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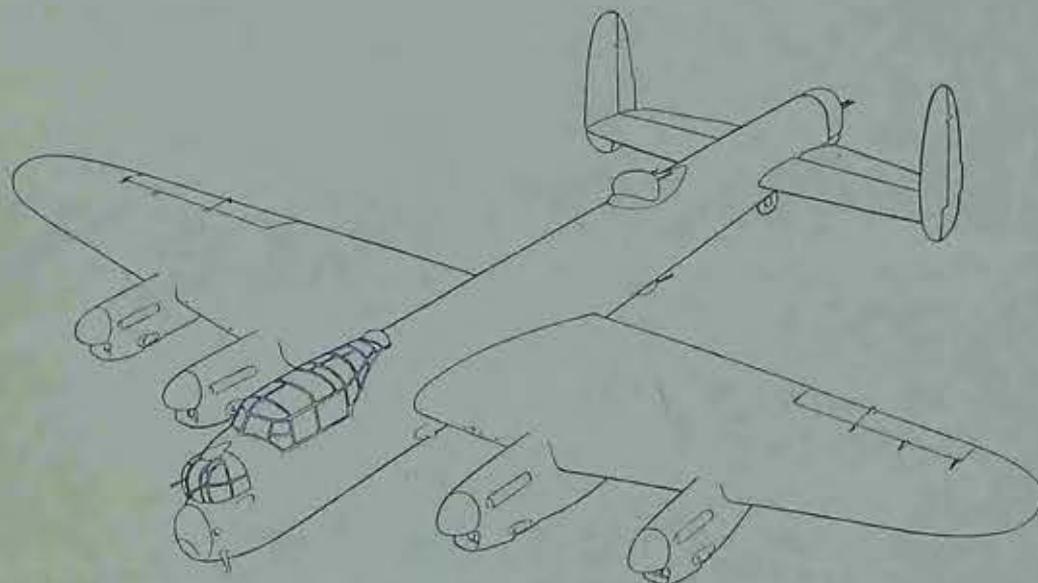
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BOMBER COMMAND QUARTERLY REVIEW

April — May — June, 1942

No. 1



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FRONTISPIECE



Fig. 1.—The Heinkel Works at Marienehe was one of the important objectives, assigned to crews of No. 3 and No. 5 Groups, during the April raids on Rostock. The results were very effective as this photograph shows. The damaged buildings (outlined in white) include the Main Assembly Hangar—hit by a stick of heavy bombs—the Prototype Assembly Shop, and other vital sections were damaged by fire or H.E. (See page 4.)

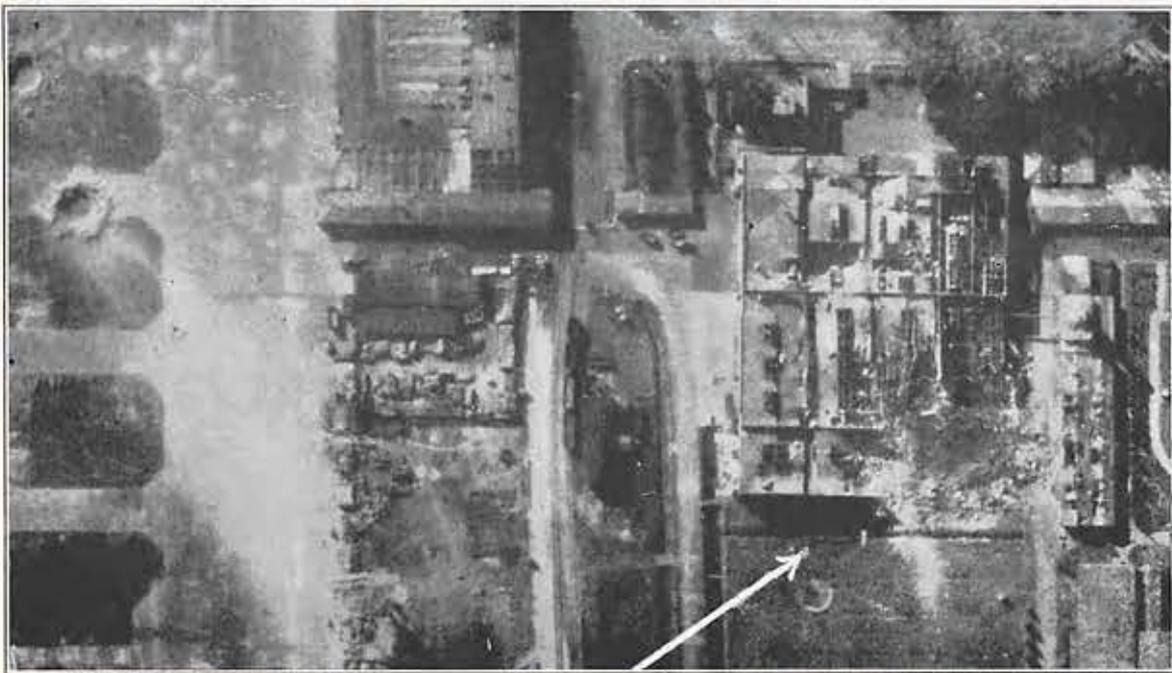


Fig. 2.—The Focke-Wulf Works at Neuenland was the special aiming-point for crews of No. 5 Group on the night of the 1,000 raid on Bremen. (See page 3.) This enlarged view shows the Machine Shops which were completely wrecked by a 4,000 lb. H.C. bomb, and most of the other buildings show signs of fire or blast damage.

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HEADQUARTERS
BOMBER COMMAND
ROYAL AIR FORCE

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TABLE OF CONTENTS

	<i>Page</i>
<i>Preface by the Air Officer Commanding-in-Chief</i>	iv
I. Review of the Bomber Offensive, April–May–June, 1942	
(a) Introduction	1
(b) Operations related to the War at Sea :—	
(i) German North Sea Ports	3
(ii) German Baltic Ports	4
(iii) U-Boat Engine Works	4
(iv) Attacks on German Warships at Trondheim	5
(v) Ports in Occupied France and the Low Countries	5
(vi) Mining Enemy Sea-Routes	5
(c) Operations against Enemy War Industry :—	
(i) The Rhineland and the Ruhr	6
(ii) South Germany and Bohemia	9
(iii) Italian Targets	9
(iv) French Factories	9
(v) Day Operations against Industrial Targets	10
(d) Propaganda in Germany and Occupied Europe	10
II. Notable Flying Incidents	
(a) A Lancaster returns from the Baltic	12
(b) A Pugnacious Stirling	12
(c) Two German Fighters Destroyed—Our Aircraft Undamaged	13
III. Miscellaneous Items of Operational Interest	
(a) Concentration and its Effect on the Enemy's Defences	14
(b) The Accuracy of Daylight Bombing	14
(c) Large H.C. Bombs	16
IV. Enemy Reactions	
(a) Hitler Replies to Bomber Command	18
(b) Enemy Night Fighters	19
(c) German Decoys and their Effect in misleading Night Bombers	21

ILLUSTRATIONS

<i>Figure</i>		<i>Facing page</i>
1 & 2.	German Aircraft Factories shattered during the April–June Quarter (<i>Frontispiece</i>)	
3.	The Port of Emden after the Raids of June 1942	4
4.	The U-Boat Yards of the Nordsee Werke, Emden	4
5.	The damaged Diesel Engine Works at Augsburg	4
6 & 7.	Large-scale Photographs of the devastated City of Cologne	4
8.	The Baltic Port of Rostock after the April Raids	5
9 & 10.	Accurate Daylight Bombing—Zeebrugge and Le Havre	16
11–13.	Effect of 4,000-lb. Bombs on Germany	17
14.	Nordholz Aerodrome and a realistic Dummy	20
15–16.	A Decoy at Wilhelmshaven at night and by day	21

DIAGRAMS

	<i>Page</i>
Effort directed against Naval and Industrial Targets	1
Map showing Distribution of Bomber Operations	2
The Accuracy of Daylight Bombing	16
(C46460)	B2

BOMBER COMMAND QUARTERLY REVIEW No. 1

PREFACE

by the

AIR OFFICER COMMANDING-IN-CHIEF

The purpose of this Review is to enable all concerned to learn more about the far-ranging operations of Bomber Command, and to have a better understanding of what it has achieved and is achieving. This issue deals with the period which included the first thousand raids. In the past, operations have been reported in the press, in which of course nothing of a secret nature can appear, and they have also been fully described in secret reports which have a very limited circulation. The object of this review is to provide information which, while more accurate and full than that which can be given in the press, can enjoy a wider circulation than the normal secret reports. I hope that all ranks will in this way be given a better understanding of the progress of the air offensive against Germany and will be encouraged to study the conditions in which the best results are achieved and the directions in which there is yet room for improvement.

As in all forms of warfare against a determined enemy, what is achieved sometimes falls short of the aim, and outstanding successes are not won more easily in the air than on land or at sea. Only by ceaseless toil and study, by determination in the face of odds and by the adoption of new tactical methods has it been possible to carry out operations which, within the last few months, have shattered a number of great German industrial centres and seriously damaged many more.

In 1940, when France had fallen and Berlin was building grandstands in the Unter den Linden for the Victory parade, few would have dared to foretell these British successes. In 1942, few who have troubled to inform themselves of the facts can doubt that, with ever-growing experience, our bombers will make their past successes look small and insignificant.

Arthur T. Harris

Air Marshal.

10th September, 1942.

I.—REVIEW OF THE BOMBER OFFENSIVE, APRIL—MAY—JUNE, 1942

(a) INTRODUCTION

During the quarter under review the Bomber offensive against Germany achieved a new degree of intensity, typified by the "Thousand Raids" which far surpassed all previous standards of aerial warfare.

A comparison with the corresponding quarter of last year brings out some interesting facts regarding this achievement. The average first line strength of Bomber Command was lower than in the period April to June, 1941, owing to the transfer of squadrons to other Commands at home and abroad. Yet the weight of bombs dropped in night raids on enemy territory shows an increase of about 50 per cent. and the total of operational sorties flown during the last quarter shows an advance of nearly a thousand. In the case of the largest raids training units were brought into the first line and contributed in all a further thousand sorties.

April-June Quarter	Approximate proportion of Heavies	Total Sorties	Weight of Bombs dropped on Enemy Territory
1941	10 per cent.	9,984	9,550 tons
1942	40 per cent.	10,784 11,818 (including O.T.U.s).	14,510 tons.

Thus the achievement of the past three months is partly the result of greater effort from a smaller number of squadrons and partly due to the change-over from the medium to the heavy bomber, which has resulted in a vast increase of bomb-carrying capacity.

A year ago heavy bombers had not long been introduced on operations and formed only 10 per cent. of our total aircraft, while Stirlings, Halifaxes and Lancasters now comprise nearly half our first line strength. This enabled our small force of home-based bombers to drop as great a load on enemy territory during last quarter as the Luftwaffe dropped over an equal period at the height of the Blitz—when the Luftwaffe was able to concentrate its whole effort against England.

A limit to the number of sorties was, as usual, set by weather conditions. May was particularly disappointing in this respect, operations having to be cancelled or restricted to minelaying on half the nights of that month. During the whole quarter unfavourable weather prevented operations on 28 nights, and hampered their execution on others.

However, new methods and developments in tactics and equipment are constantly being introduced in an attempt to lessen the effects of both poor visibility and of the enemy defences. Considerable improvement in the success of our night operations has resulted from the use of new aids to navigation, the operational development of which coincided with the period under review. This has made possible a new technique of concentrated attack by waves of aircraft. Under these conditions it is possible to deliver a heavy attack by hundreds of aircraft within half an hour—a concentration calculated to overwhelm the enemy A.R.P. system and to reduce the efficiency of his A.A. and fighter defences.

Our bombers have two main tasks (each of which has many aspects):—

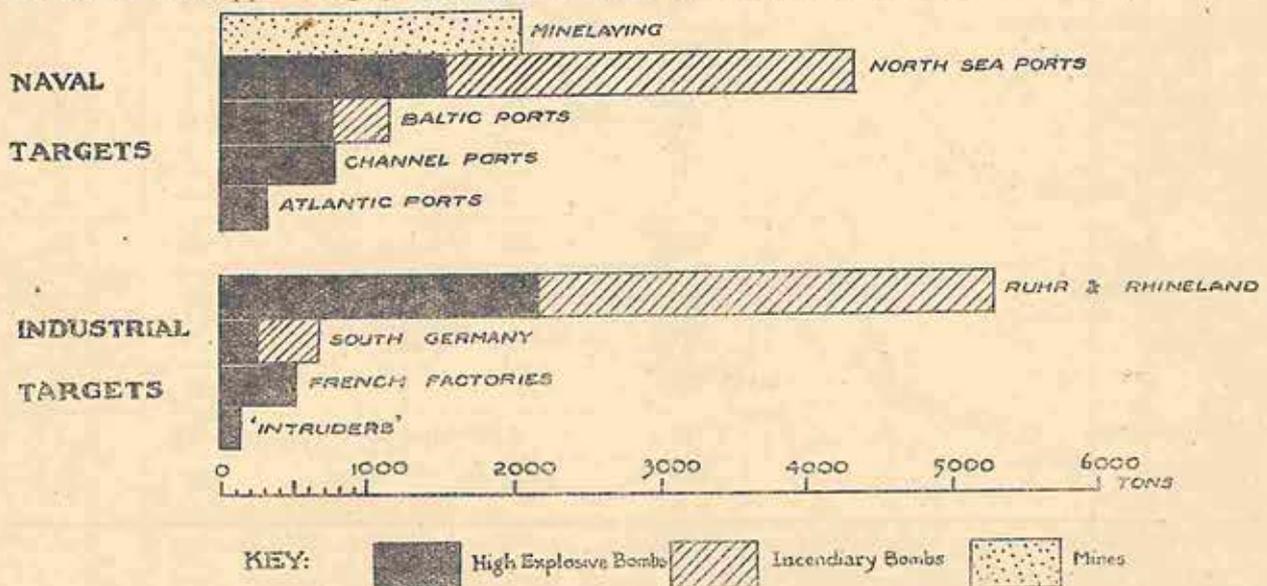
- (1) to destroy the enemy's ports, ships and the main-spring of his offensive against our ocean convoys;
- (2) to inflict maximum damage on German and German-controlled war industries.

In the course of such operations it is now part of our policy to create havoc in those German towns and cities which house the workers on whose efforts the Nazi war machine is dependent.

A third, and minor activity, is the maintenance of the spirit of resistance throughout the occupied countries by the distribution of printed information.

These are huge tasks and entail continual and intense effort. It can be claimed that last quarter witnessed a tremendous advance on anything we had previously accomplished and in fact probably exceeded the achievements of the whole offensive up to that time.

The distribution and weight of this effort are here shown diagrammatically and are summarised in two tables which appear on pages 2 and 6. In addition, the raids themselves are broadly reviewed



in the light of the main objectives to which reference has been made. Known results are briefly stated and, where necessary, an indication is given of the part played by weather and other operational factors without some understanding of which it would be impossible to appreciate the outstanding achievement of these three months.

(b) OPERATIONS RELATED TO THE WAR AT SEA

Since the beginning of the war, naval targets have received particular attention from Bomber Command. In the first year naval bases and warships were the primary concern; from June, 1940, to the outbreak of the Russian campaign the invasion fleet received much of our attention; but, from the very first, the Battle of the Atlantic and the U-Boat menace to our convoys has remained the most serious feature of the war at sea. Between 1st April and the end of June this year our bombers were most actively engaged in this conflict night and day.

The escape of the German battle-cruisers from their uneasy refuge at Brest in February, 1942, at last released Bomber Command aircraft for large-scale operations against naval targets in Germany. Indeed, the Nazis achieved nothing by their spectacular dash up the Channel. Both the *Scharnhorst* and *Gneisenau* were damaged—both mined in passage and subsequently bombed in Kiel Harbour—to such an extent that they have not yet been of any use to the enemy. Thus for a year and a half Bomber Command has kept these ships out of the war.

Meanwhile our bombers have been freed to attack submarine building-yards and other vital objectives in Germany itself—and, incidentally, our crews have the satisfaction of knowing that when their bombs miss the precise aiming-point Germans and not Frenchmen suffer. Another important opportunity has been seized as a result of the release of a large part of our effort from Brest: namely to effect a great increase in the scale of our mine-laying activity which has a considerable bearing on the course of the war at sea. (These operations are discussed on page 5.)

TABLE I
DISTRIBUTION OF EFFORT DIRECTED AGAINST NAVAL TARGETS
1st April—30th June, 1942

Targets.	No. of Sorties despatched.	Tonnage of Bombs dropped.		No. of Operations.	
		H.E.	Incendiaries.	Night.	Day.
<i>German North Sea Ports :—</i>					
*Bremen	1,470	809	1,493	4†	2
Emden	842	455	987	4†	2
Hamburg	526	271	284	3†	—
	2,838	1,535	2,764	11	4
<i>German Baltic Ports :—</i>					
Kiel	88	40	48	1	—
*Rostock	521	441	304	4†	—
*Warnemund	193	285	31	1†	—
	802	766	383	6	—
<i>Southern Germany :—</i>					
Augsburg (U-Boat Engine Works) ..	12	14	—	—	1
<i>German Bases in Norway :—</i>					
Trondheim (Battle Cruisers)	77	117	—	2	—
<i>The Low Countries :—</i>					
Flushing	30	27	—	—	3
Bruges (Oil)	18	16	—	—	2
Ostend	20	33	—	1	—
	68	76	—	1	5
<i>Targets in Channel Ports :—</i>					
Dunkirk	175	216	—	4	7
Cherbourg	64	51	—	1	4
Boulogne	65	39	—	2	4
Le Havre	272	329	—	10	2
Dieppe	78	71	—	5	2
Fécamp	11	—	—	—	1
Coastal Shipping	8	3	—	—	2
	673	709	—	22	22
<i>Atlantic Ports :—</i>					
St. Nazaire	221	224	—	10	—
Lorient	17	19	—	1	—
Nantes	47	39	—	3	—
	285	282	—	14	—
Minelaying	1,310	2,759 mines laid		45	1
Total Effort	6,065	3,499	3,147	101	33

N.B.—Some of the sorties despatched bombed alternative targets not included in the Table.

