

CHAPTER 9

THE CAMPAIGN AGAINST OIL JUNE-DECEMBER 1944

THE theoretical value of the German oil industry as a target for strategic bombing was recognised by Allied planners throughout the war, although at times widely differing interpretations were given of the available Intelligence material. Oil targets had consistently been included in and often headed the priority lists for R.A.F. attack in 1940 and early 1941, but with poor results. Up to mid-1941 the tactical and technical restrictions imposed by inability to find precise targets or to bomb accurately, together with the wide spreading in time and space of the relatively small bombing capacity of the R.A.F., strictly limited the material effect of bombing during a period when Germany had not bitten deeply into accumulated reserves, was still importing overland nearly 60 per cent of pre-war imports from all sources, and had captured nearly five months total oil stocks in the French campaign. This was moreover in a period when the only severe drain on German oil resources was in respect of aviation fuel for the *Luftwaffe* blitz against England. Even when the attack against Russia was launched in June 1941, the early progress of the campaign gave little hope that the R.A.F. with its existing capabilities could affect the issue by concentrating against oil targets, and accordingly, on 9th July 1941, Bomber Command was given the task of "dislocating the German transport system and destroying the morale of the civilian population".

Lacking both the means and the method to achieve observable results the R.A.F. thus failed in its first offensive against oil. During the next three years when great strides were made both in the expansion of Bomber Command and in its technical proficiency, the choice of targets for strategic attack was greatly influenced by the requirements of the immediate military situation. First the submarine threat to Allied supply lines during 1942-43 and then the danger to Allied air supremacy posed by the growing German fighter force in the autumn and winter of 1943 made it imperative for bombing directives to give priority to enemy submarine and aircraft industries even though "economic" targets may have promised far better results. Even in the spring of 1944, with the U-boat and German Air Force threats contained if not eliminated, and at a time when Anglo-American bombing forces were large enough and sufficiently well equipped and trained to deliver shattering and repeated attacks against Germany, these had to be postponed in favour of devoting full tactical support to the long-heralded invasion of France. Thus although the POINTBLANK directive of 4th February 1943, which was based on decisions taken at the Casablanca conference, included oil as one of the major German war industries scheduled for attack, this was a "paper" priority which could seldom be given more than nominal attention.

In addition to the over-all directives set down by the Combined Chiefs of Staff, and the urgent distractions imposed by the general war situation, another factor which worked against any deliberate campaign to destroy German oil resources was the fervent belief of R.A.F. Bomber Command in mass attacks against German cities. Area bombing had been adopted in July 1941 as a policy of necessity only until the precision and weight of night bombing could be improved. Harris, who became Commander-in-Chief of Bomber Command early in 1942, gathered around him a staff with a wholehearted belief in area bombing, not as a temporary expedient, but as a way to final victory. They had (at that time with some justification) a poor opinion of the economic Intelligence assessments on which spot target systems had hitherto been based. While doubting that war potential could be significantly lowered by bombing individual factories because of the suspected energy, recuperative powers and surplus capacity of German industry, they considered that lowering of morale and the cumulative effects of attrition caused by the destruction of German cities would bring about a general collapse of the economy. This feeling was by no means confined to the staff at Bomber Command headquarters but was disseminated through groups, squadrons and training units until it became the dominant credo of individual air crews, and was in fact much strengthened by the indifferent results of such attempts as were made during 1943 to attack oil targets in Germany. Gelsenkirchen, a sprawling network of townships shrouded by natural fogs and heavy chemical haze, had been attacked during 1943 several times with forces of more than 400 bombers but the dispersed nature of this industrial area made selection of precise aiming points difficult and also prevented the raging fires which were the chief agents of destruction in city areas. Australian and other aircrew felt that the same risks had to be run as in raids against major cities with little certainty that any worthwhile result would be achieved. Accordingly, in practice, the oil targets were treated as spoof, diversionary or last-resort targets to keep enemy defences stretched, but no systematic attempt was made by the R.A.F. in 1943 or early 1944 to destroy them.

The United States Air Force, equally dedicated to a contrary philosophy of daylight precision bombing against spot targets, naturally was far more eager to conduct an offensive against German oil potential. The first U.S.A.A.F. bombing attack in the European theatre was on 11th-12th June 1942 when 15 Liberators based in the Middle East attacked the Ploesti oilfields in Rumania. This, however, was a token of intention rather than a measure of capacity. Throughout 1943 the American Eighth Air Force in England was struggling to attain the means and opportunity to attack oil targets but was limited in its ability to strike deep into Germany and was moreover preoccupied by other tasks. Apart from a few experimental raids in western Germany, its next significant oil objective was again oil refineries and wells at Campina and Ploesti on 1st August 1943—a lapse of 14 months. This attack was made by Eighth Air Force bombers operating from North African bases but it failed to

achieve tactical surprise and the attacking force sustained heavy losses. Moreover the actual damage to installations at Ploesti was not as great as had been anticipated although the main achievement of the attack was to eliminate permanently the surplus of effective refinery capacity. Results balanced against losses were not such as to encourage repetition of the raid under existing circumstances and further attacks against Ploesti were deferred until the American Fifteenth Air Force could be transferred from North Africa to the Foggia complex of airfields in Italy from which it could be expected to operate in strength and with effective fighter protection. Throughout the winter of 1943-44 neither the Eighth Air Force, heavily committed to the urgent campaign against the German aircraft and ball-bearing industries, nor the Fifteenth Air Force, bogged down by logistic difficulties and tactical tasks, could devote much attention to the oil campaign.

Spring 1944 saw a re-examination of strategic air targets. The Anglo-American heavy-bomber forces had expanded with almost dramatic speed so that in March 1944 Bomber Command alone had 1,300 heavy and 300 other aircraft, while the Eighth Air Force was numerically larger and still expanding. Bases, support manpower, replacements of aircraft and crews, and supplies of bombs were all available in adequate numbers. The monthly average bomb-load on Axis-held territory, which in 1940 had been only 1,128, in 1942 when the U.S.A.A.F. first operated had been 6,000, and in 1943 had been 26,000 tons, had now risen to 45,000 tons, and it was planned to more than double that figure.¹ The means of carrying out the combined bombing offensive against Germany were manifestly not lacking. The method of doing so had at the same time been greatly facilitated by equally impressive improvements in operational technique. The development of the ultra-long-range Mustang fighter permitted the U.S.A.A.F. to plan continuous fighter escorts for attacks deep into the heart of Germany. New radar devices such as H2S Mk III and G-H² were already available in small quantities and rendered possible precision-bombing through cloud or at night. There was no longer any German threat which demanded imperatively the diversion of heavy bombers from purely strategic objectives. Accordingly, on 5th March 1944, General Spaatz presented to General Eisenhower a proposal that oil targets should be regarded as an alternative to the transportation plan put forward by A.E.A.F. as a prerequisite for OVERLORD. However, Leigh-Mallory and Tedder were earnest advocates of the policy of attacking the extended transport targets and Harris was definitely opposed to the oil plan, so Spaatz's proposal failed.

What had been rejected officially could still be obtained by indirect means, for Spaatz no less than Harris was well aware that the cumbrous system of personalities, committees and staffs dealing with the planning and direction of Allied policy was not geared for precise and unequivocal

¹ In fact the average monthly figure for 1944 reached 131,000 tons.

² A radar blind-bombing system which used Gee equipment in conjunction with an airborne transmitter and two ground beacons.

decisions. A lack of clarity in the wording of major directives made these an adequate cloak for a variety of conflicting decisions which were seldom clearly challenged if pursued with determination by operational commanders at lower levels. The oil campaign was thus begun by the U.S.A.A.F. in a semi-clandestine manner when, on 5th April 1944, the Fifteenth Air Force attacked what were alleged to be railway marshalling facilities at Ploesti. This raid was ostensibly to harass the Germans facing Russian forces then breaking into Rumania, but the real target was the Astra group of refineries. Further raids against transportation targets at Ploesti followed on 15th and 24th April, and by 4th May M.A.A.F. headquarters gave a belated aura of legitimacy by granting approval for a continuance of such attacks if tactical considerations allowed.

A different subterfuge had to be adopted by the Eighth Air Force in England. Although on 26th March Eisenhower finally declared that rail centres affecting OVERLORD together with attacks against the German Air Force must take priority over oil targets, Spaatz continued to canvass the desirability of attacking oil installations in Germany, both to reduce supplies to the *Luftwaffe* and to provoke heavy air battles which on a knock-for-knock basis could be regarded favourably as coming within the priority already allotted to attrition of the G.A.F. On this rather tenuous but passionately pleaded argument Eisenhower agreed on 19th April that the next two days of good visual conditions could be devoted to the bombing of oil targets in Germany as an experiment to discover if the enemy was willing to defend these plants. Bomber Command declined to participate, having no faith in the objective and being unwilling either to mount large-scale daylight raids into Germany at this stage, or to release prematurely to squadrons the new H2S or G-H equipment which would give accurate blind-bombing results but was in reserve for Bomber Command's own chosen targets. In the event it was not until 12th May that General Doolittle (commanding the Eighth Air Force) was able to send 900 Fortresses and Liberators against six synthetic oil plants in Germany. Heavy air battles ensued between the German Air Force and escorting Allied fighters and although 46 American heavy bombers were shot down, an equal number of German fighters was destroyed³ and all six targets were damaged, three very heavily.

On 28th May some 400 heavies again attacked five of the damaged plants and next day 224 Liberators made a long run to attack Politz. Both these raids met more than normal opposition from German fighters and 49 bombers were lost. Thus, before OVERLORD was mounted, the U.S.A.A.F. had enthusiastically expanded its "two clear days" of experiment into three day-raids: it felt vindicated by the observed results of damage and by the fierce enemy reaction, which was interpreted to mean that oil targets were a specially sensitive enemy defence commitment. Lobbying to extend the campaign and to gain official sanction for it was redoubled. On 8th June, only two days after the landings in Normandy, Spaatz was able to issue to the two components of the

³ USAAF claims amount to 190; official German figures to 50 on this day.

