COASTAL COMMAND REVIEW

January and February, 1942

No. 1

HEADQUARTERS,
COASTAL COMMAND
ROYAL AIR FORCE

This book is secret. No quotations may be made without the authority of the Chief Intelligence Officer, Headquarters, Coastal Command.

"While this book is, of necessity, issued as secret, and no part of it must be communicated to anyone outside the Services, it is intended for the information of all officers but principally of all members of aircrews, under conditions of security approved by the Commanding Officer. The whole purpose of producing it would be frustrated if it were relegated to the interior of an official safe."

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

Plate 1. *Frontispiece.* A HUDSON OVER ICELAND. This aircraft was made by the Lockheed employees in their spare time, of material given by the firm, and was presented to the R.A.F. A glacier is seen in the background, descending slopes of lava.

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INTRODUCTION BY THE AIR OFFICER COMMANDING-IN-CHIEF

The object of this Book—which, it is hoped, will become a monthly publication, after the next issue—is to interpret Coastal Command to its members, to its colleagues in Government Departments, and to other Services.

While the book is, of necessity, issued as secret, and no part of it must be communicated to anyone outside the Services, it is intended for the information of all officers but principally of all members of aircrews, under conditions of security approved by the Commanding Officer. The whole purpose of producing it would be frustrated if it were relegated to the interior of an official safe.

The book will set out the results achieved by Coastal Command in each bi-monthly or monthly period : how much flying it has done, how many U-Boats and ships it has attacked, how accurate has been its bombing and its navigation, and so on, throughout the wide range of its activities. From time to time analyses will appear of Coastal Command operations, which seek to discover the various factors that govern their success or failure. Many of Coastal Command operations are of such a nature that improvements cannot be detected from day to day, or by a single crew or squadron. The publication will state results achieved over long periods and by many squadrons, and will enable each member to see how he is contributing to the success of the whole. Often these analyses will enable operational personnel to understand the reasons for changes in tactics and equipment.

The book will provide a medium through which knowledge of all matters may be spread throughout the Command. Technical developments, valuable experiences of aircrews, the activities of other Commands and other Services, or of the enemy, are a few of the many subjects which will find a place.

I therefore recommend its careful study by all concerned and feel sure it will be read with interest and profit.

P. B. JOUBERT,
Air Chief Marshal.

March 27th, 1942.

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January and February, 1942

General

The main focus of the Battle of the Atlantic shifted at the beginning of the year from the eastern to the western offshore area, and U-Boat activity has since been concentrated near the relatively unprotected coasts of Canada, the U.S. and the Caribbean. In January, the amount of shipping destroyed on the western side of the Atlantic was so great as to make the month one of the worst in the war, although only about half as many U-Boats as usual were operating to the north of 50° N. and east of 35° W. Bad weather allowed these to keep within 300 miles of the coast, in spite of which only three ships are known to have been attacked during January. At 0400 hours on the 14th, two merchant vessels, totalling 12,000 tons, were sunk in an outward-bound convoy (ON 55) in the position 58° 40′ N. and 20° 00′ W., about 300 miles south of Iceland. The other attack was on the 31st, about 600 miles away (at 48° 43′ N., 21° 46′ W.) when an escort vessel of an incoming convoy (SL 98) was torpedoed and sunk; the convoy was not again molested.

In February, too, very few U-Boats—about six or eight—operated in the eastern Atlantic. They stayed mainly in the area Iceland—Rockall—N.W. Ireland and had very little success. At 0450 hours on the 9th, the independently routed tanker "Anna Knudsen" was torpedoed, in 59° 43′ N. and 09° 24′ W., and damaged, but reached port. An inward-bound convoy (SC 67) was attacked at 0030 hours on the 11th, in 56° 10′ N., 21° 00′ W.; a merchant vessel of 4,000 tons and one of the escort vessels were sunk. U-Boats were probably in contact with two or three other convoys during the month but these are the only attacks recorded.

Aircraft engaged on convoy protection naturally sight far more U-Boats when a convoy is actually being attacked than during their other flying time, so that the comparatively small number of sightings in these two months, 25, is only to be expected. Special attention must, however, be given to sightings in the Bay of Biscay, through which the U-Boats pass to and from their bases in western France. In January, two were seen in daylight in the positions 43° 55′ N., 10° 15′ W., and 47° 00′ N., 12° 30′ W., one being at the extreme south of the Bay, and the other further west than usual—in areas where U-Boats might imagine they were safe. In February, an aircraft on a meteorological flight saw one in daylight in the middle of the eastern half of the Bay (in 48° 20′ N., 09° 20′ W.); it was probably searching for survivors from a crashed enemy aircraft. It seems that the frequency of our attacks in the past has resulted in the U-Boats feeling compelled to remain submerged by daylight, at least in the east of the Bay; one was seen in the western part by a long-range aircraft. A civil aircraft also sighted three in company off the west coast of Spain, in 42° 20′ N., 09° 20′ W.; a sweep was afterwards laid on, but they were not found again. A Hudson on convoy escort from Gibraltar sighted another off the south-west coast of Spain (36° 15′ N., 08° 32′ W.), at 1510 on January 23rd, and attacked in time to prevent it molesting the convoy.

Operational flying in the Bay by night produced no sightings in January, and only one in February. All the night flying here to date, a total of 615 hours, has produced five sightings. At the time when U-Boats habitually crossed the Bay on the surface by day as well as by night, 615 hours would on average expectation have given 11 sightings. Therefore, night search seems roughly half as effective as daylight search.

The discrepancy cannot be explained by supposing the U-Boats to be submerged a good deal of the night. It should be realised that the chance of night attack cannot be seriously diminished even if U-Boats travel through the Bay submerged as much as is technically possible. For they *must* stay up for five hours in the 24 to charge, and submerged passage cuts down their overall speed to about 40 per cent. of surface speed. So they must stay up for two half-nights in place of each full night needed in a passage made entirely on the surface.

Weather

In January, weather at sea was mainly bad, six good days near the beginning of the month being followed by a period of about 20 days on which a succession of troughs of low pressure crossed the area from the west accompanied by rain and low cloud. These troughs slowed up in the east and consequently weather at the bases was frequently bad. About the middle of the month a week of gales in the northern half of the area produced such rough seas that U-Boats must have found it difficult to make attacks. The weather in February, both at sea and at the bases, was better as a result of two anti-cyclones, of which one covered the main operational area, north of 50° N., from 4th–9th, while the other moved north and then west from Britain to Greenland in the second part of the month. There were about 22 good days at sea.

Weather at the bases can be tabulated thus, the figures giving the number of days falling into three categories of weather. The term " Indifferent " includes days when the weather (*e.g.*, haze or slight rain) made flying difficult but not impossible, and also days with some period (more than two and less than about 16 hours) in which flying was impossible owing to the weather.

January

Weather	Base.						
	Alder-grove.	Lima-vady.	Loch Erne.	Oban.	Pem-broke Dock.	St. Eval.	Wick.
Good	9	12	12	8	13	11	13
Indifferent	16	16	12	16	9	18	11
The whole day totally unfit for flying.	6	3	7	7	9	2	7

February

Weather.	Base.						
	Alder-grove.	Lima-vady.	Loch Erne.	Oban.	Pem-broke Dock.	St. Eval.	Wick.
Good	10	12	17	15	17	17	8
Indifferent	16	15	9	11	11	10	19
The whole day totally unfit for flying.	2	1	2	2	—	1	1

Operations

The following tables show the extent of A/S air protection received by our shipping :—

	Number 1942		*Number Protected 1942*	
	Jan.	*Feb.*	*Jan.*	*Feb.*
Convoys	58	56	51	53
Independent ships	50	65	6	15

Plate 2. ICE RECONNAISSANCE OFF GREENLAND. (From 15 Group's *Report for* 1941).

Plate 3. THE WRECK OF THE GERMAN LINER *MADRID*. Bombed off Ijmuiden by Beauforts on 12th December, 1941, and claimed as damaged, this ship (of 8,777 tons) is considered a total loss in view of this photograph taken in February, which shows that her back is broken.

Sorties on escort and protective sweeps totalled 187 in January and 244 in February. These were distributed thus :—

	Escorts.				Protective Sweeps.	
	Which Met.		Which Failed to Meet.			
	January.	February.	January.	February.	January.	February.
Convoys	62	79	28	32	91	116
Independent ships	2	9	4	8		

In January the percentage of convoys met to total sorties for convoys was 69 per cent., in February 71 per cent.

The number of " finds " (*i.e.*, locations by all methods) of U-Boats came to 34 in January and 46 in February.

Sightings by Aircraft.		Attacks by U-Boats on Shipping.		Other Methods, Mainly Admiralty.	
January.	February.	January.	February.	January.	February.
7	18	3	3	24	25

In January, six sightings were followed by attacks (the seventh was made on a meteorological flight) and eight of the " finds " by hunts. In February ten of the sightings were followed by attacks and seven among all the " finds " by aircraft hunts. The results of hunts are given in the following table :—

Total No. of Sorties.		Average Duration.		No. of 2nd Sightings.	
January.	February.	January.	February.	January.	February.
13	15	4½	4	0	0

Of the hunts in January, one was made by three aircraft, three by two, the rest by a single aircraft. In February, one hunt was made by five, one by three, two by two, and the rest by single aircraft.

The following table analyses sightings of U-Boats in terms of the different types of duty upon which the aircraft were engaged (excluding Gibraltar and U.S. aircraft in Iceland) :—

	Total A/S Escorts.		Protective Sweeps.		Offensive Operations.		Chance.		Coastal Command Total.	
	Jan.	Feb.	Jan.	Feb.	Jan.	Feb.	Jan.	Feb.	Jan.	Feb.
U-Boat sighted	0	0	1	5	4	5	1	6	6	12
Number of sorties	96	128	91	116	165	174	—	—	352	418
Average number of sorties per sighting.	—	—	91	23	41	35	—	—	59	35

The chance sighting in January was by an aircraft on a meteorological flight. Of the six chance sightings in February, three were made by a civil aircraft (all the U-Boats being together), one by a meteorological aircraft, one by a long-range Hudson on ice reconnaissance off the north-west corner of Iceland, and one by an aircraft of Fighter Command (between Alderney and Cap de la Hague on the 11th). In February, two further sightings and attacks were made by U.S. P.B.Y. aircraft operating from Iceland.

The sightings and attacks of January and February were distributed amongst stations and squadrons as follows :—

Station.	Squadron.	Aircraft.	Sightings.		Attacks.	
			January.	February.	January.	February.
Aldergrove	53	Hudsons	0	1	0	0
Aldergrove	206	Hudsons	2	5*	2	4*
Aldergrove	1404	Met. Blenheims ..	0	1	0	1
Aldergrove	1405	Met. Blenheims ..	1	0	0	0
Gibraltar	233	Hudsons	1	0	1	0
Iceland	269	Hudsons	0	1†	0	0†
Iceland	612	Whitleys	0	2	0	2
Iceland	American	P.B.Y.s	0	2	0	2
L. Erne	209	Catalinas	0	1	0	1
Nutts Corner ..	120	Liberators	3	0	3	0
St. Eval	502	Whitleys	0	1	0	0
		Totals ..	7	14	6	10

* Two of these U-Boats were seen on one sortie by A/206 on 19th February; all depth charges had been used up on the first attack—very properly since the odds against such a " double event " are of the order of thousands to one against.

† The aircraft, being on Ice Reconnaissance, had no means of attack.

The following table shows the 2,579 operational flying hours by types of duty, meaning the hours actually spent on the job, excluding passage-time.

	All A/S Escorts.		Protective Sweeps.		Offensive Operations.	
	January.	February.	January.	February.	January.	February.
Sorties	96	128	91	116	165	174
Operational flying hours ..	266	390	318	446	545	615
Average duration hours of a sortie.	3	3	3½	4	3¼	3½

Three areas may be distinguished, as on the accompanying Chart I :—

H. Within 300 miles of C.C. bases ; best covered by short-range aircraft (Hudsons, Northrops, Beauforts), given 1,955 flying hours : 43 finds of U-Boats, 17 sightings : 1 ship attacked.

W. 300–400 miles from C.C. bases ; best covered by medium-range aircraft (Whitleys and Wellingtons), 306 : 13, 2 : 2.

C. 400–600 miles from C.C. bases ; best covered by long-range aircraft (Catalinas, Liberators and Sunderlands), 304 : 14, 4 : 2.

The number of sorties carried out by these various classes of aircraft was :—

	Escorts.		*Protective Sweeps.*		*Offensive Operations.*		*Total.*	
	Jan.	*Feb.*	*Jan.*	*Feb.*	*Jan.*	*Feb.*	*Jan.*	*Feb.*
I. Short range ..	682	82	86	111	86	65	240	258
II. Medium range	9	6	4	3	43	47	56	56
III. Long range ..	19	31	1	2	36	62	56	95

Encounters with Enemy Aircraft

During January and February the following encounters with enemy aircraft were made by our aircraft when engaged on anti-submarine patrols and U-Boat hunts.

On the 28th January, at 1734, in position 49° 29′ N., 07° 13′ W., a Sunderland, *S/10* (on a crossover patrol), sighted a Ju.88 one mile away.

On 12th February, at 1135, in position 48° 14′ N. 08° 25′ W., another Sunderland, *Q/10* (on an anti-submarine patrol), sighted a He.115 six miles away. When the distance had closed to 1,000–1,500 yards, *Q*'s tail gunner fired four to

SECRET

CHART. I.

GEOGRAPHICAL DISTRIBUTION OF THE A/S AIR EFFORT.

JANUARY – FEBRUARY. 1942.

KEY.

A. Hours of operational flying in the square.
- □ = 1 hour " " " on escort.
- ■ = " " " " " protective sweeps.
- ◪ = " " " " " offensive operations.

B. Finds of U/boats in the square.
- = 1 U/boat found.
- = 1 U/boat sighted by A/C.
- = 1 U/boat attacked by A/C.

C. Shipping sunk in the square.
- = 1,000 tons sunk.
- = 1 attack by U/boat on shipping.

AREA "W."

AREA "C."

AREA "H."

T.I. Dept. No. 2 1/15

CC.30.

five short bursts, and then descended to 1,500 feet. The enemy aircraft dived, and the Sunderland opened fire with tail and midships guns, and possible hits were estimated. The Heinkel fired two short bursts of cannon fire, and climbed into cloud cover. At that moment a second He.115 was sighted approaching from astern, and six long bursts were fired from our aircraft's tail and midships guns, probably scoring several hits; the enemy returned fire and broke away.

On 12th February at 1314, in position 48° 14′ N. 08° 45′ W., a Whitley, *E/502* (on a U-Boat hunt), sighted a He.115 and gave chase for 30 minutes; then *E* passed it, turned, and fired 600 rounds from the rear gun. Tracer was seen to enter the fuselage of the Heinkel, which returned fire, but did no damage. During the combat a single-engine aircraft was sighted, which was believed to be a Focke-Wulf 190. Both the aircraft were last sighted about five miles away, with the single-engine aircraft circling the Heinkel which was at sea level.

On 12th February, at 1345, in position 48° 02′ N. 08° 23′ W., a Catalina, *S/209* (on a U-Boat hunt) sighted an unidentified aircraft. *S* circled and saw it was a large biplane flying boat, with black crosses on its wings, possibly a Breguet Bizerte, which altered course and fired a recognition signal. As *S* prepared to attack, three Arado 196's were sighted and the Catalina sought cloud cover. The enemy took up positions dead astern of *S* and opened fire. Our aircraft took violent evasive action and fired with all guns at different opportunities. The enemy aircraft were shaken off after 20 minutes.

On the same day, a Catalina making a reconnaissance from Gibraltar, *J/202*, was attacked by a Savoia 79, which fired a few ineffective bursts at short range, but was forced to take violent evasive action when our aircraft dropped depth-charges. After a quarter of an hour's manœuvring the enemy was chased away; but this or another Savoia was sighted again two hours later, apparently doing a patrol.

An aircraft thought to be a Do.17 was sighted on February 24th by a Hudson, *Z/233*, on convoy escort from Gibraltar.

(ii) Anti-Shipping Operations

January and February, 1942

General

Operations may be classified into :—

(i) Anti-shipping patrols. These are flown along the enemy coasts to locate and, when circumstances permit, to attack shipping. Aircraft usually fly singly.

(ii) Anti-shipping strikes. These are directed against shipping which has previously been sighted, usually by an anti-shipping patrol. Several aircraft take part in each strike.

(iii) Attacks against ships in harbours.

The amount of flying which each of these operations involved in January and February, as compared with December, is roughly as follows :—

	December.	*January and February.*
Anti-shipping patrols	1,100 hours.	1,100 hours.
Anti-shipping strikes	500 hours.	300 hours.
Attacks on harbours	200 hours.	100 hours.
Totals ..	1,800 hours.	1,500 hours.

Considerably increased anti-raider commitments during January and February account for at least part of the reduction in anti-shipping operations.

It is shown that the average amount of flying per sighting was approximately the same during January and February as it was in December. The average tonnage of the ships sighted has, however, dropped off, especially off the Dutch Coast. The reduction in the number of large ships may well be due to weather conditions.

The total number of ships attacked during the two months was 62, the results being shown in the following table :—

TABLE 1

Coastal Command Attacks on Shipping in January and February, 1942.

Armament.	No. of attacks.	Estimated tonnage.	Assessment.							
			Sunk.		Seriously damaged.		Damaged.		No Claim.	
			Nos.	Tonnage.	Nos.	Tonnage.	Nos.	Tonnage.	Nos.	Tonnage.
Bombs	51	146,000t.	3	1,600t.	6	11,700t.	10	25,500t.	32	107,200t.
Depth Charges..	2	10,000	0	0	0	0	2	10,000	0	0
Torpedoes ..	3	12,000	0	0	0	0	0	0	3	12,000
Cannon	6	2,800	0	0	0	0	5	2,600	1	200
Totals : January and February.	62	170,800t.	3	1,600t.	6	11,700t.	17	38,100t.	36	119,400t.
(Totals, Dec.)..	(63)	(179,000)	(5)	(25,000)	(4)	(9,100)	(12)	(37,200)	(42)	(107,700)

The figures in brackets are for December. Attention is drawn to the discrepancy between the December figures given here and in a previous report (ORS/CC No. 172). The old figures were the claims made by Coastal Command: the present figures are the most recent assessments and must therefore be considered to replace the previous ones. The most important change is an increase in the ships sunk from two (9,000 tons) to five (25,000 tons). Comparing the December with the January and February figures, the most significant change is the recent reduction in the size of the ships sunk : in December the average tonnage was 5,000 tons, while in January and February it was only 500 tons.

Anti-Shipping Patrols

1. *Effort and Geographical Distribution.*—Anti-shipping patrols are flown along the Norwegian, Dutch and French-Spanish coasts. The distribution of effort between the three areas is shown in the following table, in which the December figures are also given for comparison :—

TABLE 2

Anti-shipping Patrols : Total Flying Hours

Coast.	Total Flying Hours.	
	Jan./Feb.	December.
Norway	577	698
Holland	242	307
France/Spain ..	242	127
Total	1,061	1,132

It should be noted that these figures do not include the naval patrols off Brest in January, and off Denmark in February.

Chart II shows in more detail the amount of flying along different sections of the enemy coast. The coast is divided into 60-mile intervals, and the thickness of the line opposite each interval is proportional to the number of sorties made there. The figures give the average number of ships sighted per sortie, along each stretch of 60 miles.