* These operations included successful attacks on Aircraft Works outside these towns.

† All these were large-scale operations.

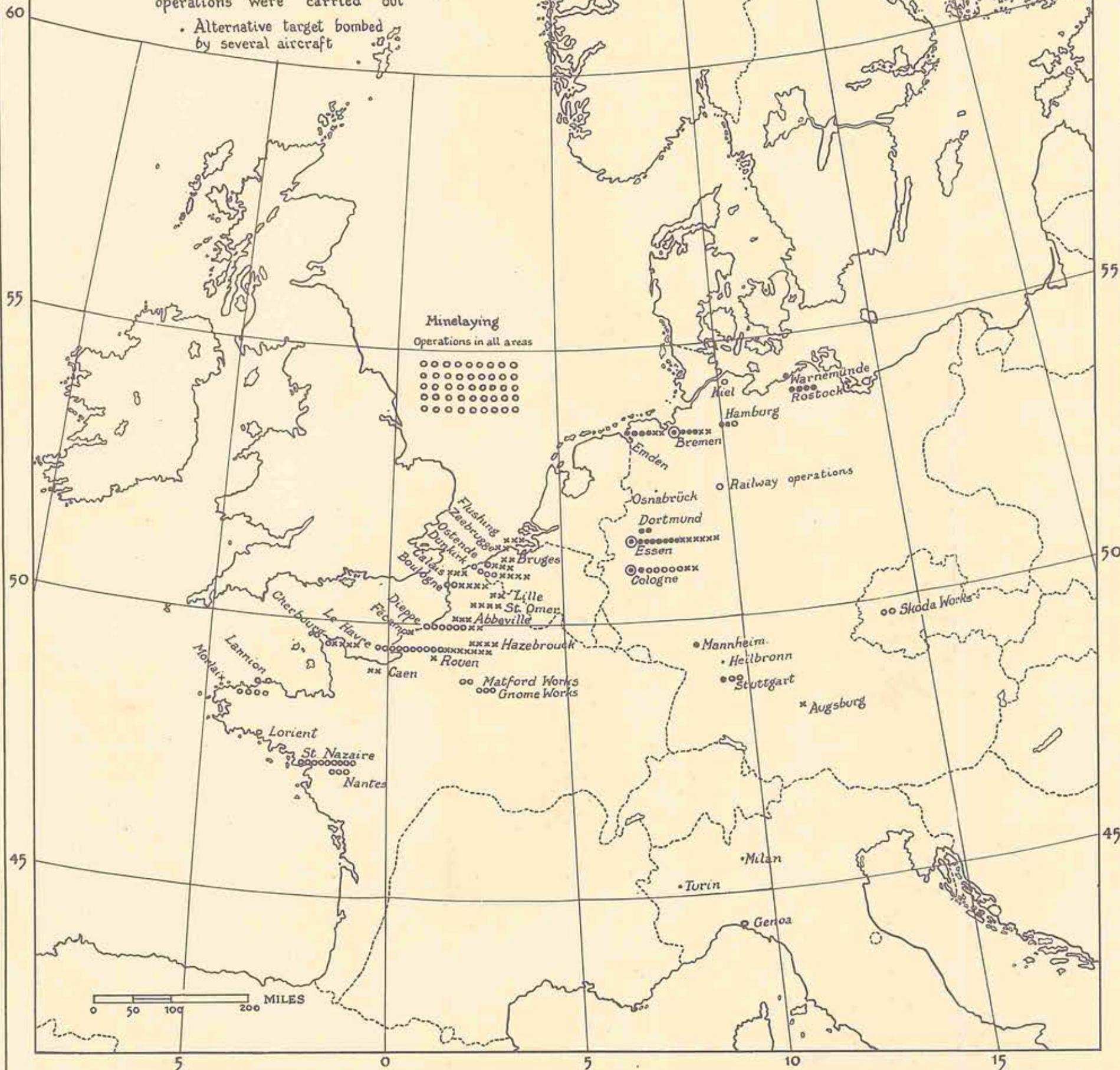
DISTRIBUTION OF BOMBER OPERATIONS

1st APRIL - 30th JUNE 1942

- ◎ Thousand Plan Night Raid
- Night Raid by more than 100 aircraft
- Night Raid by less than 100 aircraft
- × Daylight Raid

In addition 28 Intruder and 40 leaflet operations were carried out

- Alternative target bombed by several aircraft



0 50 100 200 MILES

The distribution of our effort against naval targets during the present period is given in Table 1. In the June quarter, our aircraft carried over 6,000 tons of bombs against naval targets in Germany and occupied territory, thus surpassing by more than 1,800 tons all previous efforts against such objectives as will be seen from the following approximate figures:—

Quarter ending June, 1941	4,850 tons.
Quarter ending September, 1941	3,400 tons.
Quarter ending December, 1941	3,680 tons.
Quarter ending March, 1942	2,410 tons.
Quarter ending June, 1942	6,650 tons.

These figures do not include the increased minelaying effort. If the number of minelaying sorties is included it will be found that some seven hundred more directly "naval" sorties were made during the quarter ending June, 1942, than in the corresponding three months of 1941. A high proportion of these sorties (representing nearly 25 per cent. of our total effort on all targets during the period) was directed against submarine-building concerns or important factories producing highly specialised U-Boat parts. The building yards of the Nordsee Werke at Emden, Germania Werke at Kiel and the Neptune Yards at Rostock were all damaged in varying degrees by Bomber Command between 1st April and the end of June, and the rate of submarine construction and repair has certainly been curtailed as a result of at least some of these operations.

(i) Raids on German North Sea Ports

Emden.—Both the town and docks of Emden suffered severe damage during the four strong attacks which took place in June (Fig. 3). The chief significance of this target lies in its use as a transshipment port for iron ore from Scandinavia, a good harbour for ships requiring repair and, most important of all, at the shipbuilding yards of the Nordsee Werke there are normally six U-Boats on the slips. The raid of 6th/7th June was one of the most successful ever made against this target, and about 10 acres of the ship-building and repair yards of the Nordsee Werke were completely devastated on that occasion (Fig. 4). This included the destruction of five large building shops (one of them only recently constructed) and twelve other shops or smaller sheds were either damaged or destroyed. During subsequent attacks a stores building was set ablaze in the same shipyard, another large shed and some smaller ones destroyed. Photographs have revealed roof damage to the covered building slips. Very extensive damage was also done to other shipyards at the port, to a railway station and to public and residential buildings in the town itself.

A letter written by a merchant sailor who was in Emden early last March gives a remarkable impression of the effect of preceding raids, and there is no doubt that industrial and living conditions at the port have deteriorated seriously as a result of our latest operations—

"We have been here for a couple of days in the docks on account of damage to the engines. I shall soon begin to think we shall never get away from here. It is absolute hell. Last week the English were here: we looked at the damage caused later. Two merchant ships in the harbour were both severely damaged, one about 5,000 tons heeling over.

A new U-Boat which was all ready to leave at any moment was destroyed, and three large buildings in the docks levelled to the ground. If the English keep on at this rate a few more times, there won't be much of the port left."

Bremen.—The effort against this port was on an even greater scale, as the four heavy raids directed against it during the period included a mass attack by 1,006 aircraft (of which 102 were aircraft of Coastal Command). Although the town and port were cloud-covered on this occasion a considerable amount of damage was done in the town and at one point in the dock area. One of the best of all the results of the June raids was the serious damage inflicted during the mass attack on the important Focke-Wulf factory at Neuenland. (This was a special aiming-point assigned to aircraft of No. 5 Group.) Here the machine shops were well-nigh completely wrecked by a large bomb, and most of the remaining buildings showed signs of H.E. or fire damage (Fig. 2). But the dock area suffered in the first attack (3rd/4th June), when buildings belonging to two separate oil refineries were partly destroyed, tanks of the Mineral Oil Refinery were demolished and a large warehouse on the Backhausen Quay completely gutted. The Hansa Lloyd Automobile Works and their dynamo works at Hemlingen suffered in these raids, and residential and commercial property was considerably damaged.

Unfortunately, the important U-Boat construction yards do not seem to have been directly affected, although H.E. and incendiaries fell in the dock area on each occasion.

Hamburg.—The second largest city in the Reich (and one of the greatest sea ports in the world) was three times the target for strong forces of our bombers. 60 or 70 U-Boats are normally under construction in the Hamburg shipyards, representing about 25 per cent. of Germany's yearly output and it was hoped, as at Emden, to obstruct the work of the U-Boat yards. Unfortunately, thick cloud covered the whole region on two of the three occasions, and haze prevented accurate bombing on 17th/18th April. However, serious damage was done to large warehouses in the dockyards, hits were obtained on a factory and severe damage caused in the north part of the city itself.

Bremerhaven and Wilhelmshaven—both of which play a part in Germany's submarine output—were bombed by aircraft unable to pinpoint the primary target on the night of the mass raid on Bremen.

(ii) German Baltic Ports

Kiel.—A raid on this heavily defended naval base at the end of April added to the damage inflicted on the naval dockyards on 12th/13th March. Despite the smoke screen in operation over the docks, sheds of Krupp's Germania Shipbuilding Yards (which had been repaired since the previous attack) were again hit and partially destroyed and the greater part of a wire cable factory was gutted by fire. Barracks and public buildings were also damaged or destroyed.

Rostock.—Apart from Cologne this port suffered more heavily than any other town in Germany (see Fig. 6). The four raids on successive nights in April caused damage on the scale of the great fire-blitz on Lübeck the previous month. On each occasion weather conditions were excellent. Practically three-quarters (or about 130 acres) of the Old Town were completely devastated, all three Heinkel factories damaged (Fig. 1) and the aerodrome at Marienehe rendered temporarily unserviceable. Both the Central Railway Station and the Franz (passenger and goods) Station were wrecked.

The port and storage facilities were heavily blitzed and some damage was done to the Neptune shipbuilding yard where shortly before the raid two submarines had been laid down in addition to its normal activity in building mine-sweepers and escort vessels.

On each occasion selected crews of No. 5 Group and No. 3 Group were given the Heinkel aircraft factory at Marienehe as their primary aiming-point, some crews attacking from 2,000 ft. or below, and the results were very effective despite camouflage and active opposition from fighters and flak batteries. The main assembly hangar was hit by a stick of heavy bombs, its roof being destroyed over an area of at least 305 ft. by 135 ft., and the prototype assembly shop and many other buildings damaged by fire or H.E. (Fig. 1). The importance of the buildings is shown by the fact that repair work was at once put in hand, and eleven days after the raid the roof of the technical school main building was patched up and half of the damaged roof of the main assembly shops had been replaced. (An Intelligence source reported that the walls of the largest assembly shed fell inwards, destroying aircraft on the lines, as a result of one of the raids.)

The attacks on Rostock caused a complete stoppage of all war supplies to Denmark via Rostock and Warnemünde as well as the train ferry service to Gjedser.

Warnmünde itself was the object of a very determined attack. The primary aiming-point for a large part of the force was the Heinkel (Arado) Works, on the outskirts of the town. This target was not only heavily defended by light flak batteries, but, moreover, a very effective defence was provided by a large number of searchlights deliberately used to dazzle the raiders. The result was that only a small part of our force actually scored hits on the works, but the assembly hall was damaged and the adjoining airfield received several sticks of H.E. In addition, the seaplane station was rendered temporarily unserviceable and direct hits were scored on the passenger railway station and on two large dock buildings. Some residential property was also destroyed.

(iii) U-Boat Engine Works

M.A.N. Works, Augsburg.—One of the outstanding raids of the war was carried out in daylight by 12 Lancasters of No. 5 Group on the M.A.N. works at Augsburg, which involved a round trip of some 1,250 miles, mostly over enemy territory. The M.A.N. factory is the largest Diesel engine works in Germany and as its great importance lies in the production of U-Boat engines, it may properly be included among operations against targets related to the war at sea, although the factory is situated in the heart of Central Europe.

The Lancaster operation was planned with extreme care and cross-country practices were carried out, including flights at low level over the Scottish hills. Large-scale diversionary Fighter-and-Boston attacks were carried out over the Calais-Cherbourg-Rouen area with the intention of enabling the two waves of Lancasters to cross the French coast unnoticed at 50 ft. above sea level. Unfortunately the first wave was attacked by between 20 and 30 Me. 109s and in a running fight lost 4 of their number. Apart from light flak at Bernay aerodrome, no further opposition was encountered by any of the aircraft before reaching the target area, and the eight remaining crews continued, pinpointing their way on topographical maps.

The captain of one aircraft of the second wave (U/97) reported as follows:—

"The outward journey was made in contact with the leading formation and caused no difficulty, there being no opposition at all. The navigation was perfect and we arrived at the last turning point together. We did a circuit over Lake Constance to allow the first section to go ahead. Approaching the target, guns opened up on all sides and all machines in the formation were hit—Nos. 2 and 3 catching fire. We ran right over the target—the bombs were released by the bomb-aimer and must have fallen in the target area specified at briefing (in the centre of the chimney cluster, the tallest chimney being on the right of where our bombs fell). As we left the target, our No. 2 picked up position and we continued flying low until it became dark enough to climb."

All the aircraft carried four 1,000-lb. bombs and, considering that only eight reached the target, the amount of important damage revealed by subsequent daylight reconnaissance was highly satisfactory. The main Diesel engine assembly shops, of one to three storeys and covering an area of 20,000 square yards, were severely damaged by a number of direct hits (Fig. 5). Many other buildings forming part of the works were damaged, and out of four buildings believed to be stores for machine parts, two were damaged and the remainder entirely demolished.



Fig. 3.—The Port and Town of Emden after the June raids (see page 3). The white patches show the general areas within which most buildings have been damaged or destroyed up to the present time.

- | | |
|--------------------------|--|
| A. The Town. | D. Government Stores. |
| B. U-Boat Yards. | E, F. Shipping repair yards and dock industries. |
| C. Main Railway Station. | |



Fig. 4.—The U-Boat Yards of the Nordsee Werke at Emden (on a larger scale) of which 10 acres were devastated and the building slips damaged on two occasions during June. Only the main points of damage are annotated.

- | | |
|---|---|
| A. Large workshop gutted. | D. Shed demolished, another partly gutted. |
| B & C. 4 large workshops reduced to rubble. | E. Long workshop and connecting shed damaged by fire. |

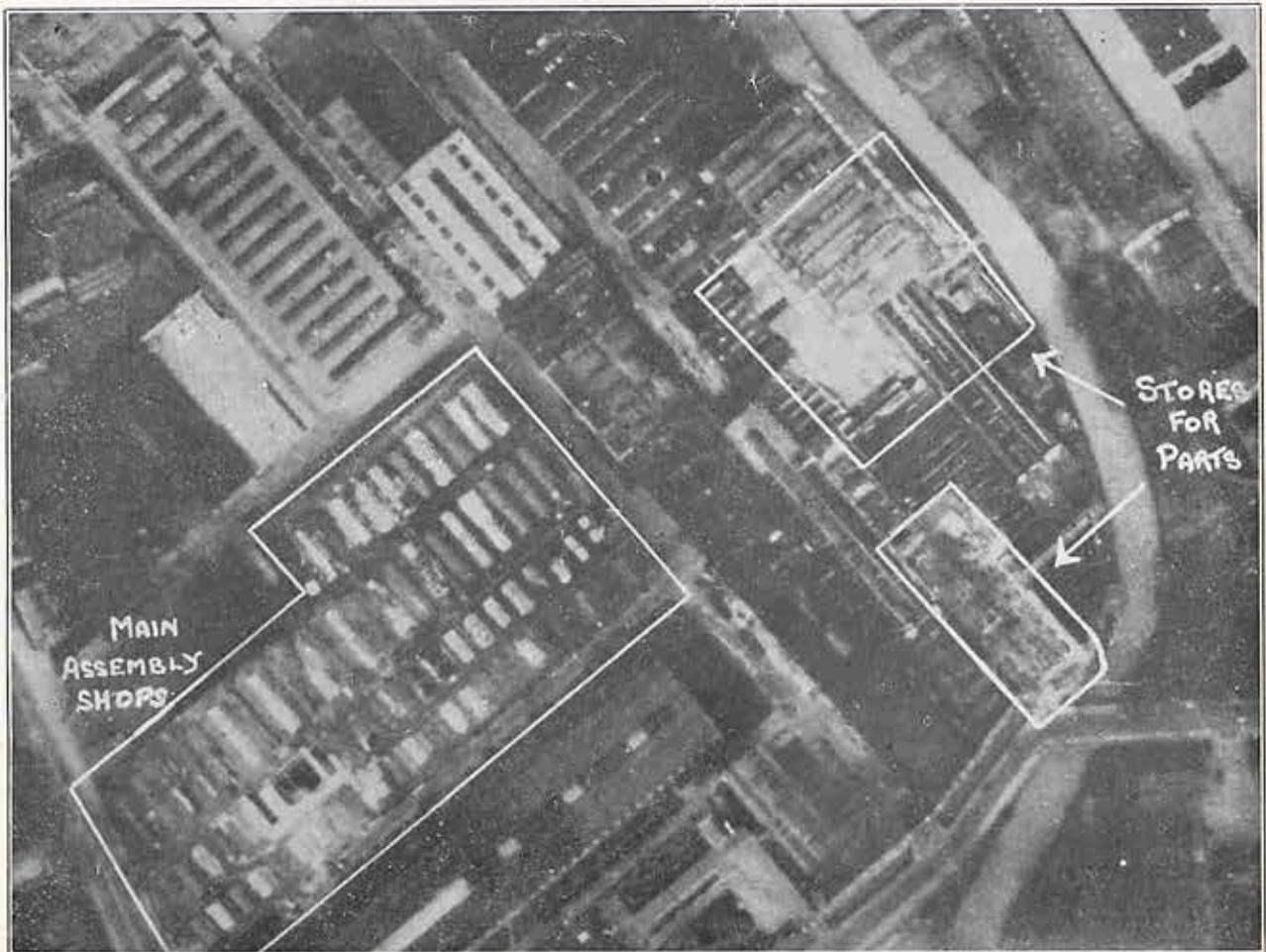


Fig. 5.—The M.A.N. Works at Augsburg, the largest Diesel engine concern in Germany, which supplies a large proportion of her yearly output of U-Boat motors. Some of the areas damaged in the celebrated daylight raid by Lancasters on 17th April, 1942, are shown in this figure. The Main Assembly Shops, which were severely damaged, cover 20,000 square yards. (See page 4.)

