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COASTAL COMMAND REVIEW

June 1945

Vol. IV, No. 6

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.*

Foreword by the Air Officer Commanding-in-Chief, Coastal Command

As this number of the *Coastal Command Review* is the last, I feel it is an opportune occasion for me to include a short foreword.

The activities and accomplishments of Coastal Command in the U-Boat war have for various reasons always been kept secret, and I have therefore looked on the *Review* as the means of letting the Command know how we have been faring in the struggle for mastery over the enemy's undersea fleet.

During my visits around the Command over the past 18 months, and these have included nearly all stations, I have been forcibly impressed by the keen spirit which has been so evident in aircrew and ground crew personnel alike. If the knowledge of operations made available in the *Review* has played a small part in helping to maintain this ardour, it has more than served its purpose. Our victory in the war at sea, which has been a 5½ years' battle with many ups and downs, would not have come about but for the united efforts and the will to win of the R.A.F. and W.A.A.F., and our Dominion and Allied colleagues.

Many of you, like myself, will be leaving Coastal Command in the near future, but we shall all, I am sure, recall with affection and respect a Command with a war record that should long be remembered.

Sholto Douglas.

Air Chief Marshal.

June 22nd, 1945.

COASTAL COMMAND REVIEW

Vol. IV, No. 6—June 1945

CONTENTS

	Page
Foreword by the A.O.C.-in-C. Coastal Command	1
Some Figures illustrating the Operational Achievements of Coastal Command	3
The Forces which did the Job	5
I.—ANTI U-BOAT	
Coastal Command Aircraft Versus the U-Boat at Sea	6
U-Boats sunk and damaged by Coastal Command Aircraft—3rd September, 1939, to 8th May, 1945	10
II.—ANTI-SHIPING	
Coastal Command's Offensive against Enemy Shipping during the European War	12
The Anti-Midget U-Boat Campaign	15
Summary of Anti-Shipping Results by Coastal Command Aircraft, March, 1941, to 8th May, 1945	17
Monthly Results for 1945 (up to 8th May, 1945)	18
III.—OTHER OPERATIONAL FLYING	
Air/Sea Rescue during the European War	20
Meteorological Reconnaissance during the European War	22
Brief History of Photographic Reconnaissance, 1939-1945	24
IV.—SPECIALIST AND GENERAL ARTICLES	
Visit of Coastal Command Shipping Investigation Party to Norway	27
The Failure of German Air Force Anti-Shipping Operations	29
 Plate No. PLATES.	
1. U-Boat Attacked by a Sunderland of No. 228 Squadron on January 30, 1940	Between pages 6 and 7
2. Attack and Surrender of U 570 on August 27, 1941	
3. Attack on U-Boat by U/10 on June 5, 1942	
4. Attack on U-Boat by S/120 in February, 1943	
5. Attack on U-Boat by T/120 in February, 1943	Between pages 8 and 9
6. Attack on 740 ton U-Boat by H/120 on June 24, 1943	
7. Attack on U-Boat by Z/86 and T/120 on October 8, 1943	
8. Crew leaving U-Boat Attacked by U/422 (R.C.A.F.) on March 10, 1944	
9. Photographs of U-Boat Attack taken at night by S/201 on June 7, 1944	Between pages 12 and 13
10. Attack and sinking of U-Boat off Ushant on June 10, 1944	
11. Attack and Sinking of a U-Boat by H and K/10 (R.A.A.F.) and T/105 on July 8, 1944	
12. Sinking of 740 ton U-Boat by Aircraft from U.S.S. <i>Bogue</i> on August 20, 1944	
13. The Wreck of the German Liner <i>Madrid</i> , December 12, 1941	Between pages 14 and 15
14. Attack on an Enemy Convoy on April, 18, 1943	
15. Sinking of the <i>Alsterufer</i> on December 27, 1943	
16. Attack on an Enemy Convoy on June 27, 1943	
17. Attack on an Enemy Convoy on March 7, 1944	Between pages 20 and 21
18. Attack on an Enemy Convoy on June 15, 1944	
19. Sinking of two Sperrbrechers on August 13, 1944	
20. Attack on Shipping in Stav Fjord on September 19, 1944	
21. Attack on Shipping in Midgulen on November 8, 1944	Between pages 22 and 23
22. Attack on Shipping in Flekkefjord on December 31, 1944	
23. Rescue by Airborne Lifeboat on May 5, 1943	
24. Air/Sea Rescue of a Fortress Crew during March, 1944	
25. Rescue of the Crew of a Sunderland on July 6, 1944	Between pages 24 and 25
26. Two ditched Gliders. September, 1944	
27. Dropping of an Airborne Lifeboat	
28. Meteorological Reconnaissance Photographs	
29. Meteorological Reconnaissance Photographs	Between pages 28 and 29
30. Meteorological Reconnaissance Photographs	
31. Meteorological Reconnaissance Photographs	
32. Meteorological Reconnaissance Photographs	
33. <i>Hipper</i> , January 26, 1941; <i>Scharnhorst</i> and <i>Gneisenau</i> at Brest, December 18, 1941	Between page 30 and Index
34. <i>Prinz Eugen</i> and <i>Scheer</i> in Lo Fjord. March 9, 1942	
35. Elbing Class Torpedo Boat in the Mecklenburger Bucht	
36. The <i>Tirpitz</i>	
37. Blohm and Voss Yards. December, 1944	Between page 30 and Index
38. L.R.R.C.005 at Oslo	
39. A Member of the Investigating Party at Work	
40. E-Boat Depot Ship <i>Adolf Luderitz</i>	
41. Naval Representative questioning the Diving Party	Between page 30 and Index
42. A Member of the Party examining Merchant Vessel <i>Concordia</i>	
43. Allied Airman's Grave at Sandefjord	
44. The <i>Prinz Eugen</i> under escort	
45. The <i>Nuremberg</i> under escort	Between page 30 and Index
46. The Last Convoy Escort	

SOME FIGURES ILLUSTRATING THE OPERATIONAL ACHIEVEMENTS OF COASTAL COMMAND

September 3, 1939, to May 8, 1945

Sorties, Flying Hours and Losses

The following are the provisional* figures for the Command's operational flying effort and losses during the war :—

Type of duty.	Sorties.	Hours.	Aircraft losses. Enemy action and missing.
Anti U-Boat and Convoy Escort	123,372	904,749	384
Anti-Shipping† and Fighters	65,382	244,295	868
Photographic Reconnaissance	16,137	49,331	161
Meteorological	19,870	71,019	26
Air/Sea Rescue‡	11,610	48,713	32
Minelaying	1,192	3,600	35
Miscellaneous	750	2,700	5
	<u>238,313</u>	<u>1,324,407</u>	<u>1,511</u>

AT A CONSERVATIVE ESTIMATE THIS REPRESENTS OVER 200,000,000 MILES OR 8,000 CIRCUITS OF THE GLOBE.

* The final figures for publication in the White Paper on the work of the R.A.F. are still being extracted from Air Ministry and Command Records.

† 74 aircraft lost in strikes on shipping in harbour, etc., are included under Anti-Shipping.

‡ Air/Sea Rescue sorties were not recorded prior to August, 1941.

Anti U-Boat Results

OVER 1,250 OCEAN CONVOYS ESCORTED

209 U-BOATS SUNK AND PROBABLY SUNK (including 21 shared with Naval and other Forces).

280 U-BOATS DAMAGED (including six shared with Naval and other Forces).

The share played by Coastal Command in this battle can be seen by comparison with total kills at sea from all causes as at present known :—

	German U-Boats.	Italian U-Boats.
By Surface Ships	238	35
By Shore-based Aircraft	227½	8
By Carrier Aircraft	50½	1
By Surface Ships and Shore-based Aircraft combined	30	4
By Surface Ships and Carrier Aircraft combined	10	—
By Submarines	26	21
By other causes	32	13
	<u>614</u>	<u>82</u>

The above figures only cover U-Boats lost at sea. Those sunk in harbour by bombing raids, surrendered, or otherwise accounted for are excluded. The figures, which are provisional, are based on final assessments of sunk and probably sunk, together with attacks listed as promising but not yet assessed. The final results cannot be ascertained until all the information obtained following the occupation of Germany has been analysed.

Anti-Shipping Results

Assessment of attacks on shipping was only begun from 1st March, 1941. Since then the figures are as follows :—

Since March, 1941 :—

	Sunk.	Damaged.
Merchant Vessels	166 vessels (476,794 tons)	346 vessels (1,090,213 tons)
Cruisers	—	1
Destroyers	3	11
Minesweepers and Sperrbrechers	19	75
Escort Vessels	52	194
E/R Boats	13	50
Midget U-Boats	16	10 (possibly sunk)
Other Vessels	4	60

Photographic Reconnaissance

During the war in Europe Coastal Command P.R. aircraft have taken upwards of :—
3,000,000 PHOTOGRAPHS

Air/Sea Rescue

In the Coastal Command Area of Operations the Air/Sea Rescue Service as a whole have saved :—
5,804 LIVES

Coastal Command can claim a major share in this achievement.

Anti-Aircraft Results

Coastal Command Aircraft have destroyed or probably destroyed
291½ ENEMY AIRCRAFT

The figures are as follows :—

A/Ship and Fighter Patrols	234½
A/U Patrols	45
A.S.R. Patrols	4
Met. Flights	2
P.R. Flights	1
On Special and Miscellaneous duties	5
	<hr/> 291½ <hr/>

Meteorological Flights

The growth in the importance of the Meteorological Flights since September, 1941, when they were first reported, is illustrated by the following figures :—

Year.	Sorties.	Hours.
1941	504	1,814
1942	2,519	9,337
1943	3,212	14,093
1944	3,862	16,639
1945 (January 1–May 8)	1,513	6,830
	<hr/> 11,610 <hr/>	<hr/> 48,713 <hr/>

Weapons Expended

The following are some figures for the expenditure of weapons :—

Type of Weapon.	Quantity Expended.
Depth charges and bombs	4,236 tons (including 6,240 D.C.s)
R.P.	10,214 weapons
Torpedoes	749 weapons
Sea mines	898 weapons

THE FORCES WHICH DID THE JOB

The following are some extracts from the Orders of Battle for Coastal Command :—

September 3, 1939 The War Begins			November 8, 1942 Invasion of North Africa			May 8, 1945 The Finish in Europe		
Aircraft Type	No. of Sqdns.	A/C Strgth.	Aircraft Type	No. of Sqdns.	A/C Strgth.	Aircraft Type	No. of Sqdns.	A/C Strgth.
Anson	9	135	Beaufighter ..	6	109	Anson	1 Flt.	10
Hudson	1	9	Catalina	2½	44	Beaufighter ..	5	96
London	2	9	Catalina U.S.N. ..	2	24	Catalina	2½	31
Stranraer... ..	1	6	Fortress	2	28	Catalina U.S.N. ..	1 Flt.	4
Sunderland ..	2	12	Halifax B.C. ..	2 Flts.	20	Canso	1	10
Vildebeeste ..	1	12	Hampden	4	55	Halifax	2	27
			Hudson	5	91	Liberator	9	141
			Liberator	4	36	Liberator U.S.N. ...	6	84
			Liberator USAAF	2 Flts.	15	Mosquito	4½	88
			Northrop	½	8	Sunderland	7	78
			Sunderland	8	67	Swordfish	1	16
			Wellington	5	74	Warwick	1	17
			Whitley	3	62	Wellington	8	138
			Whitley B.C. OTU	1	25	Ventura	1	17
			Swordfish F.A.A. ...	2	24	Barracuda F.A.A. ...	2	20
			<i>P.R. Units.</i>			<i>P.R. Units.</i>		
			Mosquito, Spitfire,	5	76	Mosquito	2	42
			Maryland,			Mustang	—	2
			Wellington			Spitfire	2	41
			<i>Met. Flights.</i>			<i>Met. Flights.</i>		
			Gladiator	1 4 Flts.	44	Hurricane,	6 1 Flt.	112
			Spitfire, Hudson ..			Spitfire, Fortress,		
						Halifax, Hudson,		
						Warwick.		
			<i>A.S.R.</i>			<i>A.S.R.</i>		
			Anson	1	18	Hurricane,	5	124
			Hudson	1	20	Sea Otter, Walrus,		
						Warwick.		
						<i>Composite Sqdns.</i> <i>(Met. and A.S.R.,</i> <i>etc.)</i>		
						Anson, Hudson,	1	19
						Martinet,		
						Spitfire, Walrus,		
						Warwick.		
	16	183		53 8 Flts.	840		66 3 Flts.	1,117

I.—ANTI U-BOAT

Coastal Command Aircraft Versus the U-Boat at Sea

"I will show that the U-Boat alone can win this war . . . nothing is impossible to us." This forecast, which was made in 1940 by Grand Admiral Doenitz, might well have been fulfilled but for the efforts of the anti-U-Boat aircraft of Coastal Command. This article looks back through Coastal's records of the long and arduous struggle, and recalls some of the stepping stones that have led to the Allies' final victory.

The "Phoney War"

At the outbreak of war, Coastal Command could muster six flying boat squadrons and eight Anson squadrons, while the first Hudson squadron was equipping and was half operational. Two Vildebeest torpedo bomber squadrons completed the list. It was inevitable that, right from the outset, Germany would practice unrestricted U-Boat warfare, that plan which came so near to producing the defeat of the Allies in 1917. The convoy system was put into operation as soon as possible after the declaration of war, and Coastal Command aircraft were employed to the full, first to patrol the trade routes and then to escort every possible convoy. This was a purely defensive policy, but the orders were that every U-Boat sighted was to be attacked at once. Signals reporting the location of the enemy were of secondary importance.

The weapons used were standard anti-submarine bombs which had been designed between the wars; the lethal radius was less than 10 feet, the minimum safe dropping height was 400 feet and there was no bombsight with which to aim. The bomb load carried by the flying boats was six 250 lb. A/S bombs in the Sunderlands and four of these bombs in the Stranraers and Londons. More often than not these last two types of aircraft were fitted with overload fuel tanks and this bomb load was reduced to only two 250 lb. A/S bombs. The Ansons could take only two 100 lb. bombs, while the available Hudsons were able to take off with four 250 lb. bombs. It is not surprising that with poor weapons and non-existent bombsights, Coastal's aircraft had little success.

But aircraft did occasionally get the opportunity of making an attack, and in January, 1940, a Sunderland of 228 Squadron in co-operation with a Naval force shared in the destruction of a U-Boat and was thus responsible for putting up the first half digit on the Coastal Command score board. Naval vessels had made contact with a U-Boat approximately 100 miles west of Ushant, and, before losing contact, made an attack which probably caused damage. The Sunderland, which was on patrol in the vicinity, was ordered to co-operate in the search, and it was not long before the aircraft sighted the U-Boat proceeding

away from the scene at high speed on the surface. An attack was made and the crew of the U-Boat abandoned ship, the Naval vessels being brought to the position to pick up survivors.

During the first months of the war, both sides were badly equipped. Coastal carried on with its few ineffectively armed aircraft and the Germans could only maintain some half-dozen U-Boats on patrol. Towards the end of 1940, however, the effect of the fall of France made itself felt and the enemy began to base his expanding U-Boat fleet right on our doorstep in the French Atlantic ports. We amassed more aircraft and the Hun was producing more U-Boats; the Battle of the Atlantic began in earnest.

Offensive Operations

At the end of 1940 the gravity of the situation was apparent; Admiral Doenitz's statement was coming true. We had pitifully few aircraft; these were out-of-date and their bomb load was unlikely to sink U-Boats. The band of civilian scientists in the Operational Research Station at Headquarters, Coastal Command, was working at full pressure, new aircraft were ordered, Radar was harnessed to the anti-U-Boat effort and developments were carried out to enable aircraft to carry depth charges similar to those used by the Navy. The problem was clear. By day or night, in fair weather or foul, Coastal aircraft must be able to detect every U-Boat which was on the surface; they must be equipped to attack with a weapon that could kill; they must be able to surprise the enemy and deliver the attack before the target has had time to dive. In order to cause greatest discomfort to the U-Boats, it was decided to change from the defensive convoy escort policy which had been pursued at the start of the war. A high percentage of aircraft was released from the convoy escort task and was employed on offensive sweeps in the transit areas through which it was known that U-Boats must pass. Close escort would be given only to those convoys which were believed to be in imminent danger.

It was during this period that an aircraft attack resulted in the surrender of a U-Boat. At about 1030 hours in the morning of August 27, 1941, the captain of U.570 brought his U-Boat to the surface from a depth of about 90 feet at the precise moment when Hudson S/269, engaged on an offensive sweep south of Iceland, was overhead. The U-Boat began to dive, but the aircraft was too quick for her and made an attack with four depth charges. The smashing of instruments, the entry of a certain amount of water and the dread of chlorine gas threw the Germans into confusion. The U-Boat re-surfaced and the crew appeared on deck wearing life jackets. By

PHOTOGRAPHS OF OUTSTANDING U-BOAT ATTACKS



The top photograph shows a U-Boat which was attacked by a Sunderland of 228 Squadron on January 30, 1940. The U-Boat afterwards scuttled itself. The bottom two photographs show the famous surrender of U-570 on August 28, 1941. The U-Boat later became H.M.S. *Graph*.



Attack on U-Boat by U/10 on June 5, 1942. The damaged U-Boat amid bullet splashes.



S.120 brought back the ideal photograph after an attack, showing the points of entry of depth charges relative to the U-Boat. February, 1943.



T.120. This photograph shows the first depth charges of the stick entering the water alongside the U-Boat. The attack was made down track. February, 1943.



Attack on 740-ton U-Boat by H/120 on June 24, 1943. Entry of depth charges.



Depth charges exploding aft of conning tower and forcing bows under water.



Crew of U-Boat after the kill.

judicious and persistent use of her gun armament, the Hudson so reduced the enemy's morale that, before the arrival of a relieving Catalina and later of surface craft, the enemy's fighting spirit had evaporated. They flew a large white flag (the captain's shirt) and, to avoid any misunderstanding, a large white board was displayed on deck. Surface vessels arrived and after some difficulty in rough seas managed to tow the enemy craft to Iceland. From there she was taken to home waters, where, after her dimensions and operational performance had been studied in detail, she was renamed *H.M.S. Graph*, and operated successfully against the enemy.

Although aircraft did not sink many U-Boats, they drove the enemy further out into the Atlantic and saved many merchantmen from attack in the waters that had hitherto been the scene of high losses. Thus, by the autumn of 1941, the situation had so improved that, in a statement issued by the Anti-Submarine Warfare Department of the Admiralty, it was noted that, "of the tonnage sunk in the North Atlantic during September, by U-Boats, about three-quarters was lost in areas which can only be covered very thinly by Catalina aircraft, being outside the range of Wellington and Whitley aircraft."

The moral was obvious; aircraft must be used to cover the whole of the Atlantic. Plans were made to obtain very long-range aircraft to cover the "gap" in mid-Atlantic which was out of range of both British and Canadian based aircraft. Liberators were chosen for this vital task and specially selected crews began training to operate the new aircraft.

The enemy now had some 50 U-Boats at sea and had adopted "pack tactics" for the attack of convoys. U-Boats were deployed in long search lines beyond the range of shore based aircraft—the first U-Boat to sight a convoy would report by signal, and the rest of the group would assemble ready to attack in what they believed were overwhelming numbers. Then—perhaps three days after the first contact had been made, the attack would begin and the U-Boats would keep attacking until the edge of the gap was reached. As soon as this happened, aircraft forced the U-Boats to dive and the convoy was left in complete safety.

The offensive patrols in the Bay of Biscay were now producing marked results. Early in 1942 our patrol density had been stepped up, our sighting and attack efficiency had improved, and U-Boats were forced to cross the Bay in darkness. In June, 1942, Leigh Light Wellingtons using A.S.V., Mark II, made their appearance on operations and at once convinced the enemy that he was no longer safe by night. He changed his tactics and arranged to cross the Bay so as to spend the least possible time on the surface; when he did surface it was by day and he had to run the gauntlet of attacks by the day aircraft.

During 1942, the Germans realized that Coastal Command aircraft were indeed a force to be reckoned with; they started to design and produce formidable flak armament and their scientists produced a search receiver which would defeat our A.S.V. As a longer term project they started to plan the now well-known Schnorkel. Immediate countermeasures included the patrolling of the Bay by fighters—at first by Arado 196s and then by Ju.88s and F.W.190s. There

is no doubt that the enemy fighters distracted our aircrews' attention from the U-Boats; many air combats took place and several of our aircraft were lost.

In the last months of 1942, the U-Boats crossing the Bay were fitted with search receivers, and, by November, had stolen a march on the searchlight aircraft. They planned to defeat our efforts to make an assault on the North West African coast; a force of some 60 German and Italian U-Boats was built up in the Mediterranean and to the west of Gibraltar. When the assault was launched, the U-Boats rushed in for the kill, but Coastal Command aircraft were ready. Aircraft based at Gibraltar and later in North Africa attacked over 60 U-Boats during the first month—six were destroyed and over a score damaged. As in the Bay, so in the Mediterranean, aircraft attacks forced the U-Boats to remain submerged by day and to come to the surface only at night. Searchlight Wellingtons again came into their own, for, although they still had A.S.V., Mark II, many of the U-Boats in the Gibraltar area were not yet fitted with efficient search receivers. Thus a number of U-Boats continued to have an unpleasant time until early 1943 when their search receivers became fully effective. However, their improved equipment came too late—the North African landings were complete.

Aircraft Gain the Upper Hand

At the same time as we defeated his efforts to foil the North African landings, the enemy was given another setback. His "pack tactics" had been producing good results when, in December, 1942, the V.L.R. Liberators scored their first major success. Two aircraft of 120 Squadron were escorting convoy HX217 of 33 ships bound from Halifax to the United Kingdom, just as the U-Boat pack was preparing to attack. Between them the two aircraft sighted 13 U-Boats and, by one means or another, attacked 11 of the targets. This was sufficient to break up the terrific concentration and allow the convoy to escape with the loss of only two ships. The spring of 1943 saw another famous battle. Convoys HX229 homeward bound from Halifax and SC122 homeward bound from America were attacked by a force of some 30 U-Boats. Eleven ships were sunk in a single night. Liberators were detailed to escort the convoys at a distance of 900 miles from the nearest air base. Within 3 days the pack was dispersed. The Liberators had flown 54 sorties during which they had made 32 sightings and 21 attacks on U-Boats.

