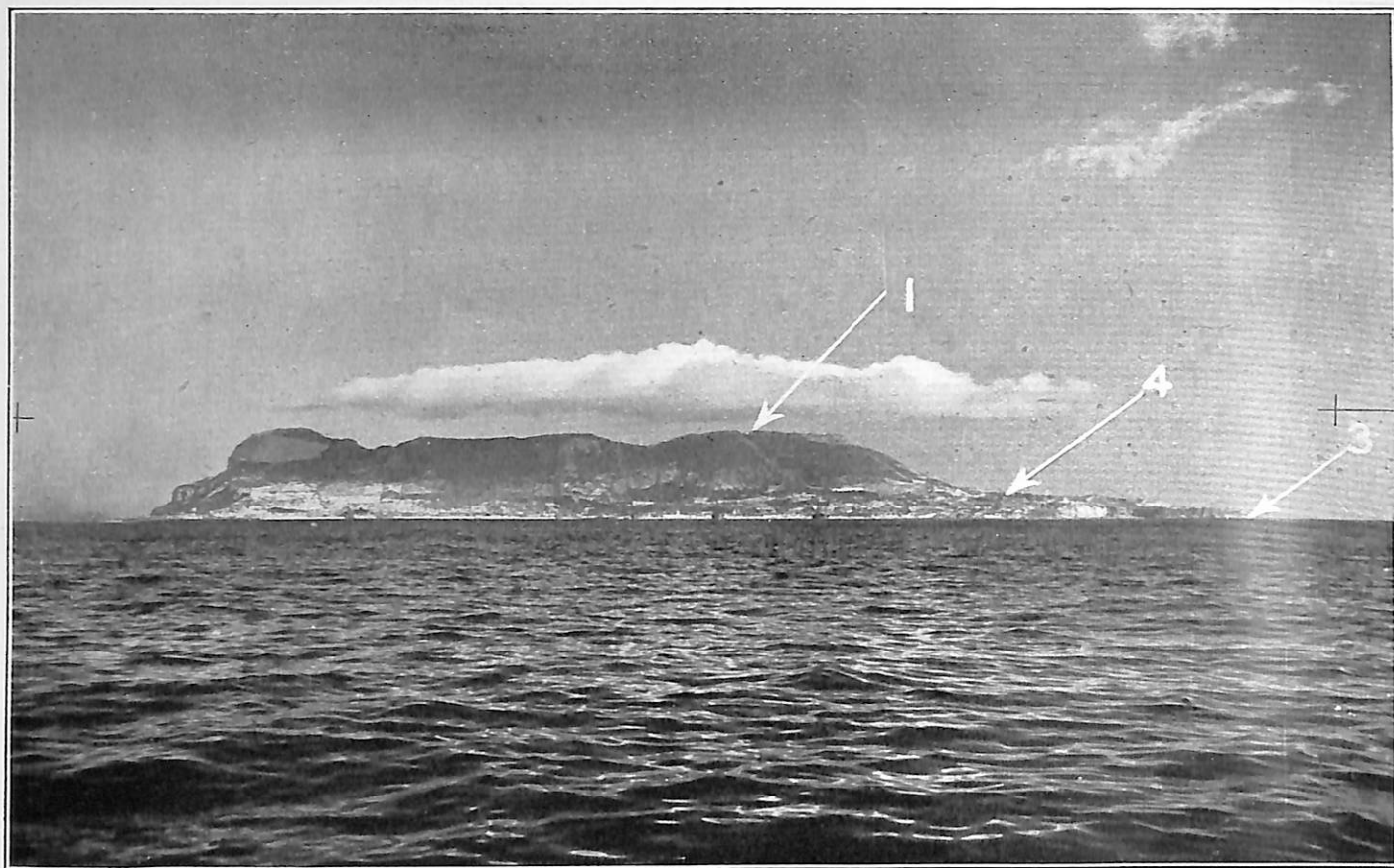


The Runway at Gibraltar

- (2) The Flying-boat base. (5) The area between this line and the face of the cliff, left, is all known as the North Front. (6) Algeciras Bay. (7) The black and yellow chequered strip marking the beginning of the runway. (8) Flying control office. (9) Road leading from Gibraltar to the Mainland.



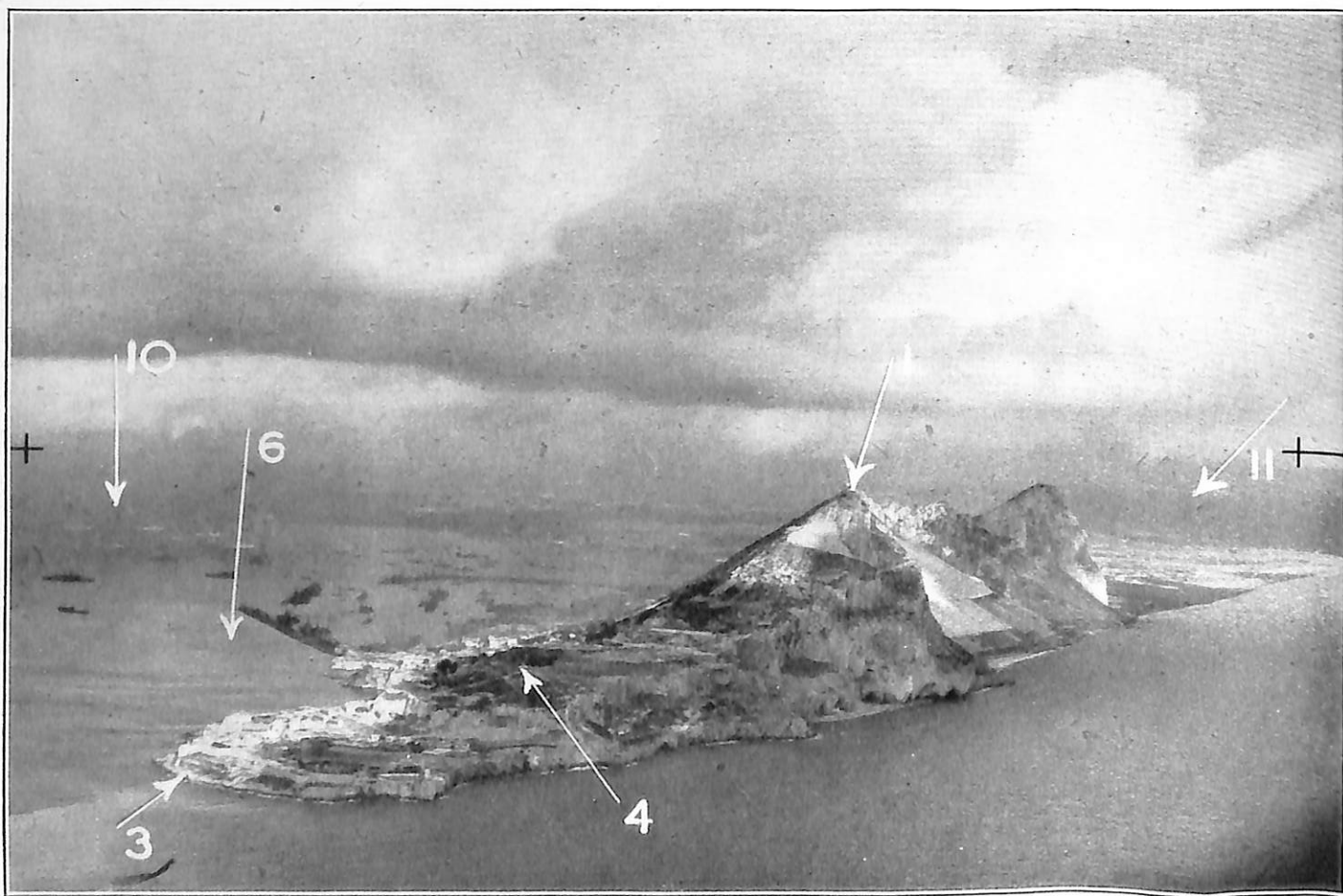
Gibraltar in 1889.



(1) The highest point.

Gibraltar from the Sea
(3) Europa Point.

(4) Windmill Flats.



(1) The highest point.

Gibraltar from the Air
(3) Europa Point. (4) Windmill Flats.

(6) Algeciras Bay

(10) Algeciras (11) La Linea

outside the flying control office. The runway surface is well drained and smooth as concrete. The unusual width of the runway minimises the chance of running into the sea, if the aircraft should swing.

"When he realises that there is only one runway and no perimeter taxiing tracks, the pilot may ask, 'What's the form in flying?' The answer is simply *Flying Control*. Aircraft are given their order of landing by R/T and when they have landed they are allowed to taxi to their parking point along the runway before the next aircraft may land. The same rule holds when they are taking off."

The panorama of Gibraltar (reproduced on Plate 6) shows a wide road which completely crosses the runway. This road carries all the traffic from Gibraltar to the mainland, but all traffic using it is controlled by the duty pilot or flying control officer, acting through a traffic policeman, assisted by lights and railway gate road blocks. These are backed up by a number of Gibraltar civil police. Any Spaniard, of whom some thousands enter and leave Gibraltar daily, who dares to imagine that he might get across while an aircraft is landing, is thus held in check. An accident due to traffic crossing the runway is now almost impossible.

Night Flying

Finding Gibraltar at night is less complicated than finding any aerodrome in Britain. The Spaniards are able to enjoy a blaze of lights as one advantage of neutrality and both Algeciras and La Linea are lit up at night. There is added help from Spanish North Africa where Tangier and Ceuta provide natural navigational beacons. Europa Point gives a third source of light, with a normal flashing beacon.