American Strategic Air Forces a directive that their main strategic aim henceforth was to deny oil derivatives to the enemy armed forces. The Fifteenth Air Force was to attack refineries at Ploesti, Vienna and Budapest together with synthetic oil plants in southern and eastern Germany and Poland; the Eighth Air Force was allotted crude oil refineries and synthetic plants in central Germany. At the same time Bomber Command, despite passive opposition, was given a priority list of 10 synthetic oil plants in the Ruhr for attacks complementary to the American Strategic Air Forces' campaign. The operations of the three major bombing forces were for the first time to be coordinated with the R.A.F. as a full-scale partner in precision attacks both by night and day.

What then was the German oil industry which had belatedly but finally been adopted as a prime strategic target? Germany was not well endowed with natural oil resources and before 1939 imported nearly 60 per cent of her total requirements from outside Europe—sources which would be inaccessible in any conflict with a major naval power. Industrial and military economy were accordingly planned to meet this situation and in 1938 total production and imports amounted to only 7,000,000 tons although Great Britain with its much smaller population imported 12,000,000 tons in the same year. War plans were based on *blitzkrieg* concepts of successive short campaigns with intermittent recuperation of stocks to offset periods of heavy expenditure; even the German Air Force was designed for ground support rather than a sustained bombing offensive. Conservation of stocks and strict economy in use was supported by an energetic campaign to develop synthetic as well as natural oils. From 1933 onwards a vigorous search was made for new deposits of crude oil in Germany and the same process took place in Austria after the *Anschluss*. Alone among the major powers Germany sedulously fostered during the 1930's a synthetic oil industry, and in 1938 the Karin Hall plan called for an output of finished oil products from domestic crude oil and coal of 11,000,000 tons by 1944, equal to one and a half times the total supply from imports and production in 1938. On the outbreak of war, seven hydrogenation plants, seven Fischer-Tropsch⁴ synthesis installations and a few tar distillation or carbonisation plants were already in operation and others were being prepared. All these plants were built either in the Ruhr, to use the high quality bituminous coal deposits, or in central Germany where there was abundant brown coal; crude oil was derived mainly from the plain area near Hanover or from Austria; the main refineries in Germany proper were at Hamburg, Bremen and Hanover.

Wartime annual oil supplies available to Germany from continental imports (mostly from Rumania), increased development of domestic crude

⁴ In this process coke or brown coal is blown with steam and either air or oxygen to prepare hydrogen and carbon monoxide which are then allowed to combine in a chemical reaction to produce a high quality crude oil. The plant required a gas preparation section covering several acres and with characteristic steel towers about 100 feet high; purification sections to remove sulphur and other compounds; reaction sections in which oil is synthesised; condensation plants; absorption plant and fractionalisation columns. The process is conducted at atmospheric pressure and all units are of much lighter construction than are the hydrogenation plants.

oil supplies, and expansion of synthetic production actually rose from 7,500,000 tons in 1940 to 9,000,000 in 1941, 9,500,000 in 1942 and 11,250,000 in 1943 without recourse to the special *Wehrmacht* and *Fuehrer* reserve stocks to be broached only in emergency. In this expansion the synthetic oil industry played a dominant part because output rose from 2,250,000 tons in 1939 to 6,000,000 in 1943. Consumption by the armed forces also rose during this period but was checked by very stringent oversight of motorised units and by cutting civilian use of oil products from the pre-war level of 2,250,000 tons to 333,000 tons annually. Thus, until the end of 1943, the German Army was never critically short of oil and the navy balanced expanding U-boat campaigns by leaving capital ships idle in harbour. It was only in aviation gasoline that a dangerous shortage arose as early as January 1942 when the hydrogenation plants were all switched to produce a maximum amount of aviation fuel, so that by January 1944 no less than 92 per cent of all aviation fuel was derived from hydrogenation. Even so, shortage of aviation fuel in mid-1942 led to partial suspension of training so that operational squadrons could remain in the line, and this situation arose again during the summer of 1943 when allocations of fuel for bench-testing aero-engines and flight-testing aircraft was also greatly reduced, to the detriment of efficiency.

Before May 1944 less than 4,000 tons of bombs had been aimed at the German oil industry in over three years of effort which had been sporadic both in space and time. During the next 12 months some 180,000 tons of bombs were in fact to be employed against the same target complex.⁵ This tonnage could have been increased at will for there was no lack of means in terms of aircraft, crews or bombs; but there were many other urgent tasks both strategic and tactical for the heavy bombers. The attack on oil targets was to be systematic, severe and of sufficient frequency to limit production as decisively as possible, but it was never given overriding priority. Indeed it soon became apparent to Allied planners that there were at least five different facets to the problem, each of which was susceptible in a differing degree to aerial bombing and each of which had to be tackled in a different way. The amount of effort actually expended against hydrogenation and Fischer-Tropsch plants, which formed one group; other synthetic plants; German refineries; production in occupied territories, and sources of imports, was very uneven. Damage inflicted on the various sources was also very disparate but not always in the same relation to the effort applied.

Bomber Command began its part in the oil campaign during the night of 12th-13th June when 294 Lancasters sought out the Bergius plant at Nordstern (Gelsenkirchen), reputedly one of the largest hydrogenation plants, producing 7 per cent of total German production. Fourteen crews from No. 460 and fifteen Australian pilots from Nos. 15, 90, 115, 166,

⁵ It is noteworthy that this tonnage against a vital strategic target was only double that which the Anglo-American heavy bombers used in a quarter of the time in purely palliative measures against flying-bomb installations in Normandy.

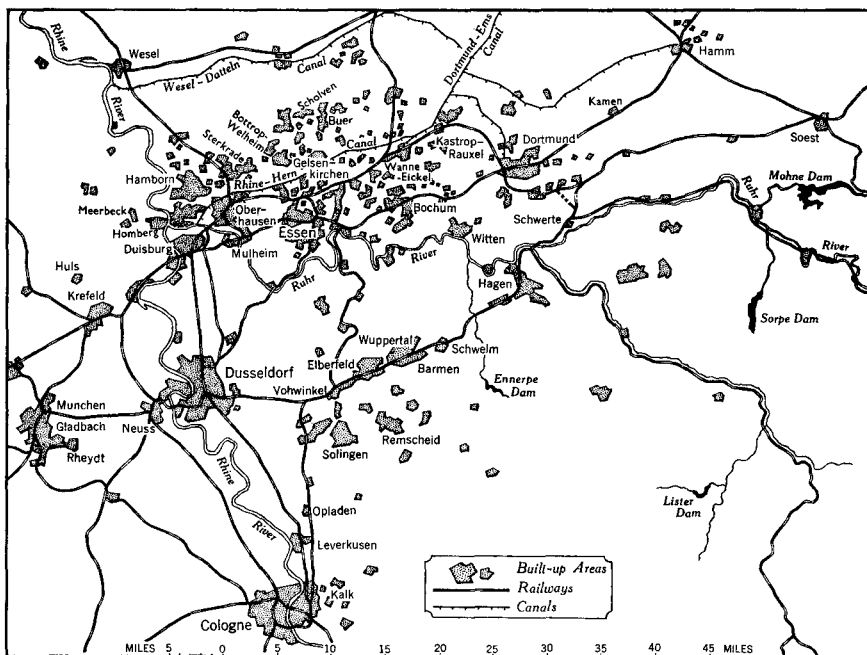
514, 622 and 626 Squadrons took part. The crews of No. 460 were enthusiastic about returning to the Ruhr after three weeks spent in concentrating on French targets, but before the raid were not very optimistic of success. They found, however, to their surprise clear weather over the target with less haze than was usual at Gelsenkirchen. Pathfinder marking was prompt and appeared to be well concentrated except for one red target indicator which fell about 10 miles south of the main cluster and attracted some of the bombs from nervous crews arriving early in the raid. Once the rhythm of attack began, large explosions were reported and black smoke rose to a great height. Seventy-five tons of bombs were dropped (out of 1,444) by crews of No. 460 and they turned for home in far more confident vein. They were also heartened in that ground defences seemed far less active than was normal for Ruhr targets, and there were no night fighters active during the attack.

Nevertheless free-lance German fighters penetrated the bomber stream during its homeward flight over Holland and 17 Lancasters were shot down including one from No. 460. Subsequent air photographs showed that the damage inflicted by this raid was severe and extended throughout the plant. Injection houses, generating plants, the turbine house, hydrogenation stalls, gas generation and paste preparation plants all revealed some degree of damage.⁶ In addition many storage tanks were destroyed and all 13 cooling towers damaged. Other facilities such as railway lines, sidings and waggons were also hit. The contemporary estimate was that efforts to make repairs could result in only a partial resumption of work.

Four nights later the target was the Fischer-Tropsch plant of the Ruhrchemic company at Holten (Sterkrade) and the bombing force was a mixed team of Lancasters and Halifaxes drawn from Nos. 1, 4 and 6 (R.C.A.F.) Groups. On this occasion No. 466 was the only R.A.A.F. squadron engaged; it dispatched 15 crews of which one failed to attack and returned early because of faulty electrical services. But whereas the initial raid had enjoyed good conditions, the Australians on this night reported special difficulties not only from gun defences and night fighters but from weather as well. A solid sheet of cloud lying between 7,000 and 10,000 feet completely covered the area and the majority of marker bombs quickly disappeared into this cloud, leaving crews no option but to aim at any glow seen below the cloud, and unable to distinguish between target indicators and enemy decoys. Consequently 1,275 tons of bombs were dropped in what all admitted to be a very scattered attack. Flak was intense and discouraged crews from remaining in the area in case the cloud thinned, while enemy fighters were assisted by the good visibility in the region above cloud. Although the special Mandrel screen was in operation and also a new radio counter-measure by which ground

⁶ In the hydrogenation process coal is ground to powder, mixed with heavy oil to make paste and pumped through heat interchangers with compressed hydrogen, which at 800°F combines with part of the coal. After cooling, the mixture is separated into gas, liquid and sludge. The liquid is fractionated into light and heavy oils while the sludge is reprocessed to provide oil for mixing more coal-paste. Hydrogenation is conducted at huge pressures and at high temperatures which requires the most sturdy construction surrounded by heavy concrete walls.

stations jammed the M-F beacons used to transmit information to German night fighters, 32 aircraft (10 per cent of the force) were shot down and many more reported combats. One crew of No. 466 claimed the destruction of an unidentified fighter while Pilot Officer Sargent⁷ was attacked on two occasions, first by an FW-190 and then by a Ju-88. His Halifax was hit during these encounters, but not badly, and the crew suffered no casualties.