But despite the efforts of Coastal Command, U-Boats were still a grave menace to the security of the country's supply lines. The night aircraft were practically useless in the face of the U-Boat search receiver which was working very well. In the first three weeks of March, we lost nearly three-quarters of a million tons of shipping, and Admiral Doenitz's prophecy again came near to fulfilment. However, the Atlantic Conference which took place about this time in Washington had prepared the way for counter action. Meanwhile, British resource was not beaten and by late February the searchlight Wellingtons "came back" fitted with A.S.V., Mark III, which worked on a lower wavelength, outside the range of the German search receiver. The U-Boats in transit across the Bay took a real beating; many attacks

were delivered by the Wellingtons and several U-Boats were sunk. Sufficient aircraft were now available to enable an "unclimbable fence" of patrols to be mounted across the U-Boats' path through the Bay. It was essential for the U-Boats to spend some three hours per day on the surface—and by maintaining constant patrols throughout the day and night, aircraft made it difficult for the U-Boats to reach their patrol areas. The enemy changed his tactics and once again the U-Boats appeared surfaced by day. With their new and formidable anti-aircraft armament, they began to stay up and fight it out with the aircraft. Moreover the enemy was maintaining his intensive fighter patrols and clashes with our aircraft were frequent. It is fitting to mention here the memorable occasion in June, 1943, when a Sunderland of 461 Squadron was attacked by eight Ju.88s. The flying boat gave an excellent account of itself, and, although badly damaged, returned to base with a claim of three Ju.88s destroyed, one probably destroyed, and four damaged. After a few weeks it became obvious that it would take more than flak to keep the U-Boats safe from the devastating effects of Coastal Command's depth charges. So the enemy started to send his U-Boats across the Bay in groups hoping that cross fire from two or more U-Boats could be brought to bear on an attacking aircraft. Some casualties were suffered, but the surfaced U-Boat remained a target very vulnerable to aircraft depth charges; the enemy's losses mounted and in May, 1943, 30 U-Boats were sunk, mostly by aircraft. The doom of the "fight it out on the surface by day" tactic was sealed in July, when, of a group of three U-Boats fighting back on the surface, two were sunk by aircraft depth charges. Surface craft, co-operating with aircraft in the Bay for the first time, were called to the scene and the third U-Boat was killed. The last of the day-time surfaced U-Boats was seen in the Bay during the first few days of August, and on August 4 the enemy paid just tribute to us when he admitted over the German radio that "the enemy defence . . . has got the better of us."

But the Hun was not beaten. He maintained his fighter patrols; he designed a search receiver to detect our 10-cm. A.S.V., and he anticipated our change to 3-cm. equipment by designing a receiver to work on that wavelength as well. He fitted his U-Boats with Radar and he kept his U-Boat fleet at sea, for he knew that the schnorkel would soon be ready for use, and that, shortly afterwards, his newer and better types of prefabricated U-Boat would be ready for operations. Thus U-Boats entered an ultra-cautious phase: self-preservation was their aim until, when the new equipment was ready, they could return to the struggle in renewed earnest.

In the autumn of 1943 one of his secret weapons was ready. He tried to stage a come-back using acoustic torpedoes. Naturally he scored some successes, but the real threat came in October, 1943, when a convoy battle on the old familiar lines was fought. The success might have been complete but for the fact that, for some unexplained reason, the enemy chose to attack a convoy which was well within range of our V.L.R. Liberators based in Iceland. During the fourteen days before the Germans gave up the struggle, 10 U-Boats were sunk and the convoy escaped with the loss of two ships.

During 1943 the British planning staffs were not idle—the invasion of Europe would soon be possible and it was essential that supplies coming from America should not be interrupted. Political moves were made, and, before the year was over, Coastal Command squadrons were based in the Azores, thus completing the air cover in the Atlantic. New weapons were still being developed by the Allies, and, in the early summer of 1943, the rocket projectile was first used against U-Boats. This new acquisition was responsible for the destruction of several U-Boats and helped to maintain the advantage already won. At about the same time, several Mosquitos were fitted with a quick firing 6-pdr. gun. The aircraft were used to attack surfaced U-Boats close to the west coast of France. This was not a decisive weapon but was able to administer several nasty shocks to the U-Boat crews and at least one U-Boat was sunk by 6-pdr. shells.

The U-Boat Forced Under

By the spring of 1944, preparations for the invasion of the Continent were well advanced. Doenitz had failed to stop the convoys of men, arms and material reaching Britain. His task now was to stop the assault on the much-vaunted "West Wall." U-Boats were withdrawn from operations and assembled in the French Atlantic ports in readiness to strike at the shipping which would have to be used for the build-up of the Allied beachhead. Manufacture of schnorkels was now in progress, and most of the U-Boats which were to combat the invasion were fitted with this device, which the enemy hoped would give them relief from constant harrying by aircraft.

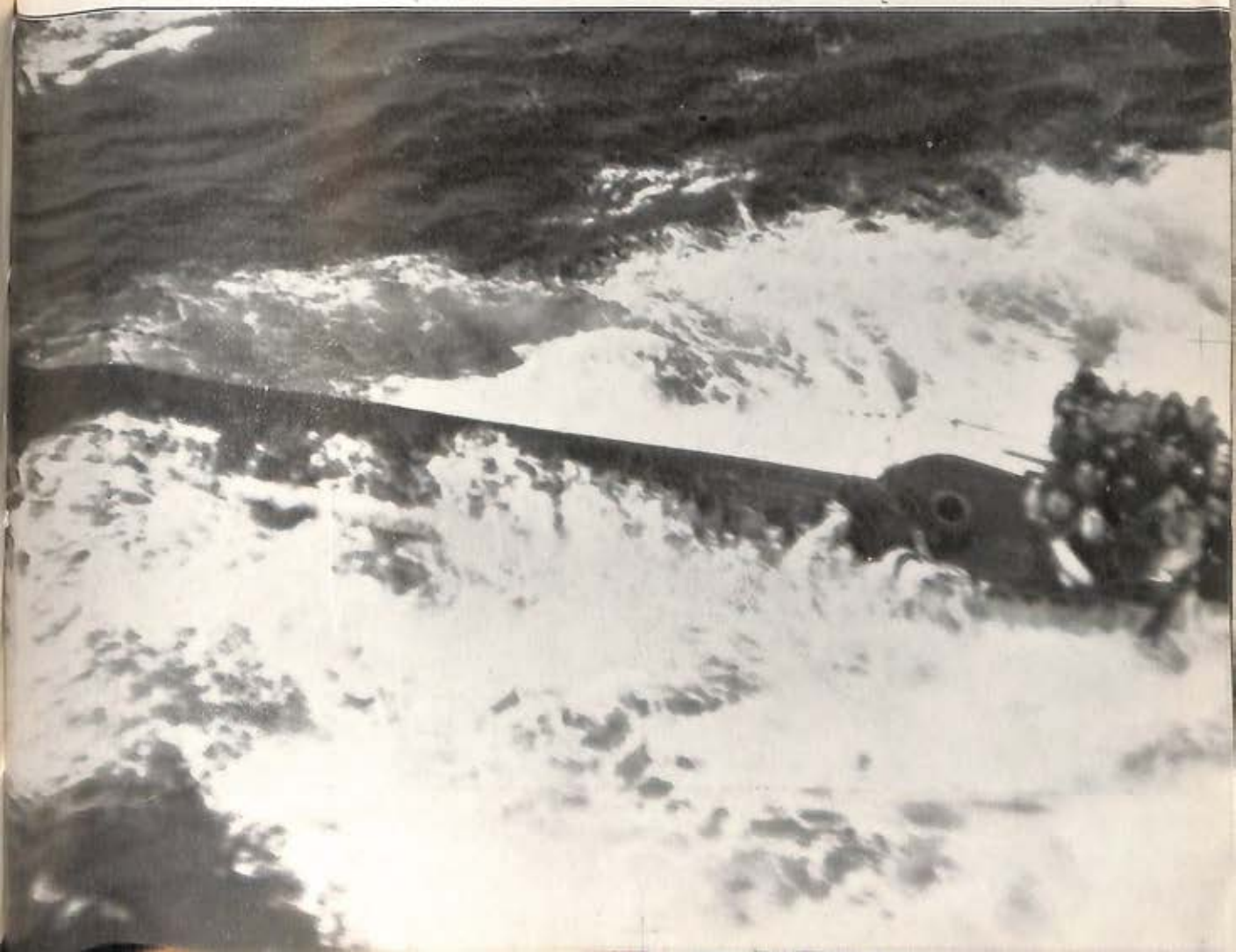
As soon as it became evident that the U-Boats were massing in harbour to wait for the invasion, the opportunity was taken to reduce the operational tasks of the anti U-Boat squadrons. The extra flying time which became available was used for training so that, when D Day came, full advantage could be taken of the opportunity finally to defeat the U-Boats.

The battle started in May when boats from Norwegian waters began their journey to reinforce the Biscay ports for the attack on our invading ships. But very few got through; the battle ranged from Scotland to the Arctic and well into the Atlantic; Coastal aircraft were able to claim 17 U-Boats sunk and 11 damaged. Thus a depleted U-Boat fleet was left to execute the plan to attack the invasion traffic. As soon as the invasion had started the enemy ordered his U-Boats to sea, and the battle flared up in real earnest. Coastal Command was ready, and within five days the Hun had lost six U-Boats sunk with five seriously damaged. The enemy adopted his old tactics of fighting back on the surface with results similar to those experienced in 1943 when the same tactics were used. Coastal lost several aircraft and valuable crews but the U-Boat fleet once more took a severe beating. The hectic few days after D Day produced one of the outstanding achievements of the war when a Liberator of 224 Squadron made night attacks on two U-Boats, sinking both within half an hour. After the first week of the invasion the enemy abandoned his ideas of staying on the surface and the all-schnorkel era had begun. But the beach-head was secure and the U-Boat fleet badly mauled.



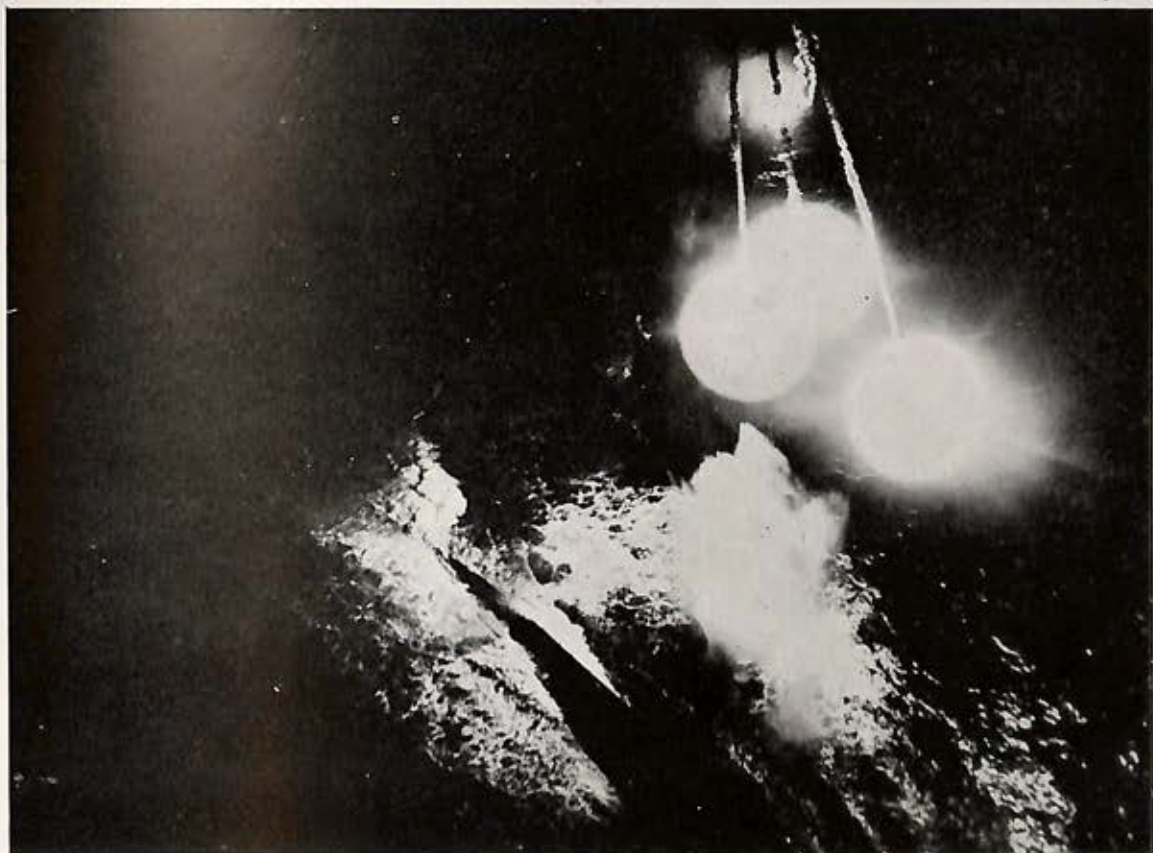
PLATE 5

U-Boat attacked by Z/86 and T/120 on October 8, 1943. The top photograph shows a large part of the crew in the conning tower, with the German naval ensign hoisted. In the lower photograph the after gun position is seen empty, the gun having been broken from the deck by explosions.

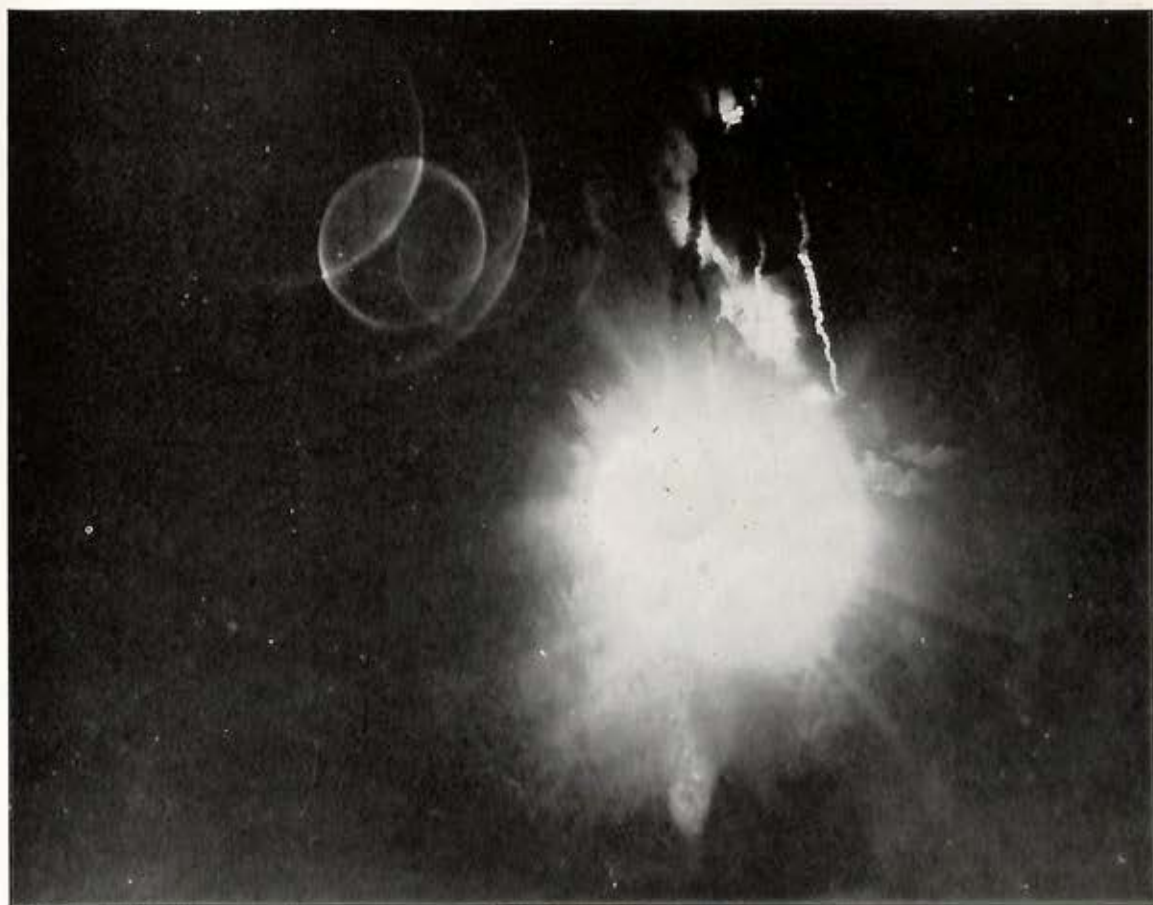


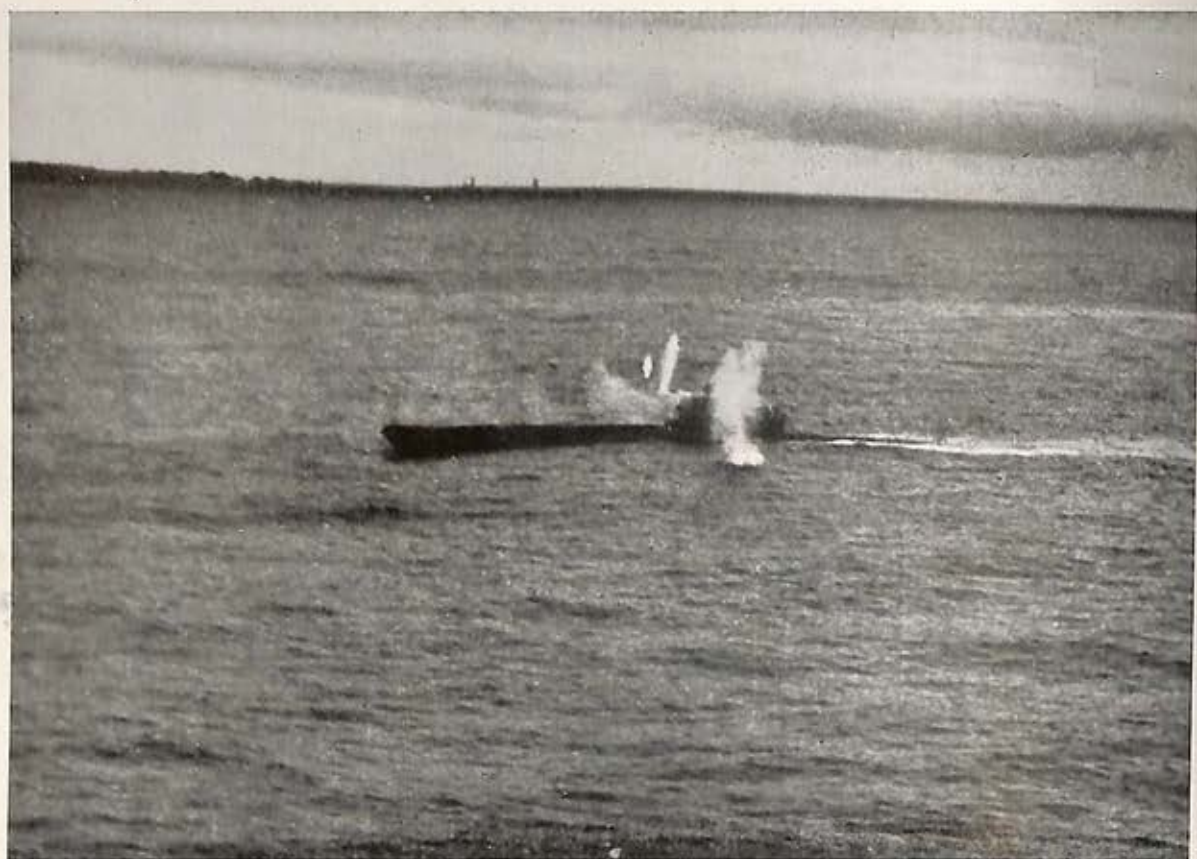


The crew of the U-Boat attacked by U/422 (R.C.A.F.) scramble to get clear of their sinking ship. The fine definition of this photograph is due to the rearward-facing F.24 camera, which is now fitted to Sunderland aircraft. The attack was made on March 10, 1944.



These remarkable photographs were taken by the light of 1.7" flares during an attack by Sunderland S/201 on June 7, 1944. Examination of the two photographs shows that the depth charges straddled and that the U-Boat was probably sunk. The chances of all conditions being favourable for getting pictures such as these are very small indeed and may not occur again for a long time.





These photographs are of a U-Boat attacked off Ushant on June 10, 1944, first by four Mosquitos of 248 Squadron and then by Liberator K/206. The U-Boat was sunk. The upper picture shows the Mosquito attack and the lower is of particular interest as it is the first photograph taken which shows a U-Boat's Radar aerial erect and out of its housing on the port side of the conning tower.

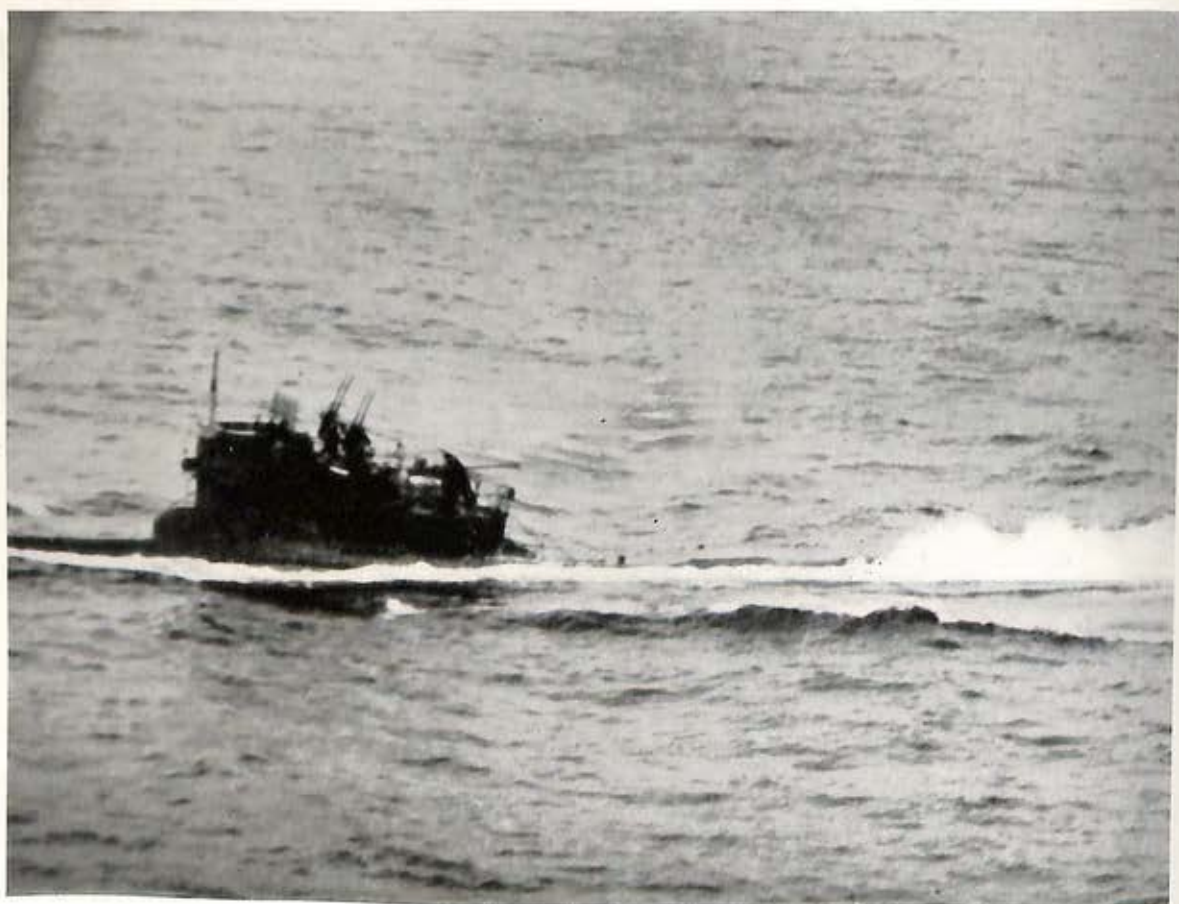




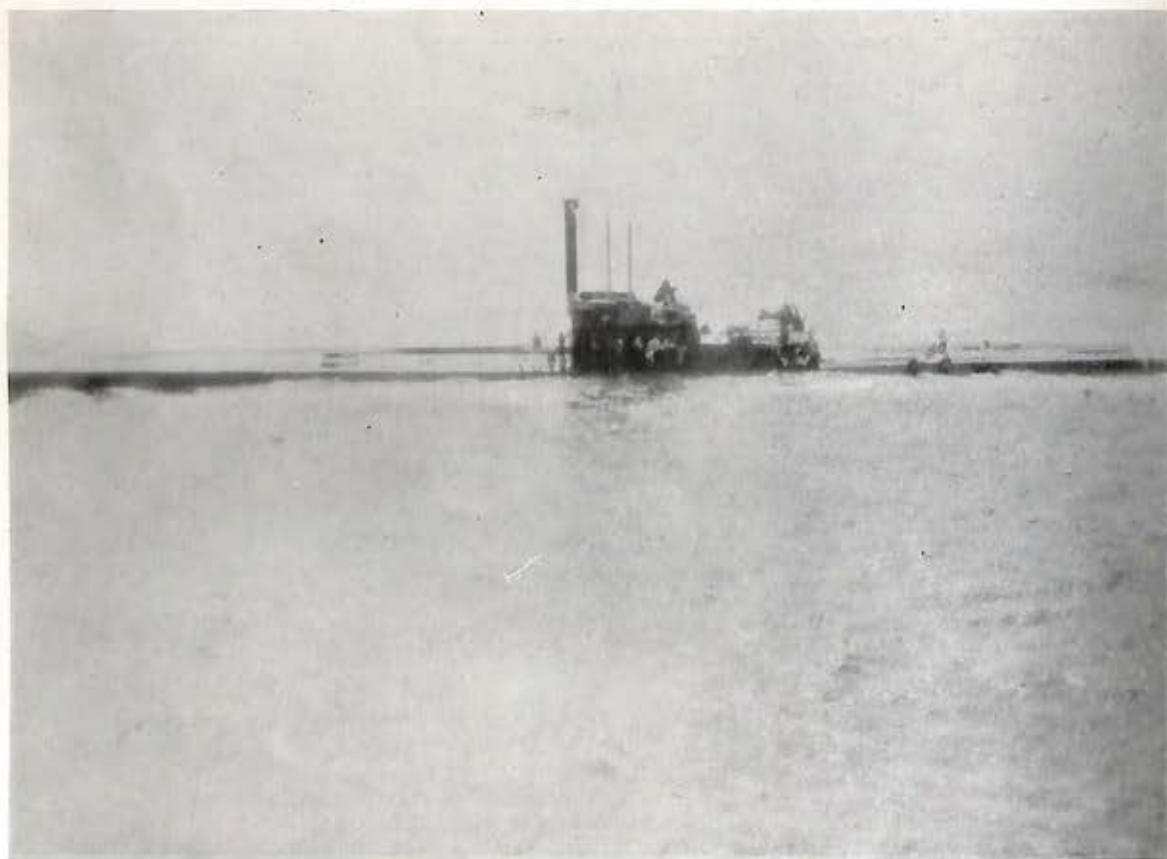
PLATE 9

On July 8, 1944, a 740-ton U-Boat was sunk by H/10 (R.A.A.F.) in position $47^{\circ} 06' N.$, $06^{\circ} 40' W.$ K/10 and T/105 (U.S.N.) also took part in the action. The upper picture was taken by H/10 during the attack and the lower, which shows the German survivors in the water, was taken by T/105.