2. *Total and Effective Sorties.*—Of all aircraft which become airborne on anti-shipping patrols, about 75 per cent. actually reach the patrol area. The following table shows the figures for the three regions of activity :—

TABLE 3

Anti-Shipping Patrols : Number of Sorties and Patrols

Coast.	Nos. of A/C airborne.	A/C reaching patrol area.	Per cent.
Norway ..	194	138	71 (70)
Holland ..	192	143	74 (72)
France/Spain ..	67	49	73 (80)
Total ..	453	330	73 (71)

The numbers in brackets give the corresponding percentages for December, 1941.

Details as to why aircraft failed to reach their patrol areas are shown below. The table shows the number of sorties which returned owing to various causes, and also expresses these frequencies as a percentage of the total number of sorties. Figures for January–February are compared with those for December.

TABLE 4

Causes of Failure to Carry out a Patrol

Cause.	Norway.		Holland.		France/Spain.	
	Jan.–Feb.	December.	Jan.–Feb.	December.	Jan.–Feb.	December.
Lack of cloud	20 (10%)	19 (13%)	10 (5%)	12 (12%)	5 (8%)	—*
Bad weather	23 (12%)	16 (11%)	12 (6%)	8 (7%)	1 (1%)	—
A/C failures	8 (4%)	8 (6%)	18 (9%)	8 (7%)	5 (8%)	—
Unknown and other causes..	5 (3%)	2 (1%)	9 (4%)	1 (1%)	7 (10%)	—
Total	56 (29%)	45 (31%)	49 (26%)	30 (27%)	18 (27%)	—

* Figures not available.

No very significant changes have occurred since December.

3. *Length of Sorties and Patrols.*—Considering the aircraft which reached their patrol area, the following table shows the average durations of both the whole sortie and the patrol itself.

TABLE 5

Anti-Shipping Patrols—Duration of Sorties and Patrols

Coast.	Day.			Twilight.			Night.		
	Nos. of Patrols.	Average Length of Sortie.	Average Length of Patrol.	Nos. of Patrols.	Average Length of Sortie.	Average Length of Patrol.	Nos. of Patrols.	Average Length of Sortie.	Average Length of Patrol.
Norway ..	87	4·7 hr.	0·4 hr. (0·4)	36	4·6 hr.	0·4 hr.	15	6·5 hr.	1·5 hr.
Holland ..	71	2·6	0·5 (0·4)	38	3·1	0·4	33	3·3	0·9
France/Spain	35	6·7	2·4 (1·7)	5	6·7	1·6	9	5·1	2·1

Figures in brackets are for December. They are only available for daylight patrols.

It will be seen that the Norway and Holland day and twilight patrols are about 25 minutes long, while the night patrols are 1½ hours and 1 hour respectively. The France/Spain patrols are considerably longer than those in the other two regions.

Patrol length will be referred to again in the next Section, which deals with the amount of flying needed on an average to sight a ship.

4. *Sightings.*—During the two months anti-shipping patrols reported 114 ships or groups of ships of over 100 tons (51 in January and 63 in February). Of these, 35 were between 100 and 500 tons and 79 were over 500 tons. In addition, there were numerous reports of fishing vessels (at least 11 in January and at least 53 in February), and 7 unidentified S.E. indications. Attention is drawn to the fact that sightings of vessels under 100 tons, and unidentified S.E. contacts, are not included in any of the tables of this Report unless it is specifically stated.

The following table shows the average number of patrol hours per sighting in different regions at different periods of the day.

TABLE 6

Anti-Shipping Patrols—Patrol Hours per Sighting

Coast.	Day.			Twilight.			Night.		
	Patrol Hours.	Sightings.	Patrol Hours per Sighting.	Patrol Hours.	Sightings.	Patrol Hours per Sighting.	Patrol Hours.	Sightings.	Patrol Hours per Sighting.
Norway ..	32·9 (30)	27 (30)	1·2 (0·9)	15·8	4	3·9	23·0	0	Greater than 23
Holland ..	30·4 (19)	40 (30)	0·7 (0·6)	17·0	8	2·1	27·8	7	4·0
France/Spain	85·6 (26)	25 (8)	3·4 (3·3)	8·2	2	4·1	18·7	1	18·7
Total ..	148·9 (75)	92 (71)	1·6 (1·1)	41·0	14	2·9	69·5	8	8·7

The figures in brackets are the corresponding figures for December. These figures are only available for day patrols.

The following points will be noted :—

(i) Comparing the three different regions (daytime), it appears that there is no significant difference between the frequency of sighting shipping on the Dutch and Norwegian coasts, and that the frequency is about three times that of the French/Spanish coast, *i.e.*, on the average three times as much flying is needed to sight a ship on the French/Spanish as on the Dutch and Norwegian coasts.

(ii) Compared with daytime figures, it needs as much flying by twilight, and 5–6 times as much by night, to sight a ship. Assuming that the amount of shipping does not decrease, this gives a measure of the relative efficiency of search by day, twilight and night.

(iii) Comparing January and February figures with December figures for day patrols, there is no significant change in the flying needed to sight a ship. Further analysis has shown, however, that the proportion of large (over 500 tons) to small ships has dropped. Off Norway the proportion was 5·5 to 1 in December and 3·5 to 1 during the present period. Off Holland the proportion was 4 to 1 in December and 1·6 to 1 in January and February.

The length of patrols (Table 5), and the frequency of shipping encounters (Table 6) both influence the number of patrols which return having made a sighting. The following table shows, as a percentage of all patrols, the number which made at least one sighting.

TABLE 7

Anti-Shipping Patrols—Percentage of Patrols which Sight Shipping

Coast.	Day.		Twilight.		Night.	
	Nos. Patrols.	Percentage of Patrols sighting.	Nos. Patrols.	Percentage of Patrols sighting.	Nos. Patrols.	Percentage of Patrols sighting.
Norway ..	87	20%	36	11%	15	0%
Holland ..	71	40%	38	13%	33	27%
France/Spain ..	35	46%	5	60%	9	11%

It is interesting to note that although shipping is considerably less frequent off France/Spain than elsewhere, the France/Spain patrols are so much longer than the others that the chance of a patrol sighting shipping in this region is greater than elsewhere, by both day and twilight.

Also, the greater length of the Holland night patrols, compared with the twilight ones, more than makes up for the greater difficulty of finding ships.

5. *Method of Sighting.*—The following table shows the number of ships sighted by eye, the number detected by Special Equipment and later sighted, and the number detected by S.E. and not seen.

TABLE 8

Anti-Shipping Patrols—Methods of Sighting Ships

Coast.	Day.			Twilight.			Night.		
	Visual.	S.E.–Visual.	S.E.	Visual.	S.E.–Visual.	S.E.	Visual.	S.E.–Visual.	S.E.
Norway ..	27	0	0	4	0	0	0	0	0
Holland ..	40	3	2	8	0	2	7	7	5
France/Spain	25	1	1	2	0	0	1	1	1

As in December, there were no S.E. detections off Norway, presumably owing to the nature of the coast. The equipment has achieved best results off the Dutch coast, where, of all ships detected at night, 63 per cent. were found by S.E.

6. *The Attack.*—The following table shows the number of attacks on shipping compared with the number of sightings.

TABLE 9

Anti-Shipping Patrols—Number of Ships Sighted and Attacked

Coast.	Sightings.	Attacks.	Percentage of Ships attacked.
Norway ..	31	4	13% (43)
Holland ..	55	19	35% (40)
France/Spain	28	7	25% (56)
Total ..	114	30	26% (43)

The figures in brackets are the percentage of ships attacked in December.

It will be observed that during January and February our aircraft only attacked ships one quarter as often in Norway and half as often in France/Spain as they did in December. The frequency of attacks in Holland is much the same for the two periods.

Anti-Shipping Strikes (*Excluding Harbours*)

Twenty-one strikes were flown during the two months, excluding the Channel battle on 12th February. The shipping against which they were dispatched was originally sighted in the following ways :—

11 by Coastal Command anti-shipping patrols.
1 by Coastal Command naval patrols.
4 by P.R.U.
1 by Fighter Command aircraft.
(4 unknown).

The average time between the original sighting and the striking force taking off was five hours.

In the following table details are given of the individual strikes :—

TABLE 10

Anti-Shipping Strikes in January and February

Date.	Time of Day.	Position.	Total Number of Aircraft.	Number of Aircraft.				No. of Attacks.
				Returning Early.	Failing to sight Shipping.	Sighting Target.	Sighting other Shipping.	
Jan.								
1	Night	Norway	1	1	0	0	0	0
3	Night	Holland	3	2	0	1(?)	0	1
6	Night	Holland	4	0	3	1	0	1
7	Night	Holland	3	0	1	0	2	2
10	Twilight	Holland	6	1	3	1+1	0	2
10	Night	Norway	3	0	3	0	0	0
21	Twilight	Holland	4	0	4	0	0	0
23	Night	Holland	3	0	3	0	0	0
31	Day	Holland	5	2	2	0	1	0
Feb.								
2	Day	France	3	0	0	3	0	1*
8	Twilight	Holland	4	2	1	0	1	1
10	Night	France	4	0	3	0	1	0
14	Night	Holland	7	0	5	2(?)	0	1
15	Day	Norway	1	0	0	1(?)	0	1
17	Day	Norway	1	0	0	1	0	1
17	Twilight	Denmark	6	6	0	0	0	0
17	Day	Holland	7	0	6	0	1	0
21	Night	France	2	0	1	1(?)	0	0
26	Twilight	Norway	2	0	0	1	1	2
27	Night	Norway	1	0	0	0	1	0
27	Night	Denmark	6	0	6	0	0	0
	Total of 21 Strikes ..		76	14	41	7+6(?)	8	13*

* One aircraft was shot down while attacking this target. It is not included in the table.

It is often not possible to be sure that a striking aircraft does sight the target ; such cases are distinguished by a query in the table. It will be seen that of the 76 aircraft taking part in strikes :—

18 per cent. returned early.
54 per cent. reached the patrol area but failed to sight any shipping.
28 per cent. sighted shipping—
9 per cent. sighted the intended target.
9 per cent. sighted shipping which may have been the intended target.
10 per cent. sighted shipping other than the intended target.

CHART II

SECRET

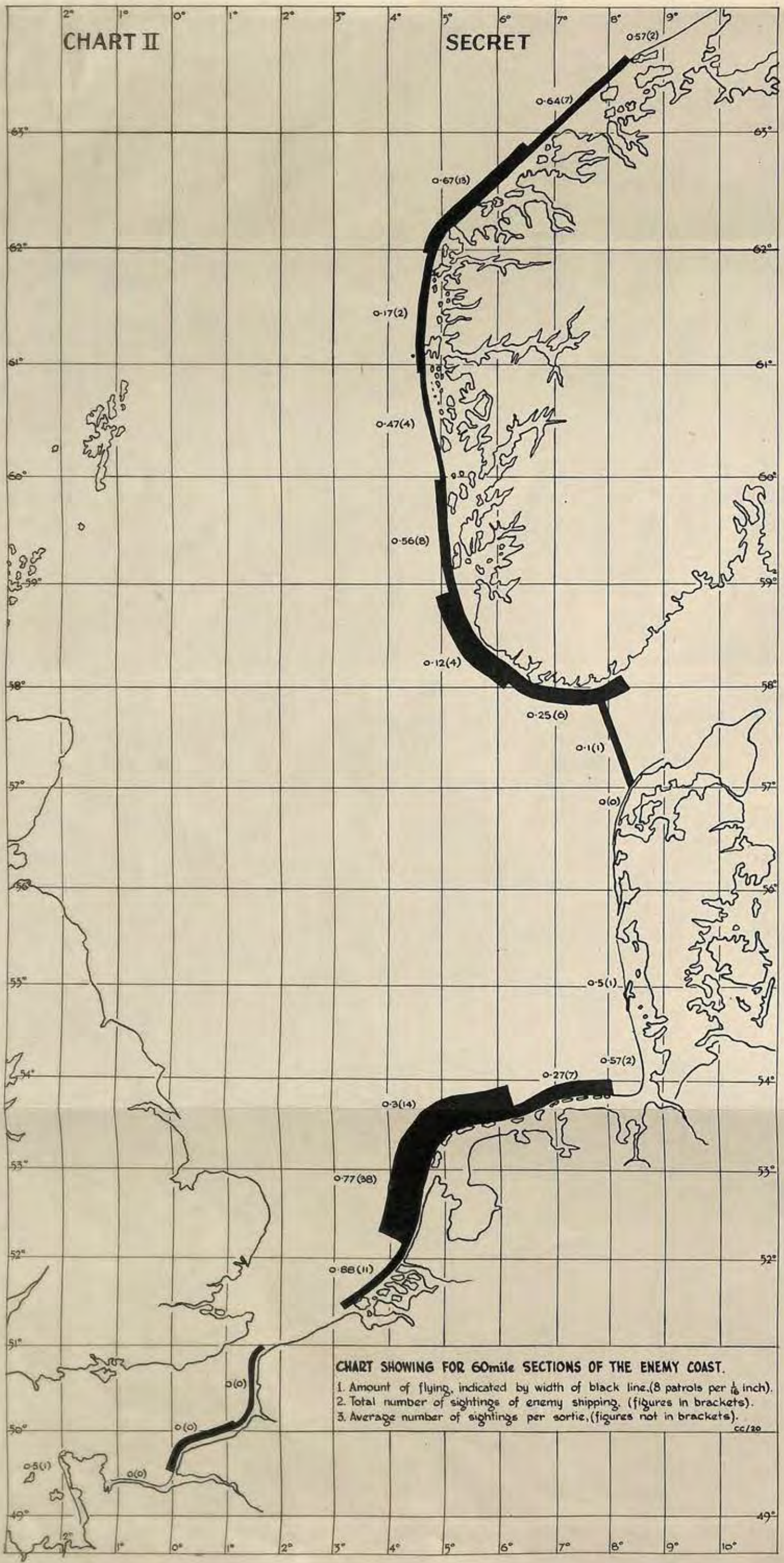


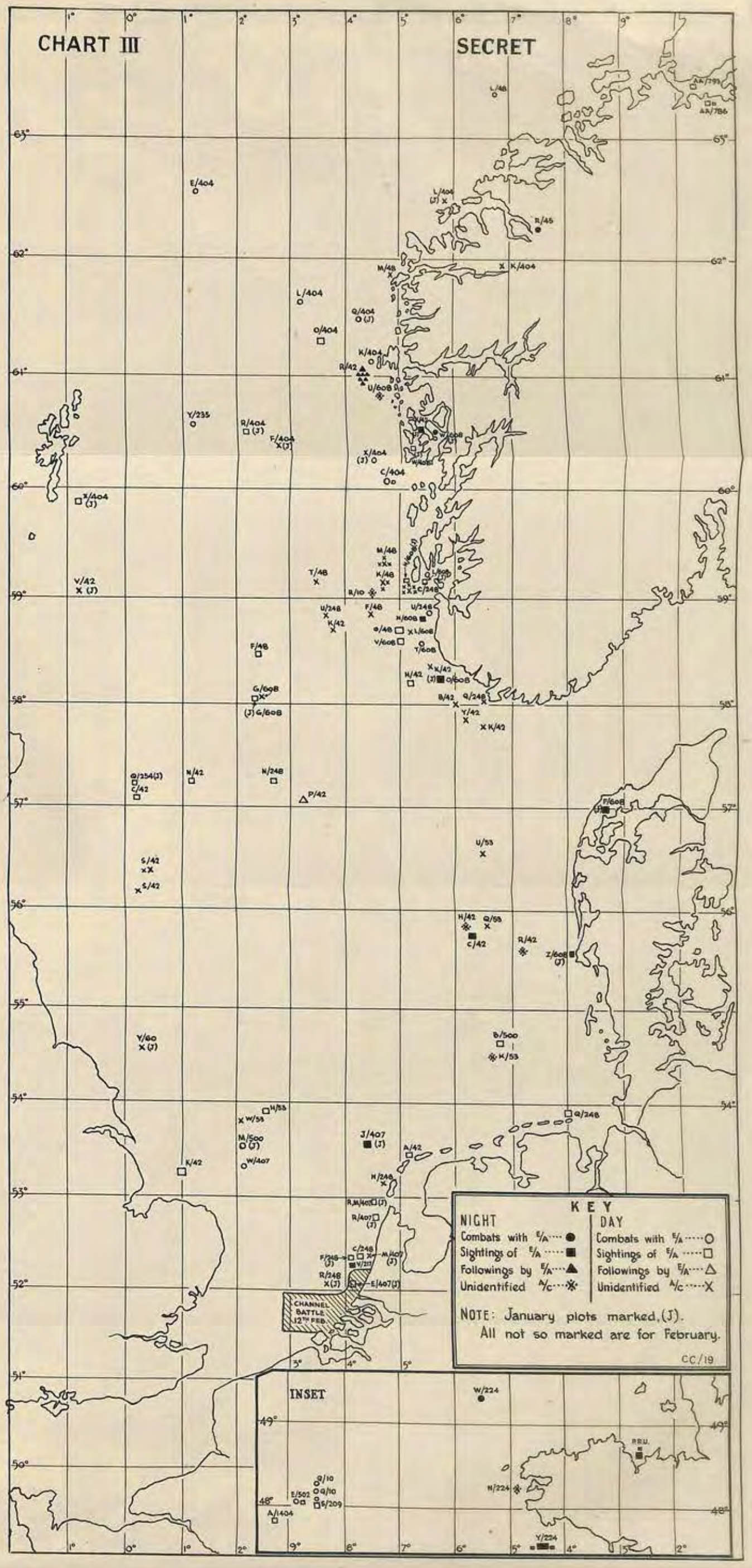
CHART SHOWING FOR 60mile SECTIONS OF THE ENEMY COAST.

1. Amount of flying, indicated by width of black line.(8 patrols per $\frac{1}{16}$ inch).
2. Total number of sightings of enemy shipping. (figures in brackets).
3. Average number of sightings per sortie.(figures not in brackets).

cc/20

CHART III

SECRET



KEY

NIGHT	DAY
Combats with E/A ●	Combats with E/A ○
Sightings of E/A ■	Sightings of E/A □
Followings by E/A ▲	Followings by E/A △
Unidentified A/C ※	Unidentified A/C X

NOTE: January plots marked, (J).
All not so marked are for February.

CC/19

A striking aircraft may fail to find its target because of some factor common to all the aircraft in that particular strike, or because of a factor peculiar to itself. Factors affecting all aircraft alike are—bad weather ; an inaccurate report by the aircraft making the initial sighting ; and unpredicted behaviour of the target in the period between initial sighting and strike. Factors peculiar to one aircraft are : faulty navigation, bad look-out or S.E., and failure to patrol enough of the coast to allow for inevitable uncertainties in the target's position.

Of the six strikes in which four or more aircraft took part (excluding those which sighted other shipping) there were three in which no aircraft found the target and three in which some aircraft found it. Of the latter it may be said that the cause lay with the individual aircraft, not with the strike as a whole. On some or all of the other occasions the cause of failure may have been common to the strike as a whole.

Enemy Opposition

Enemy Air Opposition.—Our aircraft sighted 51 enemy aircraft during anti-shipping patrols and strikes during the two months. On 20 occasions a chase took place ; of these there were seven occasions when our aircraft attacked the enemy, and three occasions when our aircraft was itself attacked. Details are given in the following table :—

TABLE 11

Type.	Our Offensive.		Enemy Offensive.		No Action.
	Chase.	Attack.	Chase.	Attack.	
Me.109	0	0	1	2	3
Me.110	0	0	0	0	3
Ju.88	0	3	0	0	4
He.111	0	2	0	0	1
He.115	0	1	0	0	0
Unknown	1	1	8	1	20
Totals	1	7	9	3	31

Of the eight unknown aircraft which chased our aircraft, six were at night, and presumed to be night fighters. Of the identified aircraft, only Me.109s took the offensive.