The importance which the Germans placed on defence of the synthetic oil plants was amply shown on 21st-22nd June when Bomber Command mounted two raids, this time with smaller forces each of approximately 130 aircraft. The two Waddington squadrons (Nos. 463 and 467) provided 34 Lancasters for the first attack on the hydrogenation plant at Scholven-Buer near Gelsenkirchen but again a heavy undercast spoilt any attempts at precision bombing and only slight damage was inflicted on the plant for an expenditure of 570 tons of bombs and the loss of eight aircraft in the whole force. Few crews on return were able to claim an uneventful trip. No. 467 lost two Lancasters, had two more badly holed by flak and another, piloted by Flying Officer Sayers,⁸ slightly damaged during two separate encounters with night fighters, one of

⁷ F-O G. A. Sargent, DFC, 415686; 466 Sqn. Photo engraver; of Subiaco, WA; b. Wickepin, WA, 3 Oct 1913.

⁸ F-Lt J. L. Sayers, DFC, 414844. 467 Sqn, 617 Sqn RAF. Railway employee; of Brisbane; b. Brisbane, 21 Feb 1921.

which was seen to be hit by his gunners' return fire and plummet down with its port engine on fire. No. 463 lost only one Lancaster but another piloted by Pilot Officer Hattam⁹ was heavily engaged by flak during the steady run-in to the target. Flight Lieutenant Baker of No. 97 bombed successfully but then his port-outer engine caught fire and he was soon afterwards hit by ground gunfire and had to evade fighters as well; from the same squadron a very experienced pilot, Squadron Leader McLeod,¹ failed to return. Losses and damage might even have been higher but for a new evasion technique employed by this force during its withdrawal. By prearrangement the force altered course and went down to a lower level, which appeared to cause difficulties for the ground gunners and also to mislead the night fighters, which lost contact.

Even stiffer opposition was encountered by the other force sent that night to bomb the Wesseling hydrogenation unit. Bombing was again unsatisfactory in cloudy conditions, and no fewer than 37 aircraft failed to return. Enemy fighters approached the bomber stream before it reached Wesseling and attacked repeatedly. An aircraft piloted by Pilot Officer Rackley² of No. 630 exchanged fire with a Ju-88 and suffered extensive damage to its control surface but continued on to bomb. On the home-ward journey Rackley was forced to lock the control column in a fixed position and jam the rudder hard to starboard to retain any control over the aircraft. By the time he was over England he found that the Lancaster would fly only straight and level and he had no alternative but to order his crew to bale out. During the battle with the night fighter the parachute of the rear gunner had been damaged so another crew member, Pilot Officer Morgan,³ in an attempt to help his comrade, volunteered to make a twin jump. Unfortunately when the parachute opened the gunner's harness, which was also possibly damaged, broke and he fell to the ground. Rackley, after all his crew had left, baled out himself only to land on a railway line and have his parachute entangled with a passing train which dragged him along the permanent way.

Similar outstanding determination to overcome difficulties was shown by Flying Officer Hegarty⁴ of No. 83 Squadron whose aircraft was also seriously damaged by an Me-110 night fighter on his outward journey. He reached the target but then discovered he could not drop his bombs because of damaged electrical gear. His aircraft was twice struck by flak as he flew in circles while the crew tried to repair the damage. A bombing run was then made but the bomb-doors would not open, so he reluctantly turned for home, and was hit again by gunfire,

⁹ F-O R. F. Hattam, DFC, 410331; 463 Sqn. Salesman; of Elwood, Vic; b. Melbourne, 16 Jul 1922.

¹ Sqn Ldr L. A. J. McLeod, DFC, 413409. 50 and 97 Sqns RAF. Clerk; of Burwood, NSW; b. Auckland, NZ, 13 Feb 1920. Killed in action 22 Jun 1944.

² F-O L. N. Rackley, DFC, 414828; 630 Sqn RAF. Clerk; of Coorparoo, Qld; b. Brisbane, 27 Mar 1922.

³ F-O D. S. Morgan, BEM, 413786. 630 Sqn RAF, 467 Sqn. Clerk; of Dubbo, NSW; b. Goulburn, NSW, 30 Jun 1923.

⁴ F-O D. J. Hegarty, DFC, 420561. 630 and 83 Sqns RAF. Jackaroo; of Cassilis, NSW; b. Marrickville, NSW, 13 Nov 1920. Killed in aircraft accident 16 Jul 1944.

this time on the starboard wing. Evasive action had by now taken him out of the bomber stream, and when he was north of Antwerp he was intercepted by a free-lance Me-110; in this combat two of his crew were wounded and further structural damage sustained by the Lancaster. The fighter was finally shaken off and Hegarty coaxed the crippled bomber to Woodbridge, an airfield specially reserved for crash landings, where after vainly attempting to repair his landing-wheel controls he put the aircraft down safely. A third Australian, Flight Lieutenant Saunders,⁵ also of No. 83 Squadron was attacked six times by fighter aircraft before reaching Wesseling.

Apart from these main-force attacks, Mosquito aircraft of the Pathfinder Group made six small-scale raids in June 1944. Four of these attacks, totalling only 80 sorties, were against the Scholven-Buer installations, while the other two, totalling 82 sorties, were directed to the Meerbeck works of Rheinpreussen, a typical Fischer-Tropsch plant about three miles north-west of Homberg. For the comparative outlay these small raids were far more effective than the main efforts, especially against the "thin-skinned" Fischer-Tropsch target. This was the result of the superior tactical freedom of the Mosquito in bad weather and also because each aircraft could be controlled by Oboe, and thus even when bombing blind a greater theoretical concentration of bomb pattern was possible. Only two R.A.A.F. pilots, Flight Lieutenant Molony⁶ of No. 105 and Flight Lieutenant Grant⁷ of No. 109, both experienced second-tour men, have been identified in the first two attacks against Meerbeck, but, as this plant will henceforth be used as the yardstick of Bomber Command efficiency against this type of target, the raids warrant some analysis.

Meerbeck occupied an area of about 100 acres of which one-third was occupied by essential process structures and the remainder open ground, transport and supply facilities. It was defended in June by nearly 100 guns, was well camouflaged and had a decoy plant about three miles away. Previously the main plant had never been bombed but the decoy plant had been successful on several occasions in attracting bombs during raids in the Homberg area. On 25th-26th June, however, the Mosquitos did hit the main works although, of 44 tons of bombs dropped, only a ton and a half fell inside the plant perimeter. Even so the sulphide-removal sections, gas-holder, cracking section and many pipe-lines were damaged.⁸ This raid alone cut the daily production at Meerbeck of 175 tons by two-thirds. The second raid on 30th June-1st July employed heavier individual bombs, but of 55 tons dropped only six and a half fell on

⁵ F-Lt A. J. Saunders, DFC, 8687. 467 and 463 Sqn, 83 Sqn RAF. Accountant; of Townsville, Qld; b. Charters Towers, Qld, 28 Jun 1917.

⁶ F-Lt J. P. Molony, DFC, 405318; 105 Sqn RAF. Schoolteacher; of Woodend, Qld; b. Mitchell, Qld, 27 Sep 1913.

⁷ F-Lt C. R. G. Grant, DFC, DFM, 402571. 460 Sqn, 109 Sqn RAF. Overseer; of Darling Point, NSW; b. Sydney, 7 Apr 1911.

⁸ All details of bombs within the perimeter of Meerbeck, damage inflicted and effect on production are quoted from the careful records maintained at Meerbeck. Other statistics are from Bomber Command sources.

the plant. This was sufficient to cause severe damage to gas-holders and a compressed-air main which put the whole installation temporarily out of action.

Meanwhile the Eighth Air Force, despite its heavy tactical OVERLORD commitments, attacked refineries at Hamburg on the 18th, refineries and synthetic plants in north-central Germany on the 20th, the refinery at Bremen on the 24th, and more synthetic units on 29th June. From Italy the Fifteenth Air Force that month attacked the major Hungarian, Yugo-



slav and Italian refineries, oil storage facilities in the south of France, in addition to large-scale fighter-bomber (10th June) and heavy-bomber (23rd June) raids against Ploesti. Wellingtons of No. 205 Group continued from Italy their steady campaign of mining the Danube River in an attempt to prevent the transport of oil products.

In July 1944 Germany's oil resources still stretched from Rumania and Austria in the east and as far north as Politz, but the effects of the systematic bombing had become most pronounced. At the end of June the Munitions Minister, Albert Speer, had written an urgent personal appeal to Hitler reporting the serious losses of fuel already sustained and emphasising the need for rapid repair and expansion of the industry. "Otherwise," he wrote, "it will be absolutely impossible to cover the most urgent of the necessary supplies for the *Wehrmacht* by September,

in other words, from that time onwards there will be an unbridgeable gap which must lead to tragic results." Edmund Geilenberg, a man of great organising ability, was appointed with overriding powers to take charge of the repair, building and dispersal of oil plants. A labour force of 350,000 men was raised to work night and day on repairs. So efficient was this organisation that the largest oil plants were often put back into full production in a matter of a few weeks and in some instances a comparatively high level of capacity was achieved within a week of an apparently devastating air attack.