This type IXC (740-ton) U-Boat, U.1229, was sunk by aircraft from U.S.S. Bogue on August 20, 1944. After the first attack the U-Boat crash-dived and then raised her schnorkel in an attempt to proceed at schnorkel depth. When this was found to be impossible, the boat surfaced with her schnorkel and periscope still extended. It is to be noted that in this class of U-Boat the schnorkel is on the starboard side, whereas the 500-ton U-Boats have their schnorkels on the port side.



The Final Phase

Once the invasion beaches were secure, it became Coastal's job to protect shipping until victory was finally won. It was not an easy task. The schnorkel was an accomplished fact and the days of the straightforward surface fight were gone. It was likely to be most difficult to detect the schnorkel at all, while the problem of attack would be much more difficult than in pre-schnorkel days. And to complicate the problem still further, it was known that the prefabricated U-Boats with high submerged speed were being completed in ever increasing numbers.

The enemy kept up his offensive with schnorkel-fitted U-Boats which managed to sink a few ships in waters close to our coasts. All available aircraft were employed to hunt the schnorkellers and some successes were obtained. The number of kills was somewhat disappointing, but as few ships were sunk, the many hours of flying without the consolation of a sighting were not wasted.

With the reduced opportunities to kill U-Boats, Coastal began to look farther afield. During 1945 there were a number of anti U-Boat sorties in the Skagerrak, Kattegat and Western Baltic. Liberators by night and rocket-fitted Mosquitos and Beaufighters by day carried the war right to the U-Boat's home waters. Numerous attacks were made, some of them on the new type U-Boats which were proceeding to Norwegian ports prior to setting out on operations. The outstanding effort in these sorties was the attack by a Mosquito strike wing which resulted in the sinking of three U-Boats in a single strike in the Kattegat.

In the final days of the war the last real action was seen when U-Boats began to evacuate North German ports and run for Norway. Many attacks were made—but owing to the complete confusion in Germany it has been impossible to obtain full details of results. After the cease fire, anti U-Boat patrols were continued until it was reasonably certain that no more U-Boats were operating against our shipping. The last patrol was flown by a Sunderland of 201 Squadron which landed at its base early on June 4, 1945.

Conclusion

After hostilities ceased, officers from H.Q.C.C. visited the German U-Boat staff in their headquarters at Flensburg and learned of the high opinion of Coastal Command aircraft held by the average U-Boat captain. The U-Boat staff stated that, of the air opposition they had encountered, Coastal Command was by far the most effective. When questioned about the aspect of our operations which impressed them most, the Germans agreed that the efficiency of our air/sea co-operation was uncanny. It would seem that it was almost an everyday occurrence for a U-Boat to dive on sighting a Coastal Command aircraft, and then some hours later, for surface craft to arrive and start hunting.

The aircraft of Coastal Command accounted for 184 U-Boats sunk, and shared in the sinking of a further 21. No less than 285 U-Boats were assessed as damaged as the result of attack by our aircraft. Coastal Command can be justly proud of its achievements in holding the U-Boat menace.

U-BOATS SUNK AND DAMAGED BY COASTAL COMMAND AIRCRAFT—3rd September, 1939 to 8th May, 1945

Notes.—(1) This table must still be regarded as provisional and subject to alteration. As further information is received following on the occupation of Germany many past assessments will require review, some to be upgraded and others possibly downgraded. It will, therefore, be some months before final figures are available. The results set out below embody assessments received up to 11th July, 1945.

(2) Assessments shared with Naval and other forces are shown separately in brackets and are not included in the main totals.

(3) The table covers both German and Italian U-Boats. The figures include assessments scored by aircraft of the United States, of the Fleet Air Arm, and of Bomber and Fighter Commands while operating with Coastal Command from bases in the United Kingdom, Iceland, Gibraltar and Azores. Results scored by U.S. Moroccan Sea Frontier aircraft from bases in North Africa are excluded.

Date.	Sunk.	Probably Sunk.	Damaged "A."	Damaged "B."	Slight Damage.	Number Sighted.	Number Attacked.
1939							
September ..	—	—	— (1)	2	2	35	27
October ..	—	—	—	—	2	14	10
November ..	—	—	—	—	1	6	6
December ..	—	—	—	—	1	9	6
	— } 0	— } 0	— (1) } (1)	2 } 2	2 } 6	35 } 64	27 } 49
1940							
January ..	(1)	—	— (1)	—	—	6	3
February ..	—	—	—	—	—	19	12
March ..	—	—	—	—	—	8	6
April ..	—	—	—	—	—	19	12
May ..	—	—	—	—	—	13	4
June ..	—	—	—	—	—	19	15
July ..	(1)	—	— 1 (1)	—	— (1)	9	8
August ..	—	—	—	—	—	15	14
September ..	—	—	—	—	—	9	8
October ..	—	—	—	—	—	9	7
November ..	—	—	—	—	—	5	3
December ..	—	—	—	—	—	4	4
	— (1) } (2)	— } 0	— (1) } 1 (1)	— } 2	— } 4 (1)	6 } 135	3 } 96
1941							
January ..	—	1	—	(1)	—	4	2
February ..	—	—	—	—	—	4	3
March ..	—	—	—	—	—	7	4
April ..	—	—	—	—	—	7	4
May ..	—	—	—	—	—	12	8
June ..	—	—	—	—	—	25	17
July ..	—	—	— 1	—	—	13	8
August ..	1 (1)	—	—	—	—	37	29
September ..	—	—	—	—	—	40	37
October ..	— (1)	—	—	—	—	24	22
November ..	—	—	—	—	—	11	10
December ..	— 1	—	—	—	—	34	20
	— } 2 (2)	— } 2	— } 1	— } 18 (1)	— } 25	4 } 218	2 } 164

II—ANTI-SHIPPING

Coastal Command's Offensive against Enemy Shipping during the European War

In reviewing the offensive against shipping by this Command so soon after the end of the War, it is difficult to get the story into a right perspective. Many who have taken part in these operations will quarrel with the emphasis and with the omissions which are inevitable in so short an account of such a great undertaking. History alone will pick out the true highlights of the battle.

The German Fleet

So far as aircraft specially equipped for attacking armoured ships were concerned, the Command began the War modestly, with two torpedo squadrons using Vildebeests, saved jealously for an engagement with the German fleet units which, perhaps fortunately, did not then see fit to try the issue with them. The first real encounter did not come until June, 1940, when H.M.S. *Glorious* evacuating R.A.F. and Army units of the Norwegian Expeditionary Force was engaged and sunk by a German squadron including *Scharnhorst* and 8 in. gun cruisers, which put into Trondheim after the action. Here a cruiser of the *Hipper* class was bombed and hit with 250 lb. S.A.P. from 15,000 feet by a formation of 12 Coastal Command Hudsons. The German squadron found Trondheim too hot and within a week had sailed for the Baltic. They were intercepted on passage, and 17 aircraft including Hudsons and nine Beauforts, with which the torpedo squadrons had been re-equipped, attacked. This time four hits with 500 lb. S.A.P. were claimed, but nevertheless the ships steamed on into the Baltic. As the winter nights closed in first *Hipper*, then *Scharnhorst* and *Gneisenau* broke out from Norway and after raiding commerce in the Atlantic put back into Brest. There, throughout the summer of 1941, they were bombed again and again by Bomber Command, and Coastal took a hand, ill suited as their aircraft were, for this work. Then it was that Flying Officer Campbell of No. 22 Squadron torpedoed *Scharnhorst* in port and won, posthumously, his V.C.

In June, 1941, *Lutzow* set out from the Kattegat as though to join forces with the ships in Brest, but she was intercepted and attacked by three Beauforts. One torpedo found its mark, and she turned for home damaged.

Throughout the autumn work on the ships in Brest continued, and they were ready by the New Year.

In February, 1942, under a lowering sky *Scharnhorst*, *Gneisenau* and *Prinz Eugen* which had by then joined them in Brest, made their famous passage through the Channel. In the

rain and low cloud of this winter day F.A.A. Swordfish and Beauforts went in to make their gallant but unavailing torpedo attacks. Though the ships got back to Germany they never again tried the hazards of the Channel.

Later in the same year the *Tirpitz*, whose sister ship, the *Bismarck*, had been sunk by the Royal Navy as a direct result of air reconnaissance in the mid-Atlantic, crept up to the extreme north, where she lay threatening the Russian convoys beyond the range of British aircraft. To challenge her, two squadrons of torpedo Hampdens were flown to North Russia in the late summer of 1942, but with their arrival the *Tirpitz* skulked in the protection of the cliffs of Alten Fjord, immune from their attack.

From that date until the end of the War there followed a series of furtive moves through the Norwegian leads. The German ships were careful to take every advantage of the difficulty of the coastline, of darkness, and of the foulest weather. From time to time they sallied out against the Russian convoys far beyond the range of shore-based aircraft, only to be attacked by the Royal Navy; but in the south of Norway, although our strikes went out after them again and again as they emerged from the leads for a few brief hours on their way to or from Germany, they were not again brought to action by Coastal Command aircraft. Though we could not suspect it at the time, and it was often necessary for the strike wings to stand at readiness through long and anxious hours during the remaining war years, our attacks against the German fleet ended in 1942.

The combined strike wings, which later in the War so completely mastered the enemy's merchant fleet, came into being in 1943, too late to contest the issue—or it may be that, because of the creation of these wings, the enemy never again came out in the open to put the matter to the test.

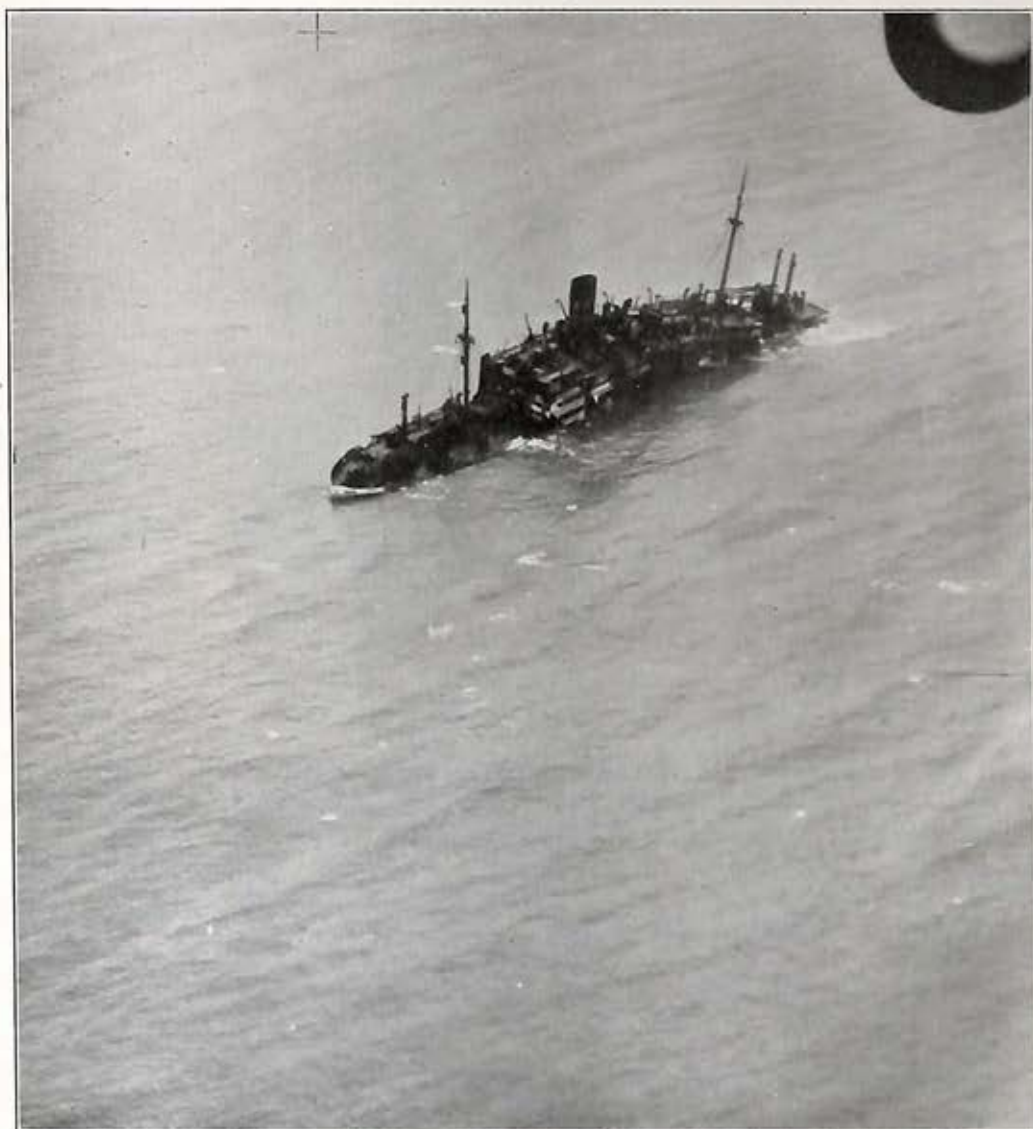
It was Bomber Command's turn, and in a few brisk raids—using their new bombs and their new technique—they accounted for all but two of the remaining ships in dock or at anchor during the last six months of the War.

The Offensive against Merchant Shipping

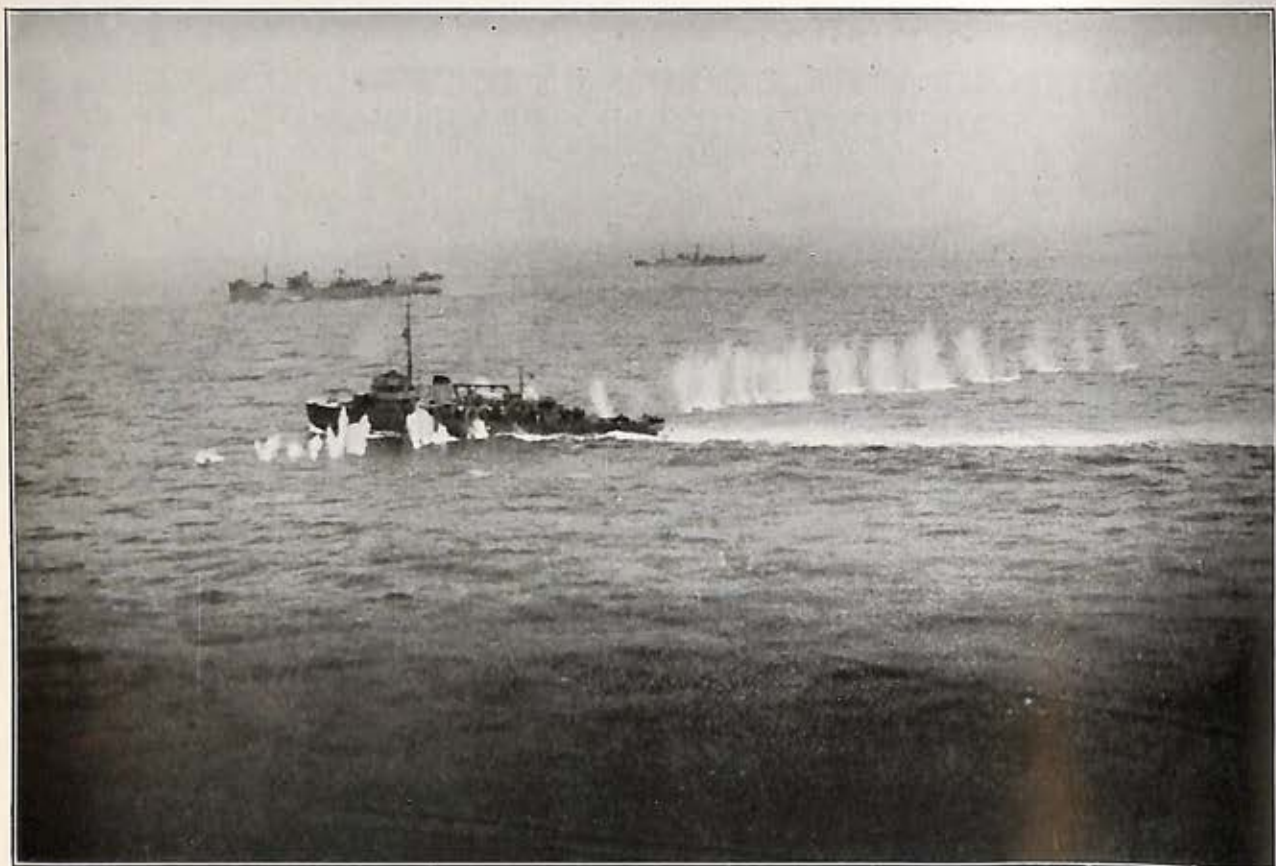
There can be no doubt that however important our defensive operations against the German Navy may have been, the results of our attacks against merchant shipping were materially very much greater. Here we were on the offensive, and could attack wherever results were likely to inflict the greatest harm upon the enemy.

It seems hard to realize now that in 1939 and during the first five months of 1940 the attack

PHOTOGRAPHS OF SOME SHIPPING STRIKES DURING THE EUROPEAN WAR



The wreck of the German liner *Madrid*. Bombed off IJmuiden by Beauforts on December 12, 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.



These two photographs show the attack made by 143, 236 and 254 (Beaufighter) Squadrons, on an escorted convoy off Texel on April 18, 1943. The above shows an 'M' class minesweeper under cannon fire.



This photograph, taken after the principal ship of the convoy had been hit by a torpedo, clearly shows the disposition of the ships. Balloons are flying and in the foreground are the sweeps from the 'M' class minesweeper which was leading the column.

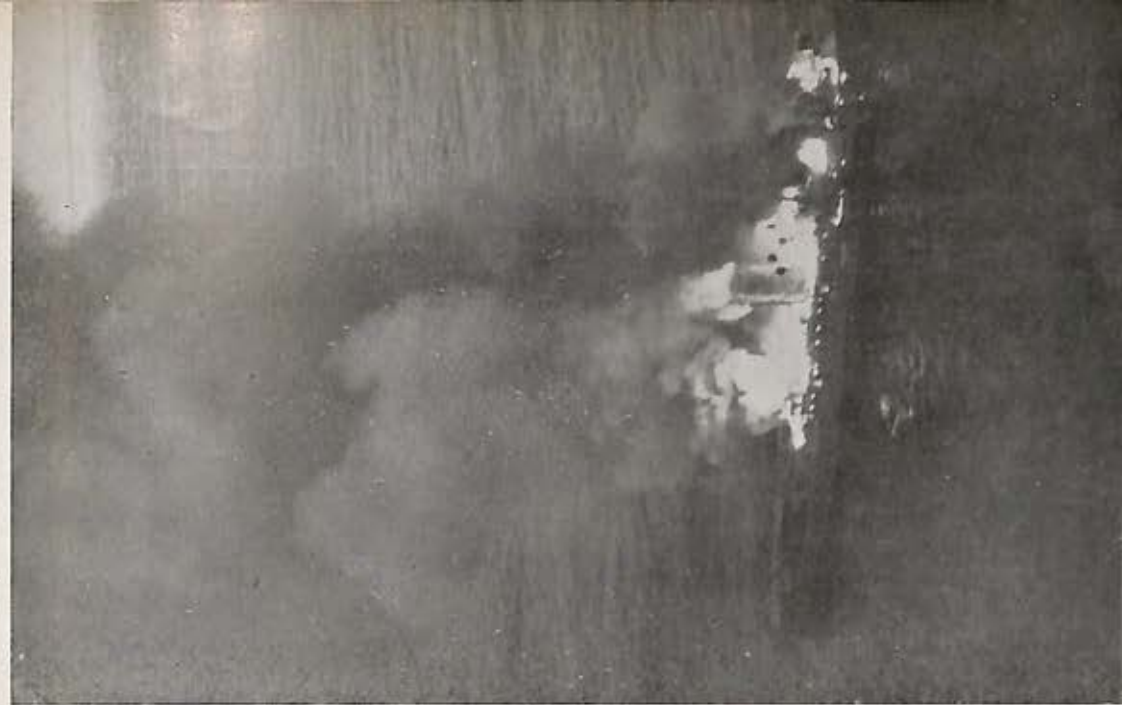


PLATE 13

Three stages in the destruction of the German blockade runner *Alsterufer* (2,700 tons) on December 27, 1943. The photograph on the left, taken by 311 Squadron, shows the huge explosion which followed the bomb hit, and in the centre photograph (taken by 86 Squadron) the fire is seen on the after part of the ship. 502 Squadron's photograph on the right shows the German still further on the way to destruction. She is lower in the water, her superstructure is burnt away, and the funnel is white hot. Although it is not known what cargo she was carrying, her speed suggests that it was both urgent and valuable.