The North Front flarepath is electric, double sided, unscreened, and running the full length of the runway from sea to sea. There are obstruction lights at either end. There is an alternative system of lighting should the mains fail. Angle of glide indicators are also provided, so that it is now possible to operate large numbers of aircraft at night as well as during the day.

Weather

The weather at Gibraltar divides itself into two seasons: the rains of winter and the dryness of summer. The prevailing winds are easterly and westerly, as we have already said. Sometimes the wind blows across the runway from north-west or north-east. But it is seldom more than light and variable. The smoke generator will reveal these conditions. Pilots sometimes find an easterly wind at one end of the runway and a westerly at the other. This is infrequent, usually occurring only when the wind is less than 10 m.p.h., and is caused by its eddying around the Rock. A light easterly wind may thus be blowing at the eastern end and may change its direction and come in as a westerly on the other side. This has never been a serious trouble and, but for the smoke, would hardly be noticed.

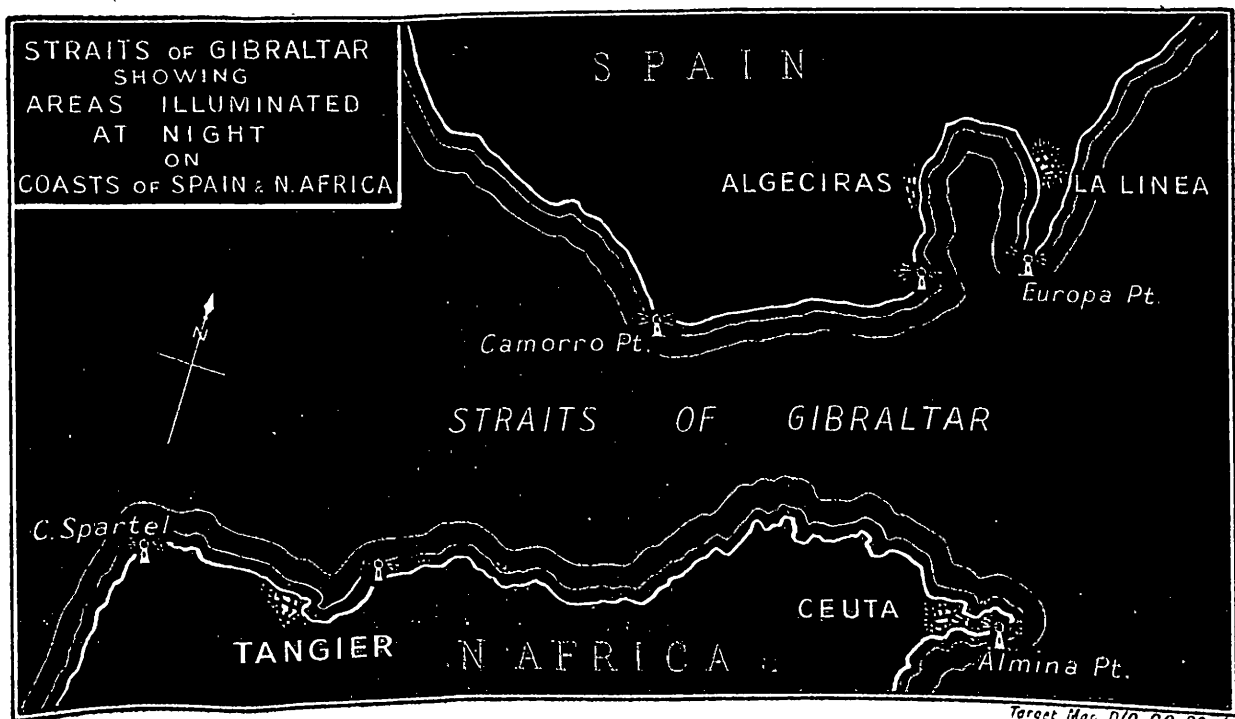
Sometimes during the summer, an easterly wind, known as the *Levanter*, will cause a pall of low cloud to form over the Rock, much the same as it forms over Table Mountain in Capetown. This cloud sometimes sinks over the land and surrounding sea, adding to the problems of the man on the ground. There are also occasional fogs which form rapidly during early summer mornings and which can usually be anticipated.

The *Levanter* sometimes achieves great strength and the air is disturbed in the lee of the Rock so that strong downward currents may be met with. The problems arising from this are dealt with under the heading "Approach to the Rock."

One final note on the weather. It must be remembered that the performance of our aircraft deteriorates in a sub-tropical climate, particularly during the summer, from May to September. These are hot months and the pilot who leaves the colder north intending to land on the Island must adjust speeds, rates of climb, etc., accordingly.

Approach to the Rock

The purpose of this article is not merely to give a picture of Gibraltar from the Service point of view. It is to dispel any idea that may still linger . . . that landing on the island is difficult. All crews leaving the United Kingdom for the



Rock, or for aerodromes beyond, are carefully briefed, not only for the journey, but for the procedure in approaching and for points to watch when making the circuit and landing. If the pilot has identified himself according to the procedure laid down, and if he has approached Europa Point on a course of 360 degrees, he will realize the trouble that has been taken to make his landing easy. He will see the circuit arrow or T and then, after calling Control on R/T for his number for landing, he will make a circuit of the Rock according to the arrow.

There are a few more points which should be helpful. The circuit should be made normally with the undercarriage down. The pilot should keep up maximum speed, according to the aircraft's limitations. There is a reason for this. When arrangements at Gibraltar were more primitive than now, there was a great deal of talk among pilots about the dangerous air currents and eddies created by the Levanter. Gibraltar's air currents and eddies demand no more than respect from a careful pilot—one who will not come nearer than two miles to the east and west sides. He will then be able to align the aircraft to the runway and make a straight approach. There is no need to disappear into the blue in making the circuit and then roaring in on a wave-hopping approach, engines full on and fighting valiantly against full flap. The two-mile circuit has been proved enough by hundreds of

pilots. By observing it, the new arrival will save the station personnel minutes of anxiety.

Every effort must be made to respect Spain's neutrality during the circuit, although it is not always possible. The Spaniards enjoy a sudden Latin enthusiasm in using their guns and, although they are friendly in spirit, they have warned us that they will fire on our aircraft if they intrude. Prudence is therefore the order of the day.

This latter danger is averted by the circuit arrow at Windmill Flats, Europa Point. This assures the pilot from the beginning that he is flying the correct circuit. There is no need for him to creep around the Rock and wait for the signal square to give him his circuit and then find that he is on a left-hand circuit instead of a right-hand one—thus adding to the confusion of others. The circuit designated by the arrow removes all need for carrying out a tight circuit of the aerodrome before making a final approach.

The only limitation on the number of attempts to land is the amount of petrol in the tanks. It is no blot upon a pilot's flying escutcheon if he goes around again. Many accidents might have been avoided at Gibraltar—in the old days before the present runway was made—if pilots had placed care first and bravado second.

From all this the rules emerge in simplicity. Have a good look at the runway. Remember what you were told. Weigh it up and then make your circuit and landing just as you would at home.

Luftwaffe at Bay

"I have noticed," said Marshal de la Ferté, one of Napoleon's most famous commanders, "that God is usually on the side of the big battalions." Already the armed forces of the Axis are beginning to realise the truth of that exquisite cynicism—on land, at sea and, most vividly, in the air. It is, therefore, particularly interesting for us in the Royal Air Force to examine the effect upon the German Air Force of an unlimited military strategy impinging upon a limited aircraft and aircrew production.

In the two years which have followed the Battle of Britain, when it was the enemy who deployed the "big battalions," the German Air Force has been committed to continuing battle on two additional fronts, one of 2,000 miles in Russia and one of 2,500 miles in the Mediterranean. In those same two years the German Air Force has been committed to do battle with two additional Air Forces—first, the whole of the large and indignant Air Force of the United Soviet States of Russia, and, more recently, a substantial proportion of the potentially huge Air Force of the United States of America. This means that even if the German Air Force had been able to maintain its numerical strength or even slightly to increase it, its scale of effort over the front as a whole must have been enormously reduced. In fact, however, during those two years, the operational strength of the German Air Force is reliably estimated actually to have declined by about twenty per cent.

This reduction in strength has been matched by a correspondingly sharp decline in reserves

of stored aircraft. It is probably true to-day to say that, in the face of the combined aircraft production of the British Commonwealth of Nations, of the United States of America and of the United Soviet States of Russia, Germany cannot easily even replace day-to-day wastage of current aircraft types.

The mighty Luftwaffe of the Lindbergh headlines is plainly developing a limp. There have been occasions when the British Army, right or wrong, complained that they "never saw a British aircraft" during their operations. To-day, this is the complaint of German prisoners of war. As these murmurings become more frequent, blend and grow into a roar, the inescapable responsibility of Reichsmarshal Goering, Second Nazi of Germany, may well have important political repercussions and widen the gulf between the Army and the Party.

Meanwhile, it is politically consonant with the prophetic mystique and the glittering façade of that Party's perverted imperialism that, while the real operational strength of the German Air Force has shrunk materially in numbers and quite catastrophically in relation to its military and geographical commitments, its front line or initial equipment should actually have been slightly increased. But the strength in depth of the German Air Force has been shattered. Now that the initiative has passed to the United Nations and while these United Nations sustain their aggressive operations, that strength in depth can never in the face of Germany's aircraft production capacity be recovered. Little wonder,

therefore, that the offensive Luftwaffe of the Battle of Britain should have become the defensive Luftwaffe of 1942, and the Luftwaffe at bay in 1943.