Strikes on Harbours

Details of the five harbour attacks which were made in January and February are given below :

TABLE 12

Harbour Attacks in January (none in February)

Date.	Objective.	Time of Day.	Nos. A/C Airborne.	Nos. A/C over Target.	Nos. A/C Attacking	Attacks.		Flying hours.
						Ships.	Harbour.	
Jan. 1	Gironde	Night	2	2	2	2	Jetty	11·7
7	Bergen	Night	12	7	6	5	Dock	58·4
17	Guernsey	Day	6	3	3	1	Jetty	9·9
30	Bergen	Night	1	0	0	0	—	4·4
30	Stavanger	Night	1	0	0	0	—	4·7
	Totals		22	12	11	8	—	89·1

It will be seen that on the average twice as many aircraft must be dispatched as are required to make the attack.

(iii) Air Sea Rescue

January and February, 1942

The number of forced landings in the sea during January was smaller than usual, because the bad weather restricted flying, but the rough seas and low visibility also reduced the chances of rescue. Twenty-six lives were saved that month. In February, thirty-eight were saved, but even this figure is considerably below the average of previous months (*see* page 40). Again the fall was chiefly due to the weather, but in part also to the concentration of effort in the Channel too close to the enemy shores for British rescue craft to operate.

One rescue is particularly notable. A Beaufort, forced down by engine trouble about 1730 hours on 23rd February, sent out a call sign by wireless as it fell ; the position thus indicated was 168 miles east of Aberdeen. A Catalina spent the night and the next morning searching. Meanwhile, a pigeon which escaped when its holder burst in the crash, flew back to its owner, a plumber of Broughty Ferry. It bore no message, of course. But it was believed to be incapable of night flying, and therefore to have started without delay, and a calculation of its speed showed that the distance flown must be less than was expected. In the morning 17 aircraft and four high-speed launches were sent. A dinghy with the entire crew was sighted at 1106, only 90 miles from a more southerly part of the coast.

Abbreviations

A/C	Aircraft.
A.R.B.	Air Sea Rescue Boat.
B.B.	Balloon Barrage.
F.A.A.	Fleet Air Arm.
H.S.L.	High Speed Launch.
M.A.S.B.	Motor Anti-Submarine Boat.
M.T.B.	Motor Torpedo Boat.
O.T.U.	Officers Training Unit.
R.N.A.S.	Royal Naval Air Services.

TABLE OF RESCUE SUCCESSES, JANUARY AND FEBRUARY

Time and Date.	Aircraft.	Position.	Marine and Air Search was conducted by	No. of Crew.	Remarks.
6.1.42. 1734 hours.	Anson. Air Observer School, Penrhos.	6 miles West of Llandbodr	1800. Private motor boat *Criccieth*. 1830. Lifeboat from Barmouth. 1857. Lifeboat from Pwllhelli. 1930. Rowing boat from Criccieth. 1930. A.R.B. from Criccieth.	4 *4*	The Walrus aircraft picked up two members of the crew and returned to pick up the remaining two.
7.1.42. 0940 hours.	Wellington. 15 O.T.U., St. Eval	2 miles from Portreath ..	Lysander (276 Squadron) from Portreath made four sorties, 0915–0945; 1100–1215; 1330–1345; 1505–1735. M.S. *Peggy*.	6 *1*	One member of the crew was picked up by Portreath Harbour Co.'s motor boat at 1000 hours.
7.1.42. 1104 hours.	Anson. P.R.U., St. Eval ..	Near Fishpool, Newquay..	Fishing boat from Newquay. Newquay lifeboat. 1112. Lysander from Portreath.	3 *3*	All crew picked up by fishing boat sent by 19 Group.
12.1.42. 1220 hours.	Albacore. 774 Squadron, A.G. Training School, St. Meryn.	Off Portqueen Bay ..	Drifter *Present Friend* from Padstow. "R" Boat No. 127 from Padstow. Aircraft from St. Meryn co-operated.	3 *3*	Crew rescued by *R.127* in co-operation with drifter. The pilot was slightly injured.
13.1.42. 1015 hours.	Swordfish. R.N.A.S., St. Meryn	2 miles from Boscastle ..	Drifter *Present Friend* from Padstow. 1020. Lysander from Portreath.	3 *3*	Ships ordered out by R.N., F.A.A. co-operating. Crew picked up by trawler and transferred to "R" boat from Padstow.
16.1.42. 0635 hours.	Wellington. Mildenhall ..	Just off Spurn Point ..	H.M.S. *Goatfall*. M.A.S.B. 25.	6 *2*	Two of the crew picked up by H.M.S. *Goatfall*.
17.1.42. 1825 hours.	Wellington. 407 Squadron, Pocklington.	2 miles off Hornsea ..	1826. R.A.F. Launch 439 from Bridlington. H.M. Destroyer *Leeds* from convoy. 0800. Two Hurricanes from Kirton. 0834/1100. Two Lysanders from 12 Group.	6 *2*	Two of the crew were picked up by H.M.S. *Leeds* at 0945 on 18.1.42.

Note.—Figures in italics indicate the number of crew saved.

TABLE OF RESCUE SUCCESSES, JANUARY AND FEBRUARY—*continued*

Time and Date.	Aircraft.	Position.	Marine and Air Search was conducted by	No. of Crew.	Remarks.
29.1.42. 0915 hours.	Hampden. 106 Squadron, Coningsby.	3 miles off Cromer ..	0915. Beaufighter *N/248* from Bircham Newton. 0945. Lifeboat from Cromer. 0945. Walrus aircraft from 12 Group. 1145. Spitfire from 12 Group. 1230. Beaufighter *B/248* from Bircham Newton.	4 *1*	Beaufighter *N* sighted the dinghy and stayed in position, and the Spitfire circled until a lifeboat picked up the survivor.
30.1.42. 0925 hours.	Halifax. *Q/76.* Middleton St. George. Operating from Lossiemouth.	3 miles from Gregness ..	Eight Patrol vessels in vicinity. 0950. Anson from Kinloss. 0955. Spitfire of 416 Squadron from Peterhead. 1000. Spitfire of 603 Squadron from Dyce.	7 *7*	A Spitfire and Anson had gone to the assistance of *Q/76.* The Spitfire, from Peterhead established contact, and circled *Q/76,* which had ultimately come down in the sea. The crew got away in a dinghy, and were picked up by a patrol vessel. Other patrol vessels attempted to salvage the aircraft, but it sank at 1034.
7.2.42. 1856 hours.	Botha. Squires Gate	In Mersey, between New Brighton and Egremont.	Balloon Ship *Georgita* of No. 8 B.B. on the spot.	2 *2*	Both airmen picked up by *Georgita* within 5 minutes.
12.2.42. 1040 hours.	Spitfire. 403 Squadron, Martlesham.	9 miles East of Walton-on-the-Naze.	H.M.S. *Reids* on patrol. A.R.B. 3 and 5.	1 *1*	*Reids* on patrol in vicinity, picked up pilot, assisted by A.R.B.s 3 and 5.
12.2.42. 1315 hours.	Swordfish. F.A.A.	8 miles off North Foreland	—	3 *3*	Crew rescued, wounded, by M.A.S.B. 31. Airmen did not bale out, but used dinghy.
12.2.42. 1345 hours.	Swordfish. F.A.A.	11 miles off South Foreland	—	3 *2*	Two members of the crew were rescued by M.T.B. 45. The dinghy was used.
14.2.42. 2249 hours.	Anson. No. 4 A.O. School, West Frough.	About 1 mile off Corswell Point.	2259. Crash boat from Stranraer. 2315. Naval Examination Vessel from Stranraer.	5 *5*	Incident reported by Royal Observer Corps to 13 Group. Crew got into dinghy, and then on to a rock about 200 yards from the shore, and they were picked up by a small boat sent from the Examination Vessel.

15.2.42. 0222 hours.	Whitley. 78 Squadron, Croft..	6 miles S. of Swanage ..	H.S.L. 139 from Portsmouth. A.S.R. Boats *Azur*, *Eve*, *Rosa* and *Arthur*. 0486. Three Beaufighters from Middle Wallop. 0612. Anson from Upper Heyford. 0810. Lysander and two sections of Spitfires from Ibsley.	5 *5*	Crew picked up by H.S.L. No. 139, all unhurt, 8 miles off Poole.
15.2.42. 1750 hours.	Hampden. 49 Squadron, Scampton.	1 mile off St. Catherine's Point.	M.A.S.B. 39 from St. Helen's. Walrus aircraft.	4 *4*	Crew picked up by M.A.S.B.
15.2.42. 1540 hours.	Wellington. 6 Squadron, Honington.	300 yards off shore, near Clacton Martello Tower.	1546. A.R.B.s 1, 2, 3, 5 and 6 from Brightlingsea. Lifeboat from Clacton. Two rowing boats from Clacton Pier. Walrus aircraft from 11 Group. Lysanders from 11 Group.	7 *4*	Four of the crew rescued by two soldiers in a rowing boat. Remainder of crew believed to have gone down with aircraft.
17.2.42. 1036 hours.	Albacore. 786 Squadron, R.N.A.S.	1 mile from Elie	Torpedo Recovery Drifter.	1 *1*	Pilot picked up by Torpedo Recovery Drifter, which had seen the aircraft come down into the sea.
17.2.42. 1500 hours.	Beaufighter. 235 Squadron, Dyce.	7 miles N.W. of West Fraserburgh.	1500. Fishing vessel.	2 *2*	The aircraft crashed into Moray Firth and was seen by a fishing vessel which rescued the crew.
23.2.42. Reported 1800 hours.	Beaufort. 42 Squadron, Leuchars	Last known position, 168 miles E. Aberdeen. Aircraft failed to return —no signal.	2325. Catalina *K/413* from Sullom Voe. 24.2.42. 0718. Hudson *K/320* from Leuchars. 0723. Hudson *H/320* from Leuchars. 0818. Hudson *F/320* from Leuchars. 0807. Blenheim *X/489* from Leuchars. 0808. Blenheim *H/489* from Leuchars. 0810. Blenheim *S/489* from Leuchars. 1000. Hudson *P/320* from Leuchars. 1125. H.S.L. 118 from Blyth. 1125. H.S.L. 158 from Blyth. 1145. H.S.L. 137 from Aberdeen. 1145. H.S.L. 157 from Aberdeen. 1139. Beaufort *K/42* from Leuchars. 1154. Beaufort *N/42* from Leuchars. 1157/1345. Beauforts *P*, *S*, *E*, *U*, *G/42*, from Leuchars. 1230/1248. Beaufighters *D*, *T/248* from Leuchars. 1205. Walrus *W/9L* from Arbroath. 1205. Walrus *W/9K* from Arbroath.	4 *4*	The dinghy was first located by a Hudson, *H/320*, at 1106 hours on 24.2.42. At 1130 a corrected position was received from this aircraft. H.S.L.s from Blyth proceeded to the later position and one of them picked up the four survivors. (*See* p. 16.)

Note.—Figures in italics indicate the number of crew saved.

TABLE OF RESCUE SUCCESSES, JANUARY AND FEBRUARY—*continued*

Time and Date.	Aircraft.	Position.	Marine and Air Search was conducted by	No. of Crew.	Remarks.
27.2.42. 1535 hours.	Havoc. 23 Squadron, Manston	1 mile N. of Foreness Point	H.S.L. 149. Lifeboat from Margate. M.A.S.B. 32. Lysander. Two fighters from 32 Squadron. Biggen Hill.	4 *3*	Crew did not bale out, but used the dinghy, three of the crew were picked up by a lifeboat from Margate.
27.2.42. 1250 hours.	Spitfire. 222 Squadron, North Weald.	1 mile E. of South Foreland	Lysander from Hawkinge. Two aircraft of 91 Squadron. Two aircraft of 32 Squadron.	1 *1*	Pilot picked up by H.M. Yacht *Chico*. He neither baled out nor used the dinghy.
28.2.42. 1825 hours.	Spitfire. 411 Squadron, Hornchurch.	13 miles off North Foreland	Dover boats in vicinity.	1 *1*	The aircraft collided with another when engaged in searching for a Spitfire from Northolt. The pilot did not bale out, but used the dinghy. He was picked up by H.S.L. 120.

Note.—Figures in italics indicate the number of crew saved.

(iv) Meteorological Flights

Introduction

At the outbreak of war there were two Meteorological Flights (Nos. 1401 and 1402), at Mildenhall and Aldergrove. These flights made regular ascents twice a day in Gladiator aircraft to about 24,000 feet, taking observations of air temperature, humidity, cloud level, etc. The results thus obtained were invaluable to the weather forecaster; they gave him data in the "third dimension" to reinforce his knowledge of what was happening in the atmosphere, which he deduced from a network of surface observations plotted on the surface weather chart. But the meteorologist craved for more, covering a wider field, upwards and outwards. Expansion occurred, mainly in 1941.

From November, 1941, all the meteorological flights in the United Kingdom and Iceland were brought under the single administrative control of Coastal Command.

Before describing the present activities of meteorological flights it is worthy of note that at the time that Coastal Command became responsible for the administration of them all, the Mildenhall and Aldergrove flights referred to above had already created an exceedingly fine tradition. At Mildenhall not a single scheduled ascent had been missed in a period of five years.

Meteorological flights are to-day broadly of two kinds, vertical ascents and reconnaissance sorties.

Vertical Ascents

Two types of vertical ascents are made, the first by Gladiator aircraft as described above, the second by Spitfire aircraft reaching about 40,000 feet. Thus the latter, more often than not, penetrate the stratosphere. Indeed, one of the primary purposes of the Spitfire ascents is to give the level at which the stratosphere begins, since this level (above which there is no further fall of temperature with increasing height) varies from day to day over a range of several thousand feet. In addition to its importance for understanding weather changes, this tells the level at which aircraft condensation trails may be expected to cease to form when they have formed at lower levels.

Gladiator ascents are now made regularly three times daily by No. 1401 Flight at Bircham Newton and by No. 1402 Flight at Aldergrove. The earlier tradition of these flights is being worthily maintained.

Spitfire ascents are made once a day by these two flights and by No. 1406 Flight at Wick. Already the latter has established a record of regularity of ascent which, considering the difficulties of the situation, is highly commendable.

Meteorological Reconnaissance Sorties

These sorties are made over the sea in Blenheim or Hudson aircraft to a distance of 300 to 500 miles from base. The aircraft goes out, generally at a low height, making weather observations, instrumental and by eye, on its route. On reaching the outward limit of flight, the aircraft descends to as near sea level as possible, and then makes a vertical ascent to about 18,000 feet, taking observations on the way up, much in the manner of the Gladiator ascents. The return to base is normally made at a greater height than the outward flight, and further weather observations are made to supplement those taken at the lower level.

These sorties are made by No. 1401 Flight from Bircham Newton over the North Sea, and by Nos. 1402 and 1404 Flights from Aldergrove and St. Eval respectively over the Atlantic. Nos. 1406 and 1407 Flights, at Wick and Reykjavik, will shortly add to the number of such sorties.

Weather has proved a more serious hindrance to this type of sortie than to Gladiator ascents, for obvious reasons. Nevertheless, the number of sorties missed has been very few and their regularity has earned justifiable commendation from many quarters. The following figures give point to the standard attained in the normal sorties, scheduled to be made, one per day.

Number of Sorties Made

	Flight No. 1401 (originally No. 1403 Flight).	*Flight No.* 1402 (originally No. 1405 Flight).	*Flight No.* 1404.
August, 1941 ..	29	28	21
September	30	26	25
October	29	24	28
November	23	27	26
December	25	23	26
January, 1942 ..	24	24	23
February	19	23	20

Additional special sorties have also been made from time to time.

Some other Aspects of Meteorological Flights

There is nothing essentially spectacular about Meteorological Flights. Their aim is to provide the Meteorological Service with carefully made, regular observations on the weather. And when the weather is bad the observations are likely to be all the more valuable. Thus, bad-weather flying is " enjoyed " to the full by Meteorological Flight crews, and the more spectacular side of the work usually comes out of the bad weather. All crews engaged on the work have probably got some experience from bad-weather flying which will be long remembered, though not all will have broken low cloud on a rising hillside, torn up gorse bushes, knocked down a gate and nearly decapitated a farmer to make a normal landing some 20 minutes later with the gorse still festooned on the leading edges—this was the experience of a crew in No. 1404 Flight. To keep a sense of proportion, however, it is true to say that the more bad weather is experienced, the more normally can it be taken in the stride, while Meteorological Flight navigators develop one and another special aid to bring aircraft home safely. Thus there is ground for believing that experience gained on Meteorological Flights will react very favourably on duties later undertaken by the crews.

Inevitably, a meteorological flight involves a good deal more than the weather, though weather is its *raison d'être*. Enemy aeroplanes are encountered and one has been shot down (by No. 1403 Flight as it was then) when the odds were against the meteorological aircraft, but were overcome by a skilful use of cloud cover. Enemy shipping has been attacked, and a notable toll of enemy submarines stands to the credit of No. 1404 Flight.

The information which the Meteorological Flights provide is of tremendous use on its own account, and doubly so now, because weather reports which were obtainable in peace time from other sources in the areas of operation have become much fewer or non-existent. The regularity of flying is an achievement ; it is a fine tribute to the Flights that all concerned should take it almost for granted that the Meteorological Flight report will always be there.

(v) Summary of Operational Effort

January and February, 1942

The number of hours flown on operational activities totalled nearly 9,000 in January and 11,000 in February, divided as follows :—

	January.	February.
Reconnaissance	827	1,255
Anti-Submarine Patrols	2,498	2,884
Offensive and Security Patrols	217	517
Convoy Duties	960	1,112
Night-flying Operations	1,453	1,167
T/B (Torpedo) Striking Force Operations	240	542
Other Operational Flying	757	1,206
Communication, Ferrying and Testing ..	2,036	2,203

Attacks upon the German warships as they passed through the Channel on 12th February, cost Coastal Command five aircraft ; three hits with torpedoes were claimed. Such detailed accounts were published in the daily press that nothing further need be said.