The Allies were well aware of German resourcefulness and energy in construction and repair of railway and industrial targets, and now that there was common agreement in principle that the campaign against oil should continue as a main objective of strategic bombing, a Joint Oil Targets Committee was set up to obtain and evaluate information on the constantly changing position. Heavy demands were placed on all branches of Intelligence and repeated photographic reconnaissance was required. This information, so diligently acquired, permitted prompt attacks against new units, or repeat attacks against resurgent production at damaged plants. The situation developed into a grim logistic duel, the Allies intent on inflicting the maximum destruction, the Germans concentrating on the provision of new facilities and restoration of existing damaged units.

One of the first decisions of the Joint Oil Targets Committee was to recommend intensification of attacks on aviation gasoline production, which gave automatic priority to the hydrogenation plants and to refineries in Rumania, Hungary, Poland and Germany in that order. One of these targets, the Rumanian network of refineries at Ploesti, remained the favourite target of the Fifteenth Air Force throughout July and August until the crippled industry was finally captured by Russian ground forces on 22nd August. The air campaign had already virtually removed Ploesti from the list of German oil sources because monthly exports to Germany of finished oil derivatives, which had averaged 180,000 tons monthly early in 1944, fell to 50,000 tons in June after the air campaign had got under way, and practically ceased entirely in July. The cost of the campaign had not been light, because in four months some 12,000 tons of bombs had been expended and no fewer than 350 heavy bombers shot down; the aim had been achieved, however, and by a sustained offensive 20 per cent of the total German supplies had been cut off by bombing. Once Ploesti was removed from the target list the M.A.S.A.F. heavy bombers turned against refineries in Poland, Austria and Czechoslovakia, with occasional raids on synthetic plants in southern and eastern Germany. By the end of September oil production in German occupied territories, which had averaged 50,000 tons monthly at the beginning of the year, was down to 5,000 tons, so that yet another 5 per cent of potential production was lost to the enemy.

The two heavy-bomber forces based in England were not free as was M.A.S.A.F. to wage an uninterrupted, single-minded campaign during the third quarter of 1944. The CROSSBOW offensive and support of land

forces absorbed a high proportion of effort both of Bomber Command and the Eighth Air Force, while the Americans, fearing a resurgence of German fighter capacity, turned once more to attacks on the German aircraft industry. Nevertheless in three months the weight of bombs dropped against oil targets alone was nearly equal to the total tonnage dropped against all enemy targets from the beginning of the war to the end of 1941. This effort was applied as shown hereunder:

Force	No. of targets	Aircraft attacking	Tonnage of bombs
RAF Bomber Command .	39	4,437	18,662
Eighth Air Force . .	79	7,705	19,439

Despite the greater number of American sorties it will be seen that both forces dropped approximately the same bomb-load. This was by no means a true measure of the effectiveness of the attacks and it was apparent that Bomber Command, which used a high proportion of 4,000-lb and 1,000-lb bombs, was creating more relative damage than the Eighth Air Force, which relied on 250-lb and 500-lb bombs. The short duration of most U.S.A.A.F. raids enabled German A.R.P. wardens to leave shelter in time to extinguish incipient fires, whereas the longer duration, lack of uniformity in approach, and heavier weight of the average R.A.F. attack provided greater difficulties for the defenders. Even in the crucial field of accuracy of aim the R.A.F. improved blind-bombing radar techniques and gave surprisingly good results; whereas, although U.S.A.A.F. visual raids were superior, in part-visual and part-radar and blind-bombing raids they were less accurate than average R.A.F. raids. On the other hand Bomber Command had a high proportion of targets which, if hit at all, were susceptible to severe damage; the U.S.A.A.F. did the bulk of work against refineries which had fewer critical key-points and which could absorb great punishment without a correspondingly heavy decline in output. The Americans by spreading the offensive throughout Germany also did much to divide and saturate enemy defences both ground and air.

The late summer and the autumn attacks by Bomber Command against oil represented 11 per cent of the efforts against all types of targets. The table set out below illustrates the way in which this campaign was conducted. In July Ruhr synthetic plants were given precedence, but in August when the ground battle became fluid, the main weight was switched from production units to storage depots, dumps and refineries in occupied territories. September was entirely devoted to attacks on synthetic production.

1944	Total attacks	Synthetic oil plants	Depots, dumps etc in occupied territories
July . . .	7	5	2
August . . .	21	2	19
September . . .	11	11	—
	39	18	21

Six of the raids against synthetic oil plants at Wesseling, Kastrop-Rauxel, Dortmund, Wanne-Eickel and Sterkrade (twice) were made by main forces drawn exclusively from No. 6 R.C.A.F. Group and in these except for minor pathfinder support Australians played no part. In the other 12 attacks either R.A.A.F. squadrons or individuals were prominent although the Waddington squadrons, Nos. 463 and 467, were not engaged at all. Thus it was No. 460 which on 18th-19th July marked the re-opening of the Bomber Command campaign against oil by dispatching 18 Lancasters in a main force of 153 (plus 17 pathfinders) against Scholven-Buer. The previous attack by No. 5 Group on 21st-22nd June had been assessed as a relative failure because unfavourable weather had led to a very scattered bombing pattern. On this occasion, however, the Australians set off in optimistic mood because the forecast weather was good and an intricate pattern of other operations scheduled over Germany and France that night gave some hope that this force might achieve a degree of surprise attack at Scholven-Buer. Both these factors remained favourable throughout the raid because the German night-fighter controllers mistook the force for a diversionary sweep through the Mandrel screen and held back the main body of night fighters to meet some other threat. The Lancasters accordingly reached the Gelsenkirchen area in a compact group and found that there was practically no cloud and only moderate ground haze. In these conditions the pathfinders dropped red target-indicator bombs with great deliberation and backed up the more centrally placed ones with extra markers. A highly concentrated bombing attack then developed, resulting in a very large explosion which impressed even the most experienced crews, for whom this type of target, a relatively small dispersed plant hidden in the natural Ruhr defences, had hitherto not produced spectacular results.

One R.A.A.F. crew failed to reach the target because the Lancaster's escape hatch blew off during the outward journey and the aircraft returned to base. The remaining 17 Lancasters of No. 460 dropped 91 tons (out of a total of 787 tons) from heights between 15,000 and 20,000 feet. All the debriefing reports on return carried a confident note, and this enthusiasm was largely justified by subsequent reconnaissance photographs. Distillation and gas-cleansing plants, hydrogenation stalls and the compressor house had all received substantial damage. Gas-holders, cooling towers, oil tanks and many unidentified buildings in the southern part of the Scholven-Buer works had been hit by bombs. Temporarily this plant was removed from the list of priority targets. The cost had not been high, because, although the integrated ground gun defences of the area had been very active, only four Lancasters (including one from No. 460 and another of No. 100 piloted by an Australian) were lost. The Canadian squadrons which attacked Wesseling that night also had an untroubled night losing only one out of 194 Lancasters dispatched.

Conditions were very different two nights later when the Halifax squadrons of No. 4 Group were sent out to make the initial Bomber Command attack on Bottrop-Welheim, while No. 3 Group staged a main-

force raid against the Meerbeck plant which had already suffered eight small-scale experimental or harassing raids between 25th June and 17th July but was now listed for a knock-out blow. The Germans were not deceived into thinking that either force was a diversion and both air and ground defences were very active.

For the Bottrop raid No. 466 provided only 6 Halifaxes because 12 others were sent that night to attack flying-bomb installations at Ardouval. However 17 Halifaxes (from Nos. 10, 51, 76, 78, 578 and 640 Squadrons R.A.F.) were piloted by Australian airmen. Flak was variously reported as being from moderate to intense, but, although four Halifaxes piloted by Pilot Officer Hagstrom⁹ and Flying Officer Murtha¹ (No. 10 Squadron R.A.F.), Flying Officer Anthony² (No. 640 R.A.F.) and Flying Officer Rodgers³ (No. 466 R.A.A.F.) were damaged by gunfire while approaching the target, in each case the crews completed their attacks and withdrew successfully. A crew of No. 51 Squadron, including four Australians in addition to the pilot, was not so fortunate. Their Halifax was very badly damaged just after bomb release and the port fin and rudder were shot away, large holes were punched in the port mainplane and fuselage, and the rear turret was buckled. The engines were not damaged but it was some little while before the star-board rudder could be made to function adequately and even then the aircraft was so difficult to control that the bomb aimer, Flying Officer Cosgriff,⁴ had to assist the pilot, Flying Officer Jowett,⁵ in wrestling with the control column throughout a nightmare return journey. On reaching England Jowett tried to save the aircraft by making a landing at the emergency airfield at Woodbridge, but unfortunately the Halifax crashed into some trees and caught fire. Both Jowett and Cosgriff were killed on impact but the other crew members escaped, except for the Australian mid-upper gunner who had already been injured over the target and suffered mortal burns while attempting to leave the burning aircraft.

Eight Halifaxes were shot down by fighters or the Bottrop gun defences that night and many inconclusive skirmishes with night fighters were reported by returning crews. A typical combat report was submitted by Pilot Officer Wilson⁶ of No. 466 who described how his Halifax had been constantly harassed by anti-aircraft fire near the target but had not been hit. In spite of the need to take evasive action during his bombing run, Wilson obtained an excellent target photograph at the time of

⁹ F-O H. R. Hagstrom, DFC, 420876. 10 Sqn RAF, 466 Sqn, 96 Sqn RAF. Clerk; of Manly, NSW; b. Sydney, 30 Nov 1920.

¹ F-Lt J. D. Murtha, DFC, 23409; 10 Sqn RAF. Farmer; of Cowan Cowan, Qld; b. Brisbane, 18 Sep 1920. Died 10 Mar 1949.

² F-Lt T. W. Anthony, DFC, 401481; 640 Sqn RAF. Junior clerk; of Armadale, Vic; b. East Malvern, Vic, 5 Mar 1921.