That Germany's leaders, both in the Party and in the Army, have long been miserably conscious of this soft core in their military strategy, proof lies, if proof is needed, in the degree to which all through the campaigns of 1942 they husbanded the striking power of their air forces. This was equally true on all fronts. Never in Western Europe, in Russia or in the Mediterranean did the German Air Force exert anything approaching the maximum scale of effort of which it was potentially capable. Most significant perhaps is the fact that even in Russia, where victory, it might be supposed, was essential alike politically to Hitler's personal *panache* and strategically to Germany's race with United States development, only some 60 per cent. of the available aircraft is estimated to have been consistently employed on intensive operations.

To-day, after four months of offensive operations by the United Nations on two major fronts, it is possible to detect an acceleration in the rate of decline in the fortunes of the German Air Force when it is called upon willy-nilly to maintain a maximum scale of effort, to fight on battlefields chosen by its enemies and there to sustain continually heavy casualties. Northern Norway has had to be stripped of bombers, Western France and the Caucasus of fighters; the siege of Leningrad had to be abandoned and industrial Italy left to its fate; and in North Africa not only did Rommel receive no reinforcements, but such limited forces as survived battle were withdrawn from him before that battle was lost. Von Hoth's Sixth Army, encircled at the gates of Stalingrad, was soon deserted to starve; F.W.200's have been withdrawn from vital Atlantic reconnaissance to serve as petrol bowsers in the Mediterranean and as transports in which to save precious officers from Russian annihilation. On all fronts aircraft and crews from both Bomber and Fighter Reserve Training Units have been flung into battle; torpedo bombers from schools are being sent into withering naval action, and for the first time the German Air Force's Transport Aircraft establishment, long enviously regarded by us as a luxurious dream, is to-day found sadly wanting.

Specially interesting is it also to see revealed the undeniable fact that the enemy's lack of numerical strength in depth finds a parallel reflection in a lack of geographical and physical strength in depth. The enemy's determination at all costs to maintain the initial equipment of his front line units has resulted, both in Russia and in Africa, in a disproportionate destruction of his total strength, both in the air and on the ground. And this has been coupled with a lack of replacement aircraft, of ground services and of supplies of fuel, parts and ammunition at those aerodromes in the rear to which his broken front line units have had to withdraw. In other words, while at all times the enemy's aircraft losses can be counted in arithmetic progression, the reduction in his potential scale of effort must, during periods of retreat, be measured in geometric progression. If a true estimate of the cumulative effect of United Nations' advances

is to be formed and the enemy's capacity to rebound is to be measured, this result of the enemy's policy must be borne in mind.

The increasingly defensive philosophy of the Luftwaffe of 1943, which finds political and strategical reflection in its husbanding, is reflected also in what we know of the allotment of production as between the offensive and defensive categories of aircraft, as well as in the influence upon the operational functions of each category which that proportionate allotment exercises.

It is always difficult when describing a vicious circle to know at what point on the circumference to take up one's tale. Let us first pay tribute, therefore, to our Russian allies and state categorically that the main reason for the reduction in the total operational strength of the German Air Force lies in the losses which it sustained on the Russian Front during 1941—losses from which the enemy has never recovered. That, without any doubt whatever, has been the dominating factor. Now it happens that the major reductions have all been in the offensive categories—long range bombers, reconnaissance bombers and dive bombers; and the overall reduction is reliably estimated to be about 33½ per cent. This brings us to the second point on our circle where Bomber Command is revealed, perhaps paradoxically, as being the second most influential factor in having reduced the enemy's capacity to bomb us. This is what has happened.

From the beginning of things the Ju.88 has been the backbone of the enemy's offensive category. As a result first of the enemy's policy of simplification and rationalisation of types, and second of endless difficulties and muddles in the production of such few new types as he has attempted to develop, the Ju.88 has steadily represented a greater and greater proportion of the enemy's total offensive strength. Simultaneously with this development and the Ju.88 casualties and wastage on the Russian Front, Bomber Command has as steadily developed the weight of its attack upon the heart of Germany. Now easily the most efficient twin-engined night fighter which the enemy possesses is the Ju.88—with the result that Bomber Command has forced the enemy to switch production from the bomber to the fighter version. This switch (point three of our circle) has been forced upon the enemy to an even greater degree by the muddle in the Messerschmitt factories. Production here was switched from the Me.110, another successful twin-engined night fighter, to the Me.210 only to discover that in operations the Me.210 developed such serious faults that production had to be stopped for a long period in 1941 and 1942.

In other words Bomber Command's offensive forced the enemy on to the defensive not only in the field but also in the factory, and so made it difficult for him to build up his bomber strength. Incidentally, of course, this is as true of the Ju.88 reconnaissance bombers as of the Ju.88 long range bomber type.

At the fourth point in the vicious circle we see that a further strain was simultaneously thrown upon the Ju.88 factories when, for reasons of its low carrying capacity, the enemy discarded, for operational purposes the Do.17. The Do.217 which took its place has never pulled its weight

numerically, partly owing to production difficulties and partly owing to its extreme fragility in operations.

Coincidentally with these developments (point five) four Coastal units were transferred to the Long Range Bomber category. At the time of the Battle of Britain, Coastal units were still in some measure offensive. This transfer in an unsuccessful attempt to maintain the Bomber strength is seen as having been merely a case of robbing Peter to pay Paul and still further reduced the offensive potential. Since that time, moreover, the long range fighters of Fighter and Coastal Command have steadily forced the enemy's Coastal units to adopt a defensive rôle. There is our sixth point in the vicious circle.

At the seventh point geography enters the lists; as the enemy's fronts steadily lengthened, his single-engined fighters became ever more thinly spread; this quite inevitably reduced the offensive potential of the fourth offensive category, the dive bomber. Without single-engined fighter escort, the Ju.87 suffers casualties which are usually crippling—and crippling they have consistently been; their casualties have resulted, *vis-à-vis* production, in an estimated reduction of about 50 per cent. in total strength. Admittedly this reduction in strength has been partially offset by the establishment of Ground Attack and Anti-Tank units, equipped with single-engined fighters of various kinds; but this apparent, and in any case far from numerically complete, compensation is less real even than it seems for two reasons. The bomb-carrying capacity of these aircraft is less than that of the Ju.87 and in their Anti-tank functions they are more defensive than offensive.

To sum up, seven major factors have combined to form a vicious circle in the toils of which the enemy has not even been able to maintain at its Battle of Britain level the operational strength of his offensive types of aircraft. His losses in Russia, the growing offensive of Bomber Command, the *faute de mieux* absorption of Coastal Units, the planning and production difficulties and muddles in the Messerschmitt factories, the discard of the Do.17, the development of Fighter and Coastal Command's long range fighters and finally the increased geographical commitments of the enemy's single-engined fighter units have combined so to reduce the enemy's offensive strength, both in numbers and efficacy, that to-day it must be husbanded almost entirely for defensive purposes—and, perhaps most important of all, it must be directed on a tactical instead of a strategic level. This was clearly exemplified in the recent retaliatory raids on the southern counties and London suburbs, following our raids on Berlin. Not only did the enemy mount a far smaller scale of effort than the available units were capable of, but he drew the very limited effort which he did

put out from virtually every unit on the Western Front—a decision which was probably not prompted entirely by considerations of home-front and Squadron morale.

So much for the offensive might of the dreaded Luftwaffe. Meanwhile, as already recorded, the essentially defensive single-engined fighter force has also declined in terms of total strength. To-day it cannot begin to meet all those wide commitments which the vast Wehrmacht, under its inspired Corporal, has so irresponsibly thrust upon it. It must flutter from pillar to post wherever the armies of the United Nations or their gathering armadas of bombers choose to strike. It can never again hope to achieve anything more than a local and tactical advantage, and that only at the cost of laying other sectors open to our bomber fleets and the growing precision of daylight destruction.

Of the enemy's twin-engined fighters, Bomber Command is estimated to have already forced some 70 per cent. on to the defensive and in this category too there has been a reduction in total strength which is estimated at nearly 20 per cent. Moreover, even this strength, as already emphasised, has only been prevented from a further landslide at the expense of the long range bomber units equipped with Ju.88s and Do.217s.

To sum up on the defensive side, it is reliably estimated that to-day some 40 per cent. of Germany's total operational aircraft production is devoted to defence.

Alone, in all categories, Army Co-operation aircraft show a real increase in total operational strength. This is the direct result of the army's vital need for reconnaissance along the 2,000 miles of land front in Russia. But the aircraft are in no sense offensive.

And so it may be seen that the German Air Force has passed finally from the offensive to the defensive, that the gathering initiative of the United Nations is likely to increase the enemy's defensive requirements and that those increasingly defensive requirements will absorb a growing proportion of German aircraft production. Unless wastage can be reduced—and such is unlikely—the possibility of any substantial development of the German offensive potential need not be entertained. Meanwhile, the disastrous reduction in the German Air Force's strength in depth prejudices its capacity to withstand what we may warrantably hope will be extended periods of heavy fighting with its attendant maintenance problems, accidental wastage and operational casualties.