Attack by North Coates wing on enemy convoy off the Dutch coast on June 27, 1943, using R.P. for the first time. It will also appear from the lower photograph that a similar weapon was being used by the enemy, from the bow of the nearest escort vessel.



of merchant ships by aircraft was taboo—the Hague Convention forbade it—so the G.R. squadrons were used for shipping reconnaissance, reporting what they saw to the Royal Navy who alone could carry into effect the rules of "Visit and Search."

In April, 1940, the enemy struck. The German armies were launched against Norway and swept south-westward down the Channel coast, cornering the British at Dunkirk. As the Stukas pounded the re-embarkation Coastal Command Ansons, Hudsons and Blenheims flew above the beaches trying for the Ju.87's, and acquitting themselves not without distinction. By July the Luftwaffe had opened the battle of Britain with air attacks against our coastal merchant shipping—the gloves were off, and shipping was free for all.

Times were desperate; the enemy might use anything which could float to invade us. Coastal Command, as well as reconnoitring the invasion ports by day and by night began, with 2 Group of Bomber Command, a bloody assault upon the enemy's shipping. Limited though our resources were, this was not the time to count the casualties; mast-height attacks by Hudsons, Blenheims and Beauforts became the order of the day. Their success, considering how few they were, was very striking, and though the early records are scanty, we know that during the last ten months of 1941 more than one hundred thousand tons of merchant shipping went down to the attacks of Coastal Command aircraft, and over quarter of a million tons were damaged in the 16 Group area alone.

From an analysis of these operations it seems that in no less than one attack in five the bombs hit their target. Considering the flak and the enemy's strong fighter escorts to his merchant shipping, the results alone prove the high standard of morale of those squadrons engaged in this desperate work.

But not all attacks were at mast height, and not all were made by day. For a time the enemy's harbours were attacked by our aircraft. One cannot let this phase of the War pass without mentioning that famous night when six Hudsons went to Aalesund and sank two ships with bombs, seriously damaged two more, and hit another two. As the casualties rose, so did the height of our attack, until in July, 1942, 4,000 feet was the average, but even so our losses still mounted, while the threat of invasion decreased. Now the U-Boat war grew more menacing in the Atlantic and the Hudsons, after eighteen months of sterling work, were no longer a match for a more strongly armed enemy. Accordingly they were diverted to anti U-Boat operations.

During 1941 the Beauforts' crews, held in readiness for the main Fleet units, kept their hands in by attacking merchant shipping from the Norwegian coast to the Bay of Biscay. They went in small numbers, without escort, and flew in the face of considerable opposition. Here, too, the casualty rate was high—almost as high as for low level bombing.

In 1942 four Hampden squadrons were made available from Bomber Command. These carried torpedoes or bombs and, by stealth, under the cover of darkness or low cloud operated close in-shore with considerable success.

At this point it seems appropriate to mention a type of operation quite distinct from the main assault of coastal shipping, but nevertheless one of considerable importance. In the winter months of 1942 and 1943 the Command was called upon to counter enemy merchant cruisers used for blockade running which carried valuable cargoes between the Far East and Bordeaux. Individual attacks were made against these ships by heavy aircraft operating far out in the Atlantic, but with the exception of a brilliant success by the Czechoslovak crew of a Liberator, direct air action by single aircraft proved ineffective. However, aircraft played a vitally important part by reconnaissance and by shadowing, so that many of these ships were brought to action by the Royal Navy. In this way the blockade runners were dealt with so effectively that few of them ever reached France.

The opening months of 1943 saw the introduction of the torpedo-carrying Beaufighter. At the same time improvements to the torpedo allowed the speed of this aircraft to be exploited in the attack and this, together with the fixed cannons which this aircraft carried, and later the introduction of the rocket, led the way for the development of strike wing tactics. At long last we had the equipment and a promise of the numbers necessary to allow that concentration of fire power which every strike pilot knew to be essential for success against German convoys in daylight.

These first wings were formed with one squadron of Beaufighters carrying torpedoes as the main weapon, the other squadrons, armed with cannon and later with rockets, providing covering fire to smother the enemy's flak. The wing worked on the principle that up to twelve aircraft should carry torpedoes depending upon the composition of the convoy, and that three anti-flak aircraft were necessary to deal effectively with each escorting vessel. In addition, when operations took place within range of our single-engine fighters, the striking force was covered by Spitfires which, in the short time necessary for the strike, were able to establish local air superiority. For long range strikes Beaufighters were used as air escort until Mustangs became available.

After training was completed these tactics met with immediate success, the month of April, 1943, showed thirty-five thousand tons sunk, by July this had effectively closed the port of Rotterdam. But the strike wings had still to go through many vicissitudes. In the early summer of that year the offensive in the Bay against the U-Boat drew German long range fighters into the area, and it became necessary to divert some of the Beaufighter squadrons to protect the 19 Group "heavies." The strike wings suffered accordingly.

But with the Invasion, 1944, the anti-shipping offensive grew in strength once more. The concentration of our forces in the south to protect the invasion fleets, which we will discuss later, allowed the strike wings, when they were not required in the Channel, to combine. On June 15 more than sixty Beaufighters armed with torpedoes, rockets and cannon flew together in the first Combined Wing Strike against a large convoy off the Dutch coast. Although eighteen escort vessels attempted to protect a valuable 8,000-ton merchant vessel and a 4,000-ton naval auxiliary

both these ships were sunk without the loss of a single aircraft. This operation was the pattern for many such strikes during the following months, and it showed what could be done by torpedo aircraft in open water when they were provided with an adequate anti-flak force.

In August a Beaufighter wing using rockets as the main weapon was formed in Cornwall to deal with the remnants of the enemy naval forces in the Biscay ports and anchorages. Two destroyers and two large sperrbrechers went down in a few minutes under a hail of fire, which established once and for all that the rocket would sink this class of warship. The results were particularly valuable because of the task ahead, when shipping would have to be hunted relentlessly through Norwegian leads and in waters where torpedo work is impossible.

By September the campaign had shifted eastwards in the wake of the Allied armies. So effective had the wing strikes become that the enemy had been driven from the Dutch coast by day and the port of Rotterdam remained closed to merchant shipping. No. 16 Group tried every ruse to get at the enemy shipping, which now only dared to move by night. On one occasion 70 aircraft penetrated the heavily defended anchorage of Den Helder to attack a variety of naval auxiliaries lying at anchor. Then it was that the "Drem" system was devised, which enabled a big strike force to fly out individually to the patrol area in the darkness and to form up at first light round a circle of flame floats. This meant that the wings appeared on the enemy shipping route before dawn, but targets remained scarce. The "Outrider" system was developed, later to be brilliantly exploited by the Norwegian Mosquitos. These "Outriders," usually two in number, flew ahead of the main striking force and guided it to its target by VHF/RT.

With the autumn, 16 Group's success had been so complete that it was possible to leave only two day strike squadrons to guard the southern North Sea and to concentrate the remaining seven in Scotland. It was our aim to disrupt and paralyse the German Norwegian shipping which, since Sweden and Finland had closed their ports to the enemy, offered the only route by which the Reich could obtain certain ores and other raw materials essential to her flagging war effort. Moreover, by cutting the convoy route between Oslo and Denmark, it would be possible to prevent the German troops in Norway moving south to take their part in the European battle.

At this time rockets were first fitted to the Mosquitos, and it became possible to form two strike wings, one of Mosquitos at Banff, the other equipped with Beaufighters at Dallachy. Because Norwegian waters are unsuitable for torpedo work, the rocket became the main weapon. Success came quickly. More ships were sunk in the short daylight hours of December than ever before in one month on the Norwegian coast.

It must not be thought that Norway was undefended by the enemy. There his single-engine fighter squadrons were both active and of high morale, interceptions were frequent, and on one occasion over 40 aircraft attacked a "strike." But by now, the Mustang with its long range gave fighter cover to our operations, and though casualties were sometimes severe the wings were never prevented from reaching their targets.

This complete ascendancy in daylight had, when the Norwegian offensive began, no counterpart by night, but it soon became obvious that the technique developed by the two Halifax squadrons in the Bay of Biscay could be used to advantage, particularly in the open waters of the Kattegat. These two squadrons trained intensively for the anti-shipping night attack, and using a combination of Radar and flares, brought their bombing to a standard which, during the last six months of the War, sank more than 25,000 tons and damaged over 100,000.

By day the coastal shipping now lay in landlocked fjords and in small defended anchorages, but even there the strike wings sought them out and some of the most spectacular photographs of the War prove how well the crews dealt with them in these precipitous retreats.

In March, 1945, long range drop tanks became available for the Mosquito wing, and for the first time it was possible to strike in the Kattegat by day. Here, in addition to merchant convoys, groups of U-Boats sailing on the surface, owing to the mines which had been laid by Bomber Command, were attacked by the full strength of the wing. The tactics which had proved so deadly against heavily escorted merchant convoys found no difficulty with this more weakly defended target, and the Mosquitos scored many successes.

Then came the climax: in the last week of the War, as the German forces fled for Norway and the North Danish ports in every kind of craft, all the strike wings were thrown in against them; the Beaufighters refuelling in western Germany and the Mosquitos working from their own base at Banff flew more than 200 sorties a day, inflicting terrible damage on every kind of ship crowded with troops in that final debacle of the German armed forces.

What was the measure of our success? Between March 1, 1941, when the Enemy Shipping Losses Assessment Committee started, and the end of the war in Europe, 478,944 tons of merchant shipping were sunk, 297,151 tons seriously damaged, and 804,810 tons damaged by Coastal Command, for the loss of rather less than one thousand aircraft in the face of the enemy. But the full effect of these attacks cannot be told in terms of the tonnage sunk or damaged. The delay to his sea communications became insupportable. The enemy suffered one of the most crushing defeats of the War.

Operations against the Little Ships of the German Navy

The German Navy had, at the expense of their armoured ships, concentrated upon destroyers, heavily armed minesweepers, escort vessels, E-Boats and R-Boats. In particular they built a considerable fleet of fast coastal craft which were employed throughout the war in the Channel area and in the southern North Sea to raid our coastal convoys and to sow mines in the focal areas through which these convoys passed. By the end of 1942 these coastal craft had been so roughly handled by Coastal and Fighter Commands by day that they were operating only by night, and from then on night patrols were flown against them first by Whitleys and Swordfish, later by Wellingtons, Albacores and Beaufighters. In the beginning these patrols acted only as a deterrent, the speed and manoeuvrability of the



PLATE 15 An eastbound enemy convoy consisting of two coasters, escorted by three armed trawlers, and two tugs was attacked off Borkum by Nos. 254, 236 and 143 Squadrons on March 7, 1944, with torpedoes, R.P. and cannon. Both the armed trawlers were set on fire and smoke was issuing from the coasters at the end of the attack. A torpedo hit, not seen on the photograph, was also claimed on another vessel. A small passenger packet, probably a pilot cutter, at anchor nearby, was also beaten up. The top photograph gives a general view of the action, with an armed trawler as the focus of attention. The middle one shows an armed trawler well alight, and the lowest shows the pilot cutter with port lifeboat swung out and hanging from the after fall.





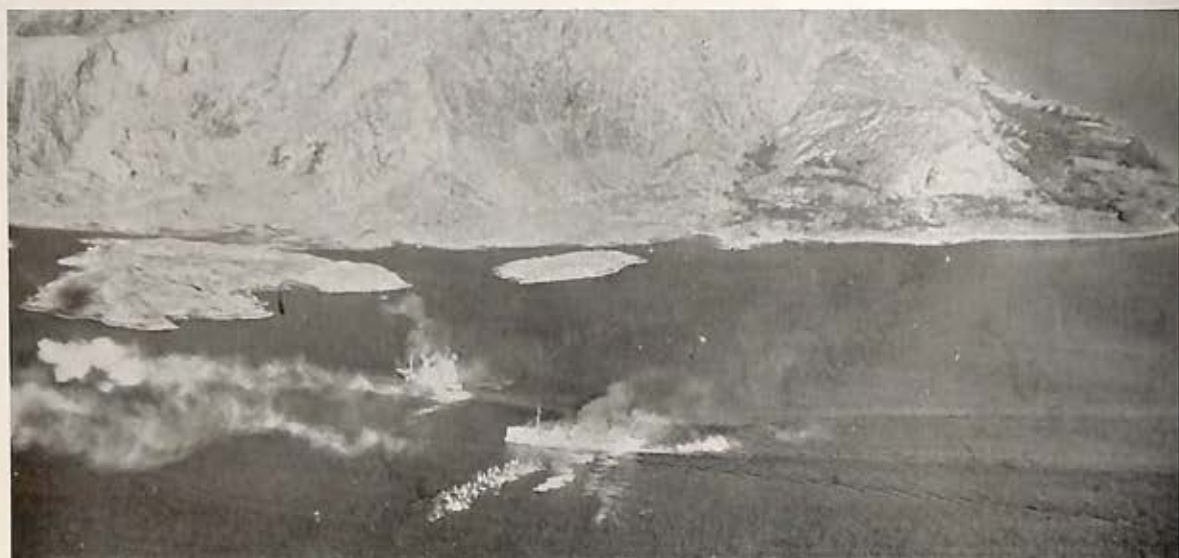
A combined Wing strike was made on June 15, 1944, by 236, 254, 455 (R.A.A.F.) and 489 Squadrons against an eastbound convoy off Schiermonnikoog. The targets were the *Amerskerke* of 8,000 tons and a 4,000-ton vessel which had been modified as an E-boat depot ship. The escort consisted of "M" class minesweepers and R-Boats. Both merchantmen were sunk by torpedo and a minesweeper also blew up and sank. At least four other escorts were damaged. The top photograph shows a heavy attack on a minesweeper, and the lower pictures show respectively the *Amerskerke* and the depot ship on fire. Both these ships were new and on their maiden voyages.



These photographs show the destruction of two sperrbrechers by 236 and 404 Squadrons off Róyan on August 13, 1944.
The *Magdeburg*, 6,128 tons, is seen under heavy attack.

PLATE 17





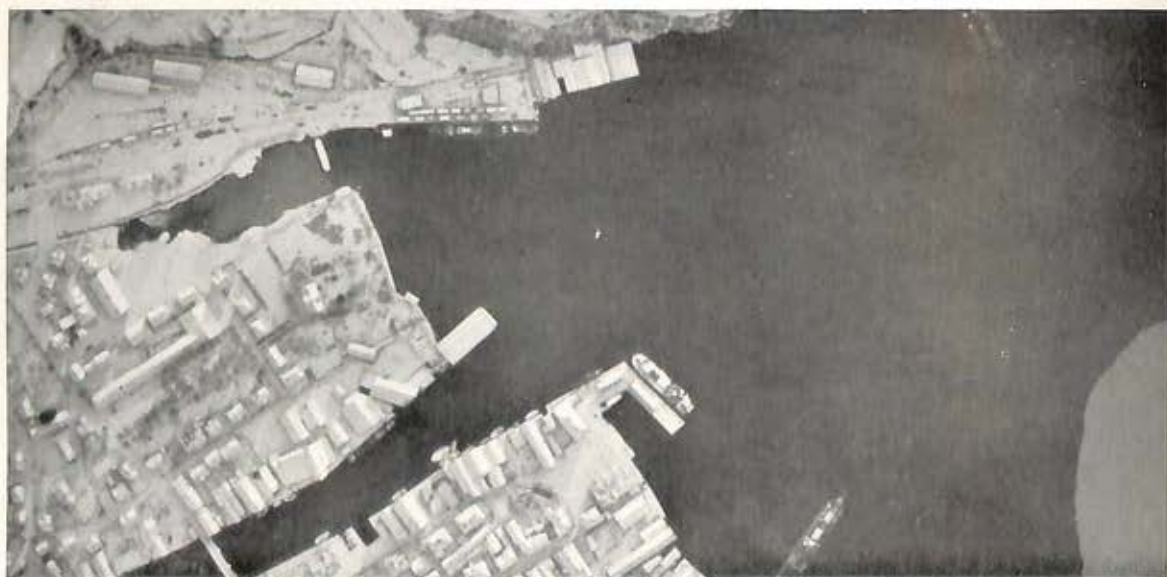
On September 19, 1944, shipping in Stav Fjord was attacked by Beaufighters of Nos. 144 and 404 Squadrons, escorted by Mosquitos of No. 235 Squadron. The targets were a northbound convoy of two ships, the *Lynx*, of 1,367 tons, and an unidentified ship of some 3,500 tons, and a single southbound ship, the *Ursa*, of 958 tons. These photographs illustrate the success of the attack, in which the two larger ships were sunk.



On November 8, 1944, the Dallachy Wing attacked shipping in Midgulen on the Norwegian coast. The above photograph shows the ships lying at anchor.



A heavy R.P. attack on two German ships, *Helga Ferdinand*, 2,566 tons, and *Aquila*, 3,530 tons, both of which were sunk. A smaller vessel, the *Framnes*, 307 tons, was damaged further down the fjord.



On December 31, 1944, the Banff Wing attacked shipping in Flekkefjord harbour with R.P. and cannon. The top photograph gives a general view of the action. The centre photograph shows the attack on two ships alongside the town quay.

In the lower photograph the outer of the two ships, of about 1,500 tons, is seen to have sunk, while the one alongside, of some 2,500 tons, can be seen to have the stern awash up to the centre castle. Still later photographs show that no salvage attempts had been made on this ship, although several weeks had elapsed.

targets making it very difficult to sink them, and by June, 1944, the Germans had built up a force of over 50 E-Boats on the east flank of our coastal convoy route.

In the plans for the invasion it was therefore decided to make the anti-shipping squadrons of Coastal Command responsible for the protection of the great invasion convoys against attacks by E-Boats and whatever minor naval units the enemy might choose to employ. It was decided to use cannon and the 250 lb. bomb fused with an air-burst pistol. Results were to prove the wisdom of this decision, but the tremendously enthusiastic training of all the squadrons concerned during May had a lot to do with their later successes. They devised a shallow dive bombing technique for use by night and brought themselves to a high standard of efficiency.

This battle really started in May, a month before the Invasion. Our aircraft operated in free bombing areas, in the Channel, or under the ground control station at Swingate, in the Dover Strait, or later under control stations located in the assault area which were used to direct our aircraft on to enemy vessels as they put out from Le Havre to attack the huge masses of British shipping at anchor off the Normandy Beachhead. As the enemy reinforced his E-Boat flotillas they were brought under a continuous attack and the work of these squadrons, though it was not spectacular, contributed in no small measure to the defeat of the E-Boat. During June, July and August the Command sank 33 Naval Vessels and damaged 135.

By October the battle had moved to the Scheldt convoy route. A unit of the Command was located in north Belgium and this unit, together with Wellingtons and Beaufighters based in the United Kingdom, had by the spring of 1945 successfully countered a very real threat to the supply of our armies in Europe. Wellingtons using Radar and

VHF/RT were instrumental in bringing the E-Boats to action with our own M.T.B.s.

In the course of the War Coastal Command aircraft sank more than 90 small ships of the German Navy, seriously damaged another 90, and damaged a total of 300.

In the early months of 1945 the Germans concentrated many hundreds of midget submarines on the Dutch coast, and employed them in large numbers to mine and to torpedo our shipping. Here Beaufighters, Wellingtons and Swordfish squadrons distinguished themselves, and by the middle of April this threat had been countered. Over 60 attacks had resulted in at least 17 kills and many more had been damaged.

In Conclusion

Looking back, what have we achieved? Though Bomber Command have to their credit six of the German capital ships, Coastal did at any rate do much to limit their activities by keeping them in port. In defending our own convoy routes, and particularly those which supplied the allied armies in Europe, we countered the night operating E Boat and mastered the midget submarine. But it was in the destruction of merchant shipping that our efforts met with the most marked success. In the strike wing we developed a weapon which, even in the face of strong air opposition, disrupted the whole strategic plan of the enemy's merchant fleet along the European seaboard from Bordeaux in the south to Trondheim in the north, and as far east as Copenhagen.

We are still too near to these events to see clearly their full effect upon the final overthrow of Germany, but the decision of Admiral Doenitz to surrender Norway without firing a shot, when that country was occupied by a large and a well-equipped garrison, allows one to hope that the anti-shipping operations of Coastal Command also played a vital part in shortening the war.

The Anti Midget U-Boat Campaign

During the last year of the war the German Navy, copying British and Italian designs, constructed a fleet of several hundred midget submarines. These they had intended to use against our invasion fleets, but they were not ready in time to affect the Normandy landings, and only came into service during the last five months of the war. They operated in the southern North Sea where they were used with great determination and some effect to lay mines and to torpedo shipping, particularly on the Antwerp convoy route.

From December 28, 1944, to May 11, 1945, aircraft under 16 Group control flew 1,191 sorties involving 3,008 hours on patrol, in operations against Midget U-Boats in the North Sea and Channel areas. Eighty sightings of Midget U-Boats were made, of which 64 were followed by attacks. The total number of "kills,"

according to the official assessment, is 16 sunk and 10 possibly sunk. The 64 attacks, apart from one in January, took place in the period from February 28 to May 3, that is within a period of nine weeks.

Summary of Operations

Patrols by 16 Group aircraft began on December 28, 1944. The first sortie was flown by an Albacore of 119 Squadron, the only type of aircraft available to meet the new commitment. They flew regularly throughout January, 1945, and patrolled inshore from the Hague southward to the Scheldt entrance. It was believed that the one-man Midgets (Bibers) were towed during the first part of the passage to their operational area in the Scheldt. The first sighting of a Midget by 16 Group aircraft was made on January 23, 1945, and was followed up by

an inconclusive attack with six 250-lb. depth charges.

On January 28, Beaufighters of 236 and 254 Squadrons were drawn into the campaign in order to locate the Seehunde (two-man Midget U-Boats) operating from IJmuiden. Seehunde, the best equipped and most cleverly designed of all the Midget types, were first used operationally on January 1, and were considered to have two main operational areas, one off North Foreland and the other along the East Anglian coast between Orfordness and Great Yarmouth. The Beaufighters were employed to fly three box patrols from 14 to 50 miles from the English coast, designed to locate the Seehunde as they were approaching the convoy routes, and another about 20 miles west of IJmuiden to cover probable routes of Seehunde westward.

No great activity was possible on either side during February. The weather was frequently unsuitable for flying, and high seas during the first half of the month prevented small battle units operating in any great strength. Only two sightings were made, both by Beaufighters, and each resulted in attacks, one of which was assessed as probably sunk. According to a prisoner of war an operation by 15 Molch type Midget U-Boats (one-man type larger than the Biber) was carried out towards the end of the month, from which not a single boat returned.

Activity by Midgets appears to have been constant throughout March, due almost certainly to the fact that on only six days during the month was the Sea State greater than force 3. Actual effort increased during the latter half of March, especially along the Thames-Scheldt convoy route. To meet this a new patrol by Beaufighters was laid on close to the Dutch coast between the Hook and the Scheldt. In all, 16 attacks (15 in the new area) were made during March, as a result of which seven Midgets were assessed as sunk and two as possibly sunk.

It was considered that reasonable results were being achieved in detecting the Biber off the Dutch coast but that only limited success was being achieved with Seehunde operating further afield. Furthermore, photographic reconnaissance of IJmuiden showed that a steady build-up of Seehund strength had been taking place there, the total present at the end of March being estimated at 35/40 boats.