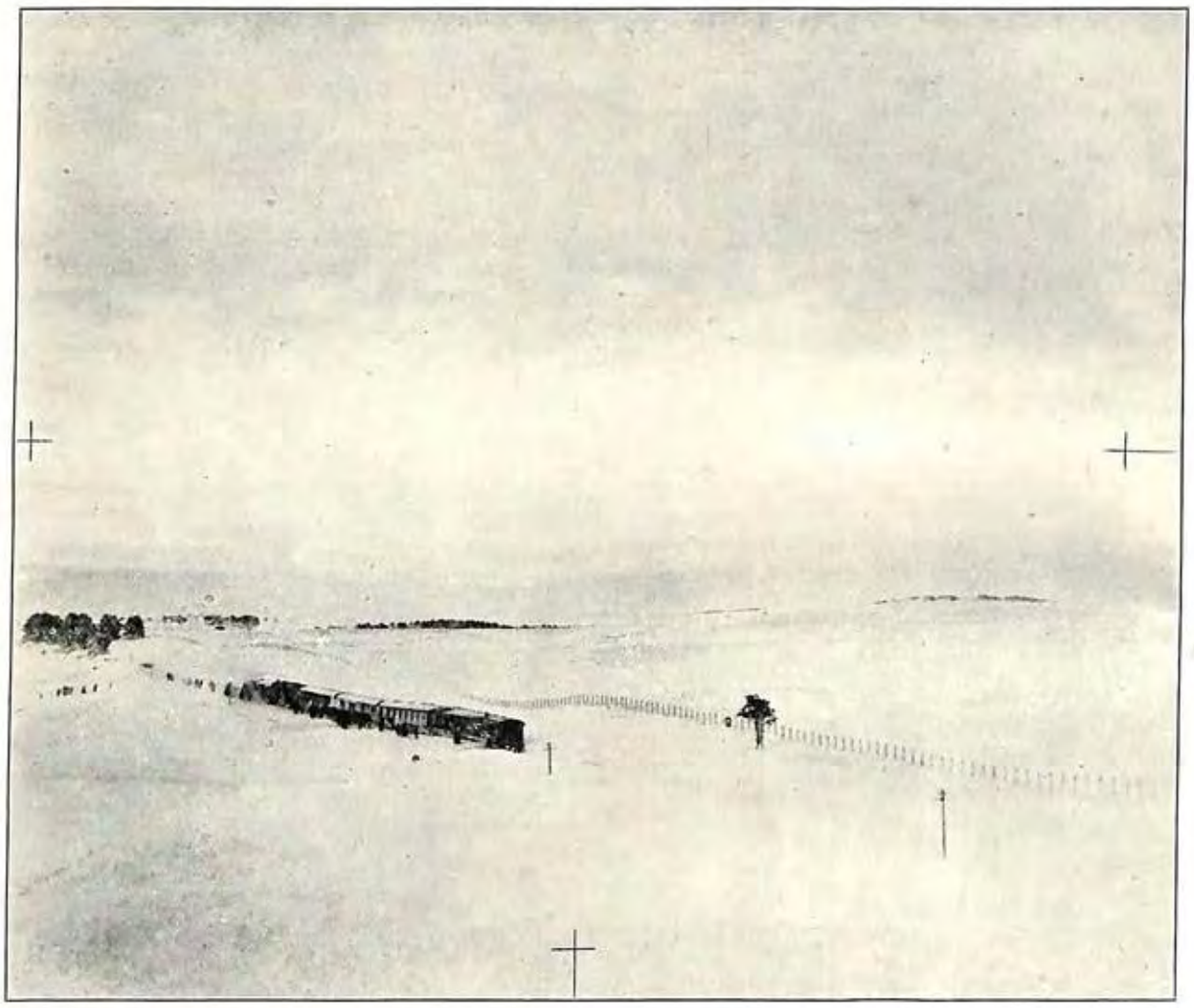


Plate 4. A SNOWBOUND TRAIN NEAR THURSO, to which food was dropped on 26th January by aircraft of Coastal Command (page 25).

Among the unclassified Operational Flying of January is reckoned some undertaken for civil relief when parts of Scotland were snowbound; food was supplied to a train caught in a drift as well as to isolated houses (Plate 4).

Pamphlets were dropped to the number of 142,000 in January, and 135,000 in February—trifling figures beside the millions dropped by Bomber Command. They have, however, some significance, because Coastal aircraft, on the comparatively rare occasions when they make flights over enemy-occupied territory, cover areas off the normal beat.

The following table, regarding the escorting of ships, was prepared on data collected from the naval standpoint, and so gives a slightly different picture from those on pages 10 and 39.

	Escort for Ocean Convoys, independently routed Ships and Naval Forces.				Escort near coast for Convoys, independently routed Ships and Naval Forces.			
	Number Escorted.	Sorties.	Flying Time.	Time over Convoy.	Number Escorted.	Sorties.	Flying Time.	Time over Convoy.
			Hours.				Hours.	
Jan.	34	61	480	123	43	94	356	186
Feb.	39	125	835	245	64	161	650	342

SECTION 2

SOME NOTABLE INCIDENTS

(i) Narratives of Attacks

Night Attack on Bergen

Three Hudsons of 608 Squadron, six of 28 Squadron, and two Beauforts of 42 Squadron were despatched from Wick, and three Beauforts of 42 Squadron from Leuchars, on the night of January 6–7th to attack shipping at Bergen. The aircraft of 608 Squadron and 48 Squadron were airborne between 0030 and 0130, and over the target area between 0320 and 0350.

O/608 flew in to the target area at 50 ft., up moon, and sighted three merchant vessels anchored in the roadstead. It attacked the largest merchant vessel across the beam, dropping four 250-lb. G.P., 11-second delay bombs. Heavy flak prevented the results of this attack being observed, as the aircraft took avoiding action along a valley to the south. *O* was the first aircraft to attack, and experienced no flak until it reached the target area, but soon considerable flak and searchlights were seen, engaging both *O* and the following aircraft.

W/608 came next over the target. It was met by light flak from Helliso Island, and intense light flak and searchlights at the entrance of Herdla Fiord. All along Herdla and By Fiord the aircraft was shot at by flak and held in searchlights, whose dazzle prevented identification of the target until, by chance, two searchlights lit up the town for a second, and the observer released four 250-lb. bombs at 200 ft. over the Graving Dock. Blinding searchlights and flak made it impossible to see any results. *W/608* then passed over Bergen and up the valley to the south, and encountered a night fighter, which attacked from the starboard quarter, using a searchlight and firing three bursts from 200 to 300 yards. *W* opened fire with side and rear guns from a height of 100 ft. above ground; then the enemy aircraft broke away and dived sharply past *W*, its searchlight illuminating the ground below. The gunner saw a glow on the hillside as *W* pulled up out of the valley. This enemy aircraft is claimed as probably destroyed.

B and *P/48* arrived about 10 minutes later. *B* was caught in the searchlights at By Fiord, and heavy and light flak and pom-poms forced it to turn back towards the sea. Six miles to the north-east of Bergen it sighted a merchant vessel of 1,000 tons, which it attacked across the port beam from 50 ft. Results were not definitely established, but the gunner saw two explosions after the attack, and smoke spreading from the direction of the ship.

P/48 flew up Herdla Fiord through the flak, and sighted the jetties and houses of Bergen lit up against the hillside by searchlights. It dropped four 250-lb. bombs from 50 ft., but could see no results. The aircraft was damaged by flak, but landed at Dyce at 0645 hours.

W/48, which reached the target a few minutes later, approached it from the south, along Hjelte Fiord, instead of rounding the northerly side of Asko Island, along Herdla and By Fiord. It was not caught by flak or searchlights, for both passed well over it. Coming up the Fiord towards Bergen it sighted a merchant vessel of 6,000 tons, which it attacked at a low level, from abaft the port beam, with four 250-lb. G.P. bombs. No explosions and splashes were seen, so, although the bombs seemed to have dropped, the pilot made four more attacks, shooting up the ship's bridge.

H/608 searched Kors Fiord, south of the target area, for shipping, without result, then turned northwards into Hjelte Fiord, and tried to find the approach to Bergen along By Fiord. Accurate flak and searchlights were met from Asko Island, but *H* could not find the entrance to By Fiord, and after flying along Hjelte Fiord, set course for base.

U/608 sighted the target area from 50 ft. at 0430 hours, and selected a ship picked out by searchlights. This ship fired intense light and heavy flak, and the aircraft took avoiding action between 50 ft. and sea level. While approaching the ship, the rear gunner fired a long burst at a searchlight, which went out. The guns then jammed, but were cleared soon afterwards. The ship was attacked with four 250-lb. G.P. bombs, but results of this attack could not be seen ; the rear gunner saw two flashes, which may have been bomb bursts, as the aircraft climbed to pass over the town and away to the south. This aircraft had engine trouble on the way home and crash-landed at Helmsdale, at 0730.

Two other Hudsons failed to return.

The two Beauforts from Wick were airborne at about 0220. Neither of them actually reached Bergen, but *V/42* dropped its bombs on a ship of about 1,500 tons in the northern end of Hjelte Fjord. Details of this attack could not be seen as the aircraft was caught in a searchlight, and was experiencing flak from the east side of the Fiord.

The three Leuchars Beauforts took-off between 0405 and 0415. *E/42* met a night fighter in Kors Fiord, before reaching Bergen, and jettisoned its bombs while evading it ; it set course for base soon afterwards. *M* and *R/42* were unable to find the target, owing to the intense darkness ; the moon was obscured at that time.

No claims were made for any of these attacks on shipping, owing to the difficulty of seeing results in the intense flak and searchlights.

A Liberator's Patrol

D/120 left Nutts Corner at 0410 hours on January 11 and carried out an anti-shipping patrol of the Bay of Biscay. At 1520 hours a He.115 was sighted flying at 100 ft. The Liberator attacked, firing 200 rounds from the side guns and 300 from the rear guns. Numerous hits were scored, and fragments were seen falling from the body of the enemy aircraft. Without returning fire, it began to glide down towards the sea, while thick white smoke poured from its starboard engine. At 1534 it disappeared into a squall of rain.

At 1545, in the position 43° 55′ N. and 10° 15′ W., the Liberator sighted a large merchant vessel 5 miles away, and found that a U-Boat was lying about a length ahead of it ; they were hardly under way. The aircraft immediately circled the ship, losing height until hard on the ship's port beam, and at 1,000 ft. began to dive upon the U-Boat. Fire was opened at 800 yards with four cannons ; 180 shells were fired during the run up, and hits on the hull and conning tower were estimated. From 300–400 ft. a stick of 250-lb. depth charges, 50 ft. setting, were released (to the number, it was thought, of four) when the aircraft's speed was 180 knots. The photographs (Plate 5), however, show five bursts, the third and fourth very close together, so that the rings of foam merge. For the U-Boat had now begun to crash-dive and, as the aircraft climbed away, the stern was standing out of the water.

A large oil patch was seen one minute after the attack and remained till the aircraft left the scene at 1615. As the depth charges wobbled out of line and missed ahead, it is unlikely that damage was inflicted, but the U-Boat must have suffered an unpleasant shake-up. The nearest explosion seems to have occurred 100 ft. to starboard of the U-Boat's course and level with its bows ; a more accurate fall, both for line and for spacing, might have been obtained if the depth charges had been released from a lesser height.

Next, the pilot attacked the ship, identified as the *Elsa Essberger* of Hamburg (6,103 tons). He climbed to 1,000 ft., circled right-handed almost on to the reciprocal, and dived towards the starboard beam, pouring in cannon fire. The ship began steaming in circles, and persisted in that form of evasive action all through. Depth charges were released from a height of 600 ft., somewhat inaccurately aimed—the nearest burst seemed about 50 yards off the ship's side—because a He.115 had appeared, dead ahead. The Liberator immediately climbed to 1,000 ft., circled to the right and gave chase, opening fire with cannon and machine guns. The Liberator came back and resumed the attack upon the ship, but was again interrupted by the reappearance of the enemy aircraft. This it attacked several times, at ranges varying between 100 and 650 yards, while

the enemy returned fire with his front and rear guns without scoring hits. Finally he ceased fire, appeared to lose control and dived with smoke streaming from the starboard engine. When last seen, however, the Heinkel had pulled out of the dive and was flying at sea level towards cloud cover.

The Liberator made a total of four attacks on the *Elsa Essberger*, interspersed with attacks on the Heinkel, which prevented accurate observation of the results. Numerous hits were scored on the hull and superstructure, if not on the water-line. The ship fired no flak, in fact no one was visible on deck. Shortage of fuel and ammunition compelled the " Liberator " to break off the action at 1615 and return to St. Eval.

It has since been learnt that the *Elsa Essberger* was obliged to put into a Spanish port for repairs and stayed there several weeks.

Attack on Guernsey

Three Beauforts (*Q*, *G*, and *B/86*) made a shipping strike on St. Peter Port, Guernsey, at 1100 hours on 17th January, 1942 (Plate 6). The main target was the jetty, which had a merchant vessel of approximately 6,000 tons on one side, and two smaller ships on the other. The aircraft made a low level attack in line astern, each dropping its bomb load within 2 or 3 seconds of the others. *B* was flying so low and so close to *Q* that it was nearly hit by *Q*'s bombs ; it actually flew between the masts of one of the ships. Four 500 lb. M.C., two 500 lb. G.P., and twelve 250 lb. G.P. bombs, all 11 second delay, were released from a height of between 50 ft. and 100 ft., and numerous bursts were seen running diagonally across the jetty. Pieces of debris were hurled into the air from the direction of the largest merchant vessel and clouds of black smoke were also seen later. A shed in the middle of the jetty received a direct hit. A party of about 30 men, wearing steel helmets, was attacked, on St. Julian's Pier, with machine-guns, and other men in uniform on the Castle Pier were also shot up as they tried to hide under a rowing boat. A party of 20 or 30 soldiers on parade in a courtyard nearby were subjected to machine-gun fire with the result that they broke parade and scattered in all directions.

Attack on a U-Boat

A Blenheim, *A/1404*, which was engaged on a meteorological flight over the Atlantic, on February 12th, sighted a U-Boat on the surface a mile distant, at 0921 hours, in the position 48° 10′ N. and 09° 00′ W. The aircraft was at 1,600 ft. and made a diving attack. One 250 lb. anti-submarine bomb, Mark III, ½-second delay, No. 32 fuze, was released from 300 ft., at an angle of 30° to the track of the U-Boat, which crash-dived simultaneously. The bomb was seen to burst abaft the conning tower, directly over the submarine. The aircraft circled and attacked with a second bomb 30 seconds later, which was seen to burst 240 ft. ahead of the swirl. Large air bubbles continued to appear for several minutes after the attack ; although the aircraft remained in the vicinity for 20 minutes, no further results were seen.

It had been arranged between the pilot and observer that both bombs should be released in a short stick, but the observer was handling the camera and did not have time to release the second, while the pilot who had released the first, was unable to use the distributor. An excellent photograph was taken, after the release of the first bomb, when the U-Boat had begun to dive, so that its bows could still be seen under water (Plate 7).

The first bomb is considered by the crew to have burst between the conning tower and the stern, while that was cocked out of the water, and apparently was a direct hit about half way along the upper deck. The second was also a very good shot, right on the tail of the U-Boat ; if it fell 240 ft. ahead of the swirl, about 20-25 seconds after the stern had disappeared, the conning tower would by that time have advanced 344 ft. (reckoning 23 seconds + 3 seconds for time of flight + ½ second delay).

The U-Boat may have been trying to pick up some German airmen who had crashed into the sea, for two enemy aircraft were seen about 30 miles away, circling over a yellow oblong dinghy, which contained two men.

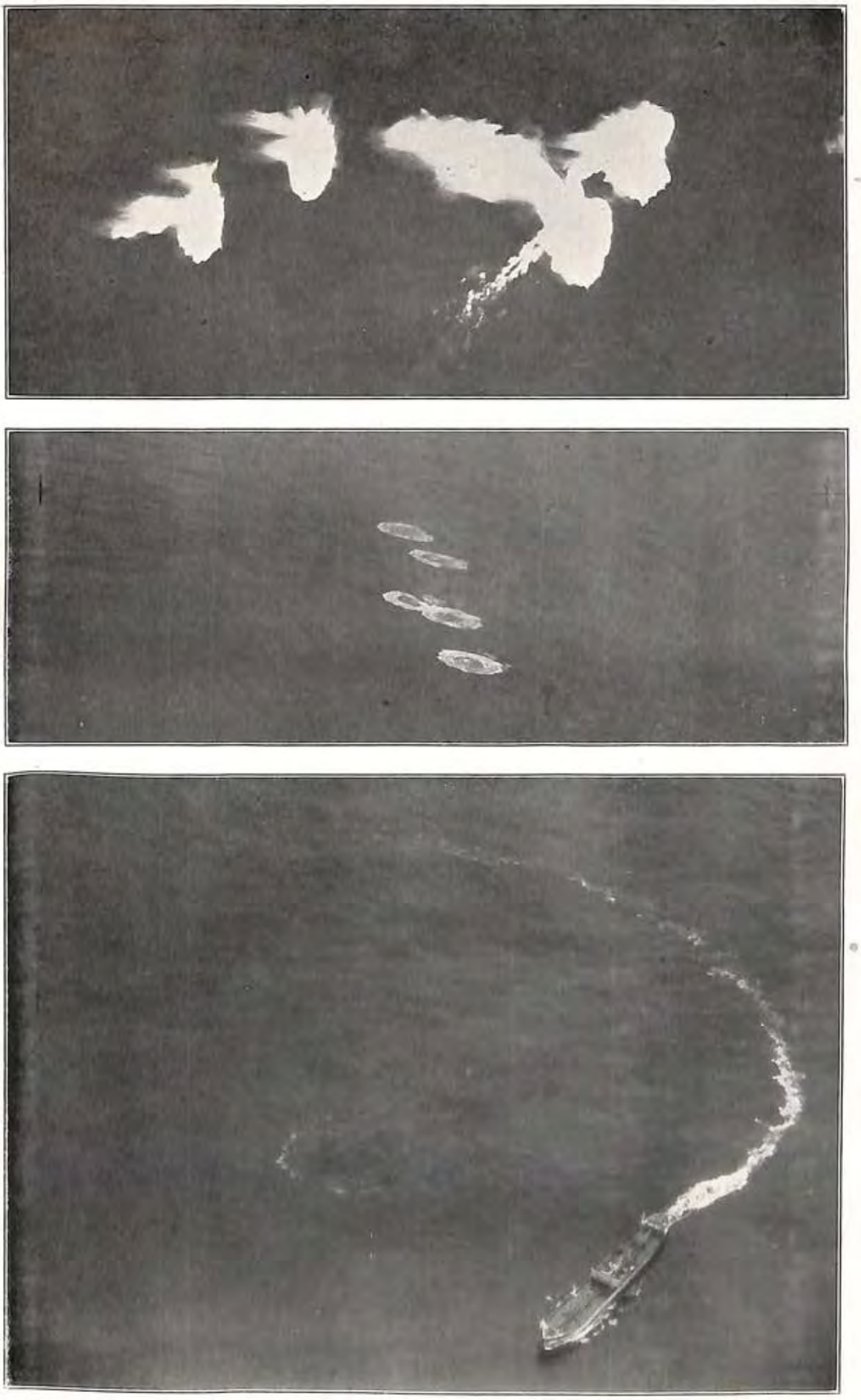


Plate 5. A LIBERATOR'S ATTACK UPON A U-BOAT AND SHIP (page 27). The first photograph shows four depth charges exploding around the U-Boat, which is crash-diving ; a fifth fell out to the left. The second photograph shows the rings formed by the explosions. In the centre of the third is the oil patch left by the U Boat, around which the *Elsa Essberger* is steaming in circles.