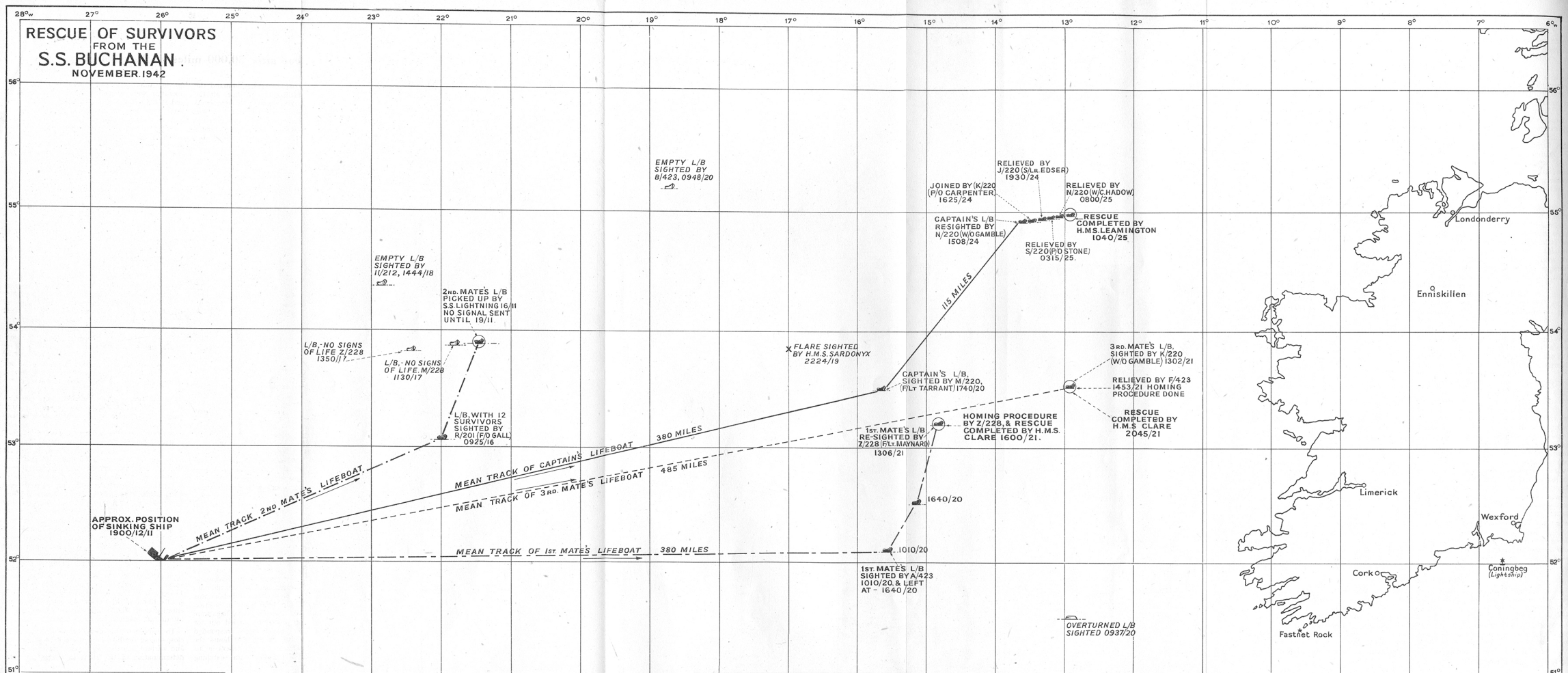
In the face of the factory and man-power capacity of the United Nations, the Luftwaffe stands desperately at bay. But remember that an animal never fights more fiercely than when it stands, in mortal and inescapable danger, at bay.

VON PAPEN SPEAKS

It is now known that the R.A.F.'s 1942 offensive against Germany inflicted damage far surpassing anything achieved by the Luftwaffe in its blitz against Britain in 1940-41. Eight of the Reich's 35 key industrial cities have been so devastated that they are more of a liability than an asset to Hitler's war machine. Others have been crippled. Nazi morale has suffered. Ambassador Franz von Papen returned to Turkey recently and confessed gloomily to a neutral diplomat: "The situation in the Rhineland is appalling. People are beginning to ask for Peace at any Price. Unless something can be done to stop these R.A.F. raids this winter, the situation will become dangerous for the Nazi party."

READER'S DIGEST, February.

RESCUE OF SURVIVORS
FROM THE
S.S. BUCHANAN
NOVEMBER 1942



Rescue after 30,000 miles of Reconnaissance

The British Press paid Coastal Command the compliment of describing the rescue of the survivors of the S.S. *Buchanan* in November as the "R.A.F.'s greatest rescue of the war." It was an overstatement for it was not an operation carried out by the R.A.F. alone, but it was a combined effort by the Royal Navy, the R.A.F. and the merchant service.

The *Buchanan* was sunk over 500 miles from land by an enemy U-Boat at approximately 1900 hours on 12th November. The passengers and crew, numbering 73 in all, took to four lifeboats which were in charge of the Captain and the First, Second and Third Officers respectively. What might be described as the human side of the rescue has already been published in the Press. The following has been compiled mainly from the narrative of the Commanding Officer of 220 Squadron.

Search operations began following the sighting of a lifeboat by R/201 at 0925 hours on 16th November. The pilot, using the group WZX, reported that there were 12 survivors on board. Later on the same day this lifeboat was contacted by S.S. *Lightning*, a vessel sailing independently, and the survivors were rescued. The Captain of this ship maintained wireless silence for three days, so that information regarding the rescue was not known until that time had elapsed. It was subsequently learned that this was the Second Officer's boat.

Meanwhile H.M.S. *Sardonyx*, which had been searching for a raft, was diverted to the lifeboat search on 18th November but, being already short of fuel, was forced to return to base on 19th November. On her way back on the evening of the 19th she sighted rockets 53° 50' N., 15° 59' W.

As a result of this, M/220 left to square-search the area, and A/423, which was operating in roughly the same area, sighted a lifeboat, which proved to be the First Officer's, at 1010 hours on 20th November. The lifeboat was then in position 52° 12' N. and 15° 32' W. The aircraft remained with the lifeboat until P.L.E. (1643). At 1740 hours M/220 also made a sighting and successfully dropped near the lifeboat two Thornaby bags which were recovered by the crew. A note was also dropped indicating that help was on the way. Contact was maintained for two hours in darkness by dropping marine markers Mark II. This lifeboat signalled with a torch the word *Buchanan*. At 1955 hours the aircraft was compelled to set course for base.

The next day, 21st November, was eventful both for aircraft and survivors of the *Buchanan*. There were many sightings, but the essential ones were as follows. The First Officer's lifeboat was re-contacted by Z 228 at 1306 hours in position 53° 18' N., 14° 49' W. Two Thornaby bags were dropped and homing procedure carried out for H.M.S. *Clare*. The naval vessel responded quickly and effectively, for at 1610 hours the rescue of the First Officer and all others in his boat was effected. H.M.S. *Lulworth* was searching

in the same area and certain aspects of the operation were witnessed by the crew of M/228 and H/423. H.M.S. *Clare* signalled to M/228 that there were three further lifeboats in the vicinity and a similar message was sent by another corvette to H/423 at 1700 hours. This news was obtained, no doubt, from the First Officer of the *Buchanan*. On the same day K/220, en route to convoy KMF/2 for escort duties, sighted a lifeboat, which turned out to be the Third Officer's, then in position 53° 32' N., 12° 56' W. The sighting took place at 1302 hours and emergency rations, signal cartridges and a map giving their position were dropped in a parachute bag with a Mac West. At 1452 hours K/220 sighted F/423 flying some 15 miles away. By firing signal cartridges, she attracted the Sunderland's attention and the latter took over escort of the Third Officer's boat at 1725 hours. F/423 began homing procedure and, as a direct result, H.M.S. *Clare* effected another rescue at 2045 hours on the same day, F/423 remaining until the end.

There still remained the Captain's boat to be rescued and searches took place on 22nd and 23rd November. Interrogation of the survivors established the fact that the lifeboat seen by M/220 on the 20th, which had flashed the word *Buchanan* in perfect morse, was probably that of the Captain, as he had the ship's radio operator with him. On 24th November, at 1508 hours, N/220 sighted the Captain's lifeboat in position 54° 56' N., 13° 35' W. She was on course 070° and was making 2-3 knots. By holding water-containers upside down the occupants demonstrated that they were in need of water, so the crew of N/220 dropped Thornaby bags which included, among other supplies, water in tins. K/220 which, like N/220, had covered approximately 1,000 miles on the search since leaving land, carried out an interception without the aid of wireless fixes. The position as given by the two aircraft differed by only 21 miles. More Thornaby bags were dropped before K/220 set course for base. At 1930 hours, J/220 made contact with N/220 in the dark, with the aid of marine distress markers and N returned to base where it landed with 30 gallons of petrol in each tank after a flight lasting 13½ hours. J/220 maintained contact by the aid of flares and marine markers until the aircraft was relieved at 0315 hours by S/220. At 0600 hours this aircraft broadcast on 385 kc/s to home H.M.S. *Leamington* on the lifeboat. It is interesting to note that ten bearings were obtained on the aircraft by the naval vessel with the result that the latter was able to effect a rescue at 1040 hours the following morning.

At 1100 hours the Captain of N/220 sent a signal: "Operation completed 1040 hours—17 rescued." The Captain's lifeboat had been at sea for 13 days. So concluded a rescue which had entailed over 30,000 miles of air reconnaissance by aircraft operating from Northern Ireland.

The success of this operation was due (a) to the close and successful co-operation between aircraft and surface vessels, (b) to the persistence and determination of the pilots in continuing their

search up to and sometimes almost beyond P.L.E., (c) to the accurate navigation of the searching aircraft and of the surface vessels, and (d) to the efficient plotting and control of the operation by Group Headquarters.