More aircraft were made available for anti-Seehund patrols. This was made possible by carrying out anti-Biber patrols off the Hook and the Scheldt only during certain periods prior to high water, believed to be the deciding factor in times of sailings. Accordingly two new box patrols in the North Sea were introduced at the end of March; one, guarding the route from IJmuiden to Yarmouth, was flown by single Beaufighters at periods after dawn and before dusk, and the other, extending from IJmuiden about 60 miles along the route to North Foreland, was covered by single Beaufighters throughout daylight hours.

During the first week of April, Midget operations were hindered by high seas, but from the 7th to the 13th of April they operated in force and 28 sightings and attacks were made by aircraft mostly in the patrol area covering the IJmuiden-North Foreland route. Eight Midgets were

assessed as sunk and three possibly sunk during this period.

During the second week of April the presence of Midgets in the Dungeness area was suspected and later confirmed by attacks on our shipping. As a result of this penetration into an area west of the Dover-Calais line, made by Seehunde with additional fuel tanks, it was decided to provide intensive cover along the east Kent convoy route at dawn and dusk periods. Patrols in this area, flown by Swordfish of 119 Squadron based in Belgium, began on April 12. Later the Swordfish patrol line was continued northward to Great Yarmouth by Barracudas of 810 F.A.A. Squadron.

From an analysis of sightings made during the first two weeks of April, it seemed that Seehunde outward bound for the Dungeness area were sailing along the coast between IJmuiden and the Hague during hours of darkness. Accordingly a detachment of Leigh Light Wellingtons of 407 Squadron was moved to Langham to carry out night patrols from IJmuiden southwards to Overflakkee. 407 Squadron made their first Leigh Light sighting and attack on April 19 with unobserved results. In all seven attacks and three sightings were made by Leigh Light aircraft.

Compared with 38 sightings and attacks by aircraft from the 1st to the 18th of April, only 18 were made from April 19 to May 3, of which only one-third were made in daylight hours. There were three important reasons for this reduction in the number of sightings, in spite of all previous gaps being filled and all likely changed routes being covered. One reason, though not the most important, was the over-cautiousness which was exercised in surfacing during daylight following on the success of the attacks in mid-April. The other two reasons were, firstly, that the Small Battle Units Command had not yet recovered from those losses, and secondly, that their effort had to be further reduced owing to the serious shortage of fuel.

With the exception of the nights of May 2 and 3, Midgets did not again present themselves in force to test the effectiveness of the amended patrols, and the campaign was brought to a close on May 11, three days after "VE" Day.

In Conclusion

The interrogation of a Staff Officer of the Small Battle Units Command has revealed that of 160 Biber which set off on operations, just over 100 failed to return through unknown causes; in 140 Seehund operations, 38 boats were missing and 24 were left stranded; and in two Molch operations, undertaken by a group of 15 boats in each case, not a single boat returned. Of all these casualties, aircraft attacks only provided definite evidence of 26 midgets sunk or damaged while some 50 were accounted for by surface forces or shore gunfire. However, bearing in mind the frailty of these little craft there seems to be good reason to believe that many of the 70 unexplained sinkings were in fact due to air attack.

The enthusiasm of the Squadrons engaged and the skilful planning of No. 16 Group certainly played no small part in countering a grave threat to this most vital convoy route.

SUMMARY OF ANTI-SHIPPING RESULTS BY COASTAL COMMAND AIRCRAFT

March, 1941 to 8th May, 1945

Note.—No anti-shipping assessments were made prior to March, 1941.

Year.	Merchant Vessels.				Naval and Other Vessels.		
	Sunk.		Seriously Damaged.		Sunk.	Seriously Damaged.	Damaged.
	No.	Tonnage.	No.	Tonnage.			
1941 (March-December)	33	100,074	33	82,455	1 Minesweeper. 2 Escort vessels. 1 E-Boat.	1 Cruiser. 2 Destroyers. 1 Escort vessel.	2 Destroyers. 2 Escort vessels. 3 E-Boats. 14 Other vessels.
1942	28	67,731	24	64,894		1 Escort vessel.	1 Destroyer. 2 E-Boats.
1943	21½	95,737	10	32,965	3 Escort vessels.	6 Minesweepers. 8 Escort vessels.	1 Destroyer. 13 Minesweepers. 20 Escort vessels. 2 Other vessels.
1944	50½	142,346	17	31,968	3 Destroyers. 15 Minesweepers. 30 Escort vessels. 10 E-Boats. 2 Other vessels.	15 Minesweepers. 33 Escort vessels. 16 E-Boats. 3 Other vessels.	3 Destroyers. 32 Minesweepers. 96 Escort vessels. 26 E-Boats. 23 Other vessels.
1945 (Up to and including 8th May)	33	70,906	23	81,186	3 Minesweepers. 17 Escort vessels. 2 E-Boats. 16 Midget U-Boats. 2 Other vessels.	2 Minesweepers. 3 Escort vessels. 3 Other vessels. 10 Midget U-Boats. (possibly sunk).	2 Destroyers. 7 Minesweepers. 30 Escort vessels. 3 E-Boats. 15 Other vessels.
TOTALS	166	476,794	107	293,468	107	104	297

A detailed monthly analysis, up to the end of 1943, is given in the *Coastal Command Review*, Vol. IV, No. 2, pages 14 to 17. Amended figures for 1944 and the Monthly Results for 1945 (up to 8th May) are given on the next page.

MONTHLY ANTI-SHIPING RESULTS FOR 1944 AND 1945 (UP TO 8th MAY)

Month.	Merchant Vessels.						Naval and Other Vessels.		
	Sunk.		Seriously Damaged.		Damaged.		Sunk.	Seriously Damaged.	Damaged.
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.			
1944 January ..	4	15,658	2	4,000	—	—	—	2 Escort vessels.	1 Destroyer. 1 Minesweeper. 6 Escort vessels. 1 Coaster.
February ..	1	3,096	—	—	2	6,500	1 Escort Vessel. 1 E-Boat.	1 Minesweeper. 1 E-Boat.	1 Minesweeper. 2 Escort vessels. 3 E-Boats.
March ..	4	11,472	3	6,898	2	2,500	—	1 Armed trawler. 1 Oiler.	3 Minesweepers. 7 Escort vessels. 2 Armed trawlers. 2 Tugs. 1 Oiler.
April ..	1	2,159	1	3,303	—	—	1 Sperrbrecher. 1 Minesweeper. 3 Armed trawlers.	1 Auxiliary vessel.	1 Sperrbrecher. 1 Minesweeper. 6 Escort vessels.
May ..	2	3,310	—	—	—	—	2 Minesweepers. 1 Torpedo boat. 1 Small vessel.	1 Minesweeper. 1 Escort vessel. 2 E-Boats. 1 T.L.C.	2 Minesweepers. 3 Escort vessels. 2 E-Boats. 1 Coaster.
June ..	2	11,400	—	—	1	1,000	1 Minesweeper. 2 E-Boats. 1 Auxiliary. 1 Motor launch.	4 Minesweepers. 3 Armed trawlers. 3 E-Boats.	1 Destroyer. 6 Minesweepers. 3 Trawler type auxiliaries. 4 Escort vessels. 7 E-Boats. 1 Unidentified vessel.
July ..	6	18,936	1	1,900	7	13,749	2 Minesweepers. 6 Trawler type auxiliaries. 5 E/R-Boats. 1 Coaster. 1 Landing craft.	2 Minesweepers. 1 Sperrbrecher. 6 Trawler type auxiliaries. 3 E/R-Boats. 1 Coaster. 1 Unidentified vessel.	2 Minesweepers. 15 Trawler type auxiliaries. 6 E/R-Boats. 1 Landing craft. 3 Unidentified vessels.
August ..	64	28,607	1	2,000	5	10,486	2 Destroyers. 5 Minesweepers. 7 Trawler type auxiliaries. 1 Escort vessel. 1 E/R-Boat.	2 Minesweepers. 4 Trawler type auxiliaries. 3 Escort vessels. 1 E/R-Boats. 1 Landing craft. 1 Unidentified vessel.	1 Destroyer. 3 Minesweepers. 1 Sperrbrecher. 7 Trawler type auxiliaries. 11 Escort vessels. 4 E/R-Boats. 1 Floating dock. 3 Coasters. 2 Landing craft. 2 Unidentified vessels.
September ..	5	7,270	1	563	1	3,323	1 Incomplete destroyer. 3 Minesweepers. 1 Trawler type auxiliary. 1 Lightship. 1 Torpedo boat.	3 Minesweepers. 3 Trawler type auxiliaries. 4 E/R-Boats. 1 Landing craft.	4 Minesweepers. 10 Trawler type auxiliaries. 4 E/R-Boats. 2 Coasters. 4 Tugs.

October	4	5,693	3	7,189	4	5,632	2 Trawler type auxiliaries.	1 Trawler type auxiliary. 1 E/R-Boat. 1 Coaster. 1 Gun-Boat.	2 Minesweepers. 1 Trawler type auxiliary. 1 Coaster. 1 Torpedo boat. 3 Tugs. 1 Ocean-going barge. 5 Minesweepers. 2 Escort vessels. 1 Trawler type auxiliary. 1 Landing craft. 1 Tug. 3 Small vessels. 2 Trawler type auxiliaries. 1 Escort vessel. 1 Tug.
November	6	17,639	1	307	5	10,565	2 Armed coasters. 1 Trawler.	1 Minesweeper. 1 Escort vessel. 1 E/R-Boat. 1 Coaster.	1 Tug.
December	9	17,106	4	5,808	10	30,345	1 Trawler type auxiliary.		1 Tug.
TOTALS	50½	142,346	17	31,968	37	84,100	60	67	180
1945 January	5	8,520	2	5,665	5	15,000	3 Trawler type auxiliaries.	1 Minesweeper. 1 Trawler type auxiliary.	3 Minesweepers. 2 Armed trawlers. 3 Trawler type auxiliaries. 1 Tug. 2 Barges. 1 Destroyer. 4 Trawler type auxiliaries. 1 Coaster. 1 Minesweeper. 2 Trawler type auxiliaries. 3 Tank handling craft. 1 Trawler. 1 Floating dock. 1 E-Boat. 1 Tug. 1 Motor Boat. 1 E-Boat depot ship. 1 Destroyer. 2 Minesweepers. 3 Escort vessels. 1 Trawler type auxiliary. 1 Coaster. 1 Lighter. 1 Minesweeper. 1 Escort vessel. 7 Coasters. 1 Gun Boat. 3 Barges. 2 Tugs. 4 Other vessels.
February	3	8,518	2	1,631	3	10,832		1 Midget U/B (possibly sunk).	
March	10	13,969	7	13,566	10	39,809	2 Trawler type auxiliaries. 1 E-Boat. 5 Tank Landing Craft. 1 Motor launch. 7 Midget U/B.s.	1 Fleet trawler. 1 Barge. 2 Midget U/Bs. (possibly sunk).	
April	13	35,736	7	28,785	9	32,372	1 Minesweeper. 3 Trawlers. 1 Escort vessel. 1 Tug. 9 Midget U/B.s.	5 Midget U/Bs. (possibly sunk).	
May (up to and including 8th)	2	4,163	5	31,539	4	21,489	2 Minesweepers. 1 Gun Boat. 1 Drifter. 1 Coaster. 1 Tanker (750 tons).	1 Minesweeper. 1 Tug. 1 Auxiliary. 1 Small vessel. 2 Midget U/Bs. (possibly sunk).	
TOTALS	33	70,906	23	81,186	31	119,502	40	18	57

Note.—The above table must still be regarded as provisional and subject to alteration as further information is received.

III.—OTHER OPERATIONAL FLYING

Air/Sea Rescue during the European War

The War in Europe is over ; many aircrew in the near future will be returning to civil life ; and not a few owe this fact to the Air/Sea Rescue Service.

Before reviewing results achieved by the Air/Sea Rescue Service, it must be remembered that prior to the outbreak of hostilities, this service did not exist. Aircraft which force landed upon the sea were mainly dependent for rescue upon the same services as ships in distress. These were the Royal National Lifeboat Institute, salvage tugs and vessels at sea. In addition, the R.A.F. had a few high speed launches and some light craft at bombing and gunnery ranges, used as safety boats.

At the beginning of the War, these facilities were greatly reduced. Aircraft of all types were obliged to fly over the sea, and the possible causes of forced landings were increased by enemy action. In these early days, aircraft suspected of having landed in the sea were searched for by aircraft of their parent station, and if located, Naval or R.A.F. craft were relied upon to make the rescue.

During the Battle of Britain, a rescue organization was formed at Dover, utilizing the few R.A.F. high speed launches available and light operational naval craft, loaned for the purpose. Lysander aircraft were borrowed from Army Co-operation Command. The success achieved was so encouraging, that it was decided to form an Air/Sea Rescue Service, responsible for organizing and co-ordinating all means of rescuing ditched aircrews. This service came into being on February 6, 1941, and since that date, until V.E. day, has been responsible for the rescue of 5,804 aircrew in the waters patrolled by Coastal Command.

At first the responsibility was divided between Fighter Command, Coastal Command and the Naval Commanders-in-Chief. Fighter Command was responsible for close search within 40 miles of the coast, Coastal Command for deep search beyond the Fighter zone, and the Naval Commanders-in-Chief for the operation of all surface craft. Special Air/Sea Rescue squadrons were formed, many more high speed launches came into service, and these with Naval Rescue Motor launches were based at strategic points around the coast.

Areas of responsibility were changed from time to time to keep pace with forthcoming operations, until from February 15, 1945, Coastal Command assumed full responsibility for Air/Sea Rescue operations around the British Isles, Iceland, Gibraltar and the Azores, absorbing the Walrus/Sea Otter element of Fighter Command for close-in search.

At the same time that the Air/Sea Rescue organization was being built up, technicians at

the Ministry of Aircraft Production were improving life-saving equipment carried in Air/Sea Rescue aircraft. The "K" type single-seater dinghy went into production, at first carried by fighter aircraft, and responsible for saving many lives during the Fighter sweeps operated over north-west France just after the Battle of Britain, and later provided in nearly every aircraft flying over the sea. Multi-seater pneumatic dinghies were greatly improved, and instead of being carried loose in the fuselage of the larger types of aircraft proper storage was provided, and automatic operation for inflating the dinghy was developed. Later came the "Q" type sailing dinghy, intended to give those who had ditched close to enemy territory a chance to sail to freedom, and later after many trials and tribulations, the Airborne Lifeboat, first dropped operationally to the crew of a Halifax who had ditched 60 miles east of Spurn Point in the early hours of May 5, 1943, and later responsible for many spectacular rescues under the nose of the enemy.

Aids to location by Radar were constantly improving, the "W/T transmitter," "Gee," "Walter," all of which materially assisted in the location of ditched aircrews.

After the United States entered the conflict, and began long range bombing of the Continent, the Air/Sea Rescue Service was augmented by a squadron of P.47.s based on the East Coast to act as VHF relay stations and spotter aircraft. Working in close co-operation with the British Air/Sea Rescue Service, and later assisted by amphibious Catalinas, this team has been responsible for the saving of many lives.

So many fine rescues were made that it is difficult to decide which to mention, but a few outstanding incidents are given in this article.

On May 4, 1942, the first successful long range rescue was made by a Coastal Command Hudson of 279 A/S.R. squadron. At 0355 hours an S.O.S. was received from a Wellington from Lindholme that it was in trouble, at 0420 hours, a further message was received, "Reeling in aerial to land." Two first-class fixes were obtained by Bircham Newton, which placed the aircraft about 160 miles due east of Spurn Point, and at 0433 hours Hudson V/279 was airborne. At 0523 hours a Ju.88 was sighted, V/279 took avoiding action and carried on with the search. Five minutes later the rear gunner saw pyrotechnics two miles astern of the aircraft, he immediately informed the pilot who turned 180 degs. and at 0533 hours the aircraft flew straight over the pyrotechnics. V/279 dropped flame floats and made a sighting report, which enabled a first-class fix to be obtained. After dropping additional flame floats V/279 climbed to 1,500 feet and sent an amplifying report, and at 0613

TYPICAL AIR/SEA RESCUE PHOTOGRAPHS



Rescue by airborne lifeboat, May 5, 1943.



Air/Sea rescue of a Fortress crew, March, 1944.



On July 6, 1944, Sunderland V/330 was on a transit flight when it was forced down into the sea near the Orkneys with engine trouble. H.S.L. 2725 rescued the passengers and crew and took the aircraft in tow.



Air/Sea Rescue units played a notable part in the airborne operations in Holland during September, 1944. Constant patrols were flown and many glider crews were picked up. The above photographs show two of the ditched gliders.



Five photographs illustrating the dropping of an airborne lifeboat.

Above. The parachutes begin to open.



Parachutes opened completely and the boat has assumed correct bows down attitude. The fore and aft inflation chambers beginning to inflate.



Inflation chambers fully inflated and the boat ready to hit the water.



The boat striking the water, bows first, with the parachutes collapsing and releasing.



The airborne lifeboat under way, with mainsail set.

hours sighted the dinghy containing 5 or 6 occupants. At 0635 hours the aircraft dropped a Lindholme dinghy about 50 yards down wind, which the Wellington crew reached. Meanwhile, at 0627 hours A/279 and U/279 took off from Bircham Newton to relieve V/279 and at 0709 hours sighted V/279 circling. At 0753 A/279 sighted two M.L.s on the nightly patrol which was carried out on the eastern side of the minefield, whenever Bomber Command operated over Germany. Contact was made, and the M.L.s were guided to the dinghy. At 0839 hours the rescue was completed; the first rescue to be carried to a successful conclusion by one of the special Air/Sea Rescue aircraft of Coastal Command.

Six Days Adrift

Wellington D/172 was airborne from Chivenor at 2030 hours, August 11, 1942, to carry out an anti-submarine patrol in the Bay of Biscay. Shortly after 0330 hours on the 12th, owing to the seizure of the starboard engine, the aircraft was forced to ditch 95 miles due west of Brest.

During the course of the next six days the crew was sighted on no less than nine occasions, they had the mortification of witnessing a Whitley which had located them shot down, and a Sunderland crash with the loss of all but one of its crew whilst attempting to land and pick them up. Air/Sea Rescue Hudsons of Coastal Command dropped them Lindholme dinghy apparatus from which they were able to obtain sustenance and dry clothing. During the six days they were adrift they were in constant fear of witnessing further attacks on our own searching aircraft. There were in the area Arados, Focke Wolf 190's and Ju.88's, and on one occasion Focke Wolf 190's dived on them from 500 feet, but did not open fire. At dawn on the sixth day three Air/Sea Rescue Hudsons escorted by two Beaufighters flew over them, and within a short time four M.L.s hove in sight, one of which picked them up. On the return journey to Newlyn the M.L.s were attacked by Focke Wolf 190s, but these were driven off by the Beaufighter escort. In all during their six days adrift the crew sighted 47 aircraft, 20 of which were German.

A Spectacular Drop

After a dinghy containing six men had twice been reported by pilots of Fighter Command on July 15, 1943, 8 to 10 miles north of Le Havre, it was decided to despatch an Air/Sea Rescue Hudson of 279 Squadron with Airborne Lifeboat and Fighter escort to attempt the rescue. Rendezvous was made with Typhoons of 11 Group over Tangmere, and course was set for Le Havre. After a short search the dinghy was sighted and the Lifeboat successfully dropped at 1237 hours. The crew were seen to clamber aboard, engines were started and course set for home. Meantime, two H.S.L.s had set out from Newhaven and the Lifeboat was intercepted at 1730 hours, halfway across the Channel. Fighter cover was provided by Typhoons and Spitfires throughout the operation, during which two F.W.190s were destroyed and two damaged, without loss to our own fighters. The crew belonged to a Wellington of 12 O.T.U. from Chipping Warden which had ditched two nights previously after being hit by flak whilst

returning from operations. They were landed at Newhaven, little the worse for their adventure.

An Intensive Period

During July, 1943, a total of 250 aircrew were rescued, the most intensive period being the fifty hours between 1730 hours on the 25th and 1930 hours on the 27th, during which 101 aircrew were rescued and landed at various ports around the coast. At 1730 hours on July 25, an S.O.S. was received from a Fortress which had been attacking Hamburg by daylight, following Bomber Command's massive attack the previous night. From then and for the following fifty hours, distress signals, reports from returning aircraft, sightings by search aircraft, automatic transmissions from dinghy radios, reports from the Royal Observer Corps and coastguards came in thick and fast. Air/Sea Rescue aircraft, supplemented by those of Bomber Command and the U.S.A.A.F., were called upon to help and the largest Air/Sea Rescue operation since the Battle of Britain was soon in full swing. As many as seventy long range aircraft were in the air at the same time covering large areas of the North Sea.

Then came the rescues. Reports were received from aircraft that they were orbiting dinghies in five different positions, as far as 200 miles apart. Two Airborne Lifeboats were dropped, one 40 miles north-east of Cromer, the other 75 miles north of Ameland, 185 miles north-east of the first one. The Cromer Lifeboat picked up two crews, Walrus of Fighter Command another, H.S.L.s of the R.A.F. and Royal Naval R.M.L.s which were at rendezvous positions were guided to dinghies, until by 1930 hours on the 27th, 101 aircrew had been saved.

First Airborne Lifeboat Drop by a Warwick

On January 7, 1944, Mosquito D/157 was reported by accompanying aircraft to have ditched 110 miles south-west of Brest, and the crew of two were seen in their dinghy. (The Captain later got into his "K" dinghy.) At 1335 hours on January 8, a Warwick from 280 Squadron with fighter escort, signalled that it was over two dinghies in approximately the same position, and a quarter of an hour later an Airborne Lifeboat was dropped, the crew immediately climbing aboard. A visual signal was sent to them to steer 350° T., and it was seen that they had started the engines and set course. Contact was then lost owing to bad weather and in the afternoon of January 9 a Warwick from 280 Squadron, with Beaufighter escort, took off from Exeter to search for the Airborne Lifeboat. Two Rescue Motor Launches also sailed from the Scillies to a rendezvous position. This search was unsuccessful, but an improvement in the weather next day enabled aircraft from 280 Squadron and 10 Group to continue the search. At 1515 hours a Mosquito from 157 Squadron sighted the survivors about 60 miles north-east of the position they had boarded the Lifeboat. That night at 2236 hours a Liberator from 224 Squadron made another sighting 21 miles further north, but lost contact in the very poor visibility. Next day, January 11, the Airborne Lifeboat, which by then had covered over 100 miles, was intercepted by a R.M.L. from the Scillies and the crew, both fit and well, were taken on board, but were most annoyed that they

had not been allowed to complete the voyage under their own steam.