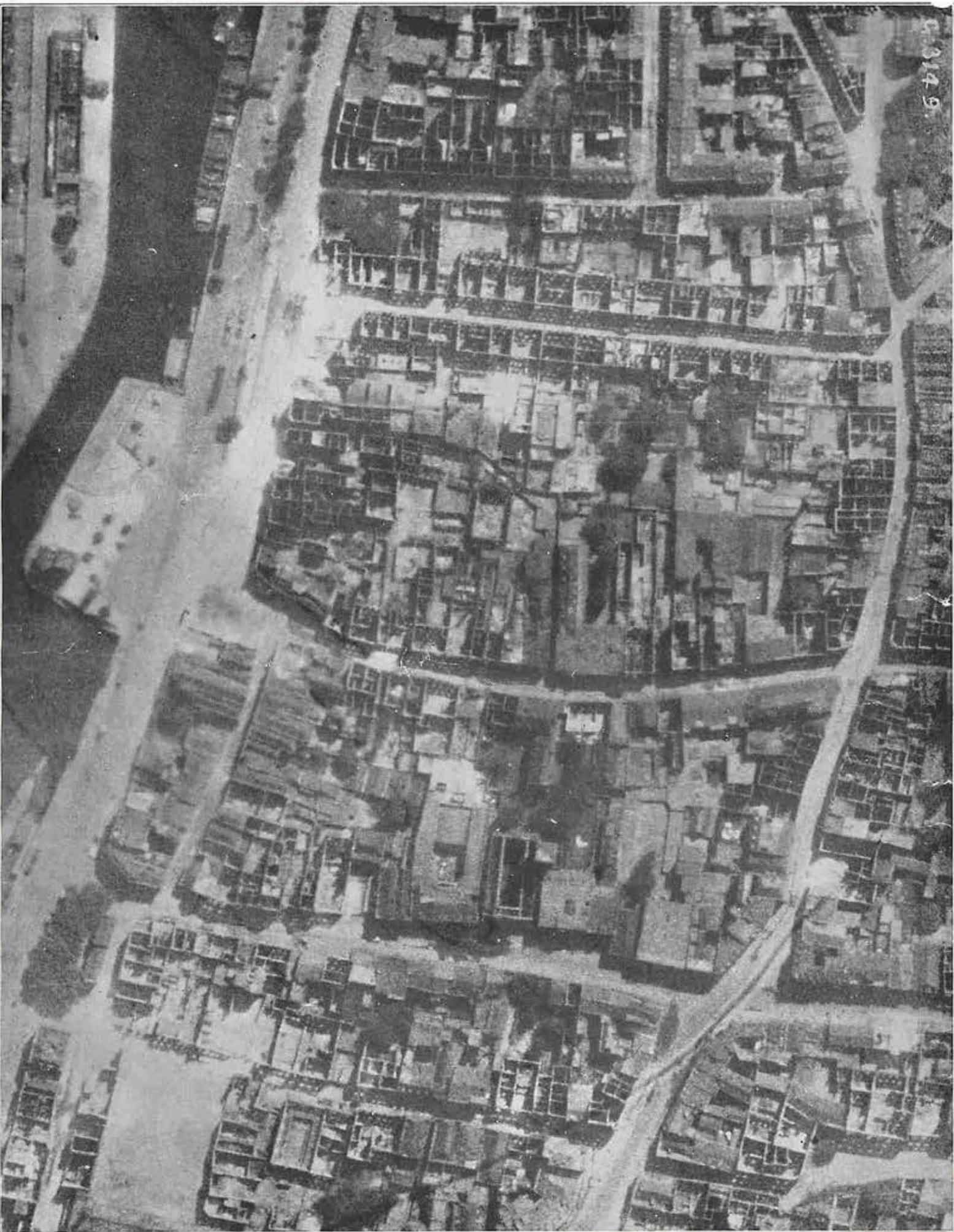


FIG. 6.—THE SHATTERED CAPITAL OF THE RHINELAND

Cologne after the 1,000-bomber raid of 30th-31st May, 1942.—Part of the central city, of which one-half, amounting to 300 acres, was completely devastated (see page 7). Note the wall-shadows *inside* the roofless buildings and the lattice-like effect of the sun shining through the window-holes. The streets are deserted: Cologne is practically a dead city judging by such photographs, taken five days after the raid.

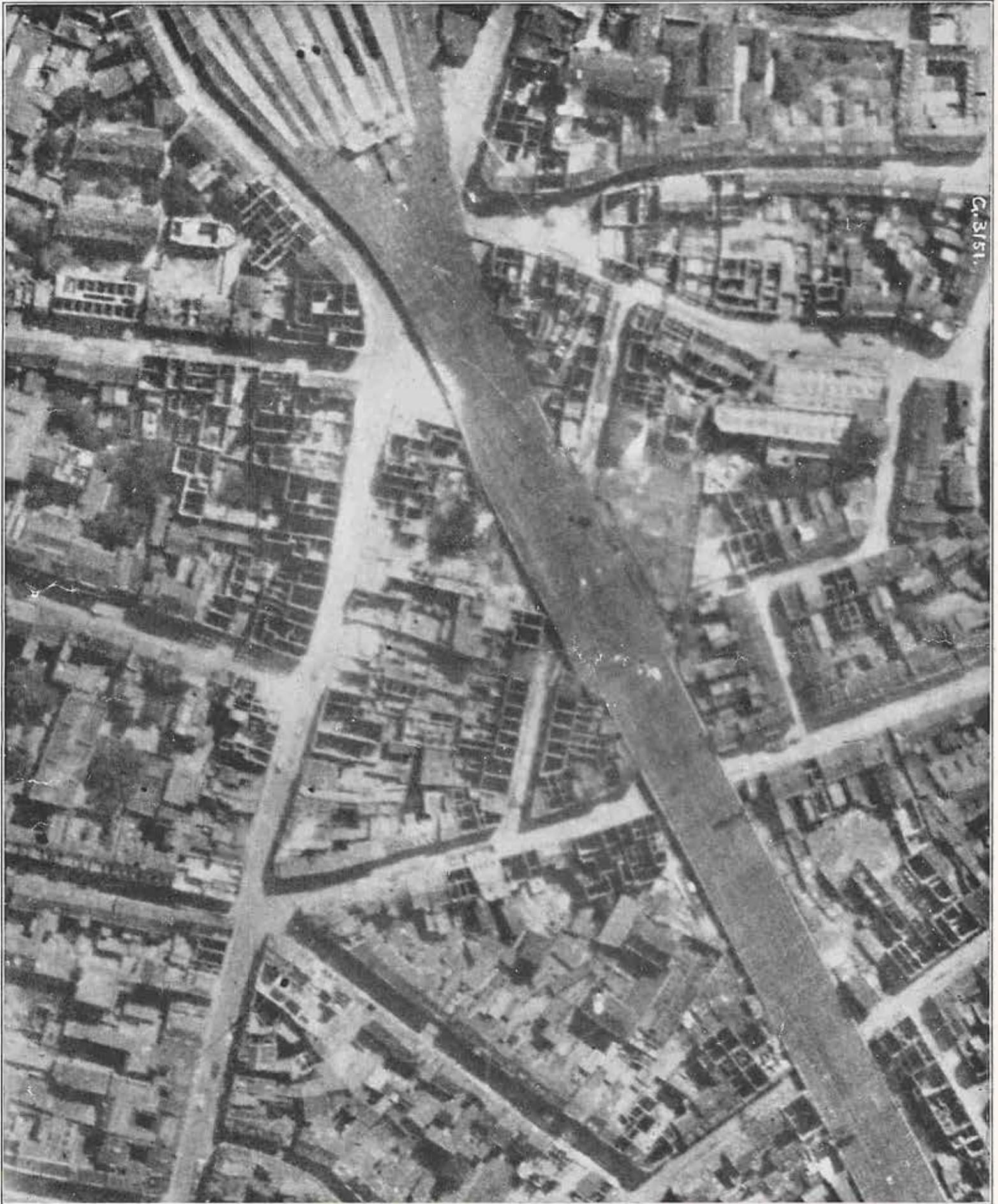


FIG. 7.—A FIRE-SWEPT AREA NORTH OF COLOGNE'S MAIN RAILWAY STATION

It is reported that so many of the A.R.P. personnel were killed or injured and so much fire-fighting equipment damaged during the mass raid that it was quite impossible to control the great fires started by the 1,000 tons of incendiaries showered on the city.

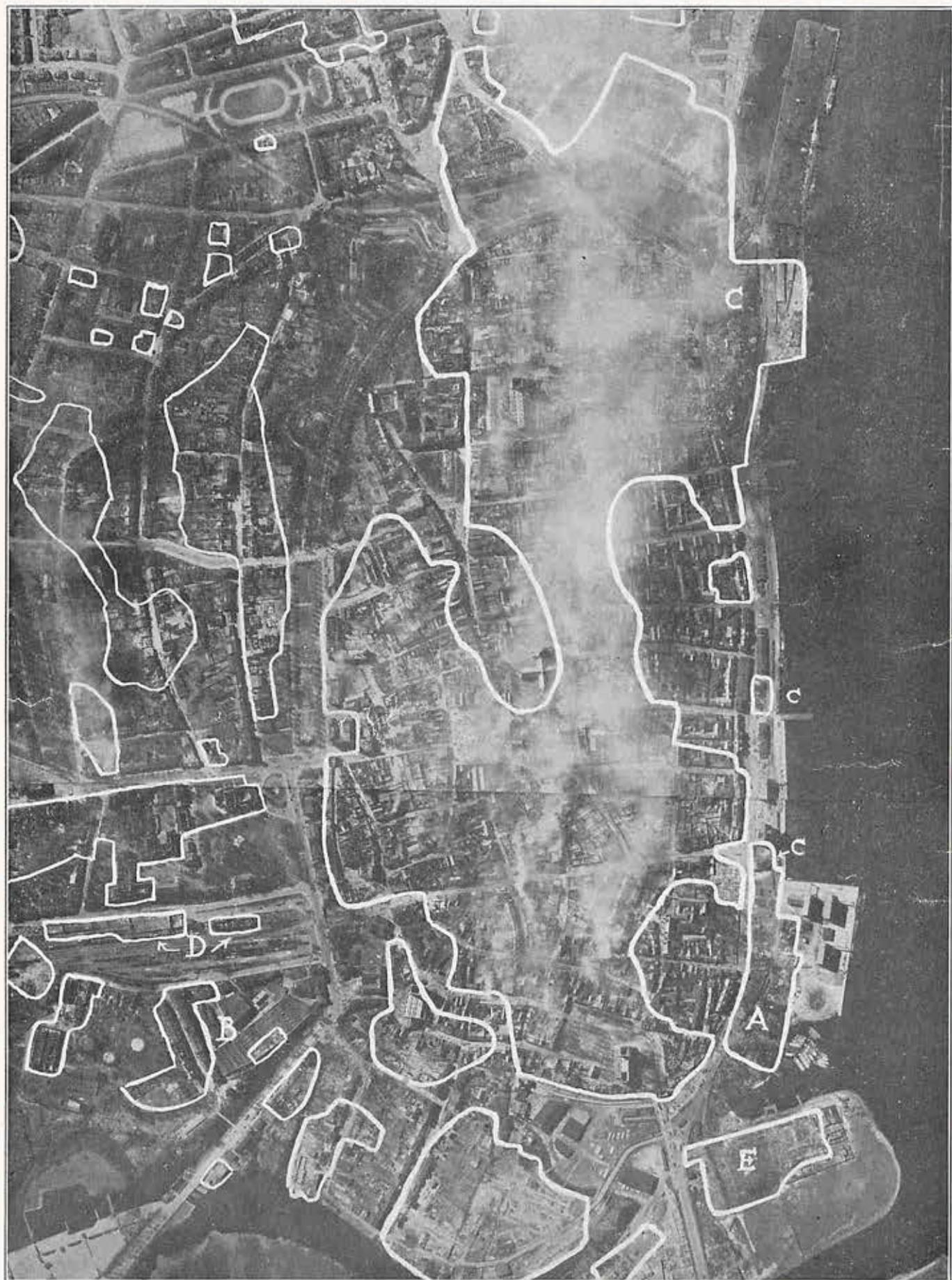


FIG. 8.—THE BALTIC PORT OF ROSTOCK SMOULDERING AFTER THE APRIL RAIDS
A photograph taken on the day after the last attack, with the damaged areas outlined. Almost the whole of the central town is seen to be gutted (*see page 4*).

- | | |
|--------------------------------|---------------------------------|
| A. Shipbuilding Yards. | D. The Goods Station. |
| B. The Heinkel Sub-Factory. | E. Dockside Storage facilities. |
| C, C, C. Blocks of Warehouses. | |

Although it is unlikely that production was completely stopped as a result of this daring raid, there is no doubt that work must have been very seriously delayed.

Humboldt-Deutz Works, Cologne.—The damage inflicted on this important U-Boat engine works and on the Gottfried Hagen Accumulator Works, is referred to under the heading of Cologne (see pages 7 and 8).

(iv) Attacks on German Warships at Trondheim

Two night attacks were directed against the *Tirpitz*, *Prinz Eugen*, *Admiral Scheer* and *Admiral Hipper* in April, but on both nights, the ships were concealed by a smoke screen. Eighty per cent. of the photographs taken with bombing on the first occasion were, however, plotted in the immediate neighbourhood of the *Tirpitz* and on the second occasion 16 out of 43 aircraft claimed to have identified and bombed her. Several near misses were reported, and some aircraft made a successful diversionary attack on Vaernes aerodrome. An Intelligence source indicates that a barracks was hit, many Germans being killed.

(v) Ports in Occupied France and the Low Countries

The ports shown in Table I were attacked either in daylight by small forces of Bostons of No. 2 Group or, at night, generally by freshmen crews. Considerable damage has been caused to dock installations and industrial targets in their vicinity, particularly in the daylight attacks. Le Havre, St. Nazaire and Dunkirk bore the brunt of these attacks, a total of some 750 tons of H.E. having been dropped on the three ports; 219 sorties were despatched against Le Havre and nearly all the damage was confined to the dock area. Only a few small points of damage occurred in the residential area apart from the Town Power Station which was deliberately attacked. (The electricity supply was interrupted for 48 hours as a result of this attack.) The power station on the Quai Colbert was hit on two different occasions, and a number of warehouses in various parts of the docks and three railway buildings also suffered. The attacks on Dunkirk at the end of April caused the destruction of nine invasion barges, seven others were damaged, and two buildings of a petrol refinery were damaged.

Useful damage was inflicted on dock targets at most of the other occupied ports attacked. Outstanding successes were achieved at the shipyard and power station at Grand Quévilly (on the day of the Augsburg raid) and at Zeebrugge, where the coke oven batteries were hit on 7th May (see fig. 9), and very few bombs were wasted in the daylight attacks on Cherbourg.

(vi) Mining Enemy Sea-Routes

The quarter April–June has seen a very considerable increase in the number of mines laid in enemy waters by Bomber Command aircraft. This increase has been brought about not only by the greater number of minelaying sorties but also by the heavier load carried by the four-engined aircraft now operating. A comparison of successful sorties and mines laid during the last two quarters is given below.

		Successful Sorties.	Mines Laid.
January–March	468	724
April–June	1,007	2,750

The range of these heavy aircraft has enabled the Command to attend frequently to more distant minefields than was the case when Hampdens of No. 5 Group were the only aircraft engaged on operations of this kind. Owing to the great length of coast line which the enemy now holds and the suitability of many of these coastal waters for such operations, his anti-mining resources are being severely tried by the widespread activities of our minelaying aircraft.

The delay and damage caused to the enemy's heavy iron-ore traffic between Norway and north German ports has been considerable. During the summer months this traffic is forced to take a route through the Kiel Canal and the Baltic Channels in order to avoid attacks by British aircraft off the west coast of Denmark. The more subtle method of attack by minelaying aircraft comes into its own especially in the restricted waterways through the Belts, and the ensuing confusion has frequently upset the movements of important enemy convoys.

The limited tonnage available to the enemy along his North Sea and Norwegian coast and his overloaded inland transport system make our mining programme doubly dangerous for him. Neutral shipowners are unwilling to jeopardise their ships on the routes so well attended to by Bomber Command. The Germans are therefore faced with the task of maintaining large fleets of minesweepers from the Bay of Biscay to the Baltic in their efforts to ensure safe passage for their precious merchantmen. Channels must be swept daily and each convoy must have individual protection as well.