Congratulatory messages were sent on the completion of the operation by the Air Officer Commanding-in-Chief, Coastal Command, the Admiralty, and the Commander-in-Chief, Western Approaches.

The Captain and survivors of S.S. *Buchanan* sent the following message: "I wish to thank you for the tremendous work you have done by spotting the lifeboats, thus enabling us all to be safely brought into port."

As a result of the experience gained in this operation, valuable recommendations have been made, some of which have been adopted. It is essential that a lifeboat, with its sails and better means of progress, should be distinguished from a raft or a dinghy in order to facilitate the plotting of its approximate position.

From the accompanying chart, facing p. 15, it will be seen that the Captain's lifeboat travelled 495 miles and the Third Mate's 485 miles, while the First Officer's lifeboat sailed 380 miles. The use of group WZX in the first sighting thus conveyed misleading information. A new group, meaning "I am over lifeboat with (number) estimated survivors" is therefore being adopted. The pilot of R/201 could have used BAD but that would have entailed signalling *lifeboat* in full.

Another factor which caused some confusion and waste of fuel and aircraft flying time was the number of empty lifeboat sightings. The question of sinking of lifeboats has already been raised, and orders have been issued that when these cannot be salvaged they must be destroyed. But conditions do not always make destruction

possible and there must always be a risk of lifeboats being left adrift.

A proper plot was maintained at Group Headquarters throughout the operation which was an essential part of the rescue.

When dropping supplies to the lifeboats, some trouble was experienced with the Thornaby bag which withstood the shock of impact itself but did not protect the contents. Biscuits and cigarettes in the emergency ration tins were ruined by sea-water and had to be dumped. The tinned water, however, was intact and of great value. As it has been proved that the Thornaby bags, when properly packed, are effective even when dropped at high speeds, it can only be assumed that in this case the packing was at fault. These, are, however, being replaced by Bircham barrels, which will obviate the trouble experienced. The Bircham barrel is a 250-lb. bomb container specially strengthened to withstand the shock of impact when dropped at high speed. It is fitted with a nose and is delivered to stations already packed. No items of air-sea rescue equipment were ever designed to withstand the shock of being thrown or dropped unprotected, so it was no surprise that a water-can attached to a Mae West, and bundles lashed with cord, burst on impact. A suggestion that rum or some other spirit should be included in Thornaby bags or Bircham barrels is contrary to a specific order.

One final suggestion which has been represented for consideration is that ships' lifeboats should have a large number painted on either the sail or the forward decking canvas, each lifeboat on a single ship having a different number. This might be improved by having the ship's four-letter code, followed by the number, on the sail or lifeboat. An aircraft would then be in a position to determine which lifeboat had been seen and from which ship it came.

Plan Your Battles

In reply to an unusually tricky supplementary question in the House, a former Secretary of State for War gave what might be regarded as the perfect Parliamentary answer when he said, "Whatever is appropriate, has been or will be done." To anyone seeking advice on evasive tactics no better answer can be given than, "Do what is appropriate." It is a fallacy to suppose that the Third Reich's development by conquest followed a rigid, predetermined plan. Closer study reveals Hitler as an opportunist, but an opportunist with a detailed plan, ready prepared, on which to exploit whatever opportunity offered. He had worked out beforehand exactly what he would do in any given circumstances. Thus he was always able to act with lightning rapidity. He won his battles while his opponents were still planning them.

Successful evasion likewise depends upon doing the right thing, at the right time, in the right place, with lightning rapidity. When the average man finds himself in a crisis he is more likely to make the right decision and execute it rapidly if he has anticipated the crisis and planned what he will do in any given circumstances. A Walt Disney mascot! A childlike faith in one's own immor-

ality! A happy-go-lucky contempt for one's enemy! These are poor substitutes for cold, hard reason when you are half-way to nowhere with a F.W.190 on your tail.

There are four basic methods of evasion. You may kill. You may dodge. You may hide. You may run.

And the greatest of these is to Kill

In Chinese, the word "crisis" has two meanings: "*danger*" and "*opportunity*." An attack by an enemy aircraft may or may not be dangerous—but it *always* offers the opportunity to destroy. It is not always by dodging, hiding or by running for it that Sunderlands and Hampdens evade Me.109s and F.W.190s, or Wellingtons and Whitleys evade Ju.88 fighters and Arado 196s—but by shooting them down into the sea.

Four main factors contribute to successful evasion by killing. Fire-power, fire-practice, fire-control and self-control. Every operational type of aircraft in service with Coastal Command to-day has the fire-power to destroy any operational type of aircraft used by the Germans. This fire-power should be exploited to the full by every aircrew, and that is possible only when

every crew has so perfected their gunnery that they have absolute confidence in their weapons and in themselves. In our larger aircraft, practice gunnery must be matched by practice fire-control. Confidence in the fire-control will, in its turn, breed self-control. In air gunnery, to fire too much, too soon, is usually as profitless as to fire too little too late.

In short, offence is the best defence. The only good German is a dead German for, once he is dead, no further evasion is called for.

Or You can Dodge

The most vital pre-requisite for this form of evasion is height. An aeroplane flies in three dimensions and is most likely to survive if it exploits all three. In certain circumstances, such exploitation may take the form of denying the use of the third dimension to the enemy. By "going down on the deck" one offsets one's lack of a ventral gun, one reduces the higher-rated enemy's advantage of speed, or one forces a single-engined aircraft to manoeuvre and fight perilously close to a detested element. But the greater one's initial height, the better one can dodge and the longer one can go on dodging. One's form of dodging obviously depends upon the type of aircraft one is flying, and upon the type one is dodging. In the case of enemy fighters it depends also whether one is dodging a free-lance fighter or a fighter controlled from the ground. Lastly, it must depend upon whether one is dodging by day or by night.

In bridge, correct discarding is all-important. It is equally important in air fighting to remember to exploit one's weaknesses as well as one's strength. *Vis-à-vis* the bomber, one of the fighter's greatest difficulties is to avoid constant overshooting; therefore a sudden throttling back is often a more effective form of evasion than a sudden boost. Or again, in some ways one may be less manoeuvrable than the fighter, but one enjoys a tighter turning circle. It was not so long ago that a Lysander dodged and fought off two F.W.190s.

It is comforting to remember that the initiative lies largely with the dodger. This is of the greatest value when dodging a very fast single-engined fighter. The full-back waiting quietly to intercept the fast wing three-quarter and waiting with an open mind, is far more likely to bring his man down than the full-back who "takes a line" and gathers his own speed to meet him. To exploit to the full, and always to retain that initiative, the dodger should vary his evasive manoeuvres. Go right! Go left! Go up! Go down! Go forward! Go back! Go slow! Go fast! The artful dodger always keeps the enemy guessing.

It is the function of tactical memoranda to offer detailed technical advice on how to dodge. But certain basic principles are worth recalling here:—

- (i) Always dodge in the direction of home; single-engined fighters hate the sea, and will be disinclined to follow you very far.
- (ii) If you anticipate having to take violent evasive action, always check your directional gyro.
- (iii) If you fly too low, the sea will give the enemy a splash target on which to correct his aim.

(iv) If when half-way round in a steep diving turn you turn back, you will fly straight into the sights of the pursuing fighter. Keep on turning until you have completed an orbit. The faster fighter who began turning *after* you did, will still be *outside* you.

(v) Just as you always steer a car into a skid, so always turn in to an attack. Then you can see what you are doing.

Or You can Hide

To hide, you must have something in which to hide. In modern aerial warfare it is also essential to know what you are hiding *from*.

At night, after some artful dodging, one can hide very easily in the darkness if the enemy is a free-lance fighter. But if one is hiding from a ground-controlled enemy fighter, whether single-engined or twin-engined, the darkness will not hide one from the ground-controlled interception machinery's all-seeing "eye." In that case one can hide by coming down to a height, say below 2,000 ft., where that machinery can no longer "see" one, as it were, in clear focus.

It is easy to fall into the erroneous belief of the ostrich when flying at night—to forget that although you cannot see the enemy, he may be able to see you. Therefore, even on dark nights it is well to avoid flying just above or just below clouds, or too low over the sea.

To hide successfully by day one must have cloud of adequate concentration and depth. Further, one must so relate one's position tactically to the available cloud so that one cannot be too easily surprised by an enemy aircraft on emerging from it, but still able to reach it in time if surprised from any direction. In brief, one should always be conscious of the value of the available cloud as a hiding place—how far away it is and how far above or below one's aircraft.

The chameleon, of course, hides in quite a different way. He identifies himself with his background. Every operational aircraft of Coastal Command is camouflaged to help it to lose itself in the background against which it operates most frequently. Do not derive false comfort from this, but remember that however naked you may feel, you are probably far less visible than you imagine yourself to be.

Or, lastly, You can Run for it

There is little enough comment to make on this form of evasive tactics. On general principles it is wise to run towards home and out to sea. It is wise to run at the height where you have the greatest altitude rating advantage. Finally, never run straight. With an enemy astern, corkscrew. With an enemy on your beam, porpoise. Running in itself is not an evasive tactic. It must always be combined with some artful if restrained dodging. Weaving, too, is not good enough. Our own fighters find that weaving frustrates them at the start. But after a bit it becomes easy to anticipate the movements, whereas corkscrewing produces a continually changing deflection and it is extremely difficult to keep the sights on.

There, then, are the basic methods of evasion—*killing, dodging, hiding and running*.