700 Miles from Land's End

At 0733 hours on June 6, 1944, Halifax K/517 reported that it was returning to base with engine trouble. This was followed by a series of dots and dashes and then the signal faded. Nothing more was heard from this aircraft and it was presumed overdue at 1230 hours on the same day. The position put the aircraft about 700 miles from Land's End and 400 miles west of Cape Finisterre. A track search was immediately made by Halifax H/517, but this aircraft returned to base with engine trouble. Meanwhile a signal had been sent to Gibraltar with the above information requesting them to make a search in that area. Catalinas from 202 Squadron at Gibraltar then joined the Halifaxes of 517 Squadron in long and extensive searches. At 1100 hours on the 7th, J/202 signalled that it was over a dinghy with survivors within a few miles of the last fix. The aircraft was instructed to drop a maximum delay Mark III marine marker. On receiving the Catalina's signal, Headquarters 19 Group immediately asked the Royal Navy for assistance, and a hospital ship and an American surface craft were diverted. In the meantime Halifax F/517 had sighted white smoke on the surface of the sea at 2129 hours on the 7th and made contact with the dinghy. The aircraft dropped six Bircham Barrels and two dinghy radios, which were picked up by the survivors. At 2154 hours Catalina G/202 was sighted. Both this aircraft and F/517 circled the dinghy until 2330 hours, when F/517 had to return to base. G/202 dropped a triangle of Mark II marine markers and a "J" type dinghy which was retrieved by the survivors. Whilst doing this, "G" homed Catalina O/202 to the dinghy, and at 0310 hours on the 8th this relief aircraft arrived. Both these aircraft continued to circle the dinghy with their navigation lights on. At 0315 hours on the 8th, G/202 had to set course for base. O/202 was not able to sight the dinghy at once, but circled the flares and markers which had been dropped by G/202. At 0513 hours the dinghy was sighted, contact was maintained and instructions

were received to send call signs and dashes on 500 kc/s so that the American vessel could be homed to the position. At 0740 hours Radar contact was made with an American destroyer. Homing was continued and the ship eventually found the dinghy at 0825 hours. Five minutes later O/202 signalled "Operation completed; returning to base." Meantime, Catalina P/202 had arrived on the scene, and it sighted both O/202 and the American destroyer.

"D" Day

From June 6 until the end of the month, 390 aircrew and 247 others were saved by the Air/Sea Rescue Service, continuous patrols were flown, and Air/Sea Rescue surface craft were at rendezvous positions throughout the operation. Two units of 68 feet H.S.L.s were allotted to 85 Group 2nd T.A.F. and despite heavy seas and gales these, together with H.S.L.s from the United Kingdom were continually at sea.

Airborne Attacks

During both Airborne attacks, the first at Arnheim and the second in the Wesel area, Air/Sea Rescue surface craft were at rendezvous positions, and aircraft were on patrol backing up these operations. Two hundred and twenty-eight men were saved during the Arnheim attack by H.S.L.s, M.A.S.B.s, R.M.L.s, M.T.B.s or Walrus amphibious aircraft. Of these 205 were glider or Dakota crews.

During the attack on the Wesel area the complete crews of two gliders were picked up after having come down in the Channel, these were the only ditchings which took place while this operation was taking place. The same Walrus guided an H.S.L. and an R.M.L. to the scene of these two incidents, and circled whilst each rescue was completed.

So efficient has the service become during the past two years that any aircrew who fulfilled their part of the bargain, that is to say, had correctly informed base of their position and successfully boarded their dinghy were, almost without exception, rescued.

Meteorological Reconnaissance during the European War

In September, 1939, four "Met" ascents were made daily to assist meteorologists in the analysis of weather situations. In May, 1945, some 30 "Met" sorties were being flown each day in the European theatre alone, half of this number consisting of long range flights with an average duration of 10 hours.

This development of "Met" flying has been one of the less spectacular tasks of Coastal Command, but one which has contributed in no small measure to the total defeat of the enemy. The excellent work of pre-war "Met" ascents had pointed the way to new developments and new problems in meteorology and the importance of upper air observations to the growing science had become apparent.

On the outbreak of hostilities the loss of many sources of meteorological information was a

severe handicap. Ships could no longer risk sending their Atlantic reports by wireless and the once colourful continental section of the weather maps gradually became an uncharted region, to be covered only by approximations and question marks. In these circumstances meteorologists eagerly sought the assistance of aircraft reports in all areas. The patrols of Coastal Command were especially useful for this purpose, but unfortunately the information had, for security reasons, to be scanty or considerably delayed. With a developing air attack, it was clear that regular, planned "Met" reconnaissance would be of great importance in timing each round of the offensive.

Late in 1940 meteorological reconnaissance sorties over the Atlantic and North Sea were started. The first aircraft were Blenheims flying

SOME METEOROLOGICAL RECONNAISSANCE PHOTOGRAPHS



A good example of well developed " anvil " tops on shower clouds as seen from 18,000 feet.



Approaching a belt of sea-fog over Northern waters.



An even cloud sheet being pierced by developing cumulus clouds.



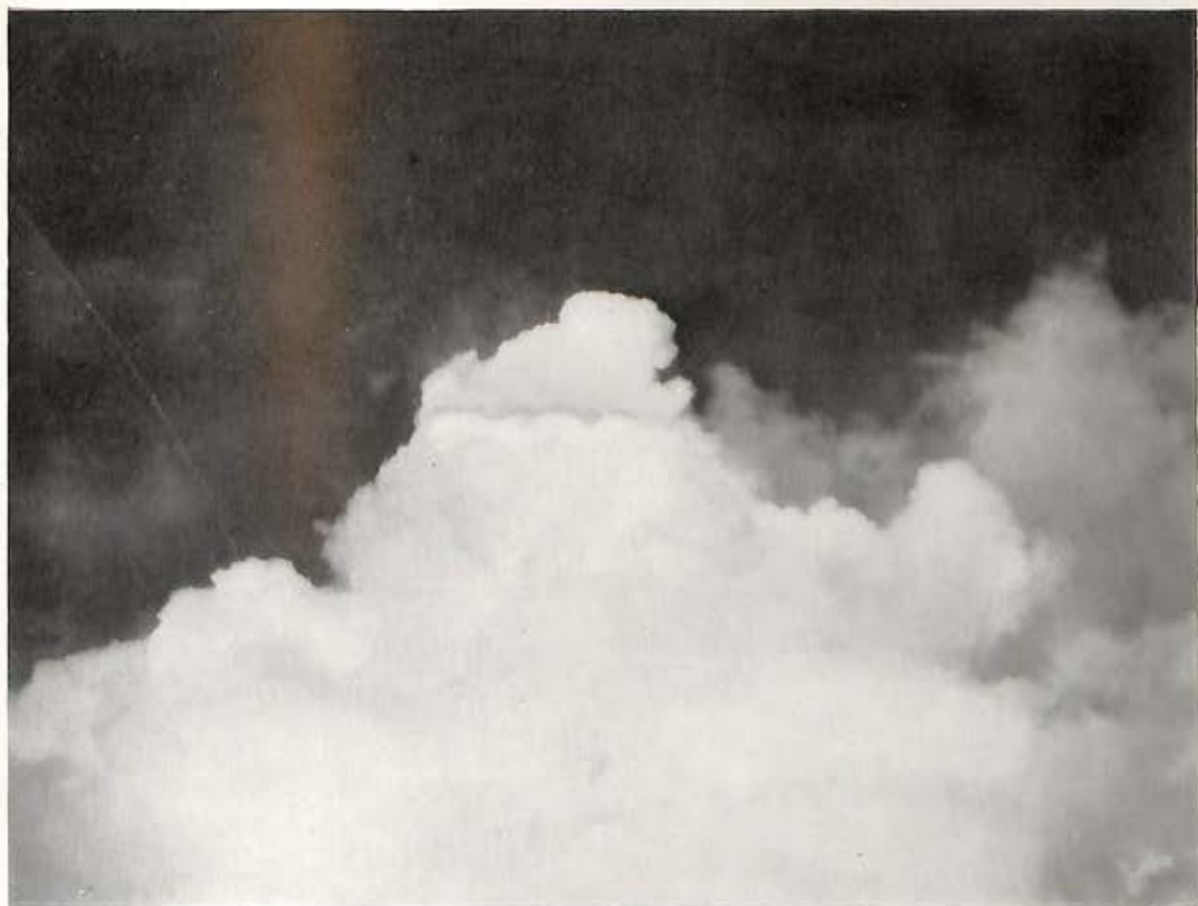
Descending through patches of very low stratus cloud to take a measurement of sea level pressure. These low level observations are made at regular intervals during the sortie.



Gibraltar Rock capped with stratus cloud. Known as the Levante, this cloud frequently forms with warm, moist easterly winds and shadows the town from an otherwise cloudless sky.



Clearing the top of turbulent clouds on a "Met" ascent.



A close-up of a developing shower cloud. These clouds grow rapidly and form "anvil" tops (see Plate 25) in the shower stage.



PLATE 28

Above. A typical view above a broken cloud layer at 10,000 feet.

Below. Persistent condensation trails being formed by a Halifax V at 18,000 feet. The wing tip trails, which are also clearly visible, were formed when the aircraft climbed steeply to obtain the photograph.



a total sortie of 600 n.m. with a "vertical" sounding at the turning point. In order to increase the range, Hudsons were later brought into these flights. These early "Met" sorties called for much hard work and skill from ground crew and aircrew alike. In spite of the small numbers of aircraft and limited bad weather aids, sorties were flown with astonishing regularity and on many occasions the "Met" aircraft alone were performing prodigious feats in the worst Atlantic weather to make possible the safer and more economical operation of other squadrons.

By the beginning of 1943, the widening scope of Allied operations made accurate knowledge of weather more important than ever. But the increase of our activities also meant that aircraft and equipment were needed everywhere in greater quantities and it was perhaps inevitable that "Met" squadrons should suffer. Only obsolescent Hampdens were available to replace the ageing Hudsons, and both ground and aircrews did wonders to fulfil their commitments and combat a rising tide of unserviceability.

However, by the end of 1943 new and improved equipment, which had for so long been "just around the corner," began to materialize. Halifax aircraft were introduced for long range flights, while Venturas were brought in to perform a medium range role. The latter were not entirely successful and eventually all squadrons were equipped with 4-engined aircraft—Halifaxes or Fortresses. The standard and detail of meteorological observations was improved by the inclusion in each crew of specially trained "Met" air observers, drawn from volunteers with previous meteorological experience.

Throughout the development of long range "Met" reconnaissance the "vertical" ascents had continued to supply upper air observations with unfailing regularity. These observations formed the basis of upper air charts which had become of increasing importance in weather analysis. The long range sorties also provided two upper air soundings (climb and descent), so that a regular supply of upper air information was obtained over a wide area from mid-Atlantic to the continent. Additional high altitude information was also obtained daily by Spitfire ascents to 40,000 ft. The observations from these flights proved of considerable tactical value in providing a warning to fighter and photographic reconnaissance aircraft of the heights at which condensation trails were liable to be formed.

Though reconnaissance loses none of its traditional importance in modern air war, for the "Met" flights it takes an apparently indirect form, often remote from the battle itself. Month in and month out the "Met" flights and squadrons have continued their unspectacular but invaluable work, providing a constant weather guard from

the Arctic to the Azores. More than 20,000 "Met" sorties have been flown during the European War, each one adding its quota to the general meteorological picture. It has been said that timely warning of bad weather has saved many aircraft from worse than the enemy could offer, and it speaks highly for the "Met" aircrews that they have "sampled" the vast majority of weather systems reaching the British Isles during the last five years. Behind the phrase "routine 'Met' sorties" has been hidden perseverance, skill and courage.

The task of meteorological reconnaissance may produce little encouragement in the form of clear cut results, but the importance of accurate weather information in all military operations cannot be over-emphasized. In the work of balloon barrages and anti-aircraft batteries, the planning of bomber raids, the hunting and destroying of U-Boats, the transport of men and material across the Atlantic, the photographic mapping of enemy territory, the invasions of North Africa, Italy and Normandy—in all these operations a vital part has been played by the meteorological reconnaissance force.

The activities of the "Met" squadrons have not been entirely confined to observations of weather. Interceptions by enemy aircraft were not infrequent in the south-west and North Sea areas, and the "Met" aircraft, particularly the poorly armed Hampdens, did not always get through. However, at least one enemy aircraft was destroyed and in a number of other combats the enemy received as good as he gave. U-Boat sightings totalled 36 and creditable attacks were made on 11 occasions. A more friendly operation took place over Northern Ireland, when a "Met" Gladiator safely shepherded a number of Fortress aircraft to a suitable aerodrome in bad weather.

Another aspect of "Met" reconnaissance which is apt to be overlooked is the "long term" value of aircraft observations in addition to their day to day use. The early meteorological flights provided much of the data from which considerable advances in weather forecasting have been made, and there is little doubt that the efforts of "Met" squadrons during this war have paved the way for further advances in the science of meteorology.

Although the end of hostilities in Europe brings a measure of relaxation to most R.A.F. units, the task of "Met" squadrons remains unaltered. Air transport repatriating prisoners of war, moving troops to occupation zones, and carrying essential foodstuffs and clothing to stricken areas requires no less protection from the forces of nature than did the bomber crews and invading armies. The constant vigil will be maintained and Coastal Command's "Met" Reconnaissance Force goes forward to guard the airways of peace.

Brief History of Photographic Reconnaissance 1939-1945

The history of photographic reconnaissance follows closely the history of all phases of the war. It has two aspects, the intelligence and the technical. In a brief account such as this, it is impossible to do more than indicate some of the more salient features of the development and history of the organization.

At the beginning of the war photographic reconnaissance, as we know it to-day, did not exist. The strategic organization which has shown itself capable alone of flying over 100 sorties in one day, and consequently processing, plotting, examining and distributing the intelligence from more than 50,000 exposures in a peak day, was built up from practically scratch. During its development it became increasingly necessary for the successful execution of operations of all kinds.

The most important factors in the early development of air reconnaissance were the introduction of the high-flying technique and the centralization of photographic intelligence. Early in 1939 Blenheims were used for strategic and Lysanders for tactical reconnaissance. Most of the interpretation of photographs was made independently by Intelligence Officers at Group level. The heavy casualties suffered by the Blenheims demonstrated the necessity for a different type of aircraft. The Spitfire was selected for experiment, in spite of the fact that it was in urgent demand elsewhere, and the prototype of the reconnaissance Spitfire was evolved in the autumn of 1939. This aircraft, stripped of its armament and with every spare inch of space devoted to petrol tanks, was fast enough to defy interception and capable of taking photographs at 30-40,000 ft.

With the greater height, cameras of longer focal length were required to give a scale of photography satisfactory for interpretation. Other difficulties remained to be overcome, such as the need for heating the cameras to prevent freezing and the formation of condensation on the lenses, the development of oxygen apparatus, and the technique of navigation, which was complicated by the fact that the pilot could see no ground detail immediately below his aircraft or for 10 miles on either side: these matters continued to be the subject of constant experiment and improvement. On November 18, 1939, the success of the first sortie flown by the "Heston Special Flight" proved that the new technique was essentially right, and in February, 1940, the first flight of Spitfires was sent to France to carry out reconnaissance for the British Expeditionary Force. In March a landmark was reached by the first successful sortie over the Ruhr. The first photographs obtained of Kiel in April showed the harbour full of shipping, but owing to the fact that there was no previous cover for comparative purposes, its significance—two days before the invasion of Norway—was not appreciated.

A great impetus to the centralization of Photographic Interpretation and Intelligence was given by the fall of France, which cut off almost all our other sources of intelligence, and brought the menace of invasion.

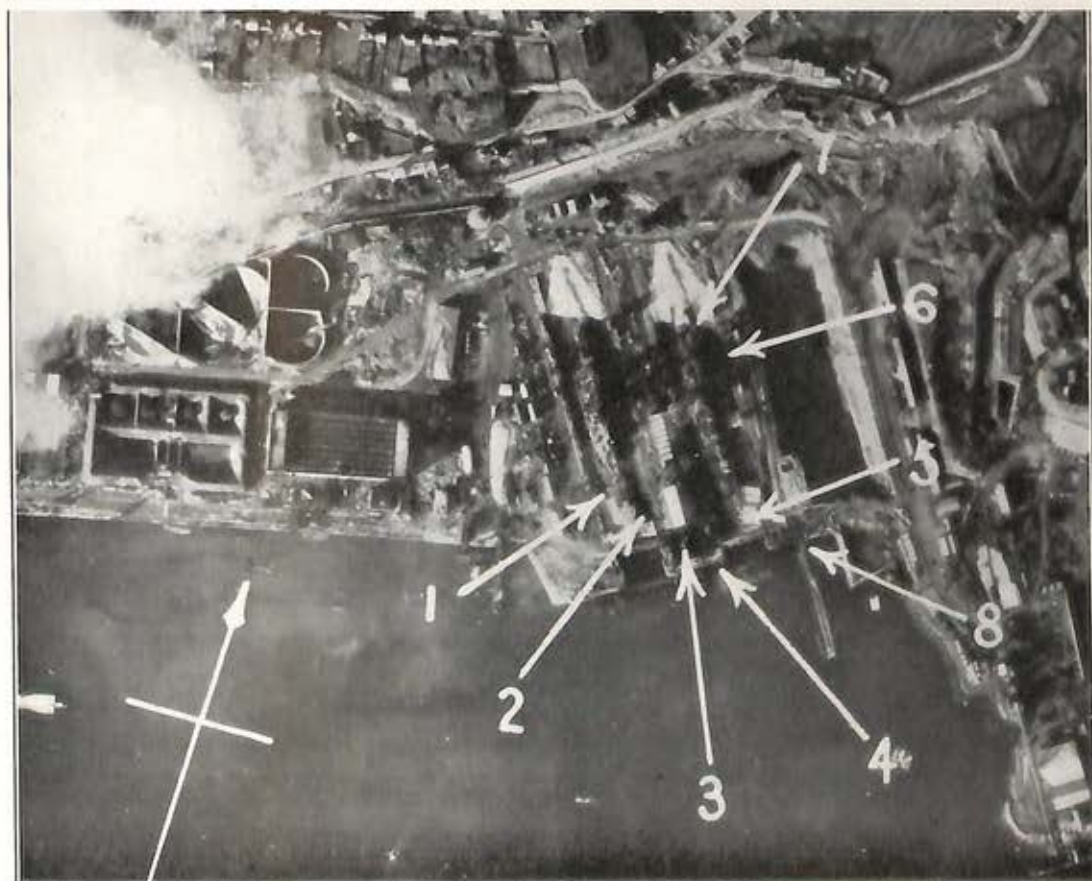
In the early summer of 1940 a small band of some 30 enthusiasts, collected together from various sources, was formed into the first Central Interpretation Unit. This Unit expanded rapidly with the growing recognition of the importance of Photographic Intelligence, until on VE-day it had a strength of 326 R.A.F. and W.A.A.F. Interpreters, 1,000 other ranks, 16 officers from the Royal Navy, 76 from the Army, as well as 124 Interpreters and 79 other ranks from the forces of the United States, who had been incorporated to form a truly Allied organization. In addition, the unit had supplied trained interpreters for units in India, the Middle East, North Africa, and 2nd T.A.F., and detachments in Gibraltar, Malta, West Africa, Russia and elsewhere.

Similarly the reconnaissance forces grew from the one flight which was established at Heston in 1940, to the four squadrons of 106 Group with two training squadrons, and the four day and two night squadrons with the Tactical Air Forces, in 1944, and supplied all the trained reconnaissance pilots and photographic reconnaissance aircraft required by the R.A.F. in the other theatres of war. After the entry of the United States into the war, their effort was fully co-ordinated with ours. Demands for reconnaissance were filtered and assigned to British or American reconnaissance forces through an inter-Allied, inter-Service Committee, thereby eliminating any duplication of effort. The American Interpretation personnel were incorporated into the existing Interpretation Unit, which became known as the A.C.I.U. (Allied Central Interpretation Unit).

The photographic Spitfire attained a range of some 1,450 miles for a round trip on a sortie which was flown to Danzig in 1941. Further to increase the range of reconnaissance, the Mosquito was introduced for photographic work in 1941, the first successful reconnaissance in this aircraft being flown over Bordeaux on September 20 of that year. The longer range of this aircraft, over 2,000 miles, made it possible to photograph Königsburg, targets in Silesia and Austria, and to land in southern Italy on the same day. It was of inestimable value in permitting strategic reconnaissance into the heart of German occupied Europe. The development of suitable cameras also proceeded, the first F.52 camera being used in January, 1942, and in May of that year, 500-exposure magazines were introduced.

Low-level photography, giving large-scale detail of enemy installations, was obtained from the first, "dicer" sorties being flown when weather conditions were unfavourable for high altitude work. Later the moving film camera, designed

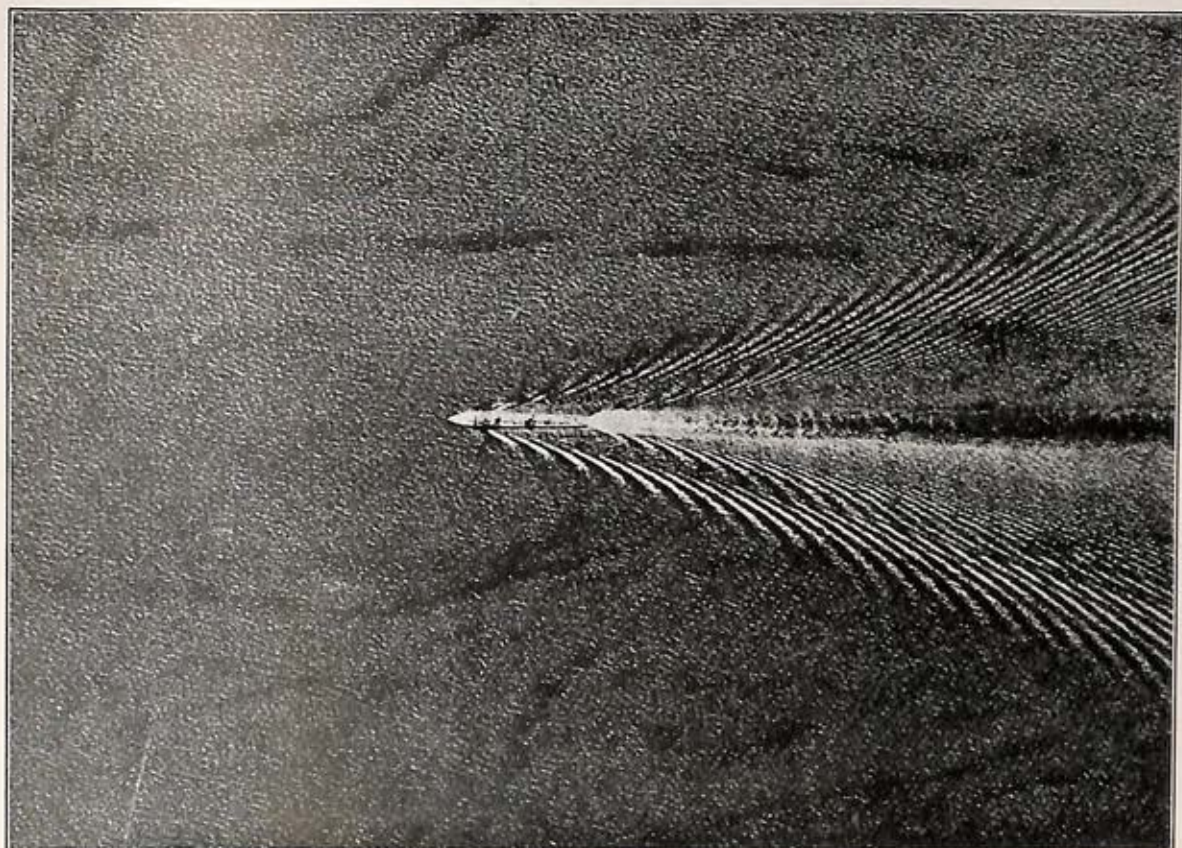
PHOTOGRAPHIC RECONNAISSANCE PHOTOGRAPHS



Photographs by P.R.U. Warships at Brest. Above, *Hipper*, from 500 feet; January 26, 1941. Below, *Scharnhorst* and *Gneisenau* lying camouflaged in dock, with pointers to bomb bursts of 75 minutes earlier. December 18, 1941.