Lastly, the effect of this unseen method of attack upon the morale of the crews sailing these hazardous routes is shown in the protests recently registered by various Swedish seamen's unions against the chartering of Swedish ships to Germany for trade between Norway and north-west German ports. It is not unlikely that the feelings of Nazi merchant sailors are similar to those of their Swedish contemporaries. The presence of mines at the entrances to the U-Boat bases must also have a considerable effect upon the strained nerves of the crews on their return from a lengthy Atlantic patrol.

Despite the feverish minesweeping activity of the enemy, the known results of our sea-mining activities show that the list of enemy vessels sunk has attained formidable dimensions.

(c) OPERATIONS AGAINST ENEMY WAR INDUSTRY

The distribution of effort against industrial targets is given in Table II and the results of attacks on the main targets are discussed below.

TABLE II
DISTRIBUTION OF EFFORT DIRECTED AGAINST INDUSTRIAL TARGETS

1st April—30th June, 1942

Target.	Number of Sorties Despatched.	Tonnage of Bombs dropped.		No. of Operations.	
		H.E.	Incendiaries.	Night.	Day.
<i>Western Germany :—</i>					
Cologne	1,480	878	1,210	5	2
Essen	2,293	1,060	1,772	8	6
Dortmund	360	168	146	2	—
Special Railway Operation	35	22	—	1	—
	4,168	2,128	3,128	16	8
<i>South Germany and Bohemia :—</i>					
Stuttgart	294	121	214	3	—
Mannheim	197	82	232	1	—
Skoda Works	11	24	—	2	—
	502	227	446	6	—
<i>North Italy :—</i>					
Genoa	18	11	3	1	—
<i>French Factories, etc. :—</i>					
Gnome Works	185	304	22	3	—
Matford Works	91	150	—	2	—
Calais Parachute Factory	18	16	—	—	3
Lille Power Station	18	—	—	—	2
Le Havre Power Station	54	47	—	—	6
Caen Power Station	18	13	—	—	2
Rouen Power Station	6	5	—	—	1
St. Omer Railway Station	30	27	—	—	4
Hazebrouck Marshalling Yard	33	27	—	—	4
Abbeville Marshalling Yard	18	10	—	—	3
	471	599	22	5	25
<i>Low Countries :—</i>					
Langebrugge Power Station	6	3	—	1	—
Zeebrugge Power Station	12	9	—	—	2
Ostend Power Station	18	14	—	—	3
	36	26	—	1	5
<i>"Intruder" Operations, including attacks on Aerodromes in Germany and Occupied Territory</i>					
	349	115	10	28	6
Total Effort	5,544	3,106	3,609	57	44

N.B.—Some of the sorties despatched bombed alternative targets not included in the Table.

(i) The Rhineland and the Ruhr

In Western Germany lies the heart of the enemy's war production—the heavy industries of the Ruhr and Middle Rhine. The great armament works of Krupp and Thyssen are merely the best known of hundreds of factories working night and day to supply Hitler's military machine with the munitions and equipment which are its very life blood.

Of the 29 night operations which Bomber Command carried out against industrial targets in Germany and the occupied countries during the period reviewed, one half have been directed against this western region. Moreover, as the latter operations included two mass raids on the "Thousand Plan" and ten other major raids by more than a hundred planes, it will be seen that this region actually experienced a very large part of the weight of our offensive against German industry.

Cologne : The first "Thousand" Raid (30th/31st May, 1942)

The mass raid on Cologne—the administrative centre of the Rhineland—was the greatest air operation ever planned and undoubtedly achieved the greatest single success in aerial warfare. Coming at the end of a month of persistently unfavourable weather it serves to emphasise the influence of meteorological conditions on our bombing effort. While known weather conditions frequently interfere with the use of our home bases, they also greatly restrict the selection of targets for any given night. More serious than those limitations, however, are sudden and unpredictable changes in the weather over the chosen target, sometimes making it quite impossible for crews to locate their objectives when they reach their destination.

It had been decided at the end of May to deliver an attack of exceptional weight on an important German industrial city. On the 30th of the month full moon, good conditions at home bases and the fact that the necessary forces were standing by, made it important to carry out this attack with the least possible delay, although thundery cloud was known to cover much of Germany. Conditions at Cologne were more promising than at any other target suitable for such an operation, and later weather forecasts showed there was even a chance of very good conditions in this area.

As is well known these forecasts were completely confirmed by events. Though very dirty weather was experienced over the North Sea (crews of No. 4 Group in particular met bad icing conditions) the cloud broke over Holland and at the target conditions were well-nigh perfect. It was one of those comparatively rare occasions when the target could be identified without difficulty by every crew. Of the 1,046 aircraft despatched to bomb Cologne itself over 900 reached the city and, in 90 minutes, they taught the Germans what we mean by the word "Blitz."

The organisation of such a vast force (about twice as great as any the Luftwaffe ever sent to this country) astonished many people besides the Germans. No. 3 Group alone despatched some 250 aircraft—a number usually regarded as a strong bomber force in itself. Operational Training Units of the Command put up 302 aircraft in addition to 64 attached to Nos. 1 and 3 Groups—a very fine effort. Apart from four aircraft of Flying Training Command the whole force which attacked Cologne were provided by Bomber Command.

A further 50 sorties—Bostons of No. 2 Group with 16 aircraft of Army Co-operation Command—set out to patrol enemy night fighter bases near the target or along the bomber routes with a view to restricting the activities of the defence. Fighter Command assisted in these "Intruder" operations which were considered by our crews to have been extremely helpful.

Full descriptions of the Cologne raid have appeared in the press and elsewhere. It will be sufficient to state that 1,455 tons of bombs were dropped on the area of the city, nearly two-thirds of this total weight being provided by an immense number of incendiaries. What such a weight of bombs would mean can be appreciated when it is remembered that during the heaviest raid which the Luftwaffe ever made on a single target in this country about 500 tons of H.E. and incendiary bombs were dropped on London (16/17 April, 1941). In fact, in one night the R.A.F. dropped on Cologne a weight of bombs greater than the Germans released on London in a whole month at the height of the 1940 Blitz.

Early next day the pilot of a Mosquito (the first operational sortie made by this new type) observed numerous fires still burning in the central city and in adjoining industrial and residential areas each side of the Rhine. Smoke covered the city and rose to a height of 15,000 ft., making photographic reconnaissance quite impossible. Eventually, when the smoke cleared away, 600 acres of complete destruction were revealed, half of which area was situated in the inner city. Nothing on such a scale had been achieved in any raid either by the Luftwaffe or ourselves. "All the inhabitants" (as the *Kölnische Zeitung* put it) "when they saw the smoking ruins of their city, realised they had seen the old Cologne they knew for the last time."

That city was not only the third largest in the Reich, but also one of the greatest centres of railway communication in Europe. The destruction of the greater part of the important Nippes Railway workshops was perhaps the most useful of many incidents directly and seriously affecting the railway communications of the city; but that was only one among 250 factory buildings and workshops destroyed or seriously damaged in the course of the raid. Many of these works used to supply vital requirements of Hitler's war-machine. For instance, the important submarine-engine (Humboldt-Deutz) works on the east bank of the Rhine, suffered severely, and the U-Boat accumulator (Gottfried Hagen) works were also damaged. Many steel and iron works and engineering establishments, machine-tool factories, chemical works and warehouses, rubber and tyre plants, were either completely gutted or extensively damaged, and a large oil-storage plant was almost completely wrecked. This is the merest indication of the most important material destruction wrought by this one raid on the great industrial and commercial centre of the Middle Rhine.

The effect on the workers and their families (though it is less easy to assess) must have been overwhelming. In March and April, Hitler and his spokesmen had tried to persuade the German people that the R.A.F. could only destroy "undefended medieval towns." The realisation that the most heavily defended cities in the Reich could be treated in an equally terrible manner must have had a tremendous moral effect throughout Germany.

It is not surprising that the authorities tried to belittle the scale of the assault and to hide it from the rest of the population. But it is hardly likely that the workers of Cologne were comforted to learn that the appalling disaster they had experienced was the work of only "70 British bombers." Even the highest officially admitted estimate of the number of raiding planes (120) would imply that our aircraft carried an average of 12 tons of bombs apiece.

Despite the soothing statements of "Berlin authoritative circles" (which in any case flatly contradicted each other) the 200,000 people who had to be evacuated from Cologne to cities in Southern Germany must have opened the eyes of an ever-growing proportion of the population. If Cologne could be treated thus in one raid it was obvious that there was little hope of escape for the other industrial cities of the north and east.

As a last attempt at face-saving, the Nazi propagandists declared that for this "senseless terror raid" the British had scraped together all their reserves, and that more than half of those reaching Cologne had been destroyed. (Our losses were, in fact, 3.8 per cent. of the total force—40, not 500, missing). This propaganda was intended to show that such an "all-out" raid could not possibly be repeated. Therefore it was not unnatural that the similar mass attack on the Ruhr only two nights later left the propagandists speechless, all reference to the second "Thousand Raid" being utterly suppressed.

However, in Russia, China and America the news of the raids caused profound rejoicing, and in Turkey newspapers referred to these events as marking the turning point of the European War.

Essen : The second "Thousand" Raid (1st/2nd June)

Before the forces assembled for the mass raid on Cologne returned to their normal occupations, a similarly organised attack was directed against Essen. While the meteorological forecast for the Ruhr was not so favourable as could be wished (haze, no low cloud, but perhaps medium cloud at 10,000-12,000 ft.) no other high priority target promised better conditions.

Most of the Ruhr towns had suffered considerably in the course of many R.A.F. raids but the natural smoke screen of this teeming industrial valley had saved Essen from the full weight of our attacks. Krupp's works had been hit and the town damaged from time to time, but neither had sustained serious damage.

Steps were taken to combat the well-known difficulties which crews experience in searching the murky Ruhr in a storm of flak and searchlights. The attack was opened by a specially selected force of 18 aircraft which, using the latest navigational aid, released long sticks of flares. A strong incendiary force of heavies searched for the target in the area illuminated and the remainder bombed the resulting fires. (Large scale intruder activity against fighter aerodromes was again a feature of the operation.)

Unfortunately, the weather was not as good as had been expected. In addition to haze and high broken cloud, a second cloud layer at 3,000-5,000 ft. was reported by many aircraft. Under such conditions, as past experience had shown, a definite identification of Krupp's Works was most improbable. Most of the flares were released sufficiently accurately to show the position of Essen. But the halo of light round the flares due to scattering by the haze prevented most crews from definitely identifying the town. The majority of the incendiary force using the navigational aid combined with the flare indication, released their bombs on dimly discerned industrial areas. The result of these very determined attempts was a scatter of relatively small fires both in and some miles around the town of Essen. Consequently, the greater part of the main force (mostly not equipped with the new aid, and arriving after the flares had burnt out) found only the glow of numerous scattered fires below the cloud and haze, some of which were decoys in the surrounding districts. Thus few crews identified Essen itself and most bombed neighbouring districts which could be recognised as industrial areas. In Oberhausen, Mulheim, Hamborn and Duisburg, however, really effective damage was done and large fires started.

Daylight reconnaissance showed that Essen escaped relatively lightly, with damage to the railways near Krupp's works and to residential property, especially in the south and south-east parts of the town: Essen had once more narrowly avoided being "written off." Given a few big cloudbreaks in the early stages and the second Thousand Raid might have been as great a success as the first. Nevertheless, the important nearby town of Oberhausen suffered severely. The zinc rolling mills, a large boiler works, a tar works, an iron foundry and several other large factories were hit. The railway station was much damaged and two-thirds of its main building was burned out. Very extensive damage was also done to commercial and residential property in the town.

Factories were also damaged at Mulheim and Ürdingen, while at Duisburg railway sheds were hit at three points and in the main marshalling yards the locomotive repair shops suffered heavily. Damage was done at other scattered points throughout the Ruhr and, though some craters were seen in open ground between built-up areas and near decoys, most of our bombers successfully aimed at useful targets.

Of the 800 or so aircraft which reached and bombed Essen or other Ruhr towns, 31 (or 3.2 per cent.) were missing—a proportion smaller than usual for the well-defended Ruhr targets.

Other Raids on Western Germany

In addition to the mass raids on Essen and Cologne, Essen was attacked seven and Cologne four times during the April-June quarter. The results of these raids on Essen were disappointing and emphasised the great difficulties to be overcome before a completely successful operation can be made against this target. Nevertheless, a considerable amount of damage was done, during operations directed against Essen, to other important industrial targets in the Ruhr.

By comparison with the colossal devastation on the night of 30th/31st May, the damage done to Cologne during the four previous raids in April and May appears almost insignificant. But it should not be forgotten that part of the Humboldt-Deutz U-Boat engine works was hit on 5th/6th April

(when this was a special aiming-point for 40 of the best crews of No. 1 Group), the greater part of the Rhine Harbour, with its railway approaches, was damaged in the same attack as well as over 400 buildings in and around the city. On another night large fires were started in the central city, causing four areas of major damage. In fact, by previous standards, these four raids can be considered as highly successful.

Dortmund was the third industrial target in the Ruhr-Rhineland zone and was bombed twice on consecutive nights. On 14th/15th April it was selected partly because the wind forecast indicated that it should be free of the Ruhr smoke. However, the Germans employed a favourite technique of screening the target area by the glare of horizontally-laid searchlights, which was fairly effective in the absence of moonlight. But with the aids available, part of the strong force despatched identified the town and docks, and a group of factories all engaged in constructional engineering work were extensively damaged, while other industrial buildings, houses and workshops and a warehouse in the dock area were gutted or destroyed.

The next night clear weather was expected but the 152 aircraft despatched encountered extremely bad weather with icing *en route*, and the target was completely covered by dense cloud rising to high altitudes. Little success could have been achieved, and some crews sought alternative targets in the Ruhr.

(ii) South Germany and Bohemia

Stuttgart, situated on the upper Rhine at a distance of some 600 miles from our home bases, is the centre of the great Bosch magneto works, and Daimler-Benz aero-motors, as well as other important war industries.

On three consecutive nights in May the town and the Bosch works at Feuerbach on its outskirts were the object of our attacks. Although some considerable fires were started on each occasion, either cloud or haze prevented accurate identification of targets and apart from the firing of suburbs on the south side of the town, the attacks were scattered, many crews taking alternative targets. On one occasion a large fire was started in Saarbrücken, on another, part of Heilbronn suffered heavy damage.

Mannheim, also, was saved from a heavy assault partly owing to the presence of ground haze, and few aircraft managed to identify the target correctly on the one occasion it was attacked.

Czechoslovakia was visited on two occasions, in April and May, when half-a-dozen Stirlings of No. 3 Group made the 1,300-mile trip to bomb the Skoda Armament Works at Pilsen. Unfortunately, 10/10 cloud was encountered at the target, but in spite of this several crews claimed to have succeeded in bombing the works by coming below the cloud.

(iii) Italian Targets

All of a force of 18 Whitleys of No. 4 Group returned from a long-range operation against industrial targets in North Italy. Genoa was bombed, but cloud prevented observation of results, and in view of the cloud six aircraft attacked alternative targets at Milan and the Fiat Works at Turin. The Italians admitted the bombing of several localities in North Italy. As usual, no enemy aircraft were seen over Italy, and there was no black-out when the aircraft reached the target area.

(iv) French Factories

Very severe industrial damage was inflicted in the course of three attacks on French factories working for the Germans in the Gennevilliers district of Paris, and in two raids on the Matford Works at Poissy, north-west of Paris.

The first Gennevilliers raid on 5th/6th April was a minor operation involving 20 Whitleys of No. 4 Group, timed to attack during the later part of the night when the moon would be well up. The Gnome-et-Rhone Aero-Engine Works and a subsidiary rubber-reclaiming factory adjoining were damaged on this occasion. At the end of the month greater damage was caused to a large group of factories on the opposite bank of the Seine. Large fires were started and the power station, the Thomson-Houston factory, the Goodrich Tyre Works and part of Construction-Aeronautiques were all affected, some of them seriously.

On the night before the mass raid on Cologne, while the required forces were standing by awaiting favourable conditions over Germany, advantage was taken of the full moon to make a third attack on the Gennevilliers factories. About 50 aircraft bombed these targets in spite of the varying amounts of cloud which were unexpectedly encountered. The Gnome Aero-Engine Works were again hit extensively, twelve buildings being damaged. The Thomson-Houston Factory was also hit and two of its buildings suffered severely, while in the Goodrich Tyre Works, very heavy damage was caused to a number of important buildings, including the largest, covering 26,400 square yards; all the buildings were either hit or suffered blast damage. The power station was put out of action by two direct hits on the boiler house, one of its chimneys crashed to the ground, and the generating house was severely damaged by blast. Industrial buildings in the vicinity were also hit. Intense light flak and moderate heavy flak (as well as searchlights) were encountered on this occasion and five of our aircraft were missing.

The two raids on the Matford Works resulted in such damage that it seemed possible that this important lorry factory would be permanently out of commission. The second of these raids, when about forty aircraft attacked the works in 35 minutes, was particularly successful. The night photographs taken with bombing showed fires burning and large columns of smoke pouring up from the works

and its adjoining foundry. Daylight photographs taken after the raid confirmed that the main buildings as well as other subsidiary plants nearby had received a number of direct hits, almost all the damage being confined to the target area. A heavy bomb, possibly a 4,000-pounder, had fallen on the machine-tool workshops undoubtedly causing great havoc. Four other 4,000 lb. bombs were shown on the night photographs to have burst sufficiently near the works to have caused blast damage. Fighters and light flak were encountered by our aircraft on both occasions.