³ F-Lt J. T. Rodgers, DFC, 425190. 466 and 462 Sqns. Clerk; of Toombul, Qld; b. Brisbane, 22 Jul 1921.

⁴ F-O B. P. Cosgriff, 418737; 51 Sqn RAF. Clerk; of Caulfield, Vic; b. East Malvern, Vic, 17 Mar 1922. Killed in action 21 Jul 1944.

⁵ F-O H. A. Jowett, 418427; 51 Sqn RAF. Clerk; of Melbourne; b. Harrogate, England, 29 Aug 1916. Killed in action 21 Jul 1944.

⁶ F-O P. D. Wilson, DFC, 417687. 466 and 462 Sqns, 96 Sqn RAF. Clerk; of St George's, SA; b. Hyde Park, SA, 21 Feb 1922.

bombing. He was trailed on the homeward flight by two unidentified fighters both of which were burning navigation lights. One attempted several times to occupy the attention of the bomber crew while his partner attacked, but on each occasion good team-work by the gunners and skilful evasive action by the pilot caused the attack to be abortive. On reaching the Dutch coast these two fighters switched off their lights and disappeared, but some minutes later Wilson had to face another attack from an Me-210 which opened fire at a range of 600 feet. Once again the pilot received timely warning from the rear gunner who had seen the enemy silhouetted against cloud and the pursuer was unable to score any hits.

In addition to flak and fighters German defence measures at Bottrop included the use of decoy markers to the east, north and north-east of the aiming point. There was some ground haze and these decoys were successful in attracting a proportion of bombs, although the northern part of the plant was heavily hit.

The composite force of 158 aircraft (mainly No. 3 Group) attacking Meerbeck on 20th-21st July lost 20 Lancasters, one squadron alone (No. 75 R.N.Z.A.F.) losing seven. This was a dangerously high percentage, and, in conjunction with the Bottrop losses, may well have called for reconsideration of the method of attack against oil targets. This was, however, an isolated occasion when German defences were outstandingly successful. And the cost, though heavy, was adequately offset because the raid achieved far more than the crews had hoped for or than contemporary Intelligence assessments claimed: the Meerbeck plant was put completely out of production by this single blow.⁷ The clear skies which helped German fighters that night also assisted the pathfinders, one of whom, Flight Lieutenant Jacobe⁸ of No. 109 Squadron R.A.F., was coned by searchlights before releasing his target marker from a height of 32,250 feet. The main-force crews, despite the determined ground and air defences, expressed great confidence in the way their attack developed and some reported a very large explosion with smoke rising to a great height. Nor were the air battles entirely one-sided as three Ju-88's and one Me-109 were claimed as destroyed and four other fighters as damaged.

Wanne-Eickel was the target nominated for a night attack by heavy bombers of No. 4 Group on 25th-26th July. No. 466 dispatched 15 Halifaxes, and the equivalent of about 12 Australian crews operated in the other squadrons engaged on this raid.⁹ Twenty aircraft failed to find

⁷ There were further raids against Meerbeck, as described later, but in retrospect these appear to have been more frequent than necessary to keep the plant inoperative. The air-raid statistics maintained at Meerbeck show that on this night only some 25 tons of bombs actually fell inside the true plant perimeter. This represented only 3½ per cent of the bombs actually dropped but this was sufficient, according to the same source, to destroy or heavily damage no less than 80 per cent of the total plant. The management estimated that reconstruction would take months. No production was possible until these repairs had been completed.

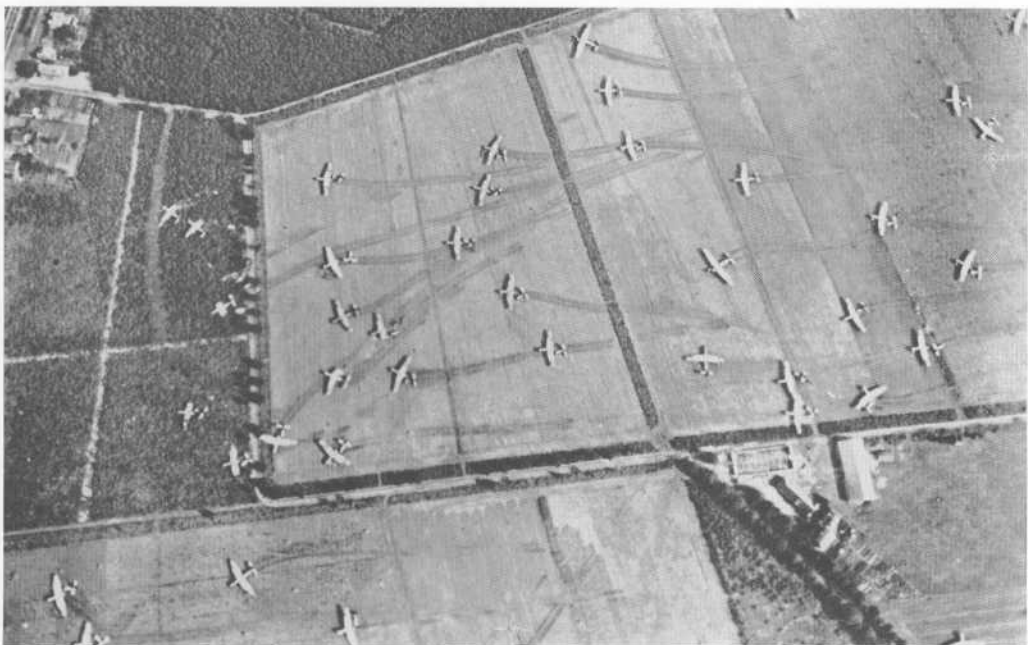
⁸ F-Lt L. C. Jacobe, DFC, 401310; 109 Sqn RAF. Salesman; of Elwood, Vic; b. Hawthorn, Vic, 2 May 1917.

⁹ There were 13 Halifaxes piloted by Australians sent out that night by Nos. 102, 158 and 640 Squadrons alone and Australian pilots flew in smaller numbers with other squadrons, but rarely did any of these crews contain more than three RAAF members.



(Air Ministry)

After the railway bridge at Oissel, south of Rouen, had been made impassable to rail traffic by R.A.F. attacks, the Germans used the existing eastern span as a road bridge and built a long ramp alongside the wrecked part of the bridge declining to the western bank. In this photograph, taken by an aircraft of Second T.A.F., a burning vehicle on the improvised bridge is holding up a stream of German traffic, while ahead roads and tracks are clear.



(Air Ministry)

This reconnaissance photograph taken by a R.A.F. Spitfire shows Horsa gliders lying at the ends of the tracks they made during the landings by the First Allied Airborne Army in Holland on 17th September 1944. Some of the fuselages have been detached for quick unloading.



(Air Ministry)

Burning vehicles at the crossroads at Conde-sur-Noireau after attacks by fighter-bombers in August 1944. Note the tank tracks in the fields.



(Air Ministry)

Falaise after the attack by Bomber Command on the night of 12th-13th August 1944. The road to Paris is seen at "A".

the primary target and those which reached Wanne-Eickel early in the raid found the target obscured by haze, and a somewhat scattered pattern of target indicators. The situation improved as the pathfinders refreshed the bombing markers, and the later stages of bombing were well concentrated and led to a series of heavy explosions at short intervals. Ground guns were active and several aircraft were hit and damaged but all returned safely. German fighters were seen en route but there were no combats. This lack of aggression was ascribed partly to the cloud which gave intermittent cover to the bombers and partly to the successful use of a new type of Window designed to jam the long-wave-length search radar in German fighters.

Within a week Bomber Command, at varying cost, had thus dealt effective blows against five of the ten synthetic oil targets for which it was responsible in Germany. Similar action could not be taken against the other five because at long last the stalemate at Caen had ended and the battlefield in France was again the centre of attention. Apart from purely tactical missions Bomber Command shifted the emphasis of attack against enemy oil resources from crude production centres to the depots and refineries in occupied countries whose stocks and facilities might be of use during the battle then raging. The first two attacks both against the important oil refinery and storage depot at Donges actually took place on 23rd-24th and 24th-25th July in the same week as the attacks against German production units. There was a lull until 4th August but then, within 15 days, Bomber Command mounted 19 separate attacks against 14 targets. The forces employed varied from 15 aircraft to over 200, aggregating 2,260 sorties (including the raids against Donges). Almost 10,000 tons of bombs of which fewer than 100 tons were incendiary bombs were cascaded ruthlessly and with precision against these targets. These depots and refineries were protected by guns which on occasions put up a defiant rather than an effective anti-aircraft barrage. The German Air Force was unable either by night or day to prevent these raids and during the whole series only 10 aircraft (0.44 per cent) were lost from all causes. Under such conditions the master-bomber technique of controlling attacks gave admirable results, and in general destruction was on a large scale, the Germans being deprived of vast quantities of oil products as well as invaluable facilities for its handling, treatment and storage over a wide area from the Biscay coast to the Ghent canal.

Of the *Article XV* squadrons only Nos. 460, 463 and 467 joined in the campaign against oil in this period. Assignments were fitted in according to weather conditions and other urgent battle commitments. In all, the Australian squadrons sent 150 Lancasters on 8 of the missions, while individual Australian aircrew had some part in every raid of the series. Many of the experienced crews regarded these attacks as little more than training missions, with tension lowered and an opportunity present to experiment with new techniques; for new crews they were an opportunity to bridge the gap between the academic and the real, to sense the chilling yet invigorating rhythm of a coordinated Bomber Command attack in

easy stages. In fact the R.A.A.F. squadrons suffered no loss on these raids, but, although relatively easy in nature, the series inevitably gave opportunities for demonstrating a high degree of airmanship. At Donges on 24th-25th July and at Chatellerault on 9th-10th August many aircraft remained over the target for a longer period than normal, which greatly increased the risk of collisions. On several raids, both in daylight and at night, many crews bombed from as low as 7,000 feet in order to achieve accurate results. The light flak defences of many targets made this risk justified but some targets particularly Bordeaux and La Pallice had much stronger gun defences.