Prinz Eugen and *Scheer* in Lo Fjord. Photographs by P.R.U. taken on March 9, 1942. Double booms surround the warships. *Scheer* is only seen above, to left. A submarine supply ship lies alongside *Eugen*, and a floating crane at the stern is repairing damage; on its removal the stern was seen to have been cut square.



This photograph was taken by 540 Squadron during June, 1944, in the Mecklenburger Bucht. It shows an *Elbing* class torpedo boat proceeding at a speed calculated from the wave pattern to be $12\frac{1}{2}$ knots. *Elbings* were for a long time described as destroyers, but the German class them as torpedo boats. As they displace 1,200 tons, mount four 4·1-inch guns and approximate to our *Hunt* class destroyers, they are a borderline case.



The German battleship *Tirpitz* photographed in Altenfjord by 544 Squadron. The aircraft took this picture from 8,500 feet and was in the air for nearly eight hours on this flight. The *Tirpitz* is seen lying inside a double boom, with a number of small craft alongside. The damage caused by the midget submarines and the Fleet Air Arm is no longer visible.



The above photograph, taken during December, 1944, shows the new type XXI U-Boats. These were assembled very quickly from prefabricated sections. Although the sections were made at a number of points, there were only three assembly yards. The Blohm and Voss Yard, seen above, was one.

to compensate for image movement due to the forward velocity of aircraft flying at low altitudes, and the forward-facing oblique cameras mounted in the aircraft wings, were introduced. In 1944 these were found to be invaluable for providing information on enemy Radar, beach obstacles and "V" weapons.

From 1940 onwards, the photographic reconnaissance force was extensively employed in every phase of the war, its scope and adaptability becoming increasingly extensive. Constant cover was obtained of the Channel ports during the summer and autumn of 1940, when the nucleus of C.I.U. computed an ever-growing total of invasion craft of all kinds, until it reached a peak of some 2,000 on September 15. After this, the numbers were seen to decline gradually and other aspects of the enemy's activity began to claim attention. One of the more important of these was the intensive development of airfields upon the Continent, bringing with it the urgent need to assess the strength of the Luftwaffe, which was accomplished almost entirely from photographs.

Intelligence for the Royal Navy on the movements of naval units became of even greater urgency with the discovery of the use of Brest as a Naval base, beginning with the arrival of destroyers, followed by the *Hipper* early in January, 1941, and the *Scharnhorst* and *Gneisenau* in March of that year. Until their withdrawal in 1942, these vessels were constantly watched by reconnaissance aircraft, which later also played an important part in the sinking of the *Bismarck* and of the *Tirpitz*. Photographs of the former in Grimstad taken on May 21, 1941, led to its sinking by the Royal Navy.

Early in 1944, a detachment of Spitfires was sent to North Russia to watch the *Tirpitz*. The whole of the Norwegian coast from Trondheim to Tromsø was covered when she moved south in October, and on the 18th of that month a Mosquito made a sortie of 2,300 miles, in spite of the failure of one of its long-range tanks, and brought back photographs of the battleship at anchor at Tromsø. Photographs taken on November 12, following the attacks by Bomber Command, finally showed her overturned at her anchorage.

The construction of U-Boats and development of their bases was constantly watched, so that a regular schedule of their construction, enabling an accurate forecast to be made of the numbers which would in future be deployed, was kept. A serious threat to our supply lines which appeared late in the war was the prefabricated U-Boat, first discovered on air photographs. From comparison of photographs of the assembly points, taken at regular intervals, estimates were available of the numbers which would have become operational by the summer of 1945.

To assist in the protection of our convoys to Murmansk, a detachment was established at Vaenga in North Russia in September and October, 1942. The watch kept on the enemy's merchant shipping reached a point where enemy movement of over 1,700 enemy merchant vessels, tankers and Sperrbrechers was charted from port to port, each individual vessel being given its code number.

The strategic bombing of Germany and Axis-held Europe made very heavy demands on the

photographic reconnaissance forces. Every industrial plant was photographed for target information prior to attack, and by this means a comprehensive picture was built up of the enemy's industrial effort. Not least in importance was his aircraft production, and intelligence gained from air reconnaissance bore fruit in the attacks on the fighter production centres which crippled the Luftwaffe in the Spring of 1943. Most new types of aircraft were discovered, such as the Me.262, first seen on photographs of the Messerschmitt Experimental Hangars at Augsburg and the airfield at Lechfeld early in 1943. Later it was seen that the production of this type of aircraft had been driven underground at such places as Eschenlohe, Kahla and Leonberg.

Following every bombing attack, damage assessment sorties were flown. In the case of Berlin, after a series of attacks beginning on September 18, 1943, 35 unsuccessful sorties were flown in unfavourable weather until at last the information which was wanted was given by the 36th and 37th sorties. It was, however, more usual for cover to be obtained within 24 hours of attacks on such important industrial targets as oil refineries, which necessitated frequent reconnaissance to estimate the extent of repair work which had been done and the percentage of productivity of the plant to give to the Chiefs of Staff the intelligence which was required in order that they could decide when further bombing was necessary. From the beginning of the war to VE-day, the different reports issued by the Damage Assessment section of A.C.I.U. reached a total of 7,765.

The rôle of photographic reconnaissance in the planning of combined operations started with the early Commando raids. Then came the invasion of North Africa and the culminating point of months of planning on D-Day. This operation required, firstly, the reconnaissance of beaches over a wide area in order that those suitable for landing could, after close study, be selected; then further reconnaissance and detailed interpretation was needed over the areas selected, giving details of defences, exits, routes and bridging requirements. The production of models was also the responsibility of A.C.I.U. For the invasion, models were made of 1,000 square miles of Normandy beach head to a scale of 1 : 5,000 and of nearly 10,000 square miles to a scale of 1 : 25,000. Some 500,000 man hours went into the actual construction of the 339 model panels which were supplied for planning and briefing purposes.

Large scale photographs, produced by the low flying Mustangs and Mosquitos with moving film and forward facing oblique cameras, ensured that no major surprises in the enemy's defences were encountered by our landing forces. Invaluable detailed information was also provided of enemy Radar, with the result that the enemy's warning system of nearly 100 stations was completely destroyed before the landing, which was, in consequence, made without Radar detection by the enemy.

The history of the flying bomb is too recent and well known to warrant repetition, in detail, of the vital part played by photographic reconnaissance in countering the menace. From the

discovery of the first flying bomb at Peenemunde to the occupation of the sites by our ground forces, approximately 2,000 sorties were flown for this purpose alone, giving a total of some 500,000 prints to be examined. 1,698 different reports were written. Of the 96 sites of the earlier "Bois Carré" type, 88 were rendered totally unserviceable by bombing, which was based on the target material put out by A.C.I.U. Only one of these sites ever came into operation.

Of the second type of "Belhamelin" sites, ground inspection later showed that only 8 of the total of 118 had not been revealed by aerial photographs. The camouflage of seven of these was found to be 100 per cent effective, and subsequent re-examination of photographs showed that indications of one only were visible and not discovered.

With the establishment of our forces on the Continent, photographic reconnaissance of enemy communications in support of our ground forces became a major commitment. At the request of SHAEF, aircraft of 106 Group made detailed reconnaissance from June 6 onwards of the railway lines behind the enemy's forward areas for information on troop movements. This work continued until VE-day and involved at times covering 2,500 miles of railway lines with aircraft flying at 1,000 feet in face of intense flak. Many sorties were also flown for the Allied airborne

armies, and prints and mosaics distributed to them for briefing purposes.

One of the last investigations carried out by photographic reconnaissance was one which was, fortunately, never completed because of the cessation of hostilities; namely, the reconnaissance of the Redoubt area and the numerous underground installations in central Germany, which would have meant safety for the enemy from Allied bombing had they had time to develop fully. A new and very detailed report was evolved to record the development of these underground installations, in which full investigation was made of the geological formation of the region and local topography to estimate the type and depth of rock and soil above the tunnelling.

Finally, in the last stages of the war, air cover was obtained of all prisoner of war camps, which provided information as to whether they were occupied or not, and the general status of the camp. This was of considerable assistance in planning the speedy return of the released prisoners to the United Kingdom.

In conclusion, it is felt that the work of the photographic reconnaissance organization will not be finished even when the war in the Far East is finally concluded. Photographic reconnaissance has wide and hitherto largely unexplored applications to peace-time planning and development, and will undoubtedly be called upon to play an important constructive role in the future.

IV.—SPECIALIST AND GENERAL ARTICLES

Visit of Coastal Command Shipping Investigation Party to Norway

(This account has been written by one of the members of the Party.)

On the recommendation of the Aircraft Anti-Ship Committee, the Deputy Directorate of Science requested Coastal Command to make all necessary arrangements for a party of specialists to visit anchorages and ports in southern Norway. The object of the trip was the examination of enemy shipping damaged during Coastal Command's offensive in order to assess the efficiency of the weapons and tactics used. It was important that the party should make their examinations as soon after the cessation of hostilities in Europe as possible, accordingly a Fairmile launch of Coastal Command Air/Sea Rescue Organization was made available by D.D/A.S.R.

The specialists chosen to make the visit included a Squadron Commander and Flight Commander of Squadrons which had been engaged on anti-shipping operations in Norway, an Armament specialist, a representative from the Directorate of Operations Maritime, a Photographic Interpretation specialist from C.I.U., an Anti-Shipping representative of the Deputy Directorate of Science, an official photographer, and an officer of the Royal Norwegian Air Force to act as guide and interpreter.

We embarked on L.R.R.C. 005 at Gorleston on Sunday, May 20. Until its arrival in Oslo the launch sailed under Naval orders. It was routed first to Rosyth, where it arrived on May 21, refuelled, and proceeded to Methil to await official orders for the crossing. The weather on May 22 was unfit, but the launch was able to sail on the evening of May 23, in company with two trawlers. Unfortunately the weather was still far from good and it was very rough the whole way across the North Sea.

Under orders to remain with the two trawlers, speed was reduced to 10 knots, and everybody on board the launch had a very uncomfortable time. However, at dawn on Friday, May 25, the little convoy arrived at position "H," off Lister, and the trawlers departed towards Stavanger, whilst the launch proceeded coastwise to Oslo. The weather cleared, the sea went down, and a brilliant sun raised everybody's spirits. At about ten o'clock in the morning we were further cheered by the magnificent sight of a British cruiser leading the German ships *Prinz Eugen* and *Nurenberg*, followed by a second British cruiser and two destroyers in line ahead, en route to Wilhelmshaven. To show our appreciation we flashed "Good show" to the cruiser. The Navy replied, "Here are two you didn't get," to which we flashed back the final message "Yes, but they didn't come out," and continued on our way.

Throughout the day, the launch steamed steadily on towards Oslo. Few on board will forget the trip up Oslo Fjord. With a brand new R.A.F. standard at the masthead, and everybody on board spick and span and feeling very pleased at having survived the crossing, the launch moved up the fjord at a good 16 knots. The whole way windows of houses were flung open, and the Norwegians waved frantically, whilst at every quayside children came scampering down to shout and wave. A Norwegian pilot was picked up at Drobak, to navigate the last few miles, and we finally tied up at Oslo at 2245 hours.

The following morning, the Officer Commanding the party and his deputy reported to F.O.I.C., Norway, who gave his blessing to the expedition and provided the necessary authorities and passes. Meanwhile, members of the party had got to work, assisted by the interpreter, and had contacted the Harbour Master and various shipping officials, who would be of assistance in making the investigations. After lunch we made preliminary examinations of the tanker *Schleswig*, the M.V. *Rotenfals* and the M.V. *Belpamela*. The work of the party was organized so that each member had his particular part in the examination and interrogations, and there was no overlapping.

The following day, May 27, a more detailed examination of the ships was made, the necessary photographs were taken, and by "cease work" we felt that the organization which we had decided upon would work adequately in the other anchorages and ports.

On May 28 the launch, with a Norwegian pilot on the bridge, sailed to Sandefjord. On the way we called in at Horton to examine the merchant vessel *Bromberg*. This took about two hours and produced some useful information. The U-Boat training base near Horten appeared to have been very severely damaged by the Bomber Command raid on February 23. Sandefjord was not reached until 2230 hours and yet at that late hour crowds of people were on the quay to welcome us. A conference was held on board forthwith, in which our identity and the object of our visit was explained to the chief of the Home Front, the local Chief of Police, and the Harbour Master.

Pending the arrival of Allied Military authorities, the Home Front (Underground Movement) were responsible for the custody of enemy ships and crews. It was arranged that a German motor boat should be at hand to convey us from ship to ship, and in addition two staff cars were made available throughout our stay at Sandefjord.

The programme of work for the next day was arranged before the conference broke up.

It was at Sandefjord that the series of official and semi-official receptions began. No Allied personnel had visited the port, and it seemed that everybody wished to entertain the Royal Air Force. The Guide-Interpreter was hard put to it to fit in all the invitations, but by dividing us into two groups, he was able to satisfy nearly everybody. For five years these Norwegians had not been allowed to speak English, had not been allowed to dance, had not smoked a decent cigarette, had existed on a scanty fish and bread diet—in short, had suffered the grim ordeal of German occupation, and it was not surprising, therefore, that the arrival of the R.A.F. launch was an occasion for much celebrating. For our part, we did our best to reciprocate the tremendous kindness shown us, by distributing a share of the limited supplies which we had been able to buy at Rosyth, and arranging the first official dance in Sandefjord since 1940. As we so often pointed out to our hosts, what we really required for this trip was a battleship.

In the cemetery at Sandefjord are the graves of six unidentified British airmen. Under German occupation the Norwegians were not allowed to tend these graves, but nevertheless, at great risk to himself, the local Customs Officer managed to keep them in perfect order. The day that the Germans capitulated, hundreds of flowers had been laid on these graves by the local population. On the afternoon of the 30th a small ceremony was arranged in which a party from the launch paraded and laid wreaths on the graves. The Commander of the Home Front asked if his men might be included in the parade, and this was arranged.

The major portion of the shipping examined during the tour was found at Sandefjord, and we spent two full days examining the merchant vessels *Concordia*, *Espania*, *William Blumer*, *Hector*, *Irania*, *Isar*, the tanker *Katlegat* and the two floating docks.

It was at this port that some of the most striking successes of the anti-shipping offensive were achieved. The people of Sandefjord understood perfectly the necessity for sinking the floating docks, of which they were so proud, and were full of praise for the daring and accuracy of the attacks made against shipping in the port.

At 9 o'clock on the 31st, we sailed for Porsgrunn and arrived soon after midday. The officer commanding the party was invited to inspect a small guard of honour provided by the Hjemmestyrkene (Home Front). Work began immediately after lunch, and a variety of small merchant vessels and the floating dock were examined. The story, pieced together from interrogation, was similar to our previous experience at Sandefjord. The attacks had been highly successful and the Norwegians had been surprised by the accuracy of the R.P.

The following morning four ships were inspected at Skien. Three were almost completely submerged, whilst the fourth was lying on its side. This attack was described by the local people as a "lightning stroke." The ships sank in less than 15 minutes, and rockets set fire to a large saltpetre warehouse, which was destroyed.

Time was short, but in addition to our examination of shipping, some of use were taken to see the famous porcelain works, whilst others were given an opportunity of inspecting the concentration camp where the Chief of Police had placed the local Quislings.

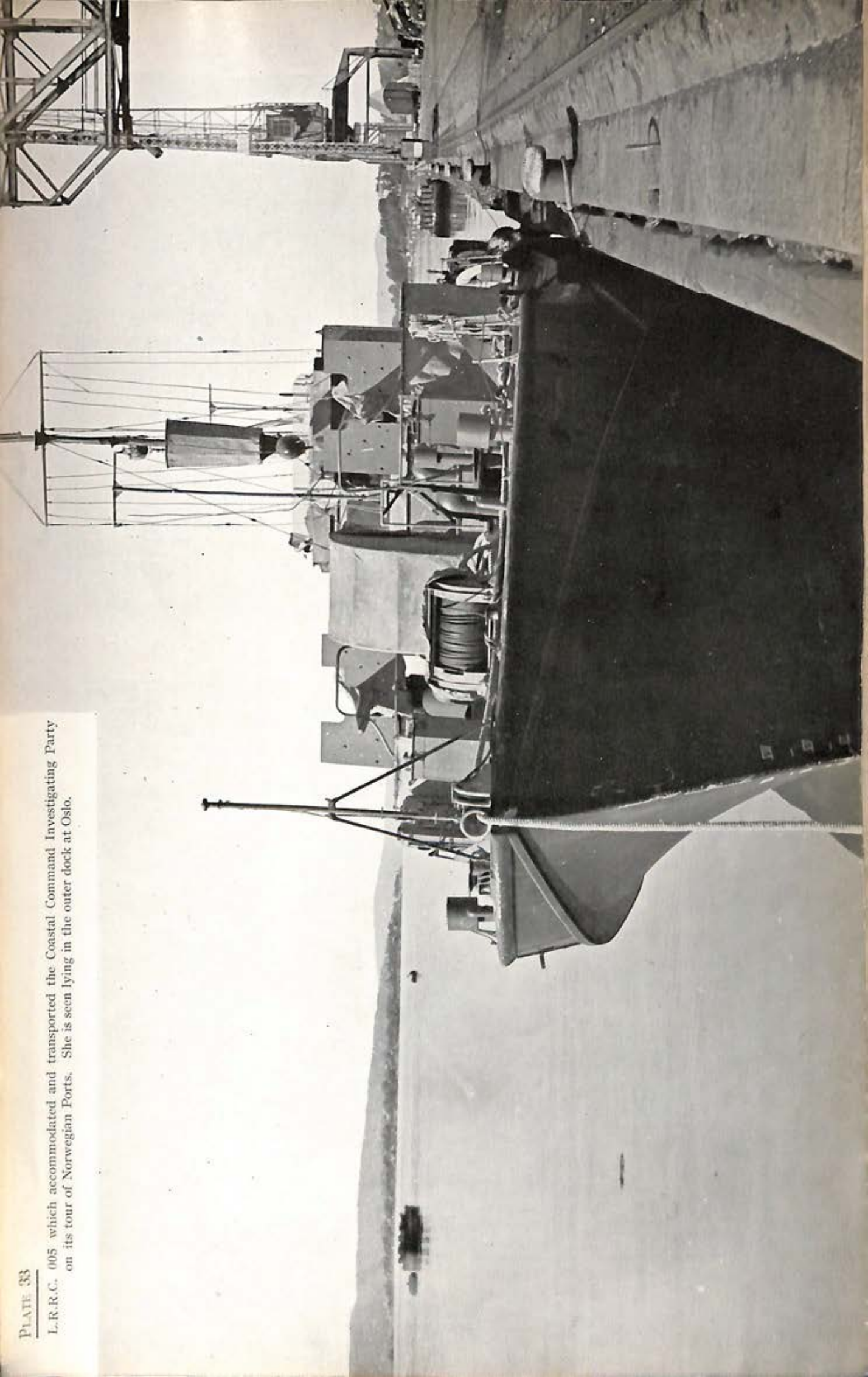
We left Porsgrunn at 1315 hours on June 1—a brilliant sunny day. The pilot chose a route which wound through the leads behind the Islands. The coast abounds with small islands, and the leads wind through steeply cliffed fjords, passing many typically Norwegian villages with white wooden houses, roofed with red or green tiles. Arendal was the largest township we passed. In peace time this little port was a great holiday resort, and there were still plenty of small yachts riding at anchor, which the Germans seemed to have overlooked. We were sorry we could not stay one night in this town, but there was not sufficient time and we steamed on to Kristiansand, where we arrived about 2230 hours.

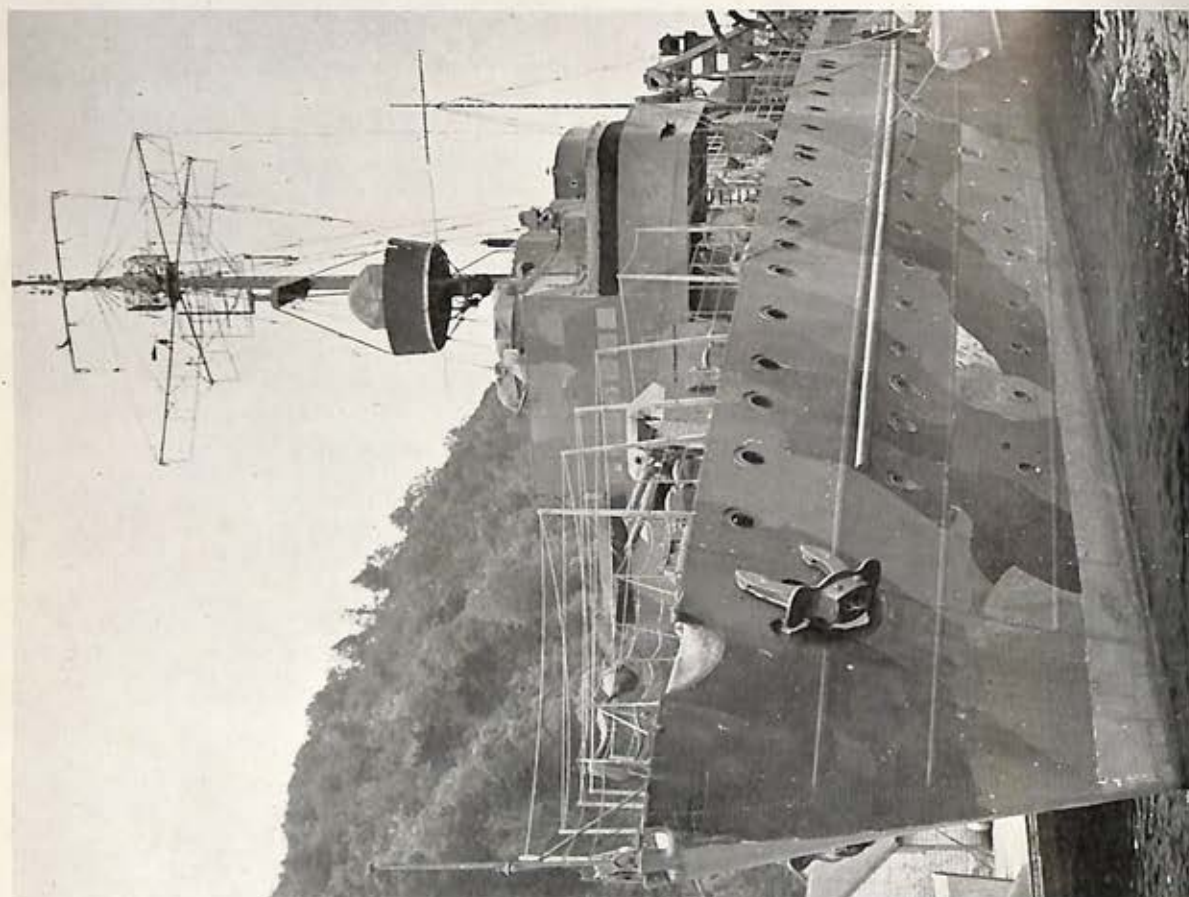
The morning of June 2 was spent reporting to the Naval Officer in charge, and examining the merchant ship *Palermo*. By 1400 hours the job at Kristiansand was finished and we were under way again for Flekkefjord, which we reached about at 1530 hours. Photographs taken during sorties against ships in this small anchorage did not exaggerate the geographical difficulties which were encountered when attacking this port. The mountains rise up sheer on either side, and it seemed incredible that aircraft should have been able to penetrate to such a target. By some means or other, news of the launch had reached Flekkefjord. Every flag was flying, and a large crowd had gathered on the quay to meet us.