The combinations and permutations of the tactics available in each of these methods are

legion. Indeed, no single method will often suffice by itself to effect a successful evasion. Methods must be combined; tactics must be varied. Nobody can write down what you should do. You must work that out for yourself in relation to the circumstances of your flight. And you must work out what you will do *before you have to do it*. *Plan your battles—plan them on the performance and armament of your aircraft. On the combined team ability of your crew. On the performance, armament and known tactics of the enemy aircraft which you are likely to encounter. And plan them on the weather conditions. Plan your battles on the ground. Plan them on practice flights. Plan them as you fly to your patrol areas. Above all, plan them as a team.*

One last word of warning. It is a paradox of modern war that surprise is still easy and frequent in the element which has made surprise almost impossible in the other elements. Aircraft whose all-seeing eyes make it well-nigh impossible for opposing armies and navies to surprise each other, are themselves constantly surprised. The success of evasive tactics is in direct ratio to the amount

of time given by the warning. The earlier the other aircraft is seen and recognised as hostile, the earlier it is identified for type and its course and height assessed, the longer time you will have in which to prepare your plan. You will have that much longer to decide your tactics—whether to dodge, hide, run or fight, whether to jettison your bombs or depth-charges, to test your guns, settle yourselves in your seats, and make everything ship-shape. *Always keep a good look-out.*

Incidentally, don't advertise your presence until you are pretty sure you have been spotted. A Ju.88 was recently shot down into the sea by two Beaufighters of this Command who would never have spotted it in the distance had it not "flapped" and called attention to itself by jettisoning its bombs. The splash was its death warrant.

"Where do you keep your Worthington?" asked the advertisement. "We don't," was the answer, "we drink it."

"How do you evade an enemy fighter?" demands a similar answer. "We don't, we destroy it."

Comments on Two Flights

The following article has been contributed by an officer who was a pilot during the last war. The contrast between the two flights must not lead anybody to imagine that all crews are equally divided into sheep and goats. It is true that in almost every squadron there are outstanding crews, with a "tail" of uneven proportions. This may be due to difference in experience and to the varying qualities of individuals. The two stories point to the need for the uniform standard of orderliness and tidiness which will help every squadron towards the apex of efficiency.

It is an old truth that the man who cleans and polishes his gun most is usually the best shot.

I had recently been requested to make a long duty journey and was privileged to go as a passenger in a service aircraft. I arranged to meet the Captain in the operations room in the early hours of the morning. I am a mere ground greenhorn, out of touch with modern aircraft and operational work, so I was thrilled indeed. With fears of disciplinary action or of missing the bus if I was late, I was waiting alongside the Controller ten minutes before the appointed time. Ten minutes after that time, no Captain or crew had arrived. They appeared eventually, collected their belongings and gear and we were taken down to the aircraft.

Climbing in, I was met by heaps of old flying clothing, bags, respirators and heterogeneous items. I was also struck by the dirty and untidy look of the clothing of the aircrew and found myself asking the question: Is it necessary to look like down-and-out commissionaires from tenth-rate cinemas to be first-class airmen? Did washing and shaving rob one of efficiency?

There was some delay in starting, due to I don't know what. But we were in the air about half an hour after the advertised time. All seemed to be going well and the drone of the engines was pleasant. We were told that our time of arrival was estimated to be so-and-so and that we would have coffee. Coffee was produced from a bright new thermos flask. Sandwiches had been prepared and there appeared to be far too many for our immediate needs. But we ate what we could.

I then noticed that the thermos flask had not been returned to its stowage place in the aircraft. It was still on the floor. Before long the crew was using this flask as a step, which did not improve its appearance or efficiency. Sandwiches also got strewn about the aircraft and it wasn't long before they were being walked on. It did not seem to be anyone's job to pick up the remains, which might have been needed later.

One member of the crew came in, wanting his flying kit. Quite an argument developed. "Where is my so-and-so flying kit?" "Where is my jacket?" "These are not my boots!" And "Who the hell do these belong to?" All this was accompanied by a certain amount of confusion until the right kit was found. Progress anywhere within that aircraft was a sort of obstacle race.

About this time a new W/T operator donned his helmet and complained because the receivers were unserviceable. This caused me little surprise as several people had walked over them. Repairs were started there and then.

I was interested to notice that the crew had put on their Mae Wests. Apparently there was none to spare for the passenger. His job in case of accident was apparently to sink immediately. I wondered also about parachutes, but decided that perhaps this crew were so tough that parachutes were not needed. There certainly was none available for me.

As time was now getting on and the expected landmarks did not appear, I had the feeling that

something was wrong somewhere. Then I found that the wireless was also under repair and that until this was completed we would be unable to find our position. However, all was well at last and some considerable time after the promised hour of arrival we actually landed safely back on Mother Earth once again.

I may be completely unjustified, but I did have the feeling that we were at our destination by guess and by God, and not by careful airmanship or navigation. I wonder if I was right? The aircraft had been flown competently, the W/T had been put right, and we had made the journey safely. But was this really enough? I did not feel qualified to do more than wonder.

On the return journey I was asked to meet another Captain in the operations room. I arrived, this time without trepidation, to find the Captain, the navigator and another member of the crew already there, swotting up the gen and extracting all the information they could from the Intelligence Officer. On the way to the aircraft I was fitted with a Mae West and parachute harness, and on arrival the Captain lined us up alongside and saw that we had our parachutes and our Mae Wests on properly and that we knew how to use them. Finally, he gave each of us our instructions in dinghy drill. This was something quite new to me, for I had heard nothing about dinghies or dinghy drill in the first aircraft. So I wondered even more. Still, it was all very encouraging and I sat back with a comfortable feeling. The inside of the aircraft was very different. In place of untidiness was order. Kit was neatly stowed

away and there seemed room to move about without discomfort. There was a place for everything and everything in its place. Uniforms were still a bit greasy, but the crew looked presentable and, any one of them could have appeared on another station with a collar and tie and wearing walking-out boots.

I listened in on the inter-communication system and heard clear and concise orders. "Captain calling navigator." "Captain calling so-and-so." And "M.V. on starboard beam," etc. In our outgoing aircraft I had heard a dispute because the Captain did not know who had reported an object seen dimly "on the right." It does make a difference if such information comes from the tail gunner or the front gunner.

The inevitable coffee and sandwiches appeared. This time the flask was treated with the respect it deserved.

We reached our landmarks at the expected times. It inspired confidence in me to hear it said, "We shall see so-and-so at such-and-such a time," and to see so-and-so duly appear. Our time of arrival was exact. I felt, when enjoying a drink in the mess afterwards, that all this was merely a matter of routine and that it happened with clockwork regularity and absolute safety.

I have little doubt that it must be a continuous grind to keep aircrews up to the model of neatness, diligence and efficiency of the latter crew with which I flew. But I have also no doubt that the results are well worth while. It certainly makes the passenger feel happier!

Night Flying Training

Night flying training presents a problem both in the O.T.U.s and in operational squadrons. In summer months, when fine weather prevails, the nights are short. In winter, the longer hours of darkness are often interrupted by bad weather.

Command lays down a minimum of night flying which must be completed before pilots leave the O.T.U. This is followed by intensive squadron training during the first month in the unit. During this period night flying is an important item. After this, all squadron crews must carry out a minimum of night flying each month, either operational or practice.

A great deal of determination is necessary to get the flying done in winter. Optimistic programmes are prepared, but these are often made impossible because the Met. forecast is doubtful or because the weather turns sour just before or after flying has begun. Human nature being what it is, the order is often given to cancel the programme for the night and to try again the next night. Sometimes, the weather clears just as the order has been given.

O.T.U.s are always fighting against time. They were the first to adopt the policy of never washing out a programme except in exceptional circumstances. All crews detailed in the night flying programme automatically report to the control. If immediate night flying is impossible, they are released to the night flying dormitory on the aerodrome. There they sleep in their clothes,

at immediate readiness. A close watch is kept on the weather, and, if there is a sign of improvement test flights are carried out. If conditions are then favourable, pupils are summoned by Tannoy and they are able to go on with their programme.

On one flying boat station, where there was trouble in arranging night flying, a novel and very effective modification of the scheme was introduced. The flare path was lit and manned every night, from dusk to dawn, and the crews detailed for night flying practice went aboard their aircraft, prepared to remain there throughout the night.

Crews proceeded to a flare path, and if conditions were unfavourable, they were instructed to moor their aircraft to the moorings nearby and remain on board. The conditions were reviewed every two hours throughout the night. During the long winter nights, weather conditions often change between the early evening and dawn. When the crews were on board their aircraft, ready to fly, with the flare path in position, the programme could be resumed without delay. The crews were naturally keen to complete the programme, to avoid spending unnecessary nights aboard their aircraft.

The Station Commander prevented abuse of the scheme by issuing a general recall if he considered the weather conditions so bad that they would jeopardize the safety of the aircraft or marine craft involved.

"CARELESS QUESTIONS"

In all that has been spoken and written about careless talk there has been too much emphasis on careless telling and not enough on careless asking. Yet it is often the case that careless talk is prompted by careless questioning. It is interesting to explore the motives and the technique of careless questions because, whereas careless telling is seldom deliberate, careless asking is sometimes calculated and almost scientific. The motives of the enemy agent or the stooge whom he is bribing, blackmailing or drugging, differ from those of one's sweetheart or one's mess crony; but his technique will be identical with theirs. We may therefore dismiss in any analysis of the motives which prompt the careless question, the self-evident motives of the enemy agent; in an analysis of the technique of the careless questioner, he may be individually examined to advantage, however, since it is important to comprehend how the innocent technique of one's sweetheart or one's crony may be developed and exploited by the trained and the informed agent.