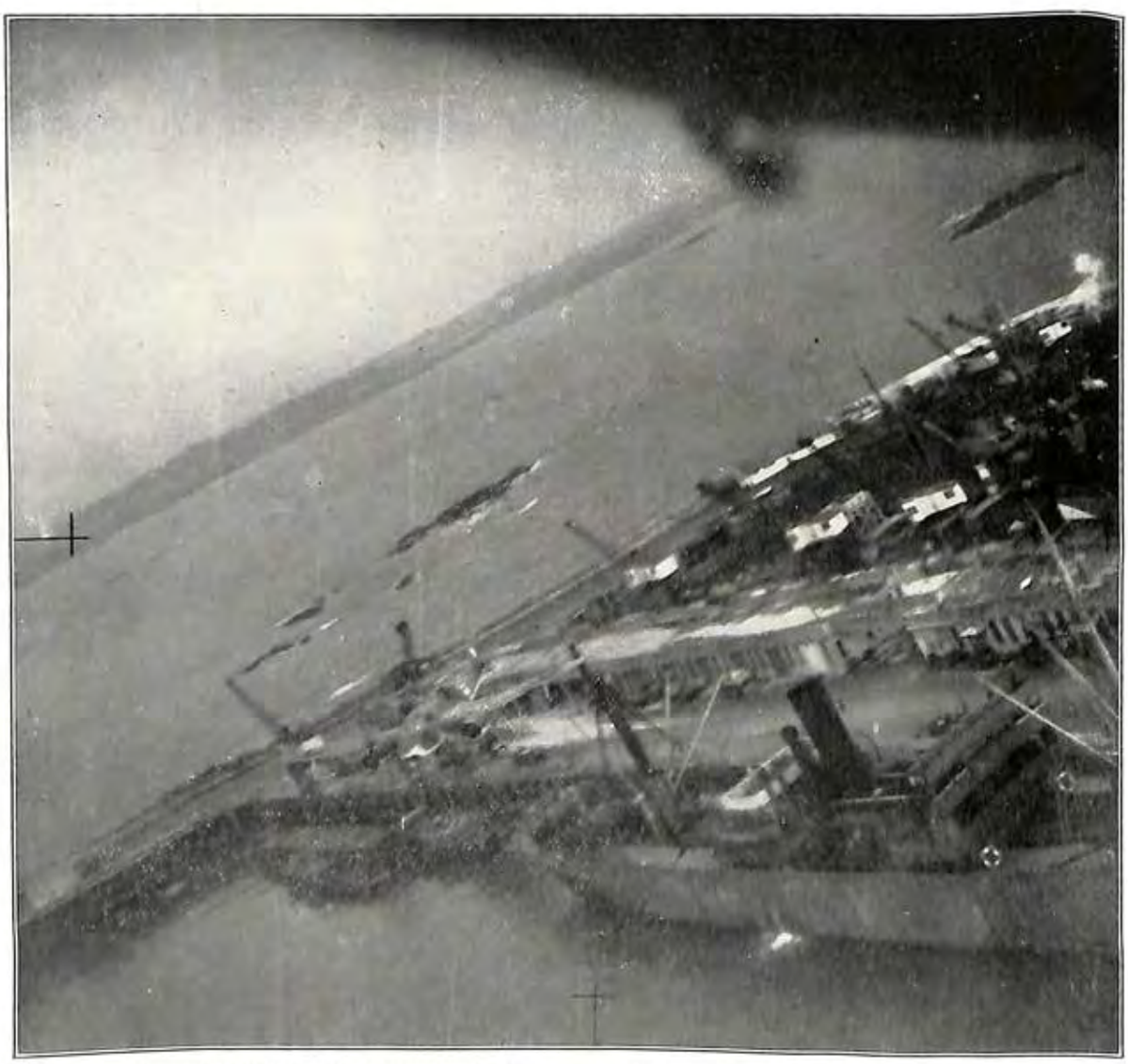


Plate 6. ATTACK ON GUERNSEY (page 28). Note the aircraft immediately above the ship, alongside the jetty in St. Peter Port.

Plate 7. A U-BOAT CRASH-DIVING BEFORE ATTACK (page 28). The bows are visible below water.

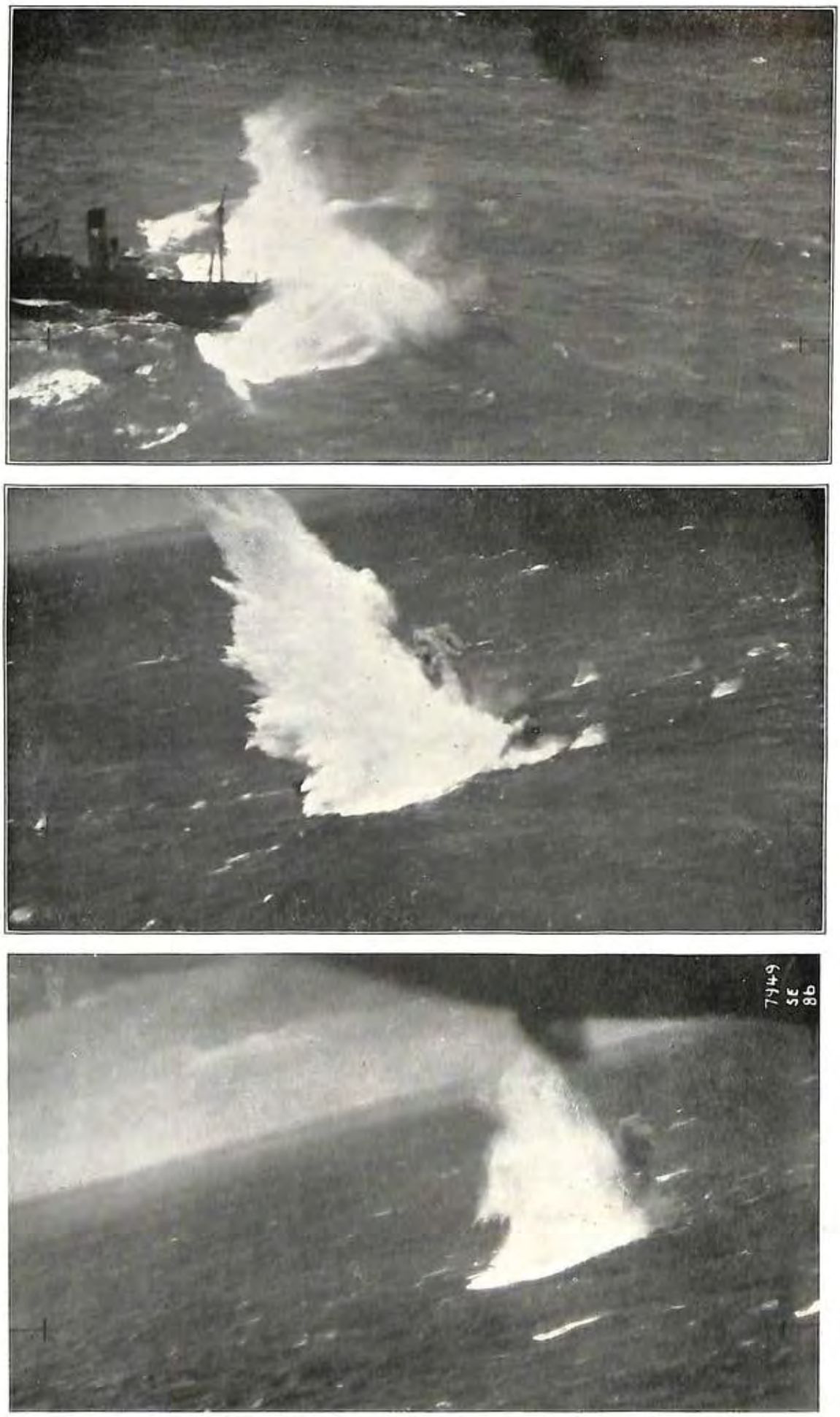


Plate 8. THE SINKING OF A TRAWLER. Successive photographs of the bombing of one of three trawlers sunk in the Bay of Biscay.

Sinking of Trawlers in the Bay of Biscay

Three Beauforts (*W*, *D* and *S*/86) were flying over the southern Bay of Biscay when they sighted four small ships, at 1434 hours on 16th February, 1942. The aircraft at once broke formation and carried out separate attacks (Plate 8).

In *W*'s attack on one ship, two 500-lb. M.C. and four 250-lb. G.P. bombs, 3 seconds delay, were dropped from 50 ft. Only one bomb overshot and the remainder were thought to have hit the ship amidships, some striking on the water-line and others on the deck. The ship promptly blew up, the aircraft was violently shaken by the explosion and when the cloud cleared, only an oily patch and some floating debris could be seen. It seemed to the crew of *D*, that the ship first broke in two, and both parts were blown out of the water before disintegrating.

D attacked the leading ship and while flying over its forepart released two 500-lb. M.C. and four 250-lb. G.P. bombs, 3 seconds delay, in a short stick from 50 ft. One 500-lb. and one 250-lb. bomb were believed to have scored direct hits. When the smoke cleared, the forepart was seen to have been blown off and the ship sank a minute or two later. During the run-up, the pilot had fired about 50 rounds into the ship from his machine-gun.

S meanwhile attacked the third ship, which had already been sprayed with machine-gun fire from *W*, and dropped one 500-lb. G.P., one 500-lb. M.C. and four 250-lb. G.P. bombs, 3 seconds delay, from 50 ft. Two bombs undershot, one overshot, the remainder were thought to have scored direct hits. A violent explosion took place ; a few seconds later the ship was well down by the bows and awash as far aft as amidships. The crew lowered a boat and abandoned the ship. As the aircraft flew away, the fourth ship was continuing on its course.

According to Bordeaux and Spanish newspapers, these ships were fishing trawlers, the first two French (*René Camaleyre* and *Jules Pierre* of Arcachon) and the third Italian (*Balena* of Naples). Their tonnage was respectively 243, 231 and 319 ; the aircraft estimated each at approximately 400. Whether they were really occupied in fishing is not known.

The two French ships are stated to have been immediately destroyed, together with their crews of 13 men each. The crew of 20 men on the Italian trawler, who had time to get away before the vessel sank, were not picked up until five of them had been frozen to death, and several others had their feet frost-bitten. It was announced that the aircraft had machine-gunned the crew after the *Balena* sank.

Attack on a U-Boat

While engaged on an anti-submarine sweep from Reykjavik, the Whitley aircraft *F*/612 sighted a U-Boat on the surface at 1125 on February 18th, in the position 63° 15′ N. and 24° 30′ W.. The U-Boat submerged when the aircraft had approached to 300 yards, and the swirl of its dive could be clearly seen at the moment of attack. Six depth-charges were dropped from 50 ft., each of 250 lb. modified Mark VIII, with pistol modified Mark X, which had been pre-set to 50 ft. They fell 90 ft. ahead of the swirl across the track of the U-Boat ; two were thought to have exploded 15 ft. from the believed position of the U-Boat, two others at 75 ft., two at 135 ft. and two at 195 ft. After a couple of minutes a large oil patch was seen, about 250 ft. in diameter, and lines of air bubbles with thick streaks of oil. One minute later the U-Boat surfaced again for a few seconds : a large patch of froth appeared 100 yards from the scene of the attack, then the conning tower of the U-Boat showed on the surface and immediately submerged again. No wreckage or further signs of damage were visible, but there was a 35-knot wind at the time and the sea was rough. The aircraft circled round, getting a view over at least ten miles, and stayed an hour and a half. On the way home the port engine failed, and it was only just possible to reach land after reducing weight by jettisoning everything possible, including the camera with the photographs which had been taken.

This is considered to have been an excellent attack which must, at the least, have shaken the U-Boat very seriously, and should have prevented it from doing further damage on its cruise.

(ii) Narratives of Other Incidents

Impact with a Balloon Cable

In bad weather, on 2nd January, a Beaufort of 217 Squadron was returning at 1902 hours from a ground patrol flight when it struck a balloon cable of the Dover Barrage, after receiving an inexplicably wrong vector from a D/F Station. At the time of the impact the aircraft was flying at approximately 160 knots at 2,800 ft. ; the balloon was at 4,000 ft. The cable was hit by the wing with such violence that the aircraft spun right round. It then corkscrewed downwards, out of control. The pilot put both engines to full throttle and succeeded in regaining control at 110 knots and approximately 400 ft., after which he put out to sea and pulled the bomb release ; then he managed to climb to 600 ft. A small fire in the starboard engine occurred immediately after striking the cable, but was quickly extinguished.

Over the water, the aircraft received a very violent jerk (probably due to the bottom parachute being torn away by drogue action) and the pilot had great difficulty in maintaining control. He headed back across the coast over Ramsgate and again felt some very violent jerks. Ultimately, he made a safe landing at Manston, where it was discovered that 1,300 ft. of cable was entwined round one wing. The cable had broken 500 ft. above and 800 ft. below the aircraft and looped itself round the wing with the two ends trailing. When over Ramsgate, it had carried away the top part of a lamppost, which caused a good deal of damage as it trailed across the town, before it fell off a mile away.

It was also found that the bomb doors had failed to open and the bomb load, which had been released, was swilling about in the bomb hatch. The cable had cut cleanly into the starboard wing to a depth of about 18 ins. The starboard aileron was out of action.

Hurricane in Iceland

A week of gales in Iceland culminated on 15th January in a hurricane which did considerable damage. Winds veered from E.S.E. round to S.W. At the height of the hurricane the highest recorded velocities were from E.S.E. Average wind speed reached a strength of 89 m.p.h., but a maximum velocity of 133 m.p.h. was recorded in gusts. This hurricane is the worst Iceland has experienced since 1925.

The Commanding Officer of a Coastal Command Station in Iceland has supplied some details :—" We thought we knew all about gales here," he said, " but they were just gentle zephyrs compared to this. A Nissen hut became airborne at 1000 hours, crashed on number one runway, and disintegrated. Before midday, we had recorded wind velocities of 120 m.p.h., with a fairly steady average of 80 m.p.h. Nissen huts 16 ft. by 36 ft. soared through the air like young blimps, while empty 4-gallon petrol tins whirred overhead, 20 ft. up, like coveys of partridges as I drove round the aerodrome. We lost two store huts, each 90 ft. long, which collapsed under pressure of the wind ; they were just a mass of twisted metal."

" All the guard huts at the entrances to the aerodrome were blown away, either whole or in pieces. I found two sentries, one R.A.F. and one American, holding on to an iron post, which was the only thing left standing, while they stopped cars to examine passes. I asked them where their guard hut was. They pointed to the sea and said : ' Out in the bay, sir '."

" Another guard was turned out involuntarily when their guardroom was hit by a tremendous gust. It did a full roll and began to catch fire, and tables and chairs flew through the air."

The hurricane lasted from morning until after dark, and the problem of safeguarding aircraft on the Iceland aerodromes taxed the resources of stations to the full. Whitleys and Hudsons were, on several occasions, lifted right off the ground, in spite of being tethered with ropes and held down by gangs of men. At Reykjavik, six Whitleys, each of which had been made fast to six 300-lb. concrete blocks, were blown slowly backwards, dragging their " anchors " with them. The air-screws were driven round steadily at a fair speed against the compression of the engines. Eventually, the engines had to be run up so that the aircraft could maintain headway against the wind. Forty men, detailed in reliefs, stood by each aircraft. Clinging to the wings and tails to keep them from moving, they had the greatest difficulty in holding down the aircraft. Later, petrol bowsers used for

refuelling were run under the wings,which were made fast to them, and to additional concrete blocks and drums filled with stones. All day, the ambulance toured the aircraft, dispensing rum from the medical comforts store; the cookhouse was fortunately undamaged and kept up a constant supply of hot soup and cocoa.

Five airmen, who formed the duty crew of an R.A.F. pinnace anchored in the bay, remained on board throughout the hurricane. The sea was so high that they could not be brought ashore for 24 hours. Great walls of spray were whipped from the surface of the bay, obscuring the little boat for considerable periods, but its crew managed to maintain touch with those on shore by the frequent use of their Aldis lamp. Although at times the pinnace was almost standing on end, and the crew were thrown about like peas in a box, they kept the engines running and prevented dragging.

The only casualties from the hurricane were four Americans and two R.A.F. men, all from the disintegrated guardroom, who suffered minor abrasions. Buildings were damaged on different aerodromes. Small boats were driven ashore or sunk. Wireless masts were blown down and signals generally suffered considerable damage. The D/F equipment was unserviceable for twenty-four hours. Our aircraft suffered no damage, but two American Naval P.B.M.s were sunk at their moorings and three P.B.Y.s were lost. One P.B.Y., which was lying in Hval Fiord, rode out the gale with its crew on board.

The exceptional severity of these gales was due to the very steep barometric gradient between depressions centred to west of Iceland and anticyclones centred over north-west Europe. On the 11th, an anticyclone was centred over southern Sweden with a pressure of about 1,030 millibars at its centre, and a deep depression lay to the west of Iceland. At 1300 hours, on the 12th, the pressure at the centre of the depression was estimated to be about 943 millibars. The south-eastward movement of the anti-cyclone, and the partial filling up of the depression, caused a slackening of the winds on the 13th, but the anti-cyclone soon returned. The abnormally strong winds of the 15th occurred when the anti-cyclone was centred over southern Scandinavia, with estimated pressure at centre of 1,036 millibars, while a deep depression, below 960 millibars at centre, lay to the west of Iceland.

The wind speeds reported on the 15th are given below :—

	Reykjavik.		*Kaldadarnes.*	
0200	E.	Force 5.	N.E.	Force 5.
0500	S.E.	Force 7.	S.S.E.	Force 7.
0800	S.S.E.	Force 7, gusty.	E.S.E.	Force 9.
1100	S.E.	Force 9, gusty.	—	—
1400	S.E.	Force 8.	E.S.E.	Force 9, gusty.
1700		—		—
1900	E.	Force 9.	S.E.	Force 10.
2200		—.		—

These figures give the mean wind speed and direction at definite times only and are not estimates of the maximum speed reached in gusts. It is known that the very rugged relief of Iceland often causes the surface wind at some localities to be stronger than would be expected from the barometric gradient, and the extremely strong gusts experienced on the 15th were due to these local topographical effects augmenting the already very high gradient wind. With the High decreasing in intensity and the Low filling up, the winds moderated on the 16th and 17th.

A Series of Misfortunes

A Hudson *W/500* was airborne at 0138 hours, on 30th January, and made landfall at Sylt, at 0347. In the position 54° 13′ N., 8° 1′ E. at 0356 hours, three ships, one of 900 tons and two smaller, were picked up on Special Equipment and sighted. All three ships had masthead lights, and were moving slowly through ice-floes in " V " formation. *W/500* dived from 500 ft. to mast height and released a stick of four 250 G.P., 11-second delay bombs on the 900-ton vessel. The rear gunner saw smoke rise from the stern of the vessel. It was therefore considered that the ship was definitely hit on the stern by at least one bomb.

At 0410 hours, flying at about 200 ft. indicated altitude, the aircraft hit a rock very hard. The Pitot head was damaged, the starboard engine stopped and the propeller blades buckled back to cowling. The pilot attempted to feather the starboard propeller, with the result that all the electrical equipment immediately failed. The gyro compass and A.S.I. were both unserviceable.

W/500 then headed west, but found itself over land, possibly near Wilhelmshaven or Emden. It was picked up by numerous searchlights and fired on by heavy and light flak. Violent evasive action was taken when flying through five anti-aircraft barrages. At 0445 hours the aircraft climbed to 1,500 ft. to try to get a fix, but it was then discovered that both wireless and Special Equipment were unserviceable. Anti-aircraft again opened fire, but this Hudson avoided it by going down to sea level, whereupon a course was set west on P/6 compass until reaching an estimated position of 53° N., 4° 10′ E.

A course was set for the English coast, but a heavy snow-storm was encountered at heights varying from 500 to 2,000 ft., making it impossible to steer an accurate course. Petrol was seen to be going down rapidly, but the aircraft flew out of the snow-storm, and land was sighted at 0630 hours (20 miles off course). The aircraft called on R/T but was not answered. The pilot therefore circled round the village of Winterton, north of Yarmouth, firing seven Véry lights into fields from 300 ft., till the largest field was selected. At 0640 a successful belly landing was made, as the hydraulics were unserviceable. The observer sustained superficial cuts on the forehead and a black eye, and lost one tooth.

A Bounce on the Sea

At 0820 hours on 30th January, a Hudson *N/279*, was airborne to carry out a Duty Buoy Inspection and search for the aircraft *P/500*, or a dinghy, in the sea, from the position 52° 32′ N. and 1° 54′ E.

The normal patrol was carried out without result until 1035. The aircraft was then flying at about 500 ft. and was about 10 miles south of Smith's Knoll, when a snow shower was encountered. The pilot put on the de-icer, and switched on the carburettor heat and Pitot head heater, and no ice was seen forming. The Meteorological forecast was snow showers north of a line from Cromer eastwards. As a severe snow-storm developed, the pilot asked the navigator for a course to the coast ; they set course and encountered an even worse snow-storm, making the visibility nil. They then descended to sea level, but climbed again to about 500 ft. on account of bad icing conditions.