The merchant vessel *Palermo* lay alongside the quay to which the launch was tied, but the two other small vessels on the programme proved to be too submerged for examination, and three hours' work saw our job completed. Flekkefjord is famous for its fishing, and although the launch was due to leave at 0900 hours the next morning, arrangements were made for some of the keener fishermen on board to try their hand at five o'clock. At the official reception, which was held in the evening, the Mayor expressed the admiration and gratitude of the people of Flekkefjord at the skill with which pilots had avoided damaging Norwegian property during the attack. No one had been killed, and only two or three houses had been damaged.

Early next morning, the launch let go head-lines and moved away to the accompaniment of cheers from the crowd on the quayside. We suspected that the E-Boat Depot Ship which was to be examined at Josingfjord had left there for Egersund, but we decided to make sure. An hour later the launch steamed into the fjord, which was the scene of the famous *Altmark* incident. The entrance to this fjord is not easy to navigate, and the waterway itself, although deep, is extremely narrow. The Depot Ship was not there, and we carried on to Egersund, where we arrived about midday. The usual procedure was adopted and we spent the afternoon examining the Depot Ship and attendant E-Boats, and interrogating the German captain and officers. We also interrogated a diver who had been working

L.R.R.C. 005 which accommodated and transported the Coastal Command Investigating Party on its tour of Norwegian Ports. She is seen lying in the outer dock at Oslo.

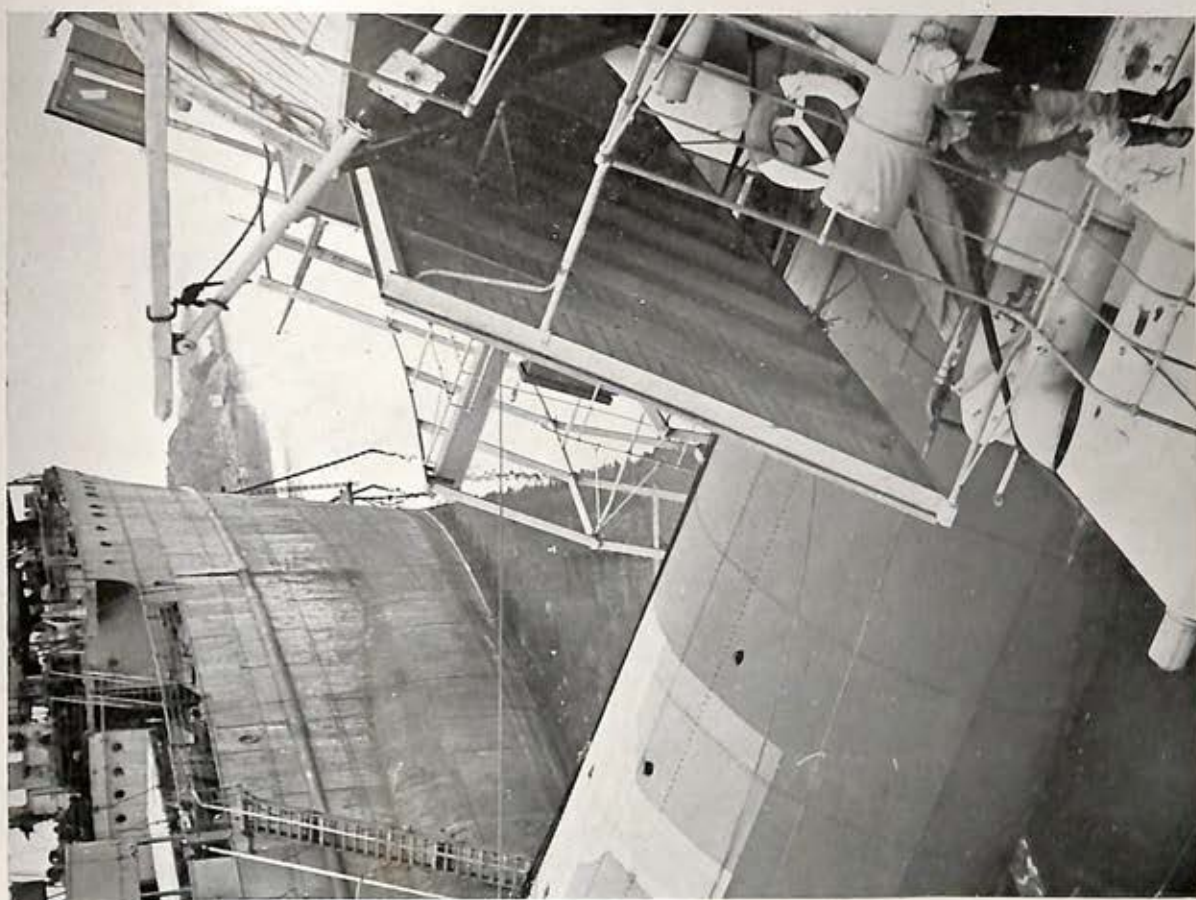




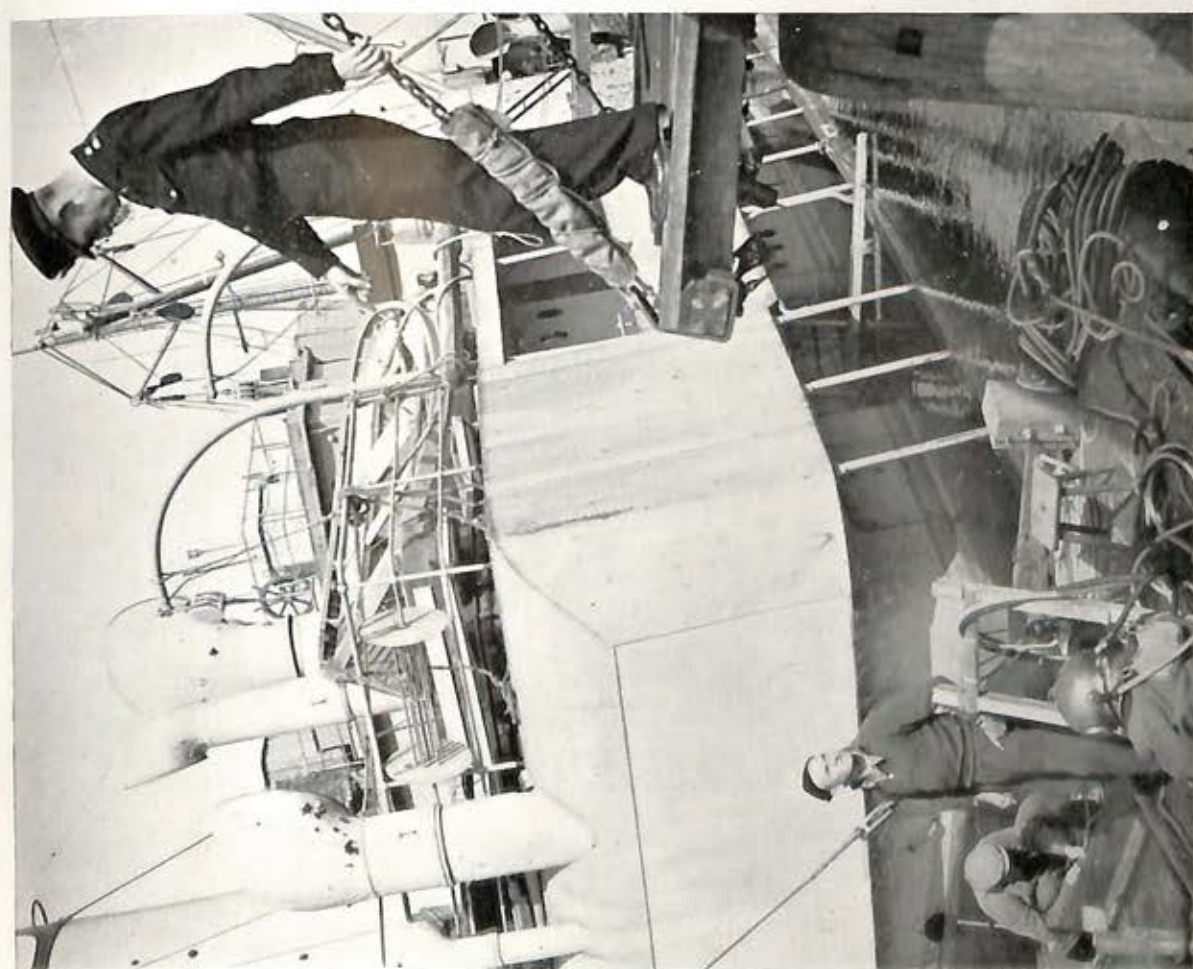
The E-Boat Depot Ship *Adolf Luderitz* seen at Egersund. She was extremely well equipped and was an excellent example of that type of vessel.



A member of the Investigating Party at work measuring up on the M/V *Concordia* at Sandefjord.



A member of the party examining the M/V *Concordia*, sunk by the Mosquito Wing. The *Espania* is seen in the background.



The Naval representative on the panel questioning the diving party which was working on the sunken *Scharhorn* at Menstad. Another victim of the Mosquito Wing.

The Commandant of the Home Front at Sandeford laying a wreath on an Allied airman's grave.



on one of the sunken vessels and recorded his findings.

The Dépôt Ship was beautifully designed and fully equipped for her job. The captain gave a full account of the attack made against her in Josingfjord.

Whilst our party carried out their work, the captain of the launch and two other officers, by request of the Mayor, represented the Royal Air Force at the first football match played in Egersund since the Germans occupied Norway. The event was taken to represent the rebirth of

sport in this part of Norway, and a crowd of about 2,000 people saw an Army team from Stavanger soundly beaten by the home side.

Egersund was the last port of call where shipping was to be examined, and in order to make up the time which had been lost through bad weather, we sailed at 0500 hours on June 4 for Stavanger, and reached the port four hours later. The remainder of that day and the following day were spent refuelling and preparing for the trip across to Rosyth. We left Stavanger at 1100 hours on the 6th and arrived at Rosyth at 1430 hours on the 7th.

The Failure of German Air Force Anti-Shipping Operations

During the early years of the war German Air Force anti-shipping operations achieved a fair measure of success. In the last few months of 1940, which was actually their peak period, the F.W.200s sank 100,000 tons of our merchant shipping in the Bay of Biscay and to the west of Ireland. Minelaying by aircraft also became at one period a formidable problem, while later in 1942, operations against our Russian convoys added considerably to our difficulties. But these efforts petered out and, although rather spasmodic attempts at increased activity were made from time to time, they met with little success. Viewed as a whole the G.A.F. anti-shipping operations throughout the war must be written down as a failure.

When seeking the reasons for the failure it becomes apparent that a major factor was the lack of a comprehensive and progressive anti-shipping policy. Hitler had been convinced that the sinking of ships was a naval task and that the U-Boat was the weapon to be used. The naval authorities were not interested in aviation and no naval air service as such existed, while Goering had no desire to co-ordinate the work of his anti-shipping squadrons with the German Navy. As a result a co-ordinated attack on our sea communications by U-Boats and aircraft was never made.

Very little interest in anti-shipping operations was taken by the senior officers of the G.A.F. and Majors Petersen and Kluemper, two of the three prominent anti-shipping leaders, were never given a fair chance to show what could be done. Colonel General Harlinghausen, Fliegerfuhrer Atlantik, another of these and a prominent figure in the early days of the war, was associated with the low level bombing attacks and was a torpedo expert. He was appointed Director of Aircraft Torpedoes directly under Goering but thereafter seems to have had little influence in G.A.F. anti-shipping policy. Petersen, who pioneered long range shipping attacks, commanded the F.W.200s of K.G.40 in 1940 and again in 1941. Their success, mainly achieved as the result of low level attack by individual aircraft, constituted a serious threat to our supply lines. But his efforts to reorganize the air attack on shipping

from western France were continually baulked by General Jeschonnek, Chief of the General Staff, until Field Marshal Kesselring, then Commanding Luftflotte II, obtained for him an interview with Hitler. However, such encouragement as he obtained was baulked by the requirements of the war in the East which then intervened and he was unable to get far with his programme of expansion, improved training and better equipment, particularly bombsights. The inadequacy of the latter which had been a primary factor in instituting the policy of low level bombing, became a fatal weakness when the improved A.A. defences on our ships made this type of attack too expensive.

Kluemper took over the torpedo and bomber aircraft of K.G.26 in the summer of 1943, and he also obtained a measure of support at first when he made a few attacks and planned them with the greatest care. Before he could perfect his technique of night torpedo attacks with flare illumination, the landing at Nettuno took place and prevented him receiving the aircraft and crews he required. Later he was forced by General Leutnant Fink, Commanding Flieger Division II, to make attacks at frequent intervals which allowed no careful planning and interfered with training.

The second cause of failure may be ascribed to bad tactical planning. With the exception of the commanders named above, very little planning was done by those who controlled these operations. It seems clear that insufficient notice was taken of meteorological reports and that too many attacks were laid on in a hurried manner.

An additional reason for failure was the question of training. The great importance of this has been shown by our own anti-shipping and U-Boat operations. The enemy programme for training in anti-shipping work was quite inadequate in all its aspects and, by the time this weakness was realized, the grip of the fuel shortage had tightened too far.

Fourth on the list of causes comes inadequate briefing, but this was due to the bad briefing policy of the G.A.F. On many occasions a long, unhurried and careful briefing of our own strike wings has resulted in a highly successful attack.

The enemy believed that it was only necessary to brief the pilot and little attention was paid to weather, probable opposition and alternative targets. Bad briefing and bad planning between them caused the loss of many crews which in its turn broke down the very high morale of the anti-shipping units.

Lastly comes the unsuitability of their aircraft and failure to modify successfully those types which they employed. The vulnerability, lack of armour and manoeuvrability of the once successful F.W.200 forced its abandonment as soon as 20-mm. cannon appeared in any numbers on our merchant ships. The He.111 was too slow and unmanoeuvrable. In later years the He.177 from which so much was expected never overcame its teething troubles and losses were very heavy, while the Do.217 could not be used for torpedo attacks owing to the impossibility of holding this aircraft steady at the low speed required for the release of the existing type of torpedo. The internal stowage of torpedoes was also unsatisfactory. None of their coastal types was entirely suitable and only that remarkable aircraft, the Ju.88, proved both popular and effective. Its

successor, the Ju.188, so long awaited by the crews, came too late to play an important part. Indeed, little had been seen of the Ju.188 in its anti-shipping capacity until the remarkable meeting of two strike wings, the Mosquitos from Banff and the Ju.88s and Ju.188s from Trondheim, which occurred west of Denmark on April 21, 1945, when the former were returning from an abortive sortie. The Mosquitos claimed to have destroyed nine of the enemy without loss to themselves. A disastrous ending to what was probably the last German anti-shipping operation of the war.

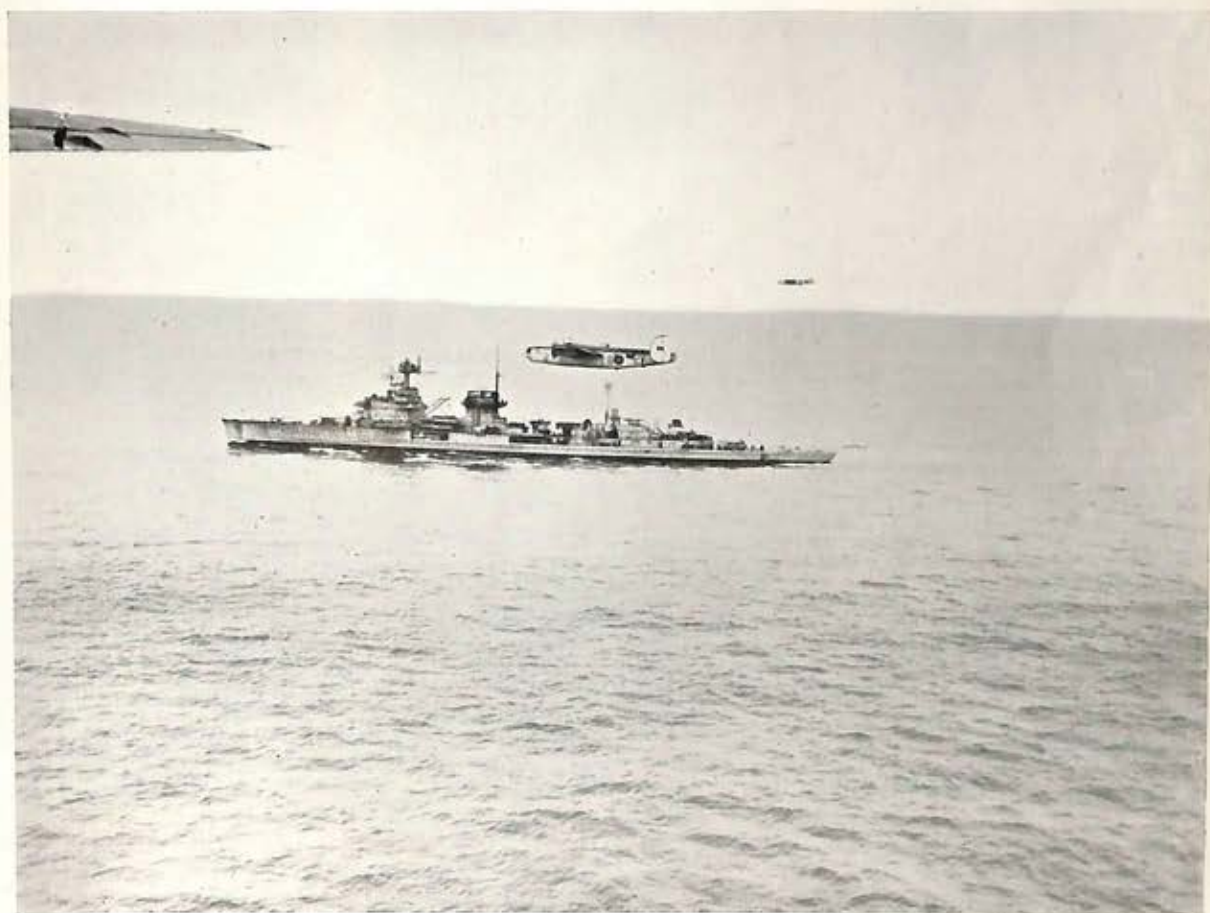
But bad tactical planning, training, briefing and aircraft were only the result of bad policy—policy which on many occasions transferred the specialist anti-shipping squadrons to other tasks for which they were unsuited and broke up the continuity of their work—policy which again and again allowed most promising anti-shipping weapons to be discarded before their teething troubles had been overcome. Undoubtedly the primary cause of the failure of the enemy's anti-shipping operations was the lack of a comprehensive plan.

Coastal Command Memorial

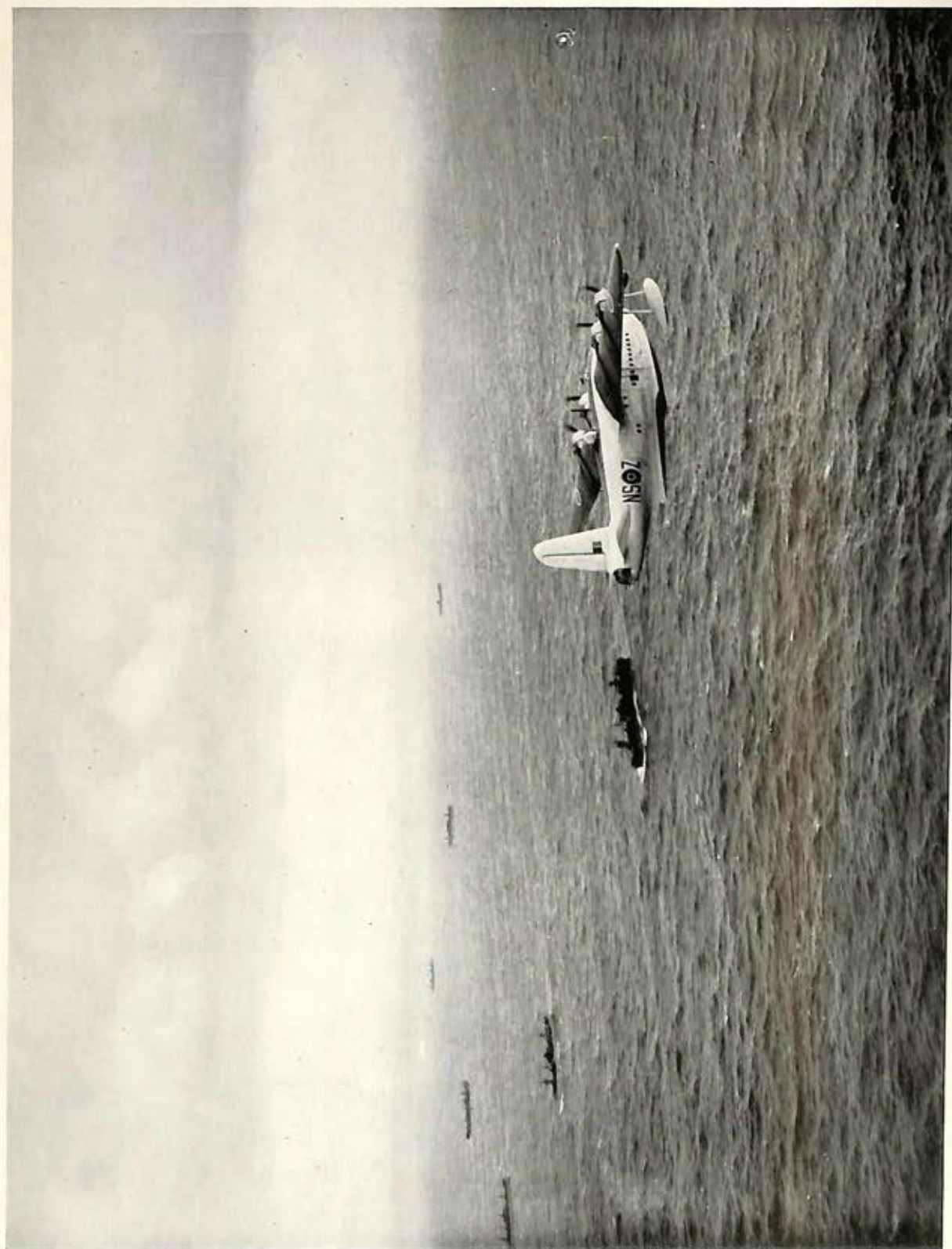
It will be remembered that the Coastal Command Memorial is to take the form of a leather bound book with vellum leaves on which will be inscribed brief histories of all Units who have served in Coastal Command during the European War, 1939-1945. Where a Unit possesses a badge this will be included in the Memorial. In accordance with the wishes of the majority it is proposed to place the finished book in some public building where all ranks may see it.

A working Committee has been formed at Coastal Command Headquarters under the permanent direction of the Air Officer in charge of Administration, and though it will necessarily be some considerable time before the memorial is finished, all will be interested to know that the work is going ahead satisfactorily.

At the same time as the book is in course of preparation an endeavour will be made to reproduce it in a simpler and much less expensive form. In addition, less elaborate copies of each individual page will be made available to those Units who wish to have them. Details as to the cost of these reproductions will be given in due course through Command Routine Orders.



The surrender of two famous enemy warships. In the top photograph the *Prinz Eugen* can be seen under escort. The bottom photograph shows the *Nuremberg*. The aircraft above the battle cruiser is a Liberator of 206 Squadron.



HY 358 was the last convoy to be escorted. In this photograph Sunderland Z/201 can be seen carrying out its final convoy patrol on June 3, 1945.