The most common form of careless question is quite literally "care-less." It is asked by somebody who neither wants nor expects an answer. That is the rhetorical question. Such a question is often merely a child of "la politesse"—a gesture of welcome, of salutation, of interest in another's life and well-being. Yet even this most casual type of careless question is enough to elicit from the garrulous, the vain, the excitable and the "anxious-to-please-young-man" a flood of information. The most innocent catch-phrases such as "What's new?", "How's tricks?" or "Got any gen?" every day give birth to innumerable blazing indiscretions.

The second most common form of careless question derives from the refined technique of a famous girls' school where, if Angela wishes Belinda to pass her the salt, she must not ask Belinda for it, but must offer it to Belinda who will then return the lead by offering it to Angela. In other words, A asks B a question about his job, not because he is in the least interested in B's job, but because he passionately wishes B, on whose conversational manners he thinks he can rely, to ask him a question about his job—which he is longing to answer. This type of careless question, the prelude to a straight swop, is particularly dangerous because it involves at least two blazing indiscretions.

The third most common form of careless question is the "child of love" and therefore far the most difficult not to answer. Love breeds in most people a strong if unwarrantable sense of the proprietary. This is particularly true of one's parents. For many years it was their job to keep us out of mischief. "Go and see what little Tommy's doing and tell him he musn't." When we grow up—and many of us don't grow up until late middle age—our parents are reluctant to abdicate from the habit of management. Moreover—and this is common to mothers, sisters, sweethearts and wives—the people who love us wish always to project themselves into our lives; to live our lives in their minds and hearts, to share with us our joys and sorrows. The cynical name for this family interest in our lives is damned interference. Such family pleading is hard to resist. Even when there is no pleading, the habit

ingrained in so many of us of "getting it off our chest" to the person we love (and therefore feel justified in using as a dumping place), is not easily denied. Never is this habit more hardly broken than by those of us who have loyally stuck to the tradition of "writing home" every week. But broken the habit must be. Even the pillar-box is no longer sacrosanct.

The least comprehensible type of careless question is born of sheer inquisitiveness. We have all met mental magpies who have flattered us with their curiosity so that we do not pause to wonder over their motives. Never mind about those motives. The fact remains that the mental magpie, the most innocent of mammals in ordinary circumstances, becomes in time of war a major menace. Let him but fall into the enemy's hands and he can do incalculable damage to his country's cause.

The motives of the common gossip need no comment. He "buys" information solely in order to build up his stature by "retailing" it. He is the common carrier. We know him well, and usually we remember to beware of him. He is contemptible.

In Service circles the relationships between differing ranks give birth to three types of careless question, all difficult to ignore. And, since they are asked by Service people, these questions are too often thought safe to answer. First there is the question asked, usually out of politeness but sometimes out of a wish to patronise, by the Senior of the Junior officer. Junior, because he is anxious to please; or because he does not wish to seem discourteous, or because he misunderstands the technique of discipline and is overawed, nearly always finds such questions too embarrassing to ignore or to refuse to answer. Second, there is the question asked by the Junior of the Senior officer. This may spring from simple vanity on the part of the Junior. He wishes to appear as a superior fellow, with breadth of vision and understanding. Or he may have a thirst for knowledge to which he has no right. Or it may be a cynical and deliberate plot to flatter the senior officer by crediting him with omniscience. Senior officers, especially those who have only recently been promoted to the inner sanctums of secrecy, find such questions all too often irresistible. Third, there is the question asked by Senior of Senior, by Junior of Junior. Such questions are born of the competitive spirit. We are all too easily scared of our co-equals getting a jump ahead of us. We must for ever be "keeping ourselves in the picture." A pernicious phrase, designed to excuse our love of gossip and to conceal our jealousies. Too often such questions are answered simply in order to score over an adversary on the ladder of fame! To increase our own stature and to debase the questioner's.

To sum up the motives which most commonly underlie the careless question, there are *first*, espionage; *second*, rhetorical politeness; *third*, conversational exchange; *fourth*, love projection; *fifth*, inquisitiveness; *sixth*, gossip ambition; *seventh*, patronage; *eighth*, currying favour; *ninth*, jealousy. Obviously there are many other motives and combinations of motives; but this brief analysis may help us rather more consciously

and deliberately to control our careless questioning. The less of such careless questioning there is, the easier is it to identify the "careless" question which, in fact, is not careless.

The technique of the careless question demands a closer analysis for which there is no space here. The technique of the careless question may always and in the most unexpected places, be in fact the studied art of interrogation: an art normally confined to Scotland Yard and the consulting rooms of psychiatrists but, in times of war, developed to a very fine pitch in all Service circles for use against the enemy, whether covertly in espionage or overtly in the examination of prisoners of war. Nevertheless, it is sensible to outline in broad terms the basic gambits.

First, then, the mechanics of the careless question. It may be written, spoken, or telephoned. Whatever the vehicle, whether paper, person or 'phone, we must recognise a question as a question, whether it ends with a question mark or not. And here, perhaps, it is appropriate to predicate the guiding rule for one's reactions to questions. One's answer should depend, first on the possible value to the enemy of the information asked for, and second, upon the value to the asker of the information asked for. It should *never* depend upon one's assessment of the reliability of the asker. One usually has a shrewd idea of the value of information entrusted to one, and one can usually imagine why the asker wants it, if in fact he wants it for the purpose of his job (if not, always ask him). But we are not policemen and we are not anti-espionage officers. We are ordinary human beings whose judgment is prejudiced by our familiarity with faces, by our uncritical acceptance of uniforms and insignia, by our personal affections—or our personal dislikes. We are neither informed nor trained to judge the questioner's reliability. Always remember that the safest and most profitable place for a viper is in one's bosom.

The written question to which, for purely physical reasons, we accord a certain deliberation, is usually less dangerous than either the spoken or the telephoned question, for that very reason of the time and physical factors. Moreover, if we answer it indiscreetly, our own indiscretion is there on the paper to see—staring us in the face. Much more dangerous is the written question which comes to us "anonymously," in the form of a printed signal or telegram. Such printed "anonymity" gives such questions an authoritative, almost an official flavour; and its very urgency is likely to impair our judgment.

The spoken question is more dangerous than the written. Although one can see and identify the speaker, hear the inflection of his voice, study the expression on his face and, in other ways, protect oneself by virtue of the questioner's presence and inability to evade a counter-question, yet the quick-fire speed of conversation, like a fast volley right up at the net, precludes too deliberate or precise an examination of every question. One may be sure that the questioner whose questions are not in fact "careless," will identify himself satisfactorily, will be ready and able to meet your counter-question, will have his inflections and expressions under perfect control and will probably step-up the tempo of the conversation.

The telephoned question is far the most dangerous. It is impossible for the staff of any

switchboard to check the origin of every telephone call and to check the credentials of every caller; nor in fact is it any part of their duty. One may assume that an enemy agent will have no difficulty whatever in getting through on the telephone to whomever he wishes to speak. We are all so inured to bad lines, faulty connections, personal identifications omitted or mumbled, urgent appeals for information, constantly changing personnel and so on, that we cannot for ever be asking people, often very senior and terrifying officers, to *speak up*, to *ring back*, to give their name and rank, to specify their job, to *hold on* and so forth. And in the Services we find too happy-go-lucky an easement for our difficulties and our conscience in the possession of internal and private lines—Black, Green, Red and "Ops." There is no such thing as an untappable telephone line and what one man has scrambled, another man can unscramble. And always remember that every telephone call goes through at least one male or female-manned exchange; maybe it is in that tangle of plugs and plug-holes that the viper has found his bosom. The telephone is the happy hunting ground of the bluffer who is expert in the "careless" question—and in using the telephone, he exposes his person to no risk whatever.

The same vehicles used by the enemy agent for his treacherous purposes, our wives and sweet-hearts, our friends and brother officers also use every day for their inherently innocent but potentially mischievous purposes, inspired by any of the motives we have examined. The only difference lies in the fact that whereas the enemy agent applies the technique of questioning deliberately, our friends employ it un-selfconsciously, most of the time.

Broadly speaking, questions fall into four categories.

First, the direct question; "Are you going to Gibraltar?" *Second*, the indirect question; "If you are going to Gibraltar, won't you need a topee?" *Third*, the invitation to confirmation; "I hear you are going to Gibraltar." *Fourth*, the invitation to contradiction; "How do you like the idea of Malta?" (Answer: "It's Gibraltar we're down for, not Malta.")

The direct question needs no further analysis. But always remember that its very naïveté disarms suspicion. But imagine your reaction to the others!

Your telephone rings: "Is that Flight Lieutenant Prune? Good morning, sir." (Don't often get a "Sir"; good show!)

"This is the Gieves representative speaking. If your Squadron is going to Gibraltar, you might care to see the new Service topee we are now showing. They are still in short supply but we would like to give your Squadron first refusal."

Let us admit that most of us would positively or negatively indicate in our answer whether in fact our Squadron was going to Gibraltar. We might say, "How do you know we're going to Gib?" or "I'll Gib?" or "We're not going to Gib." or "Thanks a lot. mention it to the Adjutant" or "The 447 boys" or "I'm not interested but I'll tell the 447 boys" or "We've been told that we don't need topees at Gib." Of course, it wasn't Gieves.