In each of the three attacks against Bordeaux one or more Lancasters piloted by Australians were badly damaged. On 13th August Pilot Officer Lorimer¹ of No. 50 Squadron, during his first operation as a captain of aircraft, was approaching the target at an altitude of 17,000 feet when his Lancaster was hit by gunfire. The elevator controls, hydraulic system and bomb-doors were damaged and first the starboard-inner and then the port-inner engine caught fire. Both engines were stopped and the fire in the starboard-inner was put out but the port-inner continued to burn. Lorimer headed northwards from the target area, losing height steadily, and, when about 10 miles off Pointe de la Coubre, the fire in the port-inner increased and he turned towards the shore. The aircraft was practically uncontrollable and down to about 4,000 feet by the time the shore was reached so Lorimer called the crew forward and ordered them to bale out. He followed them, leaving the aircraft at about 1,000 feet, and landed in a small clearing in the *Forêt de la Coubre*.

The first crew member to leave the aircraft landed on the beach and was captured immediately; the others were taken within five or six hours. Lorimer was chased by German troops during most of the first night and moved very little during the next two nights as there seemed to be a great deal of activity in the area. He then headed inland away from the coastal area, travelling at night, and finally, after spending a day at a farm-house, made contact with a pharmacist in a village north of Royan who hid him for three weeks. He then went to Saintes where he met men of the Resistance Army, and after five or six days with them continued on to Cognac and then Angoulême. He headed north from Angoulême, met an American patrol and was driven to Paris, arriving on 25th September and returning to England three days later.

On the same night (18th-19th August) that the campaign against storage depots ended, with the second raid on Reime-Ertvelde, Bomber Command resumed the interrupted attacks against the synthetic plants in the Ruhr. The first target chosen was Sterkrade-Holtén which had been left unmolested since June. Sixteen Halifaxes of No. 466 were in the force of 234; bombers and crews reported a fairly uneventful trip with considerable cloud along the route, few actual combats with enemy aircraft, and less intense ground opposition at the target than usual. Some

¹ F-O P. D. A. Lorimer, 424773; 50 Sqn RAF. Jackaroo; of Narrandera, NSW; b. Narrandera, 10 Mar 1924.

damage to the power station, catalyst plant and ovens was confirmed by later reconnaissance, so that further attack was deferred until late in September. Two daylight raids against Sterkrade on 27th and 30th September were both unsuccessful, each being spoilt by the presence of thick cloud, and the majority of crews were forced to bomb alternative targets of opportunity in the general area. As was to be emphasised again and again weather proved a far more effective defence for the synthetic plants than did fighters or guns.

No. 4 Group was out again on 27th August for a repeat attack against Homberg-Meerbeck. The force of 243 aircraft was the largest yet committed by Bomber Command against a single oil objective. The raid was made in daylight, a revolutionary move soon to become standard practice, and, in addition to a heavy fighter escort, the bombers were accompanied by one Mosquito detailed to make an immediate bomb damage survey. From an Australian viewpoint the attack was also memorable as the first operation over Germany of the newly re-formed No. 462 Squadron. Indeed, perhaps the most outstanding display of determination and airmanship arising from the raid was given by Flying Officer Lane² of that squadron. The port-outer engine of his Halifax failed in the early stages of the outward journey, before the enemy coast had been crossed. Lane decided to continue even though he would have to fly his aircraft at a much lower level than the main force. Over Homberg the Halifax not only received special attention from the gun defences but was also in danger from bombs cascading from aircraft at higher altitudes. A second engine was disabled by gunfire and, as the primary target was at that time obscured, Lane dropped his bombs on docks on the east bank of the Rhine.

Throughout the raid there was five to seven-tenths cloud with tops at between 5,000 and 8,000 feet so that, although a few crews reported that they bombed through clear patches, most had to unload at ground markers which tended to be obscured by defensive smoke and bomb bursts. At least one large explosion was seen which sent up a column of thick brown smoke. These conditions were not satisfactory for the reconnaissance Mosquito, but the general feeling among returning aircrew was that the raid had been successful. It had also proved to be a surprisingly easy trip, the only Australian other than Lane to strike trouble being a pilot of No. 158 Squadron who brought back his aircraft, although badly damaged over the target, to a safe landing at an emergency airfield in England.

In vivid contrast to the night raid of 20th-21st July no aircraft were lost by Bomber Command in the 27th August raid on Homberg. This was largely due to the absence of enemy fighters, and this in turn reflected not lack of aircraft but the acute shortage of aviation gasoline brought about by earlier raids. Some of the 100 anti-aircraft guns which had previously guarded this plant had also been temporarily redispensed to protect plants elsewhere which were still in operation. This inability to

² F-Lt A. W. Lane, DFC, 22873, 466 and 462 Sqns, 96 Sqn RAF. Clerk; of Newmarket, Qld; b. Toowoomba, Qld, 24 Apr 1919.

defend its oil installations adequately put the Germans in a continuing dilemma. With the Rumanian oilfields gone and the Polish oilfields and refineries about to fall to Russian armies, only an optimum output from domestic capacity could keep the *Wehrmacht* in the field; but until stocks of aviation fuel could be built up it was impracticable to make other than regular token or irregular full-scale opposition to either American or British air raids. Tremendous civil engineering resources were being poured into the reconstruction of damaged plants and the expansion and dispersion of new production facilities as called for by the Geilenberg plan: the genius of Speer and the organisation of Todt attempted to redress the balance. But while bombing forces could come unchallenged to attack installations which were very susceptible to blast, the position of German oil resources would be precarious. Results of the raid on the 27th August, as noted by German authorities at the time, gave them no room for optimism. Although less than 5 per cent of the bombs dropped fell inside the plant, water-gas generators, gas-purification plants, a reactor house, pumping installations, the power house and pipe-lines were all heavily damaged. Reconstruction of the plant was estimated to have been delayed by at least one month.

During September 1944 Bomber Command mounted 11 day-raids against Ruhr synthetic oil plants. This activity came in two short bursts and there were no night raids. Kastrop-Rauxel, Kamen and Nordstern (11th September); Wanne-Eickel, Dortmund and Buer (12th September); and Nordstern (13th September) were the targets during the first phase of operations, which was designed to profit from concurrent widespread Eighth Air Force attacks against its own list of oil targets at Bohlen, Brux, Magdeburg and Misburg. For six consecutive days from 8th September more than 1,000 American bombers raided Germany, and on 11th September the German Air Force rose in full strength for the first time since 28th May. Heavy air battles also occurred on each of the two following days, but, although Bomber Command lost 7 aircraft in the first Nordstern raid and 4 over Wanne-Eickel, the total losses of 18 aircraft from all causes out of the aggregate of 945 employed in the 7 attacks was by no means severe. The general reaction from crews was greater confidence in the practicability of daylight attacks against Germany. All the attacks bore promise of substantial success except the 11th September raid on Nordstern; and this accounts for the repeat attack two days later.

Australian contribution to the September air campaign against oil installations was not very high, only Nos. 462 and 466 operating twice against Buer and Nordstern on 12th and 13th September. Australian fighter pilots among the escorts for these day raids averaged 10, or nearly one squadron, on each occasion, although they actually flew in scattered units. Similarly when an opportunity arose at the end of September to attack Bottrop and Sterkrade, R.A.A.F. squadrons (again Nos. 462 and 466) flew only in the second attack on Bottrop. These late September raids all failed because on both 27th and 30th September there was heavy

cloud over both objectives and master bombers were unable to provide any clear pattern of target markers. The influence of weather on the oil campaign was strikingly evident when analysis of crew reports on 30th September showed that only 24 out of 139 crews of No. 6 R.C.A.F. Group claimed an attack against the primary target at Sterkrade while, of 136 Halifaxes sent by No. 4 Group to Bottrop, only four claimed an attack. The 14 crews of No. 462 attacked targets of opportunity in the Ruhr as did all except one of the 15 crews of No. 466.

Remote from the committees which thrashed out the policies of strategic bombing or the cabals which set them in motion against an ever-changing situation on the ground, the individual Australian aircrew member, whether with a R.A.A.F. or R.A.F. squadron, was too close to the kaleidoscope pattern of day-to-day operations to appreciate the full significance of the "Oil Plan". Many were far more concerned with their own crew training, the study of technical proficiency in attack, and the appraisal of enemy defences, than with the selection of target systems. The Bomber Command interpretation of the POINTBLANK objective—"the progressive destruction and dislocation of German military, industrial and economic systems"—with its marked bias towards morale bombing of industrial cities, was accepted without question because it had been the focal point of training since the individual joined his first Bomber Command training unit. Aircrew were avid readers of Intelligence summaries, but these again were prepared by Bomber Command and, though faithfully reflecting the undoubted successes against the limited number of Ruhr oil targets attacked up to the end of September 1944, the campaign against German fuel resources appeared to many to be opportunist in character and ancillary to the main aim of attacking German cities.

This did not result in any lack of fervour in attack. Harris had built up Bomber Command into a large, well-drilled, well-equipped attacking machine. Squadrons and groups vied with each other to demonstrate superior ability to attack any kind of target allotted to them and in recent months had become accustomed to spending 80 per cent of their effort on other than area targets. Many of these diversionary tasks, emergent from the invasion of France, had been glitteringly successful, and in some aspects such as daylight and precision bombing had revealed undreamt of capabilities. Operational losses had been light, Bomber Command bases were untroubled by enemy attacks and there were ample trained crews, aircraft and supplies of all kinds on hand. Bomber Command had tasted success and had the utmost confidence in its powers to take a decisive part in the final defeat of Germany. Thus, when the news filtered down to units late in September 1944 that the command of the strategic bomber forces was to revert from SHAEF control to that of the Combined Chiefs of Staff, most Australians assumed that this would lead to a greater degree of concentration by Bomber Command on area targets.