All flying instruments failed, and the clock was reaching 100 knots ; the gyro horizon showed a steep climb, so that the pilot put forward the stick to avoid stalling. About two seconds later, the pilot and navigator saw the sea immediately below ; the pilot put his feet on the dashboard and assisted by the navigator, pulled the aircraft out of a dive, but hit the sea hard with the bottom of the aircraft as they jettisoned the escape hatch. They then climbed, at a guess, to 500 ft., but again dived to sea inadvertently and hit the water violently, losing the log maps through the escape hatch.

About three minutes later they flew out of the snow-storm, continued on their course and sighted land between Southwold and Lowestoft. The instruments now worked normally, but the aircraft was unable to contact the base on R/T. An H/F message to base was received by Bircham Newton to warn them of possible damage to the aircraft. However, *N/279* landed successfully at 1150.

Rescue of two Seamen from a Raft

A Hudson, *G/206*, was flying on an anti-submarine sweep on 10th February, when it sighted a raft with two men aboard, 50 miles south-west of Rockall. As he swept low over the raft, one of the men fired a Véry light. The sighting was reported to base and a fix obtained at 1130 hours. The flying controller followed the aircraft all the way in because he did not trust the position given. A series of fixes were taken of the aircraft on its journey back to base, and the result was to confirm the suspicion. On nearing the base, the aircraft came up for a series of Q.D.M.s which again proved the first position to be wrong.

A Catalina was sent out from Oban at 1310 towards the correct position, but it developed engine trouble and had to return. The Navy also despatched a trawler, the *Angle*. Another Catalina from Oban started at 0543 next morning with Thornaby bags and a spare dinghy, and found the raft at 1012; it had drifted south-west during the night. One of the men was hidden under a pile of blankets but the other roused up enough strength, in the hope of attracting attention, to jump about and fire a Véry cartridge. The aircraft climbed to 3,000 ft. to obtain a fix, but saw the *Angle* 12 miles away, so came down again and circled the raft while signalling to the trawler with the Aldis lamp. The men were taken aboard *Angle* an hour later, in spite of a heavy swell, which at times brought her bows right out of the water.

It turned out that these were sailors, a Dane and a Swede, from a Swedish ship *Yngaren*, which had been torpedoed, when hove-to in a storm, about 4 o'clock in the morning of 12th January, several hundred miles west of where they were picked up. A doctor examined the men, and found them perfectly fit in spite of 30 days' exposure to appalling weather.

Impact with a Propeller

On 17th February, a Beaufighter, *M/235*, was airborne at Sumburgh, at 0636 hours, and after taking off, the crew felt a slight jar as the under-carriage was being raised. The aircraft had swerved slightly and hit the propeller of another Beaufighter on the runway. The pilot thought that he had bumped on the runway, and decided to carry on the patrol, as the undercarriage was locked in the up position and the aircraft was flying normally. When examined by torchlight for damage, none was found.

At 0740 hours the aircraft reached the position 61° 10′ N. and 4° 10′ E., and cloud had then lowered to 100 ft. The pilot climbed above the cloud to 600 ft. to try to see the coast, but could not because of extended cloud, and started to descend in order to attempt a patrol under cloud up the coast. When at 100 ft. with an air-speed of over 200 knots, the aircraft swung violently out of control; it was still in cloud, but the sea was just visible. The pilot regained control, climbed to 1,000 ft. and set course for base. The aircraft was extremely unstable, but was able to climb gradually to 6,000 ft. As it grew light, the pilot discovered a gash of eight to twelve inches in the leading edge of the starboard wing, made by the propeller. At 0841 hours they reached base, and tested the stalling speed of the aircraft which was found to be 110 knots. The pilot then managed to land the aircraft, with flaps and under-carriage down, without further damage.

SECTION 3

ANALYSIS OF PAST OPERATIONS

(i) Day Attacks on U-Boats by Aircraft

Detailed information on attacks by aircraft on U-Boats—such as sighting distance, visibility, nature of approach, etc.—is contained in the A.U-B. reports which are compiled at Stations and reviewed at Coastal Command Headquarters. By collecting together and analysing the information for a large number of attacks it is possible to arrive at some general conclusions which are of interest and which also serve as a guide to future operations. We give in this note some of the results of such a survey for day operations, the following being the main points dealt with :—

(i) Condition of U-Boat at instant of attack (whether visible or submerged).

(ii) The dependence on visibility of the chance of sighting a U-Boat and of attacking it before it submerges.

(iii) The channel effectively swept by an aircraft and the number of U-Boats which escape detection through diving.

(iv) The effect of better camouflage and higher speed on catching U-Boats on the surface—a mathematical note.

Condition of U-Boat at Instant of Attack

Here we are concerned with the percentage of U-Boats partly above the surface when attacked, and the percentages submerged for different periods. The day attacks carried out by Coastal Command aircraft between June, 1941, and February, 1942, have been analysed from this standpoint and the results are given in the following table.

	Condition of U-Boat at instant of Attack.	Number of Attacks. (Total = 123)	Percentage of Attacks (compared, in brackets, with September, 1939–May, 1941).
Class A ..	Partly above surface	42	34 (35)
	Submerged less than ½ min. ..	33	27 (14)
Class B ..	Submerged ½ to ½ min.	19	15 (9)
	Submerged ½ to 1 min.	15	12 (12)
	Submerged more than 1 min. ..	14	11 (30)

It will be seen that out of a total of 123 attacks 42 (or 34 per cent.) were carried out before the U-Boat had time to submerge from view. Of these U-Boats three appeared to make no attempt to submerge. The other 39 were caught unawares, and were in the act of diving when bombed.

Twenty-six per cent. of the U-Boats attacked had been submerged less than 15 seconds. Thus the high proportion of 60 per cent. of all attacks was made on U-Boats on the surface or only just submerged (designated " Class A " U-Boats). For the period of the war up to last summer (the figures for which are given in brackets in the third column of the table) the proportion of " Class A " U-Boats (50 per cent.) is almost as high as for the later period.

This high percentage of surfaced or near surface U-Boats, together with the fact that the long-submerged " Class B " U-Boat is a much more difficult target (owing to the much greater uncertainty in its depth and in its plan position), led to the abandonment last summer of the use of deep settings of 100 ft. and 150 ft. for depth charges. The optimum setting is in fact one which permits full advantage to be taken of the much more accurate bombing in plan which is possible against the " Class A " U-Boats. Since most of the " Class A " U-Boats are actually above the surface, this means a setting within lethal range of a surfaced U-Boat, which is, for 250 and 450 lb. depth charges, a setting of 20 to 25 ft. Fuses with such settings have not yet been produced though they are under development (*see* page 42). The new Mark XIII pistol is an approach to the setting aimed at, giving actually a setting of 35 ft.

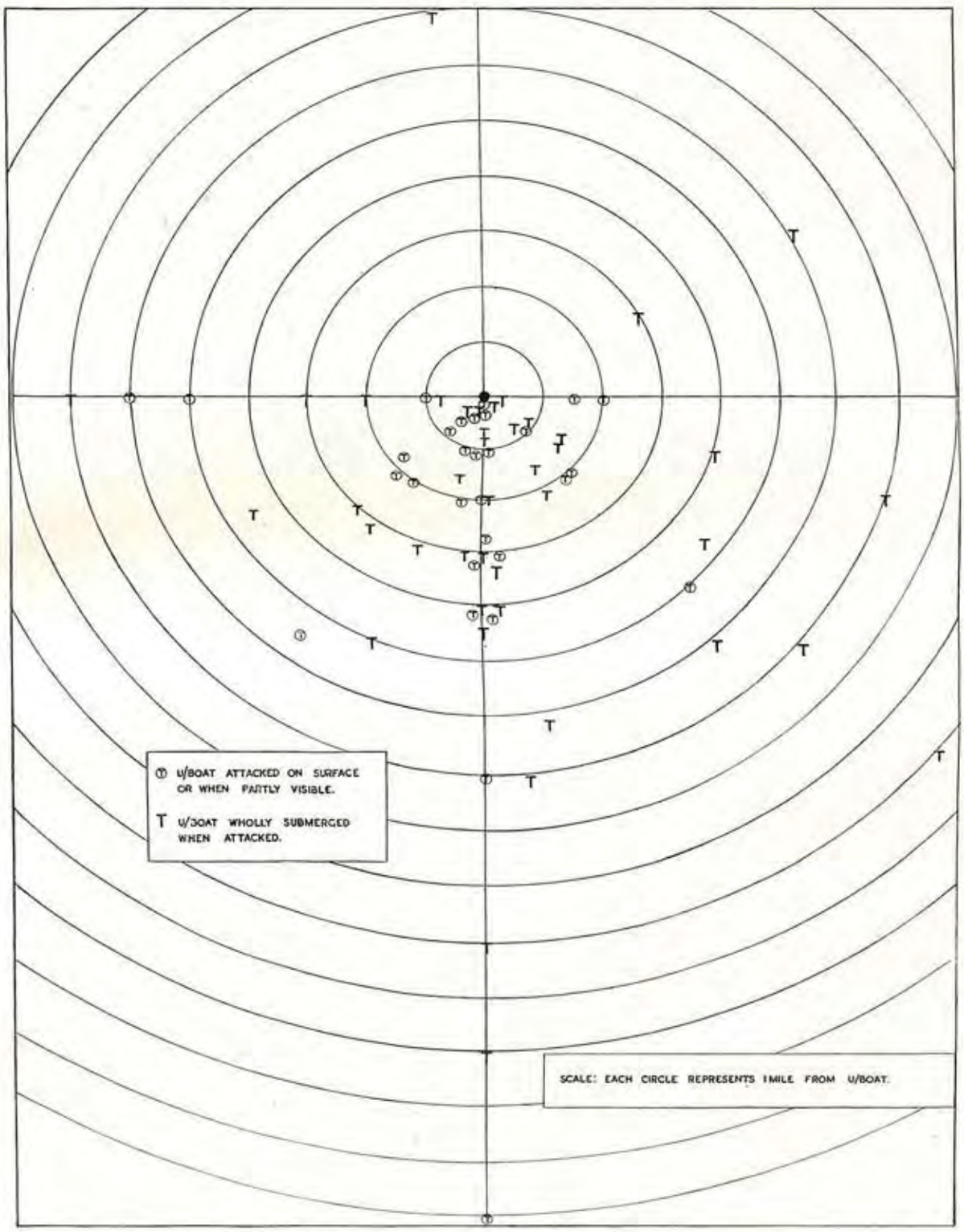


FIG. 1.—Position of Aircraft in relation to U-Boat at moment of sighting.

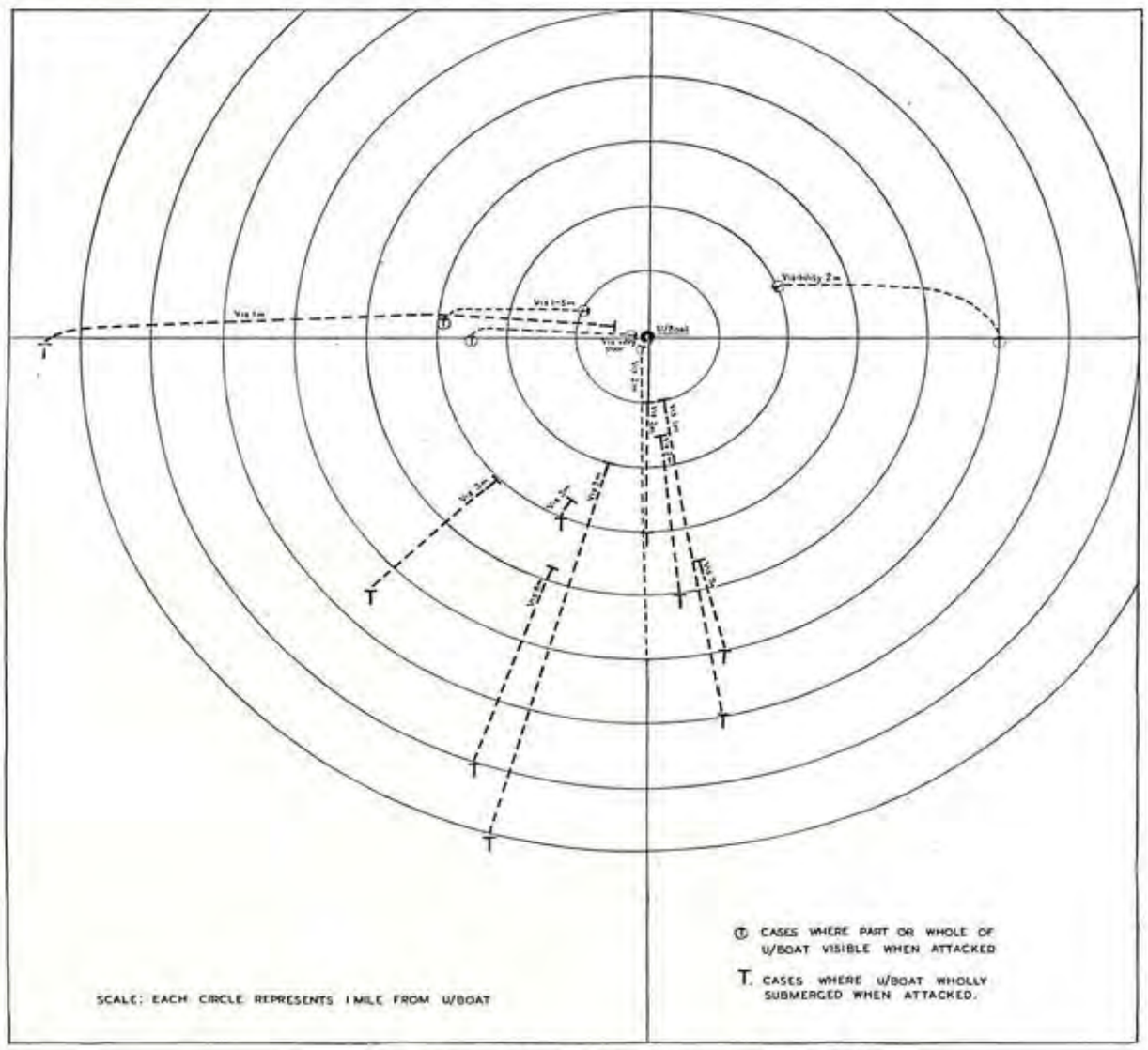


FIG. 2.—Attacks on U-Boats first contacted by A.S.V.
Dotted lines indicate distance between A.S.V. contact and visual sighting.

Two types of attack are clearly distinguishable. Those almost broadside on were made by aircraft using their beam aerials which subsequently got contact on their homing aerials. Others obtained their first contact on their homing aerials well in front.

Sighting Distances

The distances at which the submarines were sighted and their bearing with respect to the aircraft heading are shown in Fig. 1 for all the attacks not initiated by A.S.V. during the period July, 1941–February, 1942 (and for which the relevant information was given in the A.U-B. reports). The disc in the centre represents the position of the U-Boat, and the direction of flying at the instant of sighting is towards the top of the page. Aircraft which attacked the U-Boat before it submerged are shown by heavy symbols, and those which failed to do so by ringed symbols. It will be seen that most of the former first sighted the U-Boat at less than four miles away, with an average sighting distance of about two miles. This is a useful result as it shows the average length of run to be expected in those attacks which catch the U-Boat on the surface. It is not very small and would, for instance, permit a reasonable time to use a bomb sight. In some cases, however, the U-Boat would have been too close for the necessary adjustment to be made. Actually in a few instances the U-Boat was so close when sighted that the aircraft was unable to attack directly and by the time it had manœuvred for attack the U-Boat had submerged. This applied to the half a dozen or so aircraft, marked by heavy symbols, which sighted the U-Boat at very close range.

Though the distant sightings (on days of high visibility) in general did not result in catching the U-Boat on the surface, it will be seen that there were occasions when they did. In one case the aircraft saw the U-Boat about 15 miles away and yet attacked it before it submerged. These instances show that U-Boats do not maintain a constant watch of high standard. General inspection of the diagram also shows that most of the U-Boats were picked up by a forward look-out as of course would be expected. There are, however, a few instances of the U-Boat being sighted after passing it on the beam. It will be noted further that there was no marked asymmetry between port and starboard.

The attacks where the first sighting was by A.S.V. and not visual (about 12 per cent. of the total) are shown in fig. 2. The dotted lines show the distance between the A.S.V. contact and the visual sighting of the U-Boat. Nearly all the aircraft responsible for these sightings had L.R.A.S.V. and for these aircraft the A.S.V. sightings were actually about half the number of the visual sightings.

Dependence of Visual Sighting on Visibility

If U-Boats always remained on the surface, the chances of visually sighting a U-Boat would be much greater in high visibility than in low. However, since the chances of the U-Boat seeing the aircraft and diving without being seen are also greater with better visibility, it is not obvious how the chances of sighting a U-Boat will vary with the visibility. A rough answer can, however, be arrived at by analysis of past experience.

The following table classifies the sightings obtained under different conditions of visibility, viz., less than 3 miles, 3 to 6 miles, and greater than 6 miles. The second column gives the relative frequency of occurrence (P_1) of the different visibilities. The third and fourth give the number and percentage (P_2) of sightings obtained under the different conditions of visibility. If now we divide P_2 by P_1 we get a measure of the chances of sighting, per hour of flying, in different visibility. It will be seen that this sighting efficiency increases only very slowly with the visibility. Thus when the average visibility was about 12 miles, the chance of sighting a U-Boat was only about 50 per cent. greater than when the visibility was about 2 miles. High visibility appears to help the aircraft a little more than it helps the U-Boat, but not much. An interesting corollary to this result is that a search on a moonlight night, which is equivalent to a day search in *low* visibility, will be roughly as productive in finding a U-Boat as the average day search.

Visibility. (Miles.)	P_1	Number of Attacks.	Percentage (P_2).	$\frac{P_2}{P_1}$.
Less than 3 (average 2)	21	18	17	·8
3–6 (average 4½)	20	17	16	·8
6 and over (average 12)	58	73	68	1·2
		108		

It is possible from the above results to estimate roughly the average effective channel swept by a non-A.S.V. aircraft by day, and also the number of U-Boats which escape detection by diving. On the days of low visibility, less than 3 miles, the average visibility was 1·7 miles. From the description of the attacks it is clear that most of the U-Boats seen were caught unawares and therefore it is safe to assume that under these conditions nearly all U-Boats within the range of visibility were seen. Thus on these days a channel of about 1·7 miles on either side of the aircraft was swept. Now, according to the result obtained in the preceding paragraph the chances of sighting a U-Boat is only slightly greater on days of high visibility, these relative chances being measured by the quantity P_2/P_1 given in the table. Using this measure of the sighting efficiency we find that the effective channel swept, averaged over all visibilities, is about 2 miles on either side of the aircraft, *i.e.*, the channel swept has a total width of about 4 miles. This, of course, does not mean that no U-Boats outside a channel of 4 miles will be seen, but that the number seen is effectively the same as it would be if *all* U-Boats inside a channel of 4 miles were seen, and *all* U-Boats outside the channel escaped detection. It should be noted that this result, that by day an aircraft sweeps an effective channel of about 4 miles, is confirmed by independent estimates based on the number of sightings resulting from a given amount of flying in an area of known U-Boat density. It is therefore a fairly reliable figure which can be used in estimating the chances of visually sighting U-Boats by day.

For A.S.V. aircraft the channel swept is somewhat bigger, but owing to the small number of L.R.A.S.V. aircraft, A.S.V. has made no appreciable addition to day sightings in the past.

The figure of 4 miles for the channel swept by day helps us to estimate the relative effectiveness of a day sweep and a night sweep with good A.S.V. If, for instance, the A.S.V. beam aerials covered from 2 to 6 miles, two channels of 4 miles would be swept on either side, *i.e.*, the chances of sighting would be twice the day chances (when only one central channel of 4 miles is swept). It is of course assumed here that at night the U-Boat will not detect the aircraft in time to dive before being picked up visually.