(v) Day Operations against Industrial Targets

The nature of our day operations and the bombing accuracy achieved are referred to elsewhere in this review (page 13). Two types of attack have been employed against industrial targets:—

- (a) Fighter-escorted raids by Bostons necessarily restricted in range to the Channel coast area of Northern France and the Low Countries;
- (b) Unescorted cloud-cover attacks on German targets either by aircraft equipped with navigational aids or by Mosquito aircraft.

A single example of a long-range low-level attack—the most remarkable of all the daylight operations—directed against the U-Boat Diesel engine works at Augsburg, has already been described.

In the course of the numerous Boston attacks much damage has been inflicted on various small targets, and the bomb-aiming has been of a high order, particularly when little opposition has been encountered. While these operations were intended to inflict damage on industrial plant working for the enemy, the bomber effort is generally on too small a scale to be compared with the results of our heavy night raids. In fact, part of our object was to draw up the enemy's fighters so as to enable our own fighters to engage them. Unless bombers come over, the Germans will not oppose our fighter sweeps, since they are unwilling to accept the wastage of crews and aircraft such encounters invariably entail. It is highly creditable to all concerned, not forgetting Fighter Command, that in the course of all these numerous operations against industrial targets only four Bostons were lost.

The daylight attacks against German industrial targets—Essen and Cologne—were primarily nuisance raids, and some had to be abandoned for technical reasons or owing to the inadequacy of cloud cover over the target. Day attacks on ports and shipping are referred to in the preceding section.

(d) PROPAGANDA IN GERMANY AND OCCUPIED EUROPE

Many will remember the first leaflet raids. Bomber Command was very largely employed on these raids during the first seven months of the war and although leaflets are now usually dropped as an incidental to the bombing task, it is of interest to compare the number of leaflets being dropped then and now. During the last three months Bomber Command aircraft dropped over 96 million leaflets as compared with 82 million for the whole of the first year of the war. The first year of the war the greatest number of leaflets dropped in one night was 2,304,000 and it took 14 Hampdens, 6 Whitleys and 8 Wellingtons to do it, a total of 28 aircraft. Nowadays it is almost a common occurrence for this number to be dropped in one night and 3 of our heavies can carry this load comfortably.

Until recently it was the general practice for leaflets to be released by dropping them down the flare chute. This practice necessitated a member of the crew leaving his position in the aircraft and the time taken to release a large number of leaflets was considerable. Now, however, the method has been developed of releasing them from small bomb containers and it is possible, in the Stirling for instance, to release over a million simply by pressing a button.

Operations over Italy and Norway took place in April and leaflets were dropped over Turin, Genoa, Alessandria and Aquil. In May and June, operations were restricted to Occupied and Unoccupied France, Germany, Belgium and Holland.

In April, 14 million leaflets were dropped over Germany. In May 7½ million and in June, 18 million. The figures for Occupied France were 21 million in April, 11 million in May, and nearly 20 million for June, while over Unoccupied France, 300,000 leaflets were disseminated in April, 8 million in May and 1½ million in June. Belgium and Holland were also well supplied with leaflets, although, being relatively small territories, the distribution was proportionately smaller.

Several special leaflet operations have been undertaken. For example, on the night of 29th/30th April, leaflets dealing with the usual May Day celebrations in Paris were dropped over France. Special leaflets, designed for dropping in conjunction with attacks on French factories working for Germany were distributed during the attacks on the Matford Works at Poissy and the Gnome-Rhone Works at Gennevilliers. During May, leaflets dealing with the Allied occupation of Diego Suarez in Madagascar were dropped, mainly over Unoccupied France. On the night of 5th/6th May about 2½ million of these leaflets were disseminated. In June, both Germany and France received suitable accounts of the thousand-bomber raids, while a special leaflet dealing with the decreasing rations was dropped over Germany. Belgium also received a special leaflet in June exposing the nefarious life of Leon Degrelle, the Rexist leader.

Among the regular publications which are dropped over Holland and all districts of France are the two miniature newspapers, the Dutch *Whirlwind* and the French *Courrier de L'Air*. This latter has become a weekly feature, and its popularity grows proportionately as confidence in the German-inspired French press declines.

The many accounts received from reliable sources in all areas describing the reception of leaflets have been interesting and informative. The leaflets dropped over Holland containing photographs of the Dutch Royal Family were especially appreciated and carefully preserved. Copies were photographically reproduced and passed on clandestinely from hand to hand. In Norway, leaflets have found their way to even the most remote farmhouses, where they are to be seen framed and hung on the walls.

The German press has issued warnings from time to time against the iniquitous pamphlets dropped by the English, but there is plenty of evidence to show that they are, nevertheless, widely read. Even markets for dealing in leaflets exist in various parts of the Continent and reports have been received from more than one source that on certain occasions, one leaflet alone has been seen by as many as a hundred people.

Most significant of all are the appeals continually received from people in occupied territories for a wider dissemination of leaflets. Some of these demands affirm that the leaflets dropped by the R.A.F. are of even greater value than the illicit newspapers printed in the occupied countries. Reports from places as far apart as Bordeaux, Marseilles and Lyons suggest that they carry more weight and are longer remembered than news received by wireless.

It may therefore be said that in the occupied countries leaflets serve to maintain belief in Allied victory and increase the ever-growing spirit of resistance.

II.—NOTABLE FLYING INCIDENTS

(a) A Lancaster returns from the Baltic

The standard of airmanship frequently achieved by Bomber Command crews is well illustrated by the following official narrative of the return of a Lancaster of 207 Squadron from minelaying operations in the Baltic Sea on the night of 22nd/23rd May, 1942.

"Owing to the northern lights and bright moonlight it was necessary, in the interests of safety, to fly as low as possible. Shortly after reaching Denmark the port engine seized up whilst at a very low altitude. In order to avoid dropping mines on Denmark course was maintained until a suitable area was found where the mines could be jettisoned safely and then the aircraft was headed for base.

"Whilst over the sea the aircraft was caught in searchlights and subjected to considerable light flak. The windscreen had become badly obscured by oil which had leaked from the front turret, and in taking evasive action the aircraft hit the sea. It bounced about three times and then ascended to about 50 ft. There was very considerable vibration and the aircraft was turned towards land and preparations were made for ditching. Owing to the excessive vibration it was necessary for the starboard inner airscrew to be feathered.

"It was then found that height could be maintained, and even gained, on the combination of starboard outer and port inner engines and course was set for base. Due to the skill of the pilot, the navigator, and wireless operator, the coast was crossed dead on track and base was eventually reached safely after crossing the North Sea at an average height of 700 ft. and at times in extremely poor weather conditions, with considerable interference from German stations to hinder the wireless operator. Owing to the fine airmanship and combined skill of these three members of the crew, this valuable aircraft was enabled to reach base under what at times seemed almost impossible conditions."

(b) A Pugnacious Stirling

Although the destruction of German night fighters is not by any means an unchallenged monopoly of Stirling aircraft their record of successful combats is particularly impressive. The tactics of the enemy fighters during the past quarter are reviewed elsewhere (page 20), and in the following paragraphs a brief selection is given from the large number of combat reports covering the same period.

Pride of place must be given to the achievements of the Stirlings on the 27th/28th June, when the loss of a single Stirling was thoroughly avenged by "P" of 214 Squadron, while on the same night two other Stirlings damaged or destroyed the German fighters which attacked them; a bag of four destroyed or probably destroyed and two others seen to be damaged.

Here is the story of the 214 Squadron Stirling as recorded in the official Combat Report:—

"P/214, a Stirling Mark I, returning from Bremen on 27th/28th June, 1942, reached Cloppenburg half way to the Dutch frontier at 0215 hours. The aircraft was flying at 16,000 ft., with cloud above and another layer of 10/10 cloud below at 10,000 ft., visibility good, and the moon low on the port bow.

"The front-gunner sighted a twin-engined enemy aircraft with twin tail 600 yards away on the port bow and 300 ft. below. The enemy aircraft closed in while climbing and fired from 500 yards with machine gun and cannon. (All the crew heard the cannon shells exploding and the navigator and front gunner smelt fumes. Damage was done to the starboard inner engine and port wing, and the rear gunner was killed.) Our aircraft took evasive action by violent steep diving turns towards the attacker and the front gunner opened fire at 250 yards with a two-second burst. As the enemy aircraft climbed from below and continued over the top of the Stirling to the starboard quarters, the mid-upper gunner fired at 20 yards range and saw tracer enter the root of the enemy's port wing. The fighter continued firing after passing over our aircraft (the mid-upper gunner distinctly saw machine-gun tracer fall short of cannon tracer) and the fighter temporarily disappeared from view.

"Meanwhile the front gunner reported a second and similar type of enemy aircraft 500 yards away on the port bow and 500 ft. down. Remaining at the level it closed to 300 yards and opened fire. The front gunner immediately replied and tracer was seen to enter the enemy aircraft which then broke away on the port quarter, the mid-upper gunner firing as the enemy broke away. In this action our Stirling again suffered damage: all wireless and electrical equipment was wrecked, the first wireless operator wounded in the left arm and the mid-upper gunner's right-hand gun was rendered unserviceable.

"The first enemy aircraft now reappeared, being reported by the mid-upper gunner 300 yards away on the starboard quarter and 200 ft. up. The enemy immediately opened fire, hitting the starboard side of the fuselage. The mid-upper gunner returned fire at once with the only gun remaining effective, raking the enemy from nose to tail with one long burst. The complete tail unit fell off and the enemy aircraft dived away out of control. Our Captain corkscrewed through cloud to 2,500 ft. when he and the mid-upper gunner saw the fighter explode on an aerodrome. During this action, as before, the Stirling evaded by steep diving turns towards the attack; until he was hit the first wireless operator was in the astrodome, and the mid-upper gunner gave fighting control for all stern attacks as the rear gunner was dead. After the second attack the Captain corkscrewed automatically as the intercomm. was shot away.

"The Stirling continued on three engines, the navigator map-reading his way across Holland, avoiding Amsterdam, and presently a pinpoint was obtained on the Dutch coast. A few minutes later, at 0335 hours, our aircraft was flying at 4,000 ft. with 8/10 stratus above and thick patches of sea mist below, the moon glowing on the horizon on the port bow, when suddenly the navigator (who was standing on his table) saw two Me. 109's approaching from the port beam in close line astern 600 yards away and 300 ft. up. The front gunner was attending the wounded wireless operator on the bed and the navigator went to fetch him—the intercomm. being u/s. The front gunner dashed for his turret and when he was half in, both enemy aircraft opened fire at about 250 yards, slightly above on the port bow. While half in the turret, with the doors open, the front gunner fired at the leading fighter, the navigator steadying him by holding his legs. As the Captain turned towards him the leading fighter flew straight into the cone of fire and dived into the sea out of control. (This is confirmed by the navigator and the front gunner.) The remaining enemy aircraft continued his turn but the Stirling turned inside him, thus positioning the fighter for a stern attack by the mid-upper gunner. The latter had by this time repaired the damaged guns, securing the right-hand one (which had shed its quick-release pin) by means of a handkerchief. The enemy attacked from port astern, but the mid-upper gunner opened fire first at 200 yards, closing, with both guns. The enemy aircraft continued diving and exploded with three dull red flashes before hitting the sea, as confirmed by the Captain, mid-upper gunner and navigator.

"During this attack the Stirling came down to 1,000 ft. and was shot at by machine-gun from the sea. The mid-upper gunner fired two or three short bursts at the source of the flashes.

"Five minutes later, on the same course, the mid-upper gunner observed a single Me. 109, 700 to 800 yards astern and about 700 ft. above. The enemy aircraft fired a long burst and the mid-upper gunner replied with a long burst but the former broke off the engagement and disappeared. During evasive diving the Stirling went out of control and the tail hit the sea when pulling out of the dive."

Thus "P"/214 had weathered five fighter attacks—certainly destroying three opponents and damaging a fourth—engaged a flak-ship and bumped on the North Sea, all within the space of 90 minutes.

At length the Stirling reached its base, on three engines, and while circling before landing, the starboard outer engine caught fire. The fire was extinguished and the engine stopped. The pilot, with only the port engines serviceable, succeeded in landing his aircraft without further injury to the crew.

(c) Two German Fighters Destroyed—Our Aircraft Undamaged

The following narratives are good examples of the many successful encounters in which Bomber Command aircraft engaged during the quarter under review:—

(i) On the night of the first Thousand Raid "R" of 149 Squadron (a Stirling Mark I) had reached the Gladbach region at 0026 hours and was flying towards the target at 16,000 ft., in good visibility, when approached by an Me. 110 from the port quarter about 50 ft. below and 400 yards away. Three white ground lights had indicated our aircraft's track. The enemy came up too rapidly for evasive action to be taken, and gave the impression of overshooting as he did not attack but sideslipped to starboard and disappeared below. He evidently throttled back as our rear-gunner next observed him reappearing below, tail first and slightly to port. Before the Me. 110 could attack, our rear-gunner fired a long burst from his four guns at a range of 70 yards. Flames were then seen to come from the starboard engine, and a whitish fire enveloped the whole length of the cockpit, after which he was seen to plunge down, crash and burn on the ground. The moon was on the starboard bow during the encounter. There was no damage to our aircraft, while the Me. 110 was claimed as definitely destroyed. "R" 149 continued on course and bombed the primary target—the blazing city of Cologne.

(ii) At approximately 0050 hours on 6th/7th May, 1942, while in the area of Ghent at 16,000 ft. a Lancaster aircraft, "R" of No. 44 (Rhodesia) Squadron, returning from Stuttgart, was shadowed by an enemy aircraft with searchlight. The rear-gunner first saw the enemy aircraft at approximately 2,000 yards dead astern slightly below. The Lancaster took evasive action by a turning dive to starboard; the enemy aircraft closed range and followed the Lancaster in a similar dive. When the range closed to 200 yards the enemy aircraft was dead astern with its searchlight pointing at the rear turret. The rear-gunner fired a short burst at its searchlight, the enemy burst into flames and broke in two as it floated towards the ground. A white flash was seen and was thought to be the enemy aircraft hitting the ground. Visibility was good although the moon had not risen, while lights were seen flashing on the ground with 5-second intervals, apparently giving the Lancaster's track. The enemy aircraft was a single-engined machine and thought to be a Me. 109.

III.—MISCELLANEOUS ITEMS OF OPERATIONAL INTEREST

(a) Concentration and its effects on the Enemy's Defences

The A.A. Defences of a target can only engage a certain number of aircraft during any given period and the number of fighters which can be controlled in one area is similarly limited. Hence any additional aircraft flying across this area will not be directly engaged. This is the principle of concentration in time and space, which applies both to the target area and to routes to that area. Concentration may also have the effect of confusing the defences by making it difficult to select one out of so many targets and by cluttering up the detection devices to such an extent that it is not possible to track even one selected target. Concentration over the target area necessarily implies a rapid rate of bombing, and this in itself tends to overwhelm the A.R.P. organisation, and hence to increase the effectiveness of an attack. There is, however, one exception to this principle, namely, that interception by fighters on cat's eye patrol is facilitated under conditions of bright moonlight.

An analysis of past operations indicated very clearly that the proportion of aircraft failing to return from operations decreased with increased concentration both on moonlight and moonless nights. There was in the beginning, however, much doubt as to the practicability of higher concentrations. In the first place there were difficulties in ensuring that the same route was closely adhered to by all aircraft and in fixing their times of arrival at the target owing to errors in navigation. Further, heavy concentration at the target necessarily led to dangerous congestion of landing facilities at home bases, and the possibility of collision in the target area had to be considered.

With the advent of our new navigational aids most of these difficulties disappeared and we have in recent months put over concentrations as high as 10 times those used a year ago.

On the very first operation involving the use of the new aid, crews were greatly impressed by the effective saturation of the Ruhr defences. One enthusiastic 3 Group captain declared: "*We were stooging up and down the Ruhr—like taking the air on Margate Prom!*" And (what was equally unusual) they brought back an excellent photograph of the heart of Essen.

The adoption of the principle of concentration—and all that that has entailed in operational planning both at Headquarters and at Stations—is one instance of the continual need for tactical improvement (coupled with improvement in training and equipment) in order to keep pace with the ever-changing tactics of a cunning and resourceful enemy. There is no doubt that the adoption of concentration has played a big part in keeping our losses down to a minimum. There is undoubtedly safety in numbers.

(b) The Accuracy of Daylight Bombing

Precise bombing of small targets is seldom possible at night unless perfect weather conditions happen to coincide with good moonlight and little opposition. While Bomber Command has shown on a number of memorable occasions what it can do, given such desirable conditions, they are but rarely experienced.

The most obvious advantage of day bombing is that, fair weather or foul, light is never completely lacking, so that crews have a chance of pinpointing a small target with speed and precision. While formidable problems of security and defence are involved—thereby qualifying the scale and generally the range of the effort which can be employed—this increased precision makes day bombing an invaluable weapon against vital targets, as the Rhodesian Lancasters' celebrated attack on the Augsburg M.A.N. factory very clearly showed.

What sort of accuracy can, in fact, be expected from day bombing: Photographs taken by fighter-escorted Bostons of 2 Group during their numerous raids on factories, docks, and railways in Northern France and the Low Countries give a fairly definite answer to that question as far as high level attacks are concerned. Such photographs as were taken during the first six months of 1942 have been examined and selected for careful analysis. More than half the total number of bombs dropped are shown on the photographs, a much higher proportion than is seen on night photographs.