In fact the first directive issued by the Combined Chiefs of Staff after resuming control of the strategic bombers was a restatement on 23rd September of a policy of attack against spot rather than extended targets.

The German petroleum industry with special emphasis on petrol itself and petrol storage facilities was ranked as first priority. As equal second priorities were the enemy rail and waterborne transport systems; armoured-vehicle production and storage capacity; and motor-transport plants. A rider to this directive promised that all SHAEF requirements for direct support tasks would be promptly fulfilled. Only when weather or tactical conditions were unsuitable for action against the stated primary objectives were area attacks authorised.³ Nor did oil as a stipulated target lose its priority during the remainder of 1944. Two very large-scale operations (Hurricane I and Hurricane II) were projected for mid-October, when the Eighth and Fifteenth Air Forces, together with Bomber Command, were to concentrate all available bombers against the Ruhr, not only to cause widespread material damage but also "in order to demonstrate to the enemy in Germany generally the overwhelming superiority of the Allied Air Forces in the theatre". It was specifically provided, however, that "these operations will not be to the prejudice of any operations which can be delivered effectively on oil targets in Germany generally". The American air commanders were very lukewarm concerning the Hurricane plan, which was finally shelved. The only other major directive issued in 1944 came on 1st November when primary objectives were listed as the petroleum industry and German lines of communication. The object of strategic bomber policy was defined as a "maximum effort against the petroleum industry, oil supplies and storage". Important industrial areas could be attacked as alternatives only when weather or tactical conditions were unsuitable for primary targets.

The policy of concentration against enemy oil resources was thus quite clear and arose from the realisation that, whereas by September 1944 German stocks had been heavily depleted by the needs of the summer campaigns, her major natural resources in Rumania had been overrun by Russian armies, and her synthetic plants had been temporarily nullified by bombing, very energetic action would be required to gain the greatest benefit from the advantage thus created. The shortening of German lines both on the Eastern and Western fronts and the ground stalemate that existed because Allied forces had themselves outpaced their supply organisations gave Germany a chance to conserve stocks. The Allies were only too well aware of German efficiency in repairing industries vital to their needs; despite all the effort put into the bombing attacks against the German aircraft industry it had continued to expand; in Germany and France the enemy had shown skill and pertinacity in repairing broken communications and damaged airfields time and time again after bombing. Should the same effort be devoted to the shattered oil plants then they might be partially or completely restored within a matter of weeks.

³ This directive was framed by General Spaatz and Air Marshal N. H. Bottomley (delegates for General Arnold and Marshal of the RAF Sir Charles Portal). It did not satisfy Harris who had no more desire for Air Ministry to dictate his choice of target than for SHAEF to do so. An exchange of letters between Harris and Air Ministry requesting clarification of the control of strategic bomber forces reached a formula on 15th December 1944 by which operational instructions to be issued to Harris on behalf of the Chief of the Air Staff were limited to the strategic offensive; tactical direction of operations was to be Harris' responsibility.

Moreover, European weather in late autumn and early winter hampered deep penetration raids into Germany and gave natural protection to the targets themselves. Finally German defence measures including intelligent use of dispersion, camouflage and smoke techniques, as well as an ever-increasing number of anti-aircraft guns, were being hastily improved.

In the event weather was the overriding factor in the campaign against oil during the last quarter of 1944. In October the Eighth Air Force, eager though it was to pursue this aim, found that only four days were suitable for attacking its allotted targets. From Italy the Fifteenth Air Force operated against installations in southern Germany and Austria six times. Bomber Command, striking only at the Ruhr, began well, with raids against both Scholven-Buer and Sterkrade on 6th October, but managed only four more attacks in the rest of the month. It was not only the raids which were impeded but photographic reconnaissance also and this led to some indecision as to the true need for repetitive attack. In turn this indecision bred a policy of attack and re-attack whenever possible despite the risk of some wasted effort. This urgency led to special efforts during November when the Eighth Air Force operated on 13 days, the Fifteenth on 7 and Bomber Command on 11 day and 5 night missions. Before the end of November Bomber Command was actually outstripping, in terms of tons of bombs on oil targets, the American air forces which had been the proponents of the plan. Indeed all the 10 synthetic plants in the Ruhr were assessed as inoperative by 30th November, and by this time the Air Ministry had agreed to share some of the burden of attack not only against the distant Politz and Leuna-Merseburg targets previously battered by the U.S.A.A.F. but also against a number of benzol plants which had hitherto not been attacked but were now recognised as providing a significant percentage of current German production. During December only the Fifteenth Air Force could maintain a steady effort against its allotted targets; the Eighth mounted only three raids and Bomber Command only five, because the desperate German ground offensive launched towards the Ardennes in mid-December immediately caused the substitution of tactical for strategic roles for the bombers.

In September 1944 German actual production of aviation gasoline (90 per cent of which came from hydrogenation plants) was down to less than 5 per cent of planned production; motor-transport fuel output was 43 per cent of planned production and diesel oil output was 50 per cent. In the next three months the Eighth Air Force cascaded 22,602 tons, the Fifteenth 15,646 tons and Bomber Command 22,770 tons of bombs against the oil industry. Despite the strenuous efforts made by Germany, her aviation fuel output rose only to 8 per cent of planned production in October, 22 per cent in November and 11 per cent in December. Production of motor-transport fuel remained fairly static at 45 per cent of required output, and only diesel fuel showed any substantial recovery, rising to 70 per cent by the end of the year. Such was the broad picture of the struggle between bombing and reconstruction agencies. The strategic bombers were not able to prevent the Germans gathering sufficient fuel

stocks to launch the Ardennes venture but they had almost certainly ensured there was not enough to maintain it for long. Not only did the critical shortage hamper the German armies and the *Luftwaffe*, but it entailed drastic rationing of industrial fuel supplies with a consequent effect on production of urgently needed war materials.

Bomber Command's contribution to the oil campaign was noteworthy in that only five of its 20 attacks against the Ruhr plants in the last quarter of 1944 were at night. Some daylight raids were mounted in good weather using normal pathfinder and navigation techniques, but it was the ability of No. 3 Group (whose Lancaster squadrons were receiving a steady proportion of aircraft equipped with G-H) to operate in weather hitherto regarded as impossible which permitted pressure to be maintained until the full list of Bomber Command targets in this area had been "neutralised". The G-H system could handle up to 80 aircraft at a time; it had a range of the order of 250 miles, and as a precision blind-bombing device could achieve an accuracy of a quarter of a mile. It was thus very suitable for the medium-sized forces used against the Ruhr, and by flying in formations of three aircraft of which only the leader would have G-H, a consistently high standard of bombing was practicable.

Although to Australians in No. 3 Group there was, during the three winter months of late 1944, a definite pattern observable in the oil attacks, the R.A.A.F. squadrons proper each mounted only two or three oil raids in the same period, and these were so dispersed in time as to appear as just another chore for Harris' great maid-of-all-work, Bomber Command.

The two Driffield squadrons, Nos. 462 and 466, made only two attacks. Both were against a single target, Sterkrade-Holten, the first being in daylight on 6th October 1944 and the second at night nearly seven weeks later on 21st-22nd November. This Fischer-Tropsch plant had escaped any crippling damage in two daylight attacks on 27th and 30th September and was correspondingly high on Bomber Command's priority list when temporarily good weather on 6th October encouraged No. 4 Group to make a carefully-prepared attempt to put Sterkrade-Holten out of action. The bombing force of 126 Halifaxes (33 from Driffield) was backed up by no fewer than 23 Lancasters and 10 Mosquitos of No. 8 P.F.F. Group to ensure if possible that, irrespective of local conditions, there would be well-laid target markers. Heavy fighter protection mainly by Spitfire squadrons was provided to prevent the enemy from attacking and dispersing the force in time and space during the outward journey and thus preventing them from reaching or identifying the small target in time to attack. Both factors, together with the absence of cloud, worked in favour of No. 4 Group on 6th October, and the bombers were not molested by fighters but appeared compactly and on time over Sterkrade to see a good pattern of markers. Many crews were able to identify the oil plant visually in relation to the markers and there was a notably high proportion of target photographs obtained at the moment of bomb release, 13 crews of No. 462 and 11 of No. 466 returning with this evidence to

confirm their efforts. More detailed later reconnaissance showed a heavy concentration of damage in the north-west area of the plant where the compressor house, ammonia-synthesis building, catalyst and research sections were all hit heavily.

This well planned and executed raid was also marked by increased German ground gun defences, a sure sign of enemy appreciation of the importance of the target. Over 70 per cent of the Halifaxes were hit by gunfire, and although only three bombers were actually shot down, others struggled home with great difficulty. There were many acts of creditable airmanship which reflected the long, thorough training arrangements of Bomber Command as well as the buoyant determination and enthusiasm which was the basis of crew spirit at this time.

The night raid against Sterkrade on 21st-22nd November was described by returning crews as uneventful. There were few fighters and only moderate flak to harass the larger force of 270 bombers. Nos. 462 and 466 each dispatched 15 aircraft, and although one from each squadron returned to base without bombing because of engine trouble the rest delivered a load of 106 tons of bombs (out of 870) in a raid which spread damage fairly evenly throughout the plant.

The two R.A.A.F. squadrons at Waddington in No. 5 Group set out in daylight on 1st November to bomb the Meerbeck plant at Homberg but only one of the 36 Australian Lancasters claimed any attack. There was a discrepancy with regard to timing, and cloud conditions were more unfavourable than had been expected. Early arrivals, most of whom brought their bombs back, either failed to see the P.F.F. markers because of the clouds or had overshot the target before marking began. Because of inability to identify the precise target, the Australians had to run the gauntlet of very active and widespread gun defences and six Lancasters of No. 463 and 11 of 467 received some damage. Later waves of No. 5 Group aircraft did drop their bombs, but crews were far from optimistic that any real damage would result.