Another interesting estimate which may be made on the basis of the results in the table is of the number of U-Boats which escaped detection by seeing the aircraft in time to dive. If U-Boats were like surface vessels and unable to disappear by diving, then on the days of average visibility of 1·7 miles the width of the channel swept would be about 3·4 miles, on those of 4½ miles average visibility it would be nearly 9 miles, and on days of about 12 miles average visibility the channel swept would be probably about 16 miles. Giving the different visibilities weight in proportion to this relative frequency of occurrence (col. 2), we find that the average channel swept by day, if U-Boats did not submerge, would be about 12 miles. However, we have seen that the actual channel is about 4 miles ; therefore, the U-Boat, by seeing the aircraft in time to submerge, reduces the chance of its sighting to about one-third. We therefore conclude that, when searching for U-Boats by day, for every U-Boat seen, about two U-Boats escape detection by diving. This incidentally means that on an A/S sweep, however close the courses of the different aircraft, there is a two-in-three chance of the aircraft passing over a U-Boat *without* seeing it, assuming perfect navigation. Day sweeps must therefore not be supposed to sweep clean.

A Mathematical Application

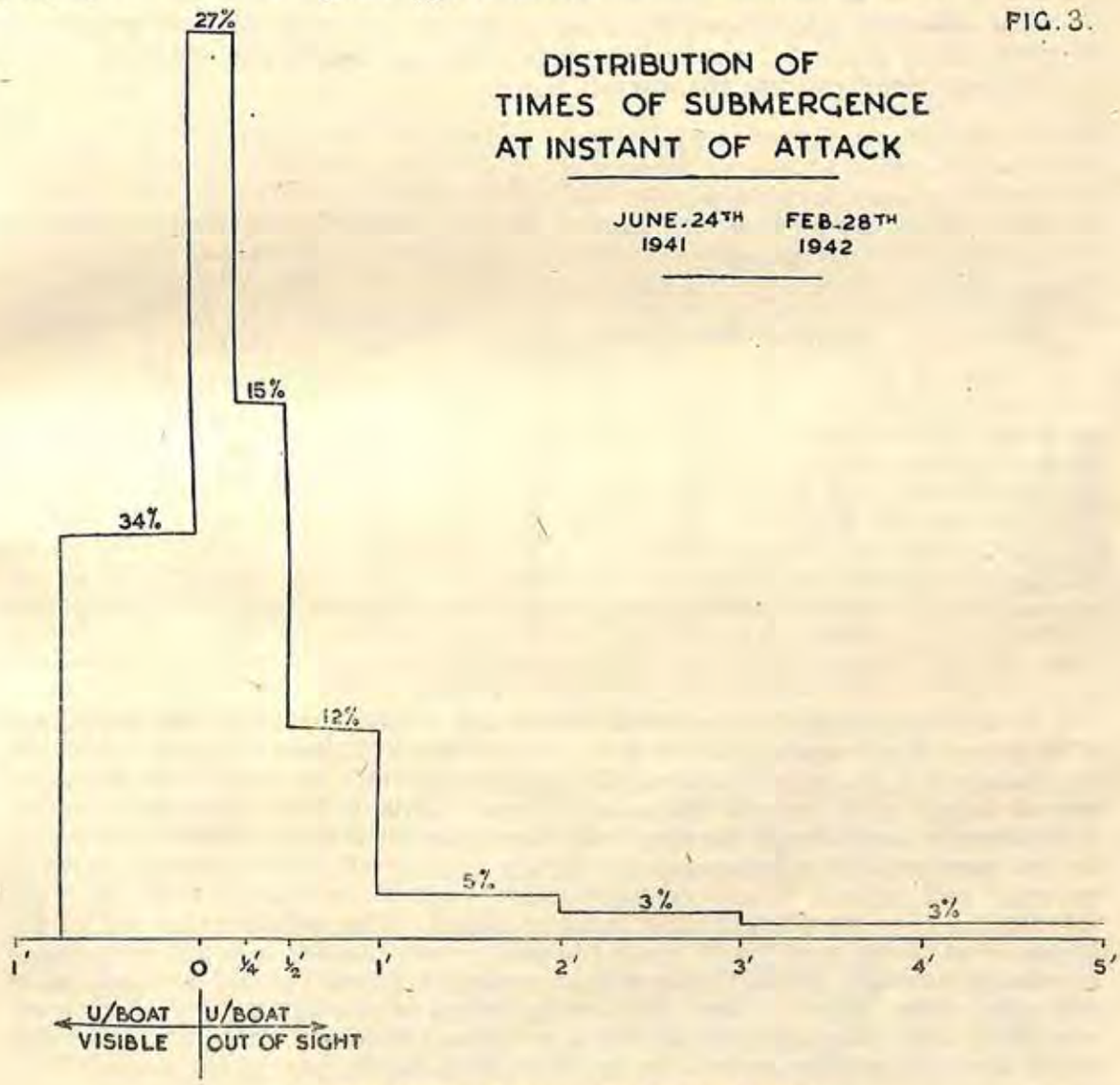
It is vitally important to attack the U-Boat before it submerges, and this can be helped by better camouflage, for instance, or a higher speed of approach. Let us suppose that painting a black Whitley white reduces the distance at which it will be seen by a U-Boat by 20 per cent. (which is roughly the estimated effect of the change). How much will this camouflage increase the number of U-Boats attacked before they submerge ? The mathematically-minded may be interested in the following method of roughly estimating the improvement to be expected.

We shall assume that it takes a U-Boat 45 seconds to dive. Then a U-Boat which is submerged t seconds when attacked by a black Whitley will have seen the aircraft when it was at a distance of about $(t + 45)\ v$ away, v being the speed of the aircraft (assuming a roughly straight approach). If now the Whitley had been

white, it would have been seen at a distance of 20 per cent. less, *i.e.*, $0 \cdot 8\ (t + 45)\ v$. Therefore the time the U-Boat would have available for diving would be $0 \cdot 8\ (t + 45)$. Therefore, if this expression were equal to 45 seconds, the U-Boat would be caught just at the end of its dive. Actually $0 \cdot 8\ (t + 45)$ is equal to 45 when $t = 12$ seconds. The answer, therefore, is that a white Whitley will catch as many U-Boats on the surface as a black Whitley, *plus* those which, with the black Whitley, will have been submerged 12 seconds. Reference to fig. 3 shows that this would correspond to an increase of the order of 30 per cent. in the number of U-Boats caught while still partly visible. The improved camouflage would also increase the total number of sightings.

The effect of greater speed may be assessed in the same way. A fast small aircraft actually is ideal for sighting U-Boats and attacking them before they submerge, especially under conditions of high visibility. However, though a small size helps to prevent the U-Boat sighting the aircraft it also, in general, limits the bomb-load that can be carried, and all factors have to be taken into account in judging the merits of a given type of aircraft for anti-submarine work.

FIG. 3.



(ii) The Meeting of Convoys by Air Escort

The escorting of shipping convoys forms one of the principal functions of Coastal Command, and its results are most valuable. Effective protection has often been given to convoys threatened with attack by U-Boats, and escorting aircraft have played a considerable part in the essential work of breaking up their " wolf-packs." An incidental, but by no means unimportant, result of the presence of aircraft is to inspire a feeling of confidence on board the merchant vessels, and so to lighten the nervous strain on their crews. The sight of friendly aircraft circling overhead spreads cheerfulness through a whole ship's company.

Aircraft have one great advantage over surface escort in that a striking force from base can reach a convoy more quickly, upon the discovery that U-Boats have detected its presence. But that is assuming that the aircraft can find the convoy—which is not always the case—and can find it without spending much time on the search.

This question of meeting is one of the vital factors in escorting convoys. It determines the measure of success attained, and so of the efficiency of air escort.

This analysis considers the chances of meeting a convoy and the duration of the actual escort. It covers the period August–November, 1941, and refers to 679 sorties and 100 convoys, to all of which aircraft protection was given or attempted. Owing to uncertainty as to movements, no sorties from Iceland are included in the analysis, while sorties to convoys within a range of 100 miles from the aircraft base have also been ignored.

Amount of Meeting in Relation to Range from Aircraft Base

The following table shows the number of aircraft sorties and the percentage of them which succeeded in meeting their convoys, inward and outward bound, at different distances from the aircraft bases.

TABLE I

Range from Base. (Miles.)	Inward.		Outward.		Inward and Outward.	
	No. of Sorties.	Percentage met.	No. of Sorties.	Percentage met.	No. of Sorties.	Percentage met.
100–200 ..	80	87	80	96	160	92
200–300 ..	174	64	123	78	297	70
300–400 ..	60	67	48	75	108	70
400–500 ..	36	67	21	57	57	63
500–600 ..	28	57	9	44	37	54
600–800 ..	12	33	8	48	20	35
Over 800 ..	0	—	00	—	0	—
Total ..	390	68	289	79	679	73

It will be noticed that for both inward and outward convoys the percentage of failures to meet tends to increase as the distance from base increases. Also the percentage of convoys met is distinctly greater for those outbound than for those inward bound, within about 400 miles of base. Outside that range the situation is slightly reversed, though this figure may have been affected by chance fluctuations, for the number of these long-range sorties was quite small. The difference between outward and inward bound convoys must result from having more accurate information of the position of those outward bound. This indicates that inaccurate information of the position of inward bound convoys causes a higher percentage of failures to meet. While 17 per cent. of sorties to outward bound convoys, up to 400-miles range, failed to meet, the corresponding percentage for inward convoys was 29 per cent; consequently failures to meet must be due to inaccurate knowledge of the convoy's position and not to bad navigation on the part of the aircraft.

Shadowed and Unshadowed Convoys

When these two classes are considered separately it becomes clear how far the chances of meeting are affected by evasive action taken by the convoy, or, in the case of an attacked convoy, by more information being available as to its position. Most of the outward bound convoys were shadowed after they had either left the aircraft area or come very near its limit, so that a more accurate picture of the effect of these two factors is given by restricting the comparison to those sorties which were made to homeward-bound convoys only.

TABLE II

Sorties to Inward Convoys

Range (Miles).	Unshadowed Convoys.		Shadowed Convoys.	
	No. of Sorties.	Percentage met.	No. of Sorties.	Percentage met.
100–200	57	88	23	87
200–390	96	77	78	54
300–400	47	68	13	62
400–500	24	—	12	—
500–600	18	67	10	43
600–800	66	—	6	—
Over 800 ..	0	—	0	—
Total ..	248	76	142	58

All but one of the observed convoys were attacked, hence both factors, evasive action by convoys and information as to their position, must be taken into account. It will be seen that the percentage met is somewhat less for the shadowed than the unshadowed convoys. Therefore the effect of greater evasive action by shadowed convoys was to cause our aircraft difficulties serious enough to outweigh the advantages of any extra information they obtained from the convoys. If the observed convoys had communicated more freely with the aircraft sent for their protection they might have received nearly twice as much escort.

Amount of Time spent over Convoys

A sortie which meets its convoy may spend a considerable time in searching for it after arriving at the expected position. This time spent in searching is of course not completely useless, as the search will cover the region of any threatening U-Boats; for the same reason even a sortie which fails to meet its convoy has a certain amount of value. But this flying is not fully effective, and certainly has no moral effect on the convoy. The following table shows the average duration of the actual, fully effective, escort for convoys at different distances from base.

TABLE III

All Sorties which Met the Convoy

Range from Base (Miles).	Total Number of "Met" Sorties.	Average Time (hours) Airborne.	Average Time on Convoy per Sortie.	Time on Convoy as percentage of Time Airborne.
100–200	141	6½	3¼	50
200–300	188	7½	2¾	37
300–400	73	10	3¼	32
400–500	34	14	5	36
500–600	16	17	5¾	34
600–800	7	16½	4¼	26
Over 800	0	—	—	—
Total	459	8½	3¼	39

Considering the figures in this Table, and also the time the various aircraft might be expected to spend in transit, it appears that searching for a convoy occupies on the average about one to two hours, according to distance from base. Thus, on the basis of time over the convoy, every sortie which meets a convoy is on the average only about 70 per cent. as effective as it would be had it met the convoy

without delay in searching. Coupling this rough figure with the percentage of sorties which do not meet the convoy at all (Table I) we get the following percentage for the time actually spent over convoys, compared with what would have been the case had the meeting taken place immediately the aircraft arrived in the expected position.

TABLE IV

Distance from Base. (Miles.)	Time actually spent over Convoy (approx.)
100—200	70%
200—400	50%
400—600	40%
600—800	25%

(iii) Air Sea Rescue

1st July–31st December, 1941

The emotional appeal of Air Sea Rescue work has tended to overshadow its interest as an experiment in co-operation. Actually its organisation involves an extraordinary amount of interlocking, especially when the speed of working is taken into account. When an aircraft is believed to have come down in the sea, a message is sent to an Area Combined Headquarters where it is considered both by a Flying Controller of Coastal Command and by a Naval Liaison Officer. The Flying Control Officer contacts the appropriate Movement Liaison Section to inquire whether they have any wide I.F.F. contacts or any R.D.F. plots that might tie up with the incident. The Observer Corps is also asked for information. The ships and aircraft sent to the scene do not belong only to the Air Sea Rescue branch, nor even necessarily to the Royal Navy or to Coastal Command. Ships of any sort may be diverted from their course, lifeboats of the Royal Naval Lifeboat Institute are called out, and also aircraft of the other Commands, especially Fighter, which is responsible within a limit of 40 miles off shore.

The last six months of 1941 involved 172 flights by the special Air Sea Rescue aircraft, compared with 1,158 by operational aircraft. There were 117 sorties by R.N.L.I. lifeboats, and 606 other vessels were diverted from their course or despatched from base.

In the half year, 418 lives were saved from 147 British aircraft which made forced landings in the sea. Forty-four aircraft were seen to fall in such a manner that none of the crew could have remained alive, and this was probably the case with a large number of the other 136 from which no survivors are reported ; from only 7 of them is it known that a dinghy was launched. Some of the aircraft came down in enemy waters where a British search was impracticable. Even including these, rescues were made from no less than 51·9 per cent. of all aircraft which may conceivably have struck the sea under control. The proportion of lives saved is actually 43·7 per cent., for 102 men were lost from the crews to which survivors belonged. Previous attention to ditching drill and full use of equipment would certainly have raised the percentages of rescue, which in any case give a misleadingly low impression of the chances of a crew who remain in control of their aircraft.

Of the successes obtained, the credit in 37 incidents (from which 97 lives were saved) goes to Marine Rescue Craft, in 55 (148 lives) to vessels diverted by the naval authorities, including some rescue craft which had been going on normal patrols, in seven (25 lives) to lifeboats of the Royal National Lifeboat Institution. In five incidents the rescue was affected through the efforts of the local R.A.F. or naval air station. In 27 cases the crew used their rescue equipment and dinghies but were picked up by vessels which happened to be in the vicinity. In another five, the crew saved themselves by means of their equipment and dinghies. On two occasions the equipment or dinghy failed to work, but surface craft happened to be at hand ; on seven others, the crew were taken aboard with no need for effort on their part.

Fifteen enemy aircraft, not included in the above figures, were reported to have fallen into the sea, and four members of their crews were saved.

SECTION 4

TECHNICAL

(i) Anti-Submarine Bombs and Depth-Charges

Early Use of Depth-Charges by Aircraft

It may often have caused surprise that, although long before the war a special type of bomb, known as the Anti-Submarine bomb, was designed for that specific purpose, it was superseded almost immediately by a weapon never intended for air use. The reason for this is not that the depth-charge is necessarily a better weapon, but that it became evident early in the war that without an efficient low height sight, the chances of a bomb falling within lethal distance of a submarine were remote. To increase these chances it was decided to release the bomb from as low as 50 ft., as this would considerably reduce the line error and also, to some extent, the range error. But at such a low height, an Anti-Submarine bomb can be dangerous to the attacking aircraft, whether it is fitted with a fuse which causes an explosion on impact, or with a delay fuse ; in the latter case, the bomb may ricochet and explode in the air. A hydrostatic fuse would have been free from this objection, but at the time no hydrostatic fuse was available to fit into anti-submarine bombs, and therefore, the depth-charge presented itself as the immediate answer.

Accordingly the standard Naval depth-charge was taken into use, the Mark VII, weighing about 450 lbs., containing 300 lbs. of T.N.T. and fitted with a standard pistol, Mark VII. This entailed fitting suitable suspension bands and nose and tail fairings to reduce drag in those aircraft where the charges must be carried externally.

This makeshift arrangement was soon found to have grave disadvantages—

(*a*) Severe limits of height and ground speed had to be imposed to prevent breaking up or premature detonation.

(*b*) There was no means of dropping the depth-charge " safe " in emergency, or of preventing a serious accident should a depth-charge inadvertently fall into water of sufficient depth during loading or unloading operations.

(*c*) The depth-charge was unsuitable, by reason of its weight and shape, for Hudson aircraft.

No means of improving the Mark VII depth-charge to enable it to be used at greater heights and speeds have been devised, except by the fitting of a drogue which reduces the force of the impact. Such a fitting is undesirable, as it introduces mechanical complications and aiming difficulties. The safety problem was, however, met by modifying the setting device in the pistol so that it remains at " safe " so long as the depth-charge is attached to the aircraft. As is well known the setting, instead of being made by hand before loading up, is put on by a torsion spring which is held at " safe " until the depth-charge is released. Further, the spring can be maintained at " safe " even after release, by use of the standard aircraft fusing arrangement.

To solve the problem of carriage on Hudsons, a special depth-charge was designed known as the Mark VIII, weighing approximately 250 lbs. This type, being meant for aeroplanes, was made sufficiently strong to withstand impact from all operational heights and speeds, and partly for this reason it has been used by other aircraft as well as the Hudsons for which it was specifically intended.

Pistol Settings

The depth-charge pistol is hydrostatic in action and must be subjected to a certain pressure of water before it can detonate the depth-charge. The pistol operates by the release of a spring-locked striker which fires a detonator. This striker remains locked until released by hydrostatic pressure acting on a rubber diaphragm.

The depth at which the depth-charge is required to explode is pre-selected by an adjustment on the pistol. The possible settings on the standard Naval pistol are 50, 100, 150, 300 and 500 ft. From a study of a large number of attacks it has become apparent that even the shallowest of these settings, 50 ft., was not enough, the optimum setting being estimated at 20 to 25 ft. (*see* page 34). Accordingly the original minimum depth of 50 ft. has, by decreasing the strength of the firing spring, been reduced to approximately 35 ft. Experiments are continuing to obtain still further reductions in the depth-charge setting.

The pistol incorporating a safety device and the above shallow-depth spring is known as the Mark XIII, and is now in general use.

Further Improvements and Developments

Steps are being taken to improve the explosive fitting and thus to make depth-charges lethal at greater distances from the objective. With new types of explosive an immediate increase of 50 per cent. in lethal range is expected.