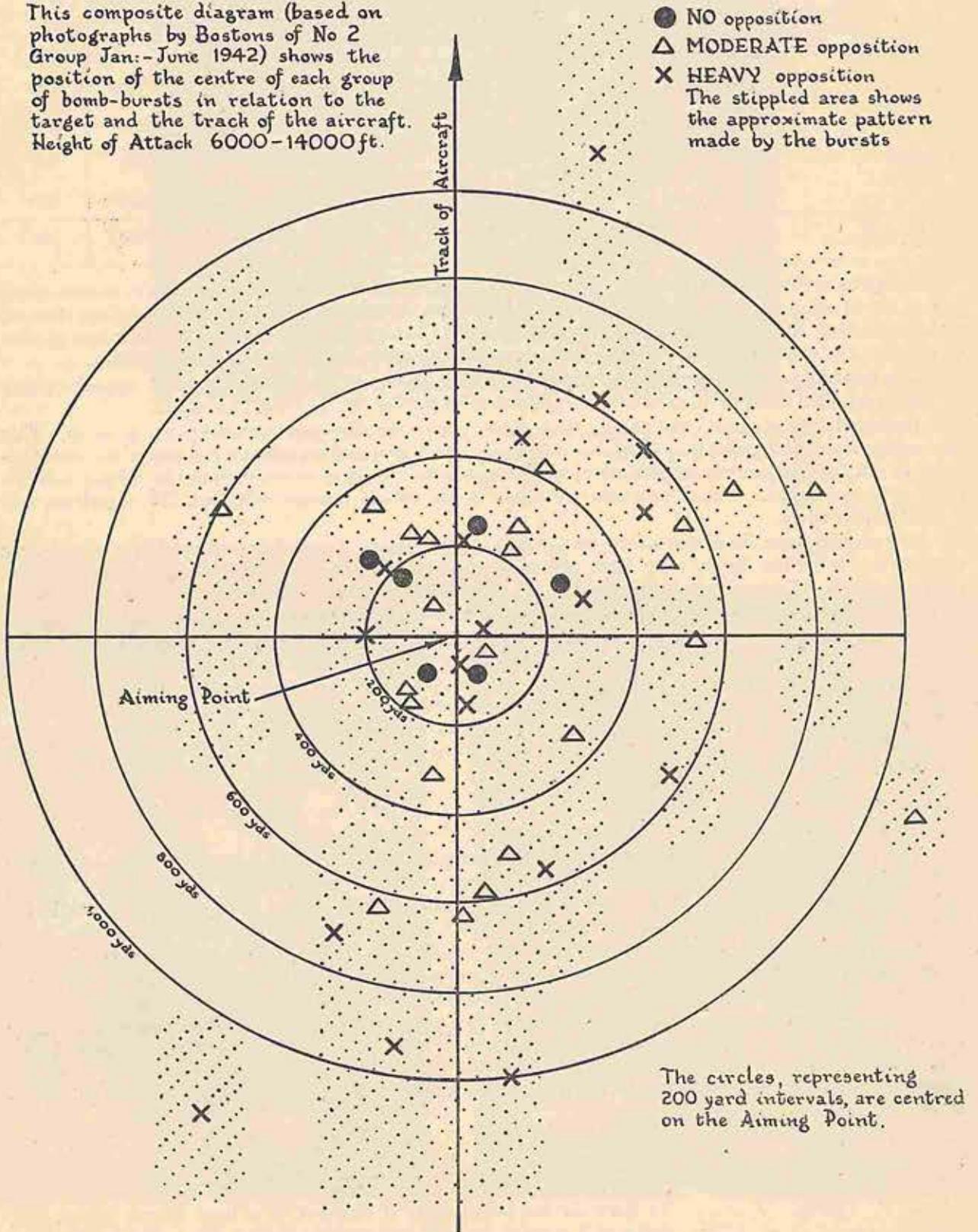
Unfortunately, little photographic evidence exists for attacks against ships. In the case of such targets the precise aiming-point is unmistakable. Land targets, on the other hand, vary in shape and size, and it was necessary to assume that the aiming-point was in all cases the approximate centre of the target. However, as most targets were, in fact, relatively small (such as power stations and shipyards) the assumption is probably quite a valid one. In a few instances, such as marshalling yards, this may not be the case and the errors may therefore appear rather larger than they actually were.

The Bostons normally attacked in formations of six aircraft, the bombs being aimed by the leader of each "Vic" of three. Thus, although the photographs show nearly 700 bursts, it is probable that this sample represents the achievement of not more than 100 separate aims, even allowing for occasions when intense opposition spoiled the formation and caused aircraft to release their bombs independently of the leaders. The Mark IX course-setting bomb-sight was used in all cases.

The photographs show, generally speaking, that each "box" of six aircraft lays down a bomb-pattern which is fairly narrow but very long, the length varying according to the amount of disagreement among the bomb-aimers. Within the limits of the pattern the sticks are distributed in random fashion, except for direction. The bombs not shown on the photographs are not necessarily remote from the target: the pattern may not have been fully built-up when the exposure occurred, or the aircraft may have turned or banked so that occasionally the target itself may not be in the picture. As well over half of the total bombs dropped are seen on the photographs it is probable that this gives a good indication of the accuracy achieved.

THE ACCURACY OF DAYLIGHT BOMBING

This composite diagram (based on photographs by Bombers of No 2 Group Jan.-June 1942) shows the position of the centre of each group of bomb-bursts in relation to the target and the track of the aircraft. Height of Attack 6000-14000 ft.



The results have been analysed in two ways (both of which gave results of the same order) according to—

- (i) The errors of individual bursts ; and
- (ii) The errors of groups of bursts, each of which was probably the result of independent aim. This method is regarded as the more satisfactory, the error being estimated from the centre of each group.

The average errors of groups of bursts were found to be as follows :—

Opposition (mainly flak)	Number of Bombs Dropped.	Numbers of Bombs Plotted on Photographs.	Number of Groups of Bombs plotted.	Bombing Errors in Yards.		
				Radial.	Line.	Range.
None	155	85	6	200	120	140
Little	191	120	8	400	250	270
Moderate	341	216	15	460	280	290
Heavy	479	269	18	520	230	440
Overall	1,166	690	47	440	230	330

It will be noticed that the error is immediately doubled when any kind of opposition is encountered. This is out of all proportion to the increase effected by any further increase in the weight of opposition, and is obviously due to the necessity for evasive action. The height of bomb-release does not appear to increase the errors in any consistent manner, except perhaps when there is no opposition.

The general distribution of bursts about a target is shown in the diagram (on the opposite page) which is compiled from the results seen on photographs during the six-months period.

During the June quarter the results have shown a considerable improvement in range error. This interesting feature is attributed partly to increased experience and technique, especially the development of the bombing-run start indicator, which assists the observer in estimating the correct time to turn on to the target. This device was developed by the Officer Commanding No. 226 Squadron, and is now widely used.

The photographs show that about 10 per cent. of the bombs dropped have scored hits on primary targets, and a further 50 per cent. have caused damage to other useful objectives including factories, railways, roads, warehouses and other buildings. About 90 per cent. of the bombs aimed at aerodromes seem to have fallen within the perimeter of these more extensive targets.

Bombing has been less effective on coastal and shipping targets as compared to inland ones, owing partly to the numbers of bombs falling in the sea or in wet docks, and partly to stronger opposition. On coastal targets 46 per cent. of bombs fell on open ground or in water, whereas the corresponding figure for inland areas is only 24 per cent. Some outstanding successes have been achieved in the course of these operations particularly on the day of the Augsburg raid, when the power station and shipyards at Grand Quevilly were attacked, and on 7th May, when coke-ovens at Zeebrugge were hit (*see* figures 9 and 10).

(c) Large H.C. Bombs

The High Capacity or Blast Bomb is not a new type. In 1918, bombs of this type known as the S.N. Major and S.N. Minor were produced, and a few of the latter were actually dropped on targets in the Rhineland by aircraft of the Independent Air Force. But bombs of this type were not included in the equipment of the R.A.F. at the beginning of the present war.

However, during the attacks by the Luftwaffe on London and elsewhere in the winter of 1940, large numbers of so-called "Land Mines" were dropped, and it was at once apparent that very considerable damage was caused by these when functioning on suitable targets.

The original requirement was governed in the first place by the type of aircraft available to carry it and the fact that it was regarded as a "Land Mine" with the "Mine" part taking precedence. The Hampden was then being adapted to carry the 1,500 lb. mine, but the somewhat complicated fuzeing of that store was unnecessary for the "Land Mine." The design requirements for the latter were in broad lines as follows :—

Weight	2,000 lb.
Stowage	Suitable for the Hampden.
Filling	The maximum amount of H.E. which could be packed into a thin case.
Fuzeing	To detonate instantaneously if dropped on a hard target, plus a long delay of $\frac{1}{2}$ hour or more if dropped in shallow water, <i>i.e.</i> , harbours.

The result was the 2,000-lb. H.C. bomb as we know it at present. The long delay requirement was allowed to lapse, and the bomb was used as a Blast Bomb only. It contained, approximately, 1,340 lbs. of filling, giving a Charge/Weight ratio of 73 per cent. It had, however, the great disadvantage of having a parachute in place of the normal type of tail, and was thus virtually unaimable. This could not be avoided if a bomb of this size and shape was to be fitted in the Hampden. Recently, however, it has been found possible in the Stirling, where a greater stowage space is available, to dispense with the parachute and fit a proper tail, and the bomb can now be aimed.

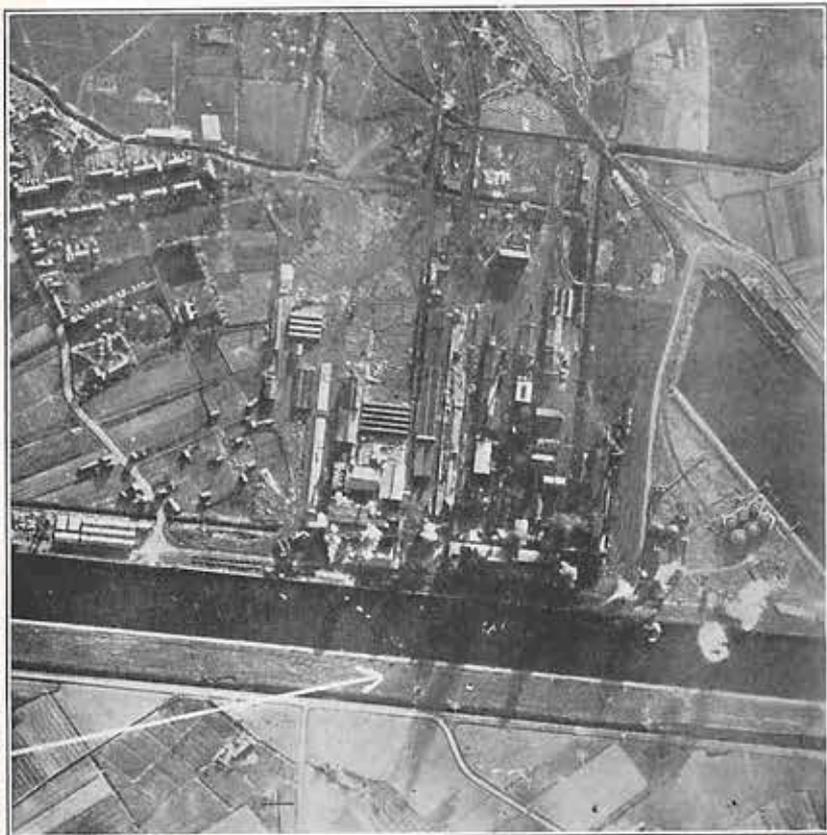


Fig. 9.—A number of direct hits on the Coke-oven Batteries at Zebrugge during the attack on 7th May, 1942. The sun being low at the time of attack, the bomb-bursts cast long shadows extending beyond the canal (see arrow).

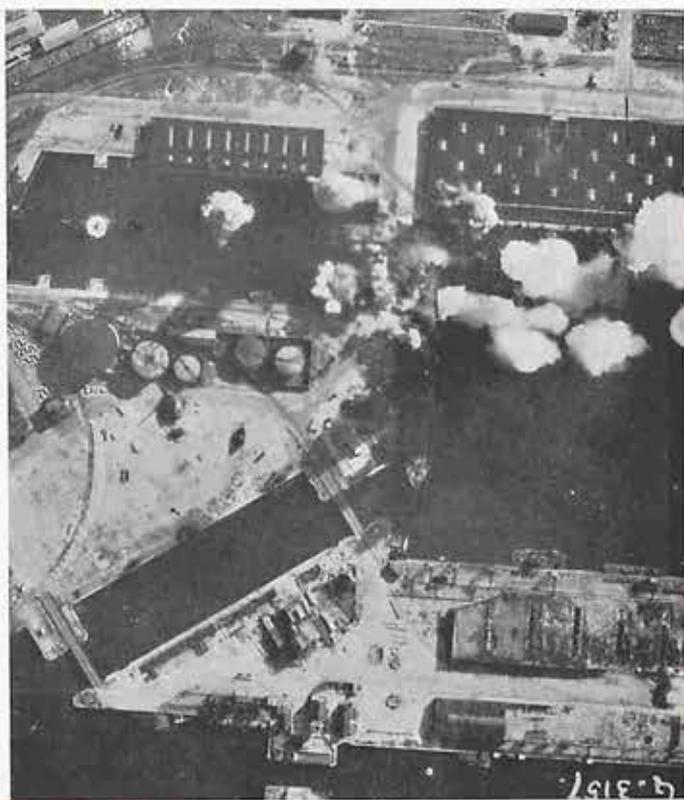
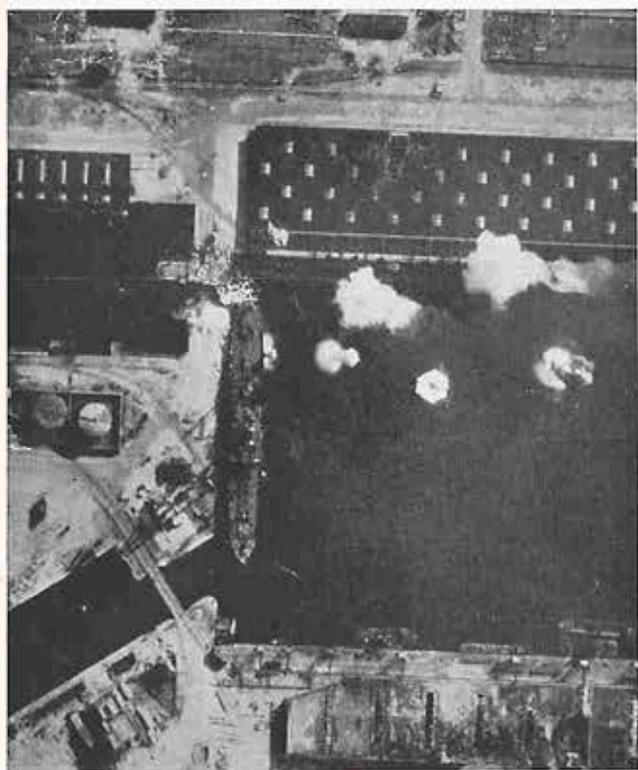


Fig. 10.—A Boston attack (from 8,000 ft.) on shipping in Le Havre Docks on 26th March, 1942: bombs bursting in contact with a 490-ft. merchantman resembling the *Neumark*. The photograph on the left shows the bursts developing, that on the right was taken a few seconds later.

ACCURATE DAYLIGHT BOMBING

The accuracy obtained by Bostons of No. 2 Group in their routine daylight attacks on targets in Occupied France and the Low Countries is reviewed on page 14.

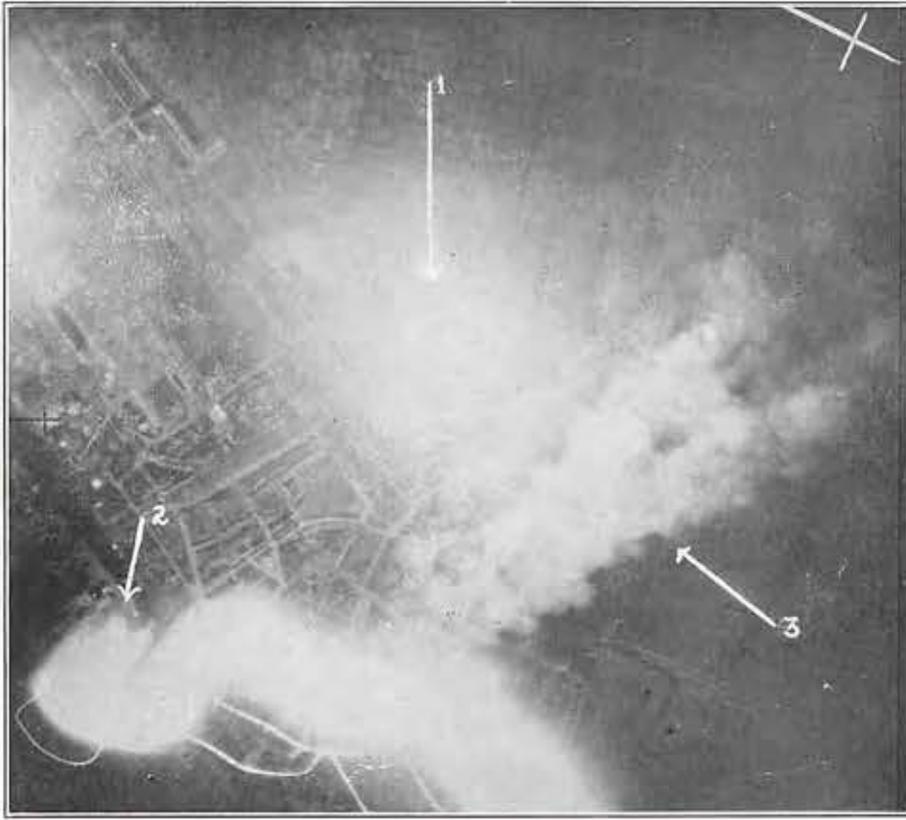


Fig. 11.—An historic photograph by an aircraft of 149 Squadron recording the first 4,000-lb. bombs ever dropped on enemy territory. On the night of 31st March/1st April, 1941, two of these bombs were dropped, and both fell within 400 yards of each other in the built-up area of the old town of Emden.