"I hear you are going to Gib."—the invitation to confirmation of what is suspected—can be made to imply by the inflection of the questioner

that he has some special gen to impart or a special word of warning to the greenhorn. This type of careless question is particularly effective against the very young, the excited first-time traveller, the proud overseas "postee," the reluctant grouser against overseas posting—in fact, against anyone who reacts at all strongly to events. It disarms suspicion from the first, since it implies that there is no need for discretion since, in any case, the questioner knows the whole facts and doesn't even frame his question as a question. Don't rely upon question marks.

"How do you like the idea of Malta?"—the invitation to contradiction—also implies knowledge on the part of the questioner; and the mere fact that his knowledge is incorrect or incomplete, or both, tempts our passion for putting people right, and too often does not excite our suspicion.

These careless question formulae and many others, offer anxious wives, idle gossips, mental magpies and enemy agents weapons which will pierce the Security armour of the most reserved and the most suspicious among us. And always remember that wives and friends and enemies seldom rely exclusively upon the straight statement of fact. They rely as much upon the negative as upon the positive; they rely upon deduction and upon elimination. One of the oldest Security slogans says, "You can't stop people guessing." It is often equally hard to stop them deducing. But we can make it very much harder

for the inquisitive by denying them confirmation and contradiction, whether by statement or by implication. And here it is worth remarking that no careless question is more likely to elicit the truth, the whole truth and nothing but the truth—and elicit it like lightning—than a question which challenges a man's loyalty to and pride in his Squadron.

Nobody has ever precisely defined the point at which a "close secret" becomes a "secret," the point at which a "secret" becomes an "open secret"—and nobody ever will, for the very simple reason that the word "secret" is an *absolute* word. It is convenient for practical purposes of paper work to use two categories "Secret" and "Most Secret." But we should all do well in the Mess and in the home to deny ourselves the luxury of this convenience and keep what is secret *absolutely* secret.

The sum of our knowledge of the enemy is immense, but there is one thing we do not know—how much he knows about us. How much he knows depends upon each one of us and upon how much he knows depends in large measure life and death, victory and defeat. There is one keystone to every bridge and in itself it is not so different that a child can recognise it; not so heavy that a child cannot lift it up to give it to the mason. Your little titbit may be that keystone. Recognise it as such and give it to nobody.

Leaves from a Navigator's Log—II

What is it that makes training so unpopular? Is it memories of marching as a squad in quick time to lectures, or of being bored to tears by a drooling lecturer? Or is it merely a natural antagonism towards the mental effort which training entails? Whatever the reason, there is no doubt a great many navigators regard their squadron training syllabus as a "bind", and they will do practically anything in their off moments, rather than try to improve their operational skill.

The general line of argument we so often meet is that, having got home every time so far (thanks perhaps to an S.E. beacon or a few H.F. D/F "QDMs"), there seems no reason why a navigator should fail to get home in the future. Navigators naturally tend to think in terms of "homing" ability when they consider their own efficiency, because so many flights are of the "out-and-home" variety. The fact that so many navigators manage to return home with apparent ease might well be reason for congratulation, did we not know that so many of the errors to which they are exposed are *systematic*. This means that the errors tend to be always in one direction and of a given value.

For example, an airspeed indicator, when calibrated by the Instrument Repair Section, may not be provided with its correction card. Thus, a navigator may accept, shall we say, 120k on the dial as meaning 120k *Rectified Airspeed*, when, in fact, the instrument repairer could have told him otherwise. Perhaps at this speed the dial reads 2k low; and at this speed and height, position error may make the dial read low by a further 4k. Thus the navigator will be six nautical miles short of his real position for every hour flown. Notwithstanding this,

if he spends half his time going out, and the other half coming back, more or less on a reverse track, such a systematic error cancels itself out and his final error is quite small. Other systematic errors are notably drift errors, due to incorrect alignment of the sight or, to directional instability of the aircraft, causing side-slip; deviation errors, due to bad compass swinging; and the personal errors of pilots, navigators and/or any other members of the crew (such as rear gunners) whose observations and actions influence the flight in any way.

These personal errors are by no means inconsiderable, and are unavoidable in every flight. One pilot will fly fractionally one wing low—it will always be one particular wing and not the other—causing incorrect drift measurements and bad course-steering. Another may habitually steer slightly to port or starboard of the course required, again producing a systematic error in course-keeping. The navigator himself has a systematic error in everything he does—whether it is using a sextant, plotting a line, measuring an angle, taking a drift, or using a navigation computer. The "Old Adam" even creeps into the tail turret and affects the rear gunner when he takes a drift. We accept these human failings as realities when it comes to bombing or air firing, for we don't express amazement when the target isn't hit with every bomb or bullet. Personal errors are just as real in every aspect of practical navigation. But, as we are not very logical creatures, we are apt to ignore their existence.

The trick about systematic errors is that they go on adding up if you fly from A to B; but as soon as you fly from B to A, even if you make a small detour to C on the way, then they begin

to cancel themselves out. Hence the feeling of all being well with the navigator if he gets you home safely after ten hours in the black-out over the Atlantic. He would have to be particularly dim if he didn't! Don't think that because you were only five miles wrong in your landfall and ten minutes out in your E.T.A. after all that time, you were, therefore, only half as wrong half-way round. The chances are you were three or four times as wrong half-way round!

This sober thought naturally invites the question, "So what?" To which the only answer can be: "So Training Syllabus for Navigators!" Don't think your day is done when you leave the Ops. Room, having given the I.O. your "Form Orange." That day may be over, but make sure all its lessons have been digested before you go off on your next job. As far as navigation is concerned your training should aim at cementing all the knowledge you have been given (most of which you have no doubt forgotten) and at improving your performance as a professional navigator.

For example, things often happen on a flight without apparent reason. Analyse all the factors and find out just what *did* happen. There are many occasions when everything seems to have gone to plan, but which, on analysis, turn out to

be much less complimentary to you than had been imagined. Face the facts and you'll be taking your first step towards the higher ranks of navigators.

It does no harm to find out what the other fellows are doing. As a rule, a navigator will work more or less as he has been taught to work. There's a strong element of conservatism about everything he does. It is hard to recall a single case when improvements in the navigational field have met at once with general approval. Smith's technique may be different from Jones's, because he was trained in one school and Jones in another. Both may have ideas which, if combined, would be very sound. So don't be content with the simple analysis of your work which the training syllabus calls for. See if you can learn something from your friends. See also if your friends can learn something from you. You may have found, as so many others have done, that the drift and wind lane method of wind finding, and the still more deadly "estimation" of wind, are snares and delusions that only trap the ignorant and are the refuge of the indolent. You may even have found that if you want something badly you usually have to sweat for it. *Per ardua ad astra*. Are you sweating enough?

Wireless Troubles in the North

Radio communications in the more northerly parts of Coastal Command's theatre of operations are less sure than in the more fortunate south. An example of this is to be found in the November *Review* in the account of the Russian Expedition. "Of all the difficulties encountered, communications . . . were by far the greatest. This was due, almost entirely, to the W/T black-out" (p. 15).

The wireless black-outs that were the trouble are associated with magnetic storms. These were discussed in an article in the November *Review* on *Navigation in and around Iceland*. They are caused by streams of particles from the sun which, impinging on the upper atmosphere, produce auroras; cause enormous electric currents to flow in the upper atmosphere which, in turn, produce disturbances in the magnetic field near ground-level; and generally tear up the normal structure of the ionised regions in the upper atmosphere (60-200 miles up). These regions normally reflect wireless waves and so enable the waves to get round the curve of the earth. In a violent magnetic storm the regions no longer reflect efficiently and a wireless silence settles down on long-distance communications in the neighbourhood of the disturbed areas.

These storms, and hence the wireless black-outs, are most serious in a fairly narrow region which makes a circle around the North Pole. The radius of the circle is 20° or 25° (1,200 to 1,500 nautical miles). The centre of the circle is offset from the North Pole to a point in the north-west of Greenland (called the Magnetic Axis Pole). This makes the region of most W/T black-outs sweep across Northern Canada and up in a general west and north direction across the Atlantic. It passes midway between Scotland and Iceland and grazes the north of Norway. In short, it sweeps right through the northerly domains of Coastal Command.

Any wireless traffic which passes through this region, such as the point to point service, Iceland to Great Britain, is liable to close down almost

without warning. We say "almost" because, although there is generally no warning that the wireless operator will detect, there exists a special organisation one of whose jobs is to issue warnings of the suspected approach of W/T disturbances. This is the Inter-Services Ionospheric Bureau which keeps an eye on the sun, for sunspots or bright eruptions; on the magnetic conditions at the earth's surface; on the ionosphere, by means of special radio transmissions; and on the state of various commercial radio circuits. All the information is gathered and sifted and one result is the issue of special warnings when W/T disturbances are expected.

Unfortunately, a warning is almost all the help that can be given. A magnetic storm is as uncontrollable as the weather, and once a large one has started there is little that W/T links in the storm zone can do but to stop trying to transmit until the storm eases. The only successful method of which we know is to use a relay station well outside the storm zone. This has to be done in the worst magnetic disturbances for W/T traffic between North America and Great Britain. The direct route passes too close to the storm zone for commercial operation in the greatest magnetic storms. But the links—North America—South America and South America—Great Britain—lie well away from the disturbed regions. Traffic from North America for England is therefore relayed via South America. In a similar way the unit in Russia might have found it possible to have relayed its messages for Group via Gibraltar.

The most cheerful feature of the picture is that magnetic storms, and therefore the associated wireless black-outs, are most common in years of sunspot maximum and least common in years of sunspot minimum. The next year or two will be sunspot minimum years. For the rest, these disturbances are most frequent in March and October.