There is of course no fundamental difference between a depth-charge and a bomb. It is largely a matter of fusing but partly of charge-weight ratio. The usual depth-charge has a fuse which causes detonation at a given depth, and has no impact fuse. A direct hit, therefore, does not endanger the aircraft. On the other hand, the high filling ratio means a thin casing, and though a direct hit does not affect the aircraft, it will generally break up the depth-charge and put it out of action. An Anti-Submarine bomb has a thicker casing than a depth-charge, and is meant to stand direct impact with a submarine even on the surface, *i.e.*, a "dry" hit. Thus, while bombs have the disadvantage of a smaller charge-weight ratio, and with existing fuses the further disadvantage of restricting the height of bombing to above about 400 ft., they score in the matter of dry hits. In night work particularly, it is expected that, in the majority of attacks, the submarines will be on the surface, so that dry hits will be relatively more important than in day attack. This consideration may result in a reversion to bombs. In one of the developments now in progress, the bomb is equipped with a new fuse which removes the danger to the aircraft from a dry hit at a low height, by providing a delay of three seconds or so between impact and detonation. However, in order to give a shallow detonation, should it miss the U-Boat (as it generally will !), it is fitted with a water-arming fuse with a *short* time delay. Another development is the fitting of a new fuse on the 100 Anti-Submarine bomb, and (at the other extreme of weights) a suitable fuse on the 1,000-lb. bomb. Notes on these developments and also on bomb-sights will appear in a later issue of this book.

SECTION 5

TRAINING

(i) The General System

There are six Operational Training Units in Coastal Command, each one of which specializes in the training of replacement crews to back squadrons undertaking a similar role—

No. 1 O.T.U., Silloth ..	Undertakes training of Hudson crews.
No. 2 O.T.U., Catfoss ..	Undertakes training of crews for the Long-Range Fighter Squadrons.
No. 3 O.T.U., Cranwell ..	Undertakes training of the Long-Range Landplane Squadrons.
No. 4 O.T.U., Invergordon	Undertakes training of Flying Boat Squadrons.
No. 5 O.T.U./T.T.U. ..	Undertakes training for the Torpedo-Bomber Squadrons.
No. 6 O.T.U., Thornaby..	Augments No. 1 O.T.U. training of crews for the Hudson Squadrons.

The aim of each O.T.U. is to provide the squadrons it backs with sufficient crews, both to replace casualties and to relieve aircrews when they have completed a tour of operational duty.

In addition to backing the squadrons in this Command, Coastal T/B O.T.U.s are responsible for providing the crews required to back the General Reconnaissance, Torpedo-Bomber and Long-Range Fighter Squadrons outside this Command. This backing calls for the following crews to be provided each month :—

6 Flying boat crews,
10 Beaufort crews,
16 Beaufighter crews,
3 Wellington crews,
28 Hudson crews,
6 P.R.U. crews.

Each squadron is required to maintain a summary upon which to record the operational flying hours of each member of the aircrew, starting at zero from the date of his joining the squadron. The summary also includes the dates the individuals joined and left the squadron, together with the date they qualified.

When an individual's operational flying time in the squadron reaches the applicable datum line, or earlier if recommended, the Group takes the following action, either :—

(*a*) Arranges with Headquarters 17 Group direct, for his posting to an appointment in that Group, or

(*b*) posts him to an established non-operational appointment in his own Group.

When possible (*a*) and (*b*) are effected by an interchange with an individual due to return for a further tour of operational duty. Or the Group

(*c*) nominates him for one of the various commitments, not covered by (*a*), which are from time to time allotted to his Group (*e.g.*, Navigation Specialist, O.T.U. Instructor, home and abroad), or it

(*d*) submits the names of any aircrew personnel who cannot be relieved in (*a*), (*b*) or (*c*) above, to Command Headquarters for disposal.

Aircrew personnel are not normally on non-operational duty for more than nine months, after which time they are available for return for a further tour of operational duty. In Coastal O.T.U.s and No. 3 School of G.R., aircrew personnel are, with the exception of three key instructors, not retained for more than a maximum of ten months.

The total numbers of Coastal Command Flying Training hours were as follows :—

		Iceland.
January		
Day	10861·05 ..	32·25
Night	832·35 ..	04·55
February		
Day	14569·45 ..	29·30
Night	1511·25 ..	—

(ii) A Torpedo-Attack Exercise

On the 11th January, 1942, Beaufort aircraft from St. Eval carried out an exercise in mass attack by torpedo upon the cruiser H.M.S. *Hermione*.

Twelve aircraft were sighted by *Hermione* at the bearing Green 25°, 275°, about 8 miles distant and were engaged with six 5·25-in. guns in barrage fire at 4,000 yards, as the flights split up. One sub-flight opened out a little to starboard and two sub-flights crossed the bow to port.

It was apparent that the first attack would come from the sub-flight on the starboard side ; *Hermione* altered course with the intention to comb this attack and the turn to starboard was checked with this in view. The pause between the attacks of the first two sub-flights made it possible to comb the first and also to reduce the threat of the remainder.

The remaining attacks were made from the port side. As a turn to port could not be made in time to comb the attacks of the last two sub-flights and in any case would have presented a broad target to the torpedoes of the second flight, the turn was continued to starboard under full helm. The last sub-flights had, therefore, to attack from abaft the beam, and the target presented was already turning away. It was hoped that this manœuvre would have resulted in a tendency to miss ahead. The attacks were, however, made in quick succession and seemed to be well carried out. There is no doubt that hits would have been scored.

Gunfire.—Hermione's foremost group (six 5·25-in. guns) continued to engage the sub-flight on the starboard side in barrage fire down to 1,500 yards, and in the later stages was supported by one four-barrel 2-pounder and two Oerlikon guns. As soon as the aircraft on the starboard side were inside the barrage range, the foremost group shifted to targets on the port side, which were engaged in succession. The after group (four 5·25-in. guns) engaged aircraft on the port side in barrage fire down to 1,500 yards, shifting target as successive aircraft came in. Aircraft were also engaged with one four-barrel 2-pounder and three Oerlikon guns on the port side. No contact was obtained by Type 279.

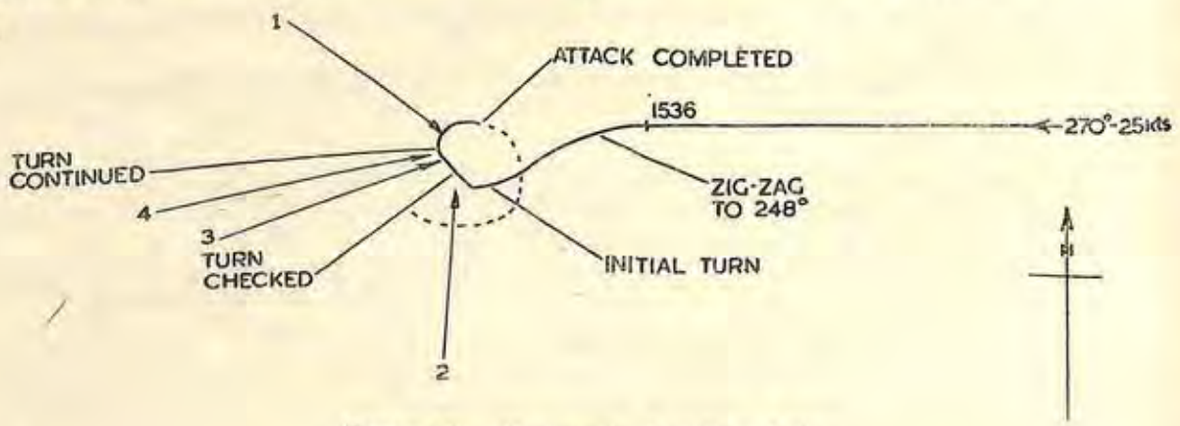


CHART IV.—*Hermione's* Avoiding Action.

(iii) A model Ditching

An investigation, for Air Sea Rescue, into a forced landing in the sea by an aircraft of Bomber Command has revealed a story of such practical interest as to justify its inclusion in this review, as an example of how the job should be done. It was a Halifax II (of 35 Squadron), and was lost on 18th December. The incident has proved that four-engined aircraft are no more dangerous to ditch than twin, with the aid of previous drill.

While engaged on operations over north-west France, both port motors were struck by flak. Only the port inner airscrew was feathered, the port outer mechanism having failed. Thus the captain was forewarned of the impending ditching. When the aircraft was struck by the flak, at 14,000 ft., considerable difficulty was experienced in maintaining a low rate of descent. Full rudder and aileron bias and full aileron with half rudder was required in order to control the aircraft. At 5,000 ft. all hope of maintaining height was abandoned and preparation for ditching began.

The wireless operator remained at his set, transmitting SOS, and he put I.F.F. to distress signal. Owing to the exertions of the captain in controlling the aircraft, the second pilot was unable to strap him in. The crew moved to the following ditching stations :—second pilot prone on the floor between the rest seats, the navigator, rear gunner and engineer lay on the floor with their feet braced against the rear spar, the front gunner lay on the rest seat with his feet against the fore spar. The crew were not anchored to the aircraft.

Six hundred gallons of fuel remained in the aircraft. There were no bombs and the bomb doors were closed. No equipment was jettisoned. The wheels were up. A gradual descent was made at approximately 110 m.p.h. at 2,800 r.p.m. on both starboard engines. Any increase of power above this resulted in loss of control. At about 1,000 ft. the wireless operator moved to his ditching station on the rest seat with his feet braced against the fore spar. Both the mid-upper and the pilot's upper exit were opened before ditching.

The sea was calm with a very slight swell. The wind was 5 m.p.h. Conditions of visibility were good with warm sunshine and little cloud.

The starboard engines were throttled back and the aircraft was glided down into wind at about 110 m.p.h. with flaps up until close to the surface. The aircraft was then held off and the tail wheel touched with the nose only slightly up. The impact occurred in the neighbourhood of 85 m.p.h. The rate of descent was almost imperceptible. As the aircraft struck the water the nose dug in and all forward speed was immediately lost while a deluge of water surged over the aircraft. When this had subsided the water level in the fuselage was 2 ft. deep and seemed to be the same level as the water outside. A great deal of water entered the aircraft from the broken nose and the upper escape hatches. The front turret was dislodged. It was noted that the propeller tips were bent. In spite of his not being secured the captain was neither thrown forward nor received any injuries. The tail gunner was the only casualty ; he sprained his foot, which he considers was due to not bracing it carefully enough.

Immediately the aircraft came to rest the engineer operated the manual releases. The captain escaped by his own upper exit and the remainder of the crew through the mid-upper exit. The dinghy (" J " type, Mark III) released satisfactorily and the drill was carried out without a hitch ; it had been well practised previously.

The aircraft remained afloat for 40 minutes with the right wing and nose slightly down. The dinghy was punctured while clearing the aircraft but the leak was effectively stopped with the stoppers provided, so that topping up was only required every quarter of an hour.

Throughout the descent the two remaining aircraft in the section kept in touch with base and finally communicated the position of the ditched aircraft, 50 miles south of Plymouth. One and a half hours after ditching a Lysander appeared and remained circling overhead until visual contact had been established between the rescue boat and the dinghy. A motor launch, with two others in attendance, rescued the crew at 1600 hours.

SECTION 6

THE ENEMY

(i) U-Boat Survivors' Statements on Air Attack

U 570: Prisoners said that when the U-Boat was cruising between Bergen and Aalesund, towards the end of July, 1941, a British aircraft dived out of the sky and bombed a Norwegian ship which was lying six or seven miles away from them. They believed that the aircraft was too busy to see their U-Boat, which, however, crash dived immediately, and with such fervour that it touched bottom, striking a reef. This caused damage to the bows, a hydroplane and the cap of a torpedo tube, and wrecked the detector gear. The U-Boat remained submerged for a period which the prisoners estimated at 30 to 45 minutes after which, as they had heard no more bombs dropped, they surfaced again and proceeded to Trondheim. Here it was decided that the U-Boat must be thoroughly examined, but much time was wasted because another submarine was occupying the only available dock. Eventually the damage to the bows was repaired, but there was no engineer at Trondheim who understood the detector gear. Consequently the U-Boat went on its one and only operational cruise unable to use this apparatus, by which it is possible to hear the approach of other ships; prisoners criticised this state of affairs bitterly.

U 501: Prisoners from this U-Boat, which was sunk in September, complained of the incessant British air reconnaissances which forced them to spend much time submerged. On one occasion a young and inexperienced rating did not realise the necessity for rapid diving, and, according to his comrades, he nearly endangered the safety of the U-Boat by not getting down off the bridge soon enough. When south of Iceland, *U 501* was said to have once been forced to stay submerged for two days, during which, of course, it could not receive wireless signals.

The Italian Submarine *Ferraris*: This submarine was running on the surface of the Atlantic, off Portugal, on 25th October when it sighted an aircraft which was assumed to be friendly; accordingly it did not submerge, but made a recognition signal with a Véry pistol. Survivors stated that the aircraft made a wide circle and returned, to make a signal as they supposed, but they suddenly found themselves attacked by two depth charges dropped from a height of 30 ft. Neither exploded, but at the same time the aircraft (a Catalina) fired about 250 rounds from its machine-gun, and officers and crew were unanimous in stating that a large number of the bullets pierced the starboard after saddle tank. This was one in which supplementary fuel oil was carried. It was perforated both above and below the water line, and the Commander at once decided that he could not submerge without leaving such a trail on the calm surface as would make his vessel an easy target for further attacks by depth charge. Accordingly he scuttled the submarine two hours later, when H.M.S. *Lamerton* came up and opened fire upon it.

U 433: Prisoners said that in November the voyage of this submarine from St. Nazaire to the Straits of Gibraltar, was continually interrupted by sighting aircraft and so being forced to dive.

U 451: This submarine attempted to cross through the Straits of Gibraltar on 21st December, proceeding on the surface at full speed, and the noise from her Diesel exhausts drowned the roar of an approaching aircraft. The 1st Lieutenant (who is the only prisoner) was on the bridge with three ratings, but he did not see the aircraft till the moment when it released a bomb. This fell ahead of the U-Boat and burst beneath it. Water poured through the conning tower hatch as the three ratings jumped inside; the hatch closed before the Lieutenant was able to follow them. He stated that the U-Boat then sank, bows down, and he swam round until he was picked up.

(In reality the "bomb" was the central depth charge of a stick of three dropped by a Swordfish aircraft using the shallow setting.)

(ii) German Defence Strategy in the Channel Naval Battle

The break-out from Brest in February of the three German warships furnished interesting information regarding the German defence strategy. Not only was the course steered close to the enemy coast in order to allow shore-based flak to play its part, but there is also definite evidence of continued attempts on the part of enemy fighters to entice our fighters towards the shore and so bring them under the fire both of the ships and of the shore batteries.

The enemy naval strategy consisted of positioning the screening destroyers all on the seaward side of the major units, in line ahead, and flanking these in turn to seaward by a " Vic " formation of E-Boats. It is of interest to note that one of the destroyers was seen to have M.G. nests high on its masts.

The enemy umbrella seems to have been maintained, for the most part, to landward of the convoy, and showed little inclination to fight but concentrated on an attempt to lure our fighters inland into accurate flak range and away from the ships.

Throughout the battle terrific flak of every kind was reported, including that from 6-in. guns which kept up an incessant barrage below the height of the Me. 109's, and, obviously in accordance with a concerted scheme, there was no upward barrage and the fire from all the ships was of low trajectory.

The air above the enemy ships was left clear, and the enemy aircraft flew low—generally under 1,000 ft., probably to facilitate recognition—but sufficiently high to escape the barrage. This zone of clear air allowed for the engagement of our aircraft, immediately they were recognised, by concentrated light flak, particularly from the machine-gun nests on the masts of the destroyers.

In general, the defence strategy would seem to have consisted of :—

(1) Intense and incessant barrage up to 6-in. and of low trajectory from all the ships; the object being to counter low-level attacks by our bombers, torpedo-carrying aircraft and fighters, and possibly to make things uncomfortable for our surface craft.

(2) Preservation of a zone of clear air above the ships, to allow our aircraft to be more accurately attacked individually, either by enemy aircraft or by light flak from the ships.

(3) Decoying tactics on the part of the enemy fighter screen, intended to entice our fighters away from the ships and into accurate range of shore-based flak batteries.

It is clear that the closest co-operation existed between the enemy aircraft and the ship-borne and land-based flak.

(iii) Attacks by Aircraft on S.S. Cushendun

(*From a Report by the Master, to the Royal Navy.*)

We were bound from Falmouth to Barry Dock in ballast. The ship was armed with a Twin-Marlin, a Lewis gun, two Hotchkiss, two P.A.C. rockets, and we had a balloon but lost it. The crew, including two naval and two military gunners, numbered 16 and there were no casualties.

We sailed from Falmouth on the 30th January and formed up with a convoy of 18 ships which sailed in two columns, our position as Vice-Commodore being the leading ship to the port column. The wind backed to northward and blew a gale, so we went into Mount's Bay for the night. On the weather moderating the convoy sailed again at 1300 next day. The wind was still northerly and fresh, but as we rounded the Longships about 1700 it began to die down, and the weather was fine with smooth sea, and later there was a good moon with visibility about 1½ miles. We steamed at seven knots, the wind dropping after dark to north, force 2.

Everything was going well, the convoy was in good formation, with the four escorting trawlers, two on each side of the port and starboard columns, about a quarter of a mile away, when at 2215 on the 31st January, in position 10 miles north of Trevose Head, we heard the sound of aeroplane engines coming from the land, and soon after a plane was sighted approaching our starboard beam. It was a twin-engined monoplane, with floats, and I think was a Heinkel 115.

He approached at a height of about 100 ft., and as he drew nearer I fired the starboard P.A.C. rocket, which caused the plane to bank steeply, pass astern of us and eventually disappear out of sight. We stood by and ten minutes later the same aircraft was seen approaching from directly ahead. This time I fired the port P.A.C. rocket, and again the plane was forced to bank steeply off our starboard bow. It then flew down the port column of ships dropping six bombs well astern of us and without damaging any vessel.

We stood by for another attack, the two naval gunners at the Twin-Marlin, the Mate at the port bridge Hotchkiss, and myself on the bridge to fire the P.A.C. rockets, which I had recharged and again made ready, and also the starboard bridge Hotchkiss. At about 0015 on the 1st February, about two hours after the first attack, the Mate called out that he had sighted a plane away to port. This time it was a large four-engined machine, a Focke-Wulf, flying very low over the water along our port beam about a quarter of a mile away. He continued on his course and passed out of sight without attacking. I remained with one hand on the lanyard of the P.A.C. rocket and the other hand on the Hotchkiss gun, and a few minutes later I heard a plane approaching from ahead, then sighted him off our port bow at a height of about 50 ft., rising steeply to clear our mast. I called out to the Mate not to fire until he saw me fire the P.A.C. rocket, and when the F.W. was a little off our port bow, at a height of 80 ft., I pulled the lanyard of the P.A.C. rocket, and the Mate immediately opened fire with the port Hotchkiss, I jumped to the starboard Hotchkiss and fired a full belt of ammunition. We saw our bullets entering the fuselage as the plane swerved sharply, making a perfect target as he swung across our bows. He was forced to turn almost at right-angles and as he flew off towards the land, across the Commodore's ship on our starboard side, we all saw smoke pouring from him, and he was rapidly losing height.

I do not think the Focke-Wulf was near enough to be damaged by the wire of the P.A.C., but it was certainly the P.A.C. rocket which caused him to take evasive action and so present a perfect target for our machine-guns which must have damaged him. In my opinion the P.A.C. equipment is an excellent defensive weapon against aerial attack and in this particular case was the means of preventing any direct attack on my ship, and probably saved the remaining ships of the convoy from attack.

Everyone behaved very well indeed and the Mate stuck well to his gun and carried out my orders efficiently. We have metal shields round the two Hotchkiss on the bridge and plastic armour round the Twin-Marlin ; this gun was also fired by the naval gunners but the belt of ammunition jammed. I was very anxious to get four P.A.C.s fitted for use, instead of only two as at present, as we have to go below to the chartroom for the spare rockets and whilst doing so another attack might develop, so I asked for the two others to be rigged when I got into Barry. I certainly go 100 per cent. on them.

I think these west coast convoys are very well run, but I should like to ask if the air escort could remain with us a little longer into the dark hours.

(C44593) 1,000 4/42