The first started fires, appearing as a broad white streak (2) on the night photograph, from which columns of dense smoke (3) are rising. The huge bomb-flame (1) of the second 4,000-pounder is recorded in the middle of the photograph, although the burst itself occurred just outside the area shown, wiping out the Telephone Exchange and other important public buildings.



Fig. 12.—Two 4,000-lb. bombs fell close together on the same built-up area of Saarbrücken on the night of 29th/30th July, 1942. The white patches (A and B) in the photograph are areas completely devastated by these bombs, the remaining outlined districts being gutted by incendiaries.

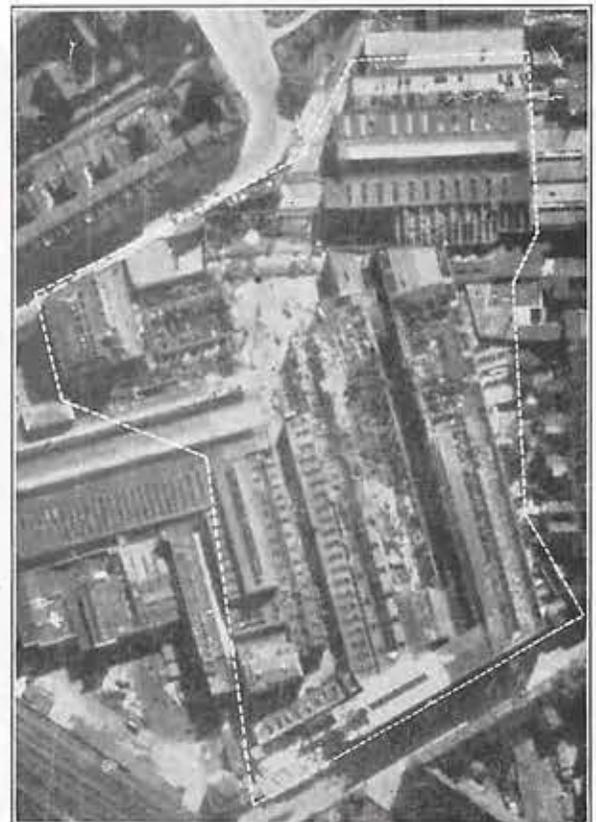


Fig. 13.—The Schiess-Defries Works at Düsseldorf manufactured machine-tools and magnetic mines up to the time of the raid of 31st July/1st August, 1942, when a heavy bomb caused the havoc seen in the above photograph.

EXAMPLES OF WHAT 4,000-lb. BOMBS ARE DOING TO GERMANY.

See article on page 16.

Almost concurrently with the development of the 2,000-lb. H.C. Bomb for the Hampden, it was decided to see what could be done with the Wellington. Here it was a question of stowage space with a weight limitation of 4,000 lb. Trials showed that a satisfactory bomb was possible, and the result was the 4,000-lb. H.C., Mark I. The Mark III type at present in use only differs in minor details from the Mark I. This bomb contains approximately, 3,000 lb. of explosive. Photographs taken of the damage caused show that on suitable targets it is most effective.

The 4,000-lb. bomb was first dropped on enemy territory on the night of 31st March/1st April, 1941, when Emden was attacked (figure 11). Reconnaissance showed that both of the bombs fell in the main part of the town, about 400 yards apart. Where the first bomb fell more than 30 houses were destroyed and major damage occurred over a wide area. Five days later P.R.U. found crowds of spectators gathered in the surrounding streets. The second bomb destroyed the Telephone Exchange, the Post and Telegraph offices and an area of about 100 yards by 80 yards was heavily blitzed.

During the next twelve months (up to 31st March, 1942), 649 of these bombs were dropped on enemy territory, including the record number of 31 dropped on a single small target—the Renault Works at Billancourt.

In the three months covered by this review, however, the number of 4,000-lb. bombs dropped on Germany and German-occupied territory easily surpassed the effort of the whole preceding year—a total of 859 being dropped between 1st April and 30th June, 1942.

One of the most severe incidents attributed to 4,000-lb. bombs occurred last March at Lübeck. The area of complete devastation covered an acre (about 10 houses being completely wiped out) while severe damage covered $5\frac{1}{2}$ acres, involving some 45 houses, and five other houses on the outskirts of this area were destroyed by fire. Another instance, at Saarbrücken, is shown in figure 12.

The colossal damage caused on 25th/26th June, by one large bomb on the machine shops of the Focke-Wulf factory near Bremen (figure 2) is probably the best example of what such bombs achieved during the April-June quarter.

A still more recent instance is the destruction of a large building in the Schiess-Defries Machine Tool Works at Düsseldorf, which took place during the attack at the end of July (figure 13).

IV.—ENEMY REACTIONS

(a) Hitler replies to Bomber Command

From the opening of the Russian Campaign in June, 1941, until mid-April, 1942, Bomber Command hammered away at Germany's ports and war industries and at the morale of her workers, yet the Luftwaffe staged no counter-measures deserving the name. The colossal wastage suffered on the Russian Front imposed a galling restraint on the use of German long-range bombers. "The bombing of British towns" (declared a Nazi military apologist in February of this year) "is simply not worth while. No British air action against German towns can entice Germany into reprisals." Even the complete destruction of the Renault Works (said to produce 30 per cent. of the French supply of tanks and military vehicles to Germany) failed to provoke any reprisal such as would have been inevitable before the Russian Campaign. German bombers in the West cautiously engaged in anti-shipping adventures, while the Ruhr, Cologne and the North Sea and Baltic Ports were bombed according to plan.

The fire blitz on Lübeck, however, caused such consternation and foreboding that the German people could stand the strain no longer. Hitler's famous patience suddenly became exhausted once again ("From now on I shall retaliate blow for blow"), and towards the end of April the Hun resumed his long-interrupted bombing raids on our towns in the hope of restoring Nazi prestige and improving morale on his home front. These "political" raids were accompanied by the usual blare of propaganda and, in order to give some scale to the attacks themselves, Reserve Training Units had to be thrown in.

The first of the so-called "Baedeker Raids" happened to coincide with the first of Bomber Command's four attacks on Rostock. On that night (23rd/24th April) a number of German aircraft operated in a highly scattered fashion over Somerset, Devon and Cornwall—one aircraft penetrated to the declared target, Exeter, dropping a stick of bombs on the western part of the town. About 25 aircraft attacked Exeter the next night without achieving much concentration, the rest of the force being scattered.

Bristol and Bath were then attacked—the former ineffectively owing to the balloon barrage, and most of the aircraft on Bath (which was extensively damaged) had to make two sorties in order to achieve sufficient weight. Bath again suffered low-level attacks the next night, a high proportion of Reserve Training Units taking part. Norwich, York, Exeter and Cowes were targets for concentrated low-level attacks of varying success during the first phase of the "reprisal" raids ending 8th/9th May. In view of the small forces engaged (never more, and generally far less, than 100 aircraft) these towns suffered considerably, as the Hun aircraft enjoyed exceptionally good weather and were generally able to come in low. But when a balloon barrage was in operation over Norwich on the last of these raids (8th/9th May) practically no bombs fell on the city.

The German wireless, however, described this "retaliatory" attack as "another blow at badly mauled Norwich—enormous fires starting—target easy to locate. . . All that remained was an enormous heap of ruins."

During the remainder of the quarter up to the end of June these attacks were continued in much the same fashion but with less success. This period witnessed a raid on Canterbury on 31st May/1st June, claimed to be a reprisal for our Thousand Raid on Cologne the night before. In fact, only 50 aircraft were over the target area though less than half had the confidence to bomb it, despite favourable weather and the absence of balloon barrage. The Hun, however, had the amazing audacity to tell the world: "This raid repays Cologne three-fold—Canterbury burning everywhere!" When the same town was visited three times during the next week a balloon barrage had a very healthy effect and our night fighters chased away a good part of the enemy force on each occasion.

Attacks on the port of Poole gave the German wireless another opportunity to brag lustily. No wonder, since (on 24th/25th May) enemy planes spent an enjoyable night in bombing open country; and on 3rd/4th June most of seventy aircraft blitzed a heath fire they themselves started early in the attack. The picturesque German wireless excelled itself on this occasion. Flares "illuminating the town and harbour installations" had given (it declared) "enough light to enable us to drop our bombs exactly where we wanted . . . a powerful strip of flame, almost like a street, could be seen raging across the target—the incendiaries dropped in large quantities on the targets had done their job well. The street of flame grew wider and wider. . . One does not need much imagination to visualise the terror of this night, the ever-widening fires all over the town, the desperate efforts below to master a conflagration of this size. The picture of a veritable street of flame running across the whole town has been reported by all German aircraft. The Luftwaffe has lashed out with lightning speed and good effect as always."

Surely this extremely life-like (but quite irrelevant) description is a reflection of the terrors now only too familiar to the citizens of many German towns?

Other examples of German "line-shooting" followed efforts against Ipswich (1st/2nd June) and Birmingham (24th/25th June). Although there were no balloons and only slight A.A. fire, most of the attack on Ipswich went on heath fires started just outside the borough boundary. But the Nazi wireless declared that:

" German bombers, repeatedly intercepted by British night-fighters, penetrated the closest A.A. barrage and dropped their bombs with great accuracy on Ipswich town and harbour. Thousands of incendiaries caused extensive fires in many parts of the town, the flames of which guided the aircraft following. Innumerable hits—particularly on harbour works—causing heavy damage, were observed."

Although 45 enemy aircraft operated over the Birmingham region there were no incidents in either Birmingham or Coventry (both protected by balloons and smoke-screens). Incendiaries fell in haphazard fashion in the surrounding countryside, but the only significant damage was caused in Nuneaton, nearly 20 miles away. This town was unprotected except by night fighters, weather was better there, and low-level attack started a serious fire in the marshalling yards. However, the Germans were specific in their claims that they had " bombed Birmingham industrial establishments—in spite of strong defence by British night-fighters and heavy A.A. artillery they penetrated the armament centre in the Midlands. Shortly after midnight heavy bombs fell on the Birmingham works without interruption for one hour. German reconnaissance aircraft ascertained that the violent air raid had caused heavy destruction in numerous military factories. . . ."

The attacks on Weston-super-Mare at the end of June caused damage to the town, although the bombing was rather scattered and many bombs fell in the Bristol Channel. No damage was done to the Bristol Aircraft Works despite the Hun's claim that " fairly strong forces dropped . . . a large number of heavy bombs and thousands of incendiaries on installations of military importance." It is worth pointing out that the Hun's " fairly strong forces " consisted of 31 aircraft on this particular night, and there were only 15 on the preceding night.

While raids on Hull and Southampton effected some damage during the quarter most of the effort in both cases fell outside the borough boundaries ; and when the Germans claimed to have " attacked the harbour of Grimsby " on 29th/30th May they were seriously bothered by bad weather : some bombs fell on a beach near an aerodrome, but neither Grimsby nor Hull received any attention at all on this occasion.

It appears to have taken the Germans twenty " reprisal " raids over a period of two months to drop on British towns a weight of bombs approximately equal to that dropped on Cologne on the night of the first mass raid. An equal amount of effort has been wasted outside the boundaries of our towns : wherever a balloon barrage was encountered little concentration was achieved, and our Fire Guards were able to control the situation.

Moreover, the Hun has chosen practically undefended towns for his most damaging raids while Cologne is (or was) one of the best defended and most important targets in the Reich. And while the Luftwaffe has taken two months to " repay " one of our raids, Bomber Command (operating on a far greater scale) has steadily increased its lead.

(b) Enemy Night Fighters

The Germans' fear of the British bombing offensive is clearly shown by the vast resources in manpower and material which they have devoted to defensive counter-measures. It has been estimated that over a million-and-a-half men are pinned down in this way by the efforts of the R.A.F. Merely in forcing the enemy to maintain so substantial a part of his military machine in protecting his western bases and war industries (to say nothing of the morale of his civilian population) Bomber Command makes a contribution of considerable importance to the Allied war effort.

Since 1941 the Hun defences have been still further developed, and apart from an increase in the already prodigious A.A. and searchlight organisation many more night fighters have been encountered by our crews. This ceaseless fighter effort and the recent redistribution around vital targets of the forces and equipment previously disposed in " Searchlight Belts," is the logical outcome of the exposure of Goering's notorious boast that no hostile aircraft would be permitted to cross the territory of the Reich.

The enemy has never dared seriously to decrease the number of his fighters in the West (whereas his bomber force has dwindled on occasions to insignificant proportions). Despite the urgent requirements of the Eastern Front the Germans have consistently maintained a force of between 6-700 fighters. An increase of fighter effort was already appreciable in the early months of this year and it was expected that in the lighter nights of the June Quarter enemy planes would be busier still. Indeed it seemed quite on the cards that the greater concentrations of bombers we were sending over (often on moonlight nights) would present the Hun fighter pilots with just the sort of opportunity they were waiting for. There is no point in belittling the enemy fighters : they are numerous, efficient and cunning. But they must be greatly disappointed to find our bombers so ready to give an uncomfortably good account of themselves. Not only is this shown by the number of fighters which our crews damage or destroy : it can be seen also from the fact that when a thousand of our bombers concentrated over Cologne in brilliant moonlight for ninety minutes, the proportion of our aircraft missing was no higher than the average figure for this target for several months.

Some idea of the scale and character of German fighter opposition can be formed from the following summary covering the months of April, May and June, 1942.

Interceptions

799 (or 6.7 per cent.) of our total bomber sorties reported interception by enemy night fighters during the period, representing a considerable increase on the numbers for winter months:—

Period.	Bombers Intercepted.		Damaged by Enemy Fighters.		Percentage missing from ALL causes.
	Total	% of total sorties.	Total.	% of total sorties.	
April	219	5.8%	40	1.1%	3.7%
May.. .. .	172	6.3%	23	0.8%	4.3%
June	408	8.3%	47	1.0%	4.2%
Totals	799	6.7%	110	1.0%	4.1%

Only about one-third of the reported interceptions developed into attacks. The mass raid on Cologne, however, resulted in the interception of 5.3 per cent. of the total sorties of which 2.5 per cent. were attacked. On this occasion, as on all others, most of the attacks were reported on the homeward journey. For instance, aircraft returning from Mannheim and Stuttgart were often unmolested until over the North Sea.

Of single-engined fighters the Me.109 has been recognised most frequently, but F.W.190, He.112 and 113, and Henschel 126 have also been reported. Twin-engined fighters are generally met with more frequently, especially the Ju.88 and Me.110—the latter coming in to the attack oftener than the former. Do.17 and 217, F.W.187 and He.111 have been observed also.

Fighter Tactics

In a relatively small number of cases fighter interceptions appear to have been assisted by track indicating from the ground, generally by searchlights. Bombers have also occasionally been intercepted while held in searchlights.

A knowledge of the direction of the attack, or approach, made by the fighter is of prime importance in the defence of the bomber and in the development of fighting tactics. It is therefore noteworthy that the reports of bomber crews show that fighters have consistently preferred to make the first attack from astern or from either quarter:—

Direction of Attack.	April.	May.	June.	Proportion of total for the 3 months.
Astern and Quarters	55	43	96	73%
Beams	4	6	12	8%
Ahead and Bows	4	8	13	9%
Not reported	10	7	7	9%
Totals	73	64	128	—

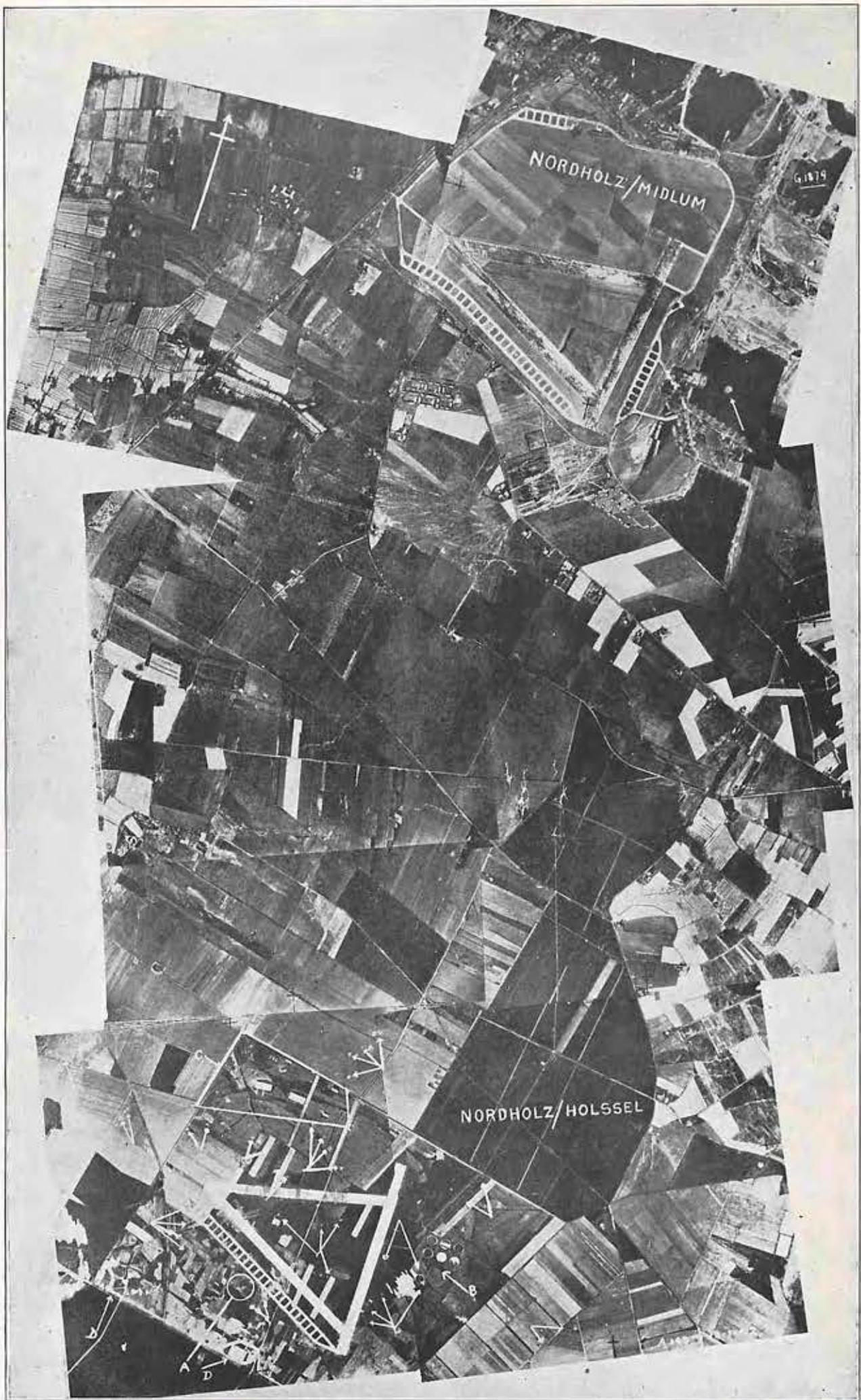
Reports of "approaches" which failed to develop into attacks (chiefly on account of the offensive or evasive action taken by our crews) show the same preference for coming in from the rear.

Of the attacks made from astern or quarters more are made from below than from above or level with the bomber. A new development of this method of attack has been reported on many operations during the period reviewed, and has proved dangerously effective in a number of cases. The fighter is said to climb steeply below the tail of the bomber, in which position it is frequently not seen, and rake the underside of the fuselage with bullets at short range.

Reply to the Night Fighter

In spite of the obvious advantage in speed which the fighters enjoy, our bombers manage to give an exceptionally good account of themselves. Unless taken completely unawares (for instance, by a climbing attack) they have every chance of shaking off the pursuer even if they fail to damage him.

This is well shown by comparing the number of our bombers intercepted by the enemy with the number damaged—85 per cent. of those reporting interceptions succeed in getting away scot-free. If, for the sake of argument, we assume that all our losses were due to fighters (which is manifestly not the case) and we add the total number of our losses to the figure of aircraft known to have been damaged by fighters—even then it could still be said that half our bombers succeed in getting away unscathed after being intercepted by fighters.



DECOYS ADD ONE MORE TO THE PROBLEMS CONFRONTING THE NIGHT BOMBER

See page 21.

Fig. 14.—A realistic dummy and the actual aerodrome at Nordholz, on the same daylight mosaic photograph. The dummy has 70 bomb craters on and around it, while very few can be seen on the real target.

At night the aerodrome is barely visible, especially in poor weather, while the dummy is cunningly illuminated.

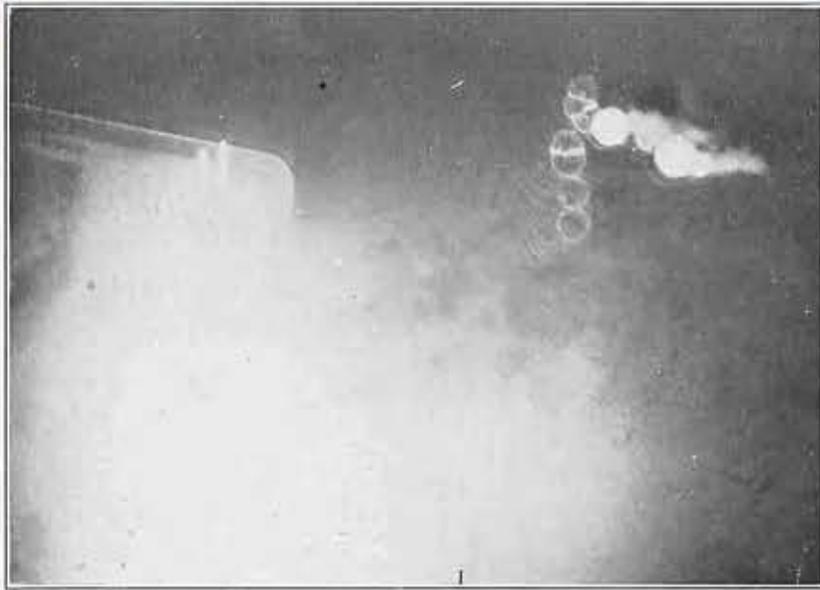


Fig. 15.—A night photograph showing a decoy in operation (note white fire-tracks) on reclaimed land north of Wilhelmshaven Docks, and bombs bursting nearby in the sea (8th-9th July, 1942).

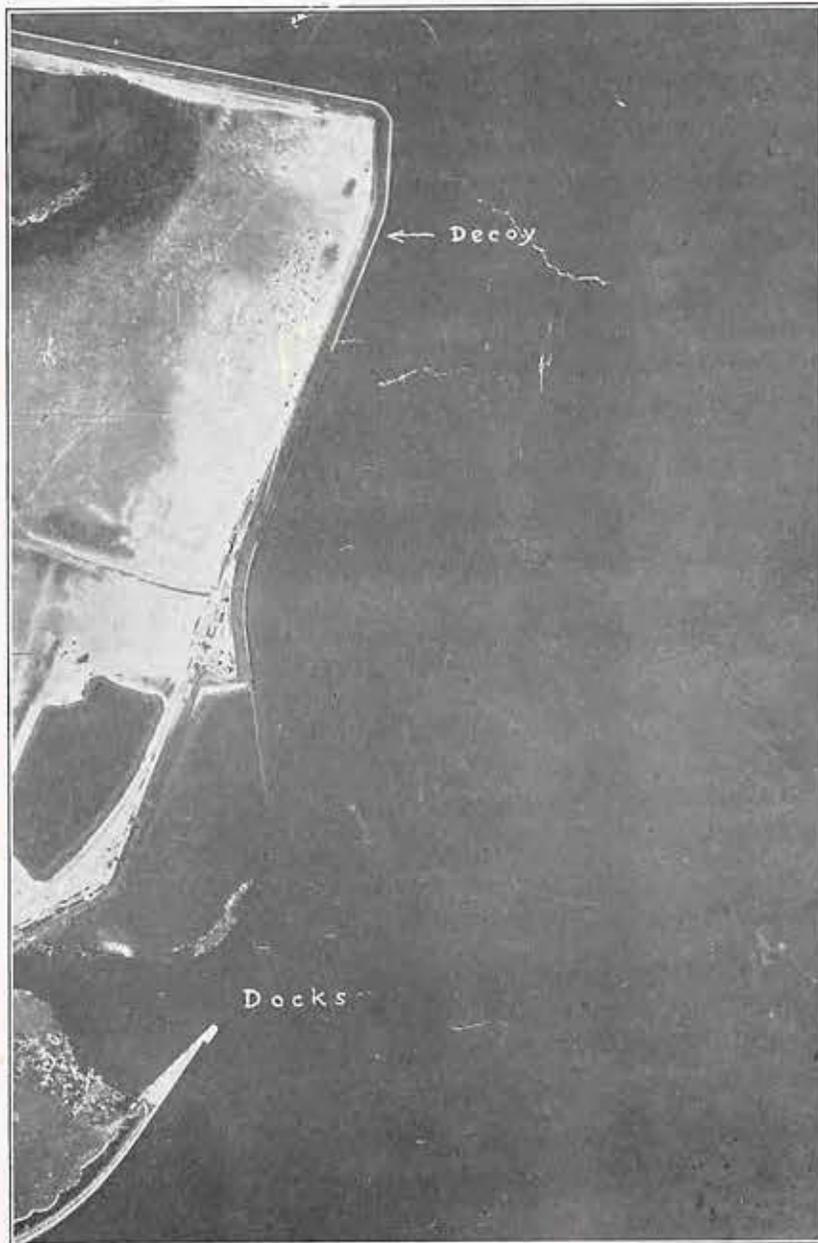


Fig. 16.—The same area photographed in daylight by P.R.U., showing the dummy tanks in which oil fires are burnt at night (see page 22).

A DECOY NEAR A NAVAL BASE

It is estimated that not more than half our losses are due to fighters, so it follows that about two out of every three bombers which are attacked or approached by fighters suffer no injury whatever from them.

Evasive action is not by any means the only reply made by our aircraft to the challenge of the enemy night fighter. From 1st April to 30th June they have damaged or destroyed 114 fighters, of which 52 are claimed as probably completely destroyed. In other cases damage was probably inflicted, but could not be claimed for certainty owing to cloud or evasive action. The effective way in which our bomber crews succeed in shaking off their opponents is no doubt largely due to the respect the latter have for our gunners' fire.

The Stirlings have been particularly successful in such engagements. In April alone they fought 14 combats, in the course of which they destroyed four fighters and damaged five others. Thus at most only five of their antagonists may have been able to get away undamaged. Their even more remarkable achievements on 27th/28th June are referred to elsewhere in this review (page 12).

It is probable that German fighters might have had more successes during the June quarter but for the good work of our intruders, which on several occasions (notably on the nights of the Thousand Raids) hampered fighter opposition by attacking many of their principal bases *en route* to the main targets. Intruder activity on such a scale was considered by our bomber crews to have been particularly effective and well worth the effort entailed.

To sum up, night fighters are unquestionably a serious menace, nearly 10 per cent. of our bombers being intercepted by them. Nevertheless, two out of three bombers, when intercepted, get away without any damage whatever.

(c) German Decoys and their Effect in Misleading Night Bombers

The Hun justly claims to concentrate only on that which is absolutely vital to winning the war. Thus the large number of "decoys" throughout Germany and the occupied countries (on which so much zeal and ingenuity has been expended) is in itself a tribute to our bombing. They show the Hun's respect for the R.A.F. offensive and a fear of things to come.

Given favourable weather conditions it may be said that his attempts to deceive our crews by the use of decoys are largely a waste of time. Whenever it is physically possible to pick out ground features easily the target gets bombed and, up to the present, no amount of Teutonic ingenuity has been able to prevent that.

However, when haze or cloud make difficult the recognition of ground features, then decoys inevitably complicate the many problems which confront our crews. Except when weather is impossibly bad these problems can be solved, but time is short. Fires alone stand out against the dark, apparently featureless landscape, and one fire after another must be investigated. Fuel consumption sets definite limits even if flak and fighters do not directly interfere. In such conditions decoys may be bombed even by the most experienced crews, particularly if haze veils their true identity.

Some of our best crews find decoys very useful: they are easily seen and (when definitely recognised) distance and bearing from the true target can be assessed with great accuracy. Dummy aerodromes in the Low Countries are particularly appreciated from this point of view.

But weather does not always enable this game to be played, nor are all crews equally experienced. The following account of the influence of certain decoys on our attacks on Germany makes salutary rather than cheerful reading; it may help some crews to be more wary and other people to appreciate more clearly the magnitude of the tasks often accomplished with outstanding success. The more the ruses of the enemy are understood the less effective will they be.

Elaborate decoy systems cover most of the large town and industrial areas in Germany and, to a minor extent, those in occupied countries also. The object of the decoy is quite different from that of camouflage. The latter is an endeavour to hide the actual target, at least from visual reconnaissance, whereas the decoy is intended to be used at night to draw bombing attacks away from targets. For this purpose decoys are usually situated two to five miles away from the towns or targets which they are intended to protect.

The normal German method of using the decoy appears to be that of lighting fires within specially built units of varying designs. These units—many of which have been photographed by day—are usually parallel walls or rectangles averaging one hundred to three hundred feet in length. Sometimes they consist of circles similar in size to oil tanks. Within these units fires are lit which by night from the air resemble large fires in built-up areas, burning buildings, oil tanks, etc.

Bombers navigating to the area may be unable to identify the target exactly. Seeing a large fire and what appears to be burning buildings without roofs, they bomb these in the belief that what they see is part of the target.

With the increased use of incendiary bombs, air crews are bound to be "fire-minded," and this tends to make them look for and to bomb fires when they find them in what they estimate to be the area of the target. This use of incendiaries has other effects of which we have several examples. A crew in difficulties may have to jettison their load of incendiary bombs, causing a fire or series of fires in areas not near the target, and so draw other bombers to the spot. Or a crew wrongly identifying a target may deliberately start a fire and cause the same effect as the one which does so by accident.

A striking example of such a "self created decoy" (*i.e.*, genuine fires which attract some of the force to the wrong place) occurred during the attack on Nürnberg last October. In hazy conditions early aircraft bombed the town of Schwabach, 9½ miles to the south-west. This was set alight and nearly all the aircraft in the attack followed suit, with the result that Schwabach was "blitzed" while Nürnberg was only slightly damaged. There is no evidence in this case of any attempt by the enemy to decoy the attack. A more recent instance of the same thing took place during the attack on Mannheim on 19th/20th May, 1942. Few aircraft bombed the proper target, and of 41 night photos purporting to be of Mannheim, 30 were plotted about 15 miles west of the town in a wooded area showing many incendiaries and fires.

It is interesting to endeavour to trace how far the use of deliberate decoys by the enemy has been instrumental in drawing attacks away from the intended target. As far back as July, 1941, during the series of successful attacks on Münster the decoy known as Münster 1 (Gelmer) was very active; this is 4 miles N.N.E. of Münster. It was photographed on 5th July, 1941, and seen to be a simple walled rectangle with units of material inside—probably combustible. Photographed again on 11th July, after four night attacks, this decoy showed much scarring of the ground within the rectangle, obviously caused by burning, and the units inside had gone. Heavy tracks lead from the decoy to the road. During the period between 5th and 11th July an area within a two-mile radius of this decoy collected 63 craters.

Photographs of other important decoys also show collections of craters, some within a much smaller radius, and clearly demonstrate their effectiveness and ability to draw bombs away from a target. The most prolific decoys are those of the Ruhr and Rhineland. Cologne is surrounded by no less than 12 decoy sites, while in the Ruhr area there are 14 between Rheinburg (north-west of Duisburg) and the town of Dortmund.

The haze conditions of the Ruhr are peculiarly suited to the use of decoy methods, and they have had a pronounced effect on several of our operations in this area. For instance, on 25th/26th March, 1942, during an attack directed on Essen, a number of crews went to Rheinburg (18 miles west), where, at the time, there was no known decoy. These crews started fires, including one at the Deutsche Solvay Works, which formed a powerful decoy system and took a great deal of the attack off the target. Subsequent day photos clearly showed the usual type of walled rectangle decoy and, within a 3-mile radius, 120 craters.

During attacks on Cologne several of the known decoys have been seen in action and have taken many aircraft off their target. On the night 27th/28th April, 1942, the Heumar decoy was active, and attracted considerable attention both from high explosive and incendiary bombs. A large number of the latter are seen in night photographs to be burning near the decoy and in Königsforst close by. The Marsdorf decoy, 5 miles west-south-west of Cologne, was effective during the attack on 13th/14th March, 1942, and a photograph taken with bombing suggests that this had no different appearance from any other fire.

A clear instance of the effect which decoys occasionally have on our operations occurred during the June quarter. There is a large and effective decoy for Stuttgart situated at Lauffen, 20 miles to the north (a most unusual distance). It covers an area 3 miles by 1½ miles and consists of the usual parallel walls, rectangles, dummy tanks, etc. On the night 6th/7th May, 1942, our attack on Stuttgart was largely decoyed to this area and eight aircraft took photographs with bombing in this neighbourhood. It had the effect, however, of turning some of the attack on to the nearby town of Heilbronn, which was photographed with bombing by several aircraft while others bombed (and photographed) the area of Phillipsburg, 46 miles north-west of Stuttgart.

Coastal targets such as the North Sea ports are generally found more easily than inland targets at night, but even here German decoys have had some successes. The port of Emden, for example, has five decoys all within 5 miles of the town. During the attack on 22nd/23rd June, 1942, of the 88 aircraft which took photos with bombing 32 were plotted near one of the three decoys west of the town. Again at Wilhelmshaven there is a very effective decoy (consisting of dummy tanks in which oil fires are burnt) only 2½ miles north of the docks. It did not fail to attract some bombs on 8th/9th July, 1942 (Figs. 15 and 16).

Decoy aerodromes are also much used by the Hun and dummy flare-path lights are frequently recorded on night photographs. The decoy aerodrome on Overflakee Island—Ouddorp 1 (West Duinen)—collected 51 new craters within 2 months. This area may well be attracting some of our "intruders." Another effective dummy aerodrome is the decoy for Nordholz/Midlum (Fig. 14). Situated 3½ miles south of the real aerodrome the decoy copies it in all its most important details, and had collected 70 craters by January, 1942.

These examples show that decoys play an important part in enemy defence plans and sometimes succeed in drawing a proportion of our effort away from its real objectives. Crews who are lured away from the target often realise their mistake in time and if they are still unable to locate the primary, succeed (as at Heilbronn last May) in finding a relatively useful objective for their bombs.

The Germans have put a great deal of effort into the organisation of their decoy system and no doubt hope that they will succeed in reducing the weight of attack on vital objectives. It is our job to see that they are disappointed and, before bombing a tempting-looking fire, it is the duty of all aircrews to satisfy themselves that they are not being led up the garden path.