This failure by No. 5 Group followed a not very successful raid by No. 6 Group on 25th October. The target was then allocated as the responsibility of No. 3 Group since it lay within G-H range and precision radar-bombing offered some hopes of success whereas visual daylight bombing had twice failed against this oil key-point. Attacks were made on 2nd November, 8th November, 20th November and 21st November, by which time the cumulative results of bombing justified removing Homberg from the active priority list. Altogether in the six raids within less than a month 1,148 bombers had been dispatched by Bomber Command and 5,286 tons of bombs expended; 15 bombers were shot down during this series. This relatively large expenditure of effort was justified by the importance of the Meerbeck plant.

Within a fortnight of their disappointing attack on Homberg, the Australians in No. 5 Group made a night raid on 11th-12th November against two refineries at Harburg, south of Hamburg. No. 463 provided 14 and No. 467 19 Lancasters on this occasion, while more than 20

of the other aircraft in a total force of 245 were piloted by Australians. To pilots of No. 463 this was an uneventful routine duty, conducted in fair weather with two thin layers of stratus cloud beneath the bomber stream. Some fighter flares were seen while crossing the Heligoland Bight and there was fierce ground gunfire in the vicinity of the target. But the raid was one of minimum penetration of enemy territory and pilots who arrived in the first wave of bombers found the target well marked and were able to bomb and turn for home without delay. Crews of the other Waddington squadron, No. 467, had a less fortunate night; they lost two Lancasters and a third piloted by Flying Officer Kynoch⁴ was first damaged by flak during the run up to the target and then subjected to two attacks by fighters as it turned for home. Although the Lancaster was further badly damaged by the second fighter attack, Kynoch, with the assistance of his bomb aimer, Flying Officer Chalk,⁵ safely flew it to an emergency airfield in the United Kingdom. A similar feat was performed during the same raid by Flight Lieutenant Cornish⁶ of No. 83 Squadron. Indeed, although many crew reports echo the opinion of No. 463 that this was an uneventful raid, the loss of 7 Lancasters out of 245 was actually the highest percentage lost on any oil raid during the three winter months of 1944.

The R.A.A.F. squadrons in No. 5 Group were not rostered for a further oil raid until nearly six weeks later when, on 21st-22nd December, Nos. 463 and 467 each contributed 17 Lancasters to a force of 207 bombers which attacked Politz. This was nominally an Eighth Air Force commitment, but the Americans had either been weathered in at their bases or forced to concentrate on tactical duties or other target priorities since their very successful raid in October which had temporarily put Politz out of action. The attack late in December was considered essential because of its possible reaction on the outcome of the Ardennes offensive, Politz then being the largest German oil plant considered capable of maximum production. The long flight to Stettin even in December presented few problems to No. 5 Group because of the partial breakdown of enemy air-warning systems. The main force in fact reached the Politz area compactly and in accordance with the careful flight plan to find itself favoured with clear skies and only a slight ground haze.

Even though a small spoof raid by six aircraft (also from No. 5 Group) against Schneidemuhl to the south of Stettin was too late and too weak to act as a real diversion, there was little enemy opposition. Flak opposition was less than expected and, although one crew of No. 463 had abandoned the mission because of aircraft unserviceability during the outward route, the remaining 33 Lancasters from Waddington had no difficulties during their bombing runs. The opinions of the crews, however, were

⁴ Sqn Ldr W. M. Kynoch, DFC, 419657; 467 Sqn. Commercial artist; of East St Kilda, Vic; b. Aberdeen, Scotland, 28 Jul 1914.

⁵ F-Lt J. A. Chalk, 419946; 467 Sqn. Clerk; of Glen Huntly, Vic; b. Melbourne, 23 Nov 1917.

⁶ F-Lt P. C. Cornish, DFC, 410458. 49 and 83 Sqns RAF. Traveller; of Glen Iris, Vic; b. Armadale, Vic, 4 Aug 1918.

rather contradictory concerning the results of the attack: some thought it had been concentrated, others were disappointed. Similarly divergent views were expressed at debriefing by Australians operating that night with Nos. 44, 57, 83, 97, 619 and 630 R.A.F. Squadrons and a consensus seemed to point to a moderately successful attack. Later evidence from analysis of night photographs taken during the raid showed that the markers were offset by approximately one mile from the true aiming point, but post-raid reconnaissance aircraft were able to discern serious damage in the power station, water-gas plant, carbonising ovens and a gas-holder.

Meanwhile No. 460 Squadron made its first contribution to the oil campaign by a daylight raid on 9th November against the Fischer-Tropsch plant at Wanne-Eickel, which was estimated as fully recovered from a heavy blow made by No. 6 (R.C.A.F.) Group on 12th October. Twenty-three crews left Binbrook at 7.30 a.m. to be over the target three hours later but it was a disappointing morning. Cloud up to a height of 21,000 feet swirled around the bomber force when it neared Wanne-Eickel. The target markers dropped by Mosquitos were completely hidden in the overcast and, although nearly 1,300 tons of bombs were dropped, the lack of G-H inevitably meant that bombing was scattered. One conscientious Australian wireless operator, making his 13th raid within 5 weeks with a crew of No. 550 Squadron R.A.F., wrote disconsolately in his diary: "It was a very poor show all round." This sentiment was echoed in varying degree by many other Australians who were back at their bases soon after lunch, tired but without the stimulation of combat or confidence in their bomb aiming. R.A.A.F. pilots of the Mustang and Spitfire escort from Nos. 19, 41, 122, 124, 126, 129 and 234 Squadrons R.A.F. found no enemy to deter, but were more philosophically inclined than the Bomber Command crews who had been nurtured on a doctrine of excitement and success. Indeed, even in such a comparative failure for Bomber Command there were inevitable minor and personal triumphs. One Lancaster of No. 460, stricken by anti-aircraft fire over the target, not only completed its bombing run under the control of its severely injured pilot, Flying Officer Owen,⁷ but was then piloted back to base in deteriorating weather by a relatively inexperienced but indomitable bomb aimer, Pilot Officer Woods,⁸ so that Owen, in severe pain and weak from loss of blood, was then able to land the aircraft safely.

No. 1 Group squadrons returned to Wanne-Eickel on 18th-19th November determined to succeed at night where it had failed by day. A slightly larger main force of 253 Lancasters was accompanied by no fewer than 56 pathfinder aircraft. Although weather at base was poor, conditions improved as forecast over the Continent and crews of No. 460 found the target area without difficulty. They reported that target indicators were plentiful and well placed so that a rhythmic concentrated attack was well under way when they arrived. Numerous explosions were noted and

⁷ F-Lt E. C. Owen, DFC, 409435; 460 Sqn. Foreman; of Warrnambool, Vic; b. Warrnambool, 26 Jun 1916.

⁸ F-O L. W. Woods, DFC, 408463; 460 Sqn. Clerk; of Hobart; b. Deloraine, Tas, 26 Dec 1922.

crews of all squadrons reported that the glow of fires could be seen up to 70 miles away.

The tendency towards larger bombing forces and a much higher proportion of pathfinder aircraft to main force for oil attacks during winter months was again apparent on 6th December when a late evening attack was made by No. 1 Group against the Leuna plant at Merseburg. This, like Politz, had originally been designated as a target for the U.S.A.A.F., but repeated attacks had failed to put it out of action, and it was becoming increasingly difficult for American daylight forces to keep up their attack. As an individual target it was much larger and more important than any of the original Bomber Command list. It was much farther away than the Rhenish synthetic plants and it was very well defended by ground guns. No. 1 Group provided 291 Lancasters, No. 3 Group 123 Lancasters and No. 8 P.F.F. Group 71 Lancasters and 12 Mosquitos for the record force of nearly 500 aircraft dispatched against a single oil target. The 24 crews of No. 460 Squadron and the 46 crews captained by Australians from other squadrons set out late in the afternoon for a four-hour flight to the target in conditions of dense cloud and sub-normal temperatures which so frequently found out the weak spots in both machine and man. Most of them agreed on return that the skymarkers laid by P.F.F. in ten-tenths cloud were plentiful and well grouped. Pilots of No. 460 who bombed at heights ranging from 17,000 to 20,000 feet were less hopeful than others that the well-grouped target indicators were in fact well placed; they feared that the main concentration of bombs would fall away from vital parts of the plant.

The relative absence of fire and smoke after bombing resulted in cautious claims, especially so as the force had passed almost directly over Giessen which was burning furiously after an attack timed for 45 minutes earlier than the Leuna raid. Final assessment of damage was in fact difficult because, when reconnaissance photographs were finally obtained, they covered not only the Bomber Command but three U.S.A.A.F. attacks. These photographs revealed that the Germans had made considerable progress with repair and reconstruction; evidence although not conclusive tended to show that Leuna had been reduced to almost one-third of its potential. The Bomber Command raid had more than justified itself. It had also stung the *Luftwaffe* into a higher level of fighter activity than was normal at this time. Many combats were reported and although four Lancasters (including one of No. 460) failed to return, air combats were not one-sided. Flight Sergeants Andrews⁹ and Hammond¹ of No. 460 and Flight Sergeants O'Brien² and Johnson³ of No. 576 by good gunnery fire-control probably destroyed enemy fighters which attacked their aircraft.

⁹ W-O J. R. Andrews, 439636; 460 Sqn. Railway porter; of Croydon, NSW; b. 9 Nov 1924.

¹ W-O T. G. Hammond, 431175; 460 Sqn. Storeman; of Caulfield, Vic; b. Northcote, Vic, 9 Apr 1925.

² F-O L. C. O'Brien, 32604; 576 Sqn RAF. Woolclasser; of Earlwood, NSW; b. Sydney, 2 Jun 1914.

³ P-O A. N. Johnson, 433062; 576 Sqn RAF. Carpenter; of West Kempsey, NSW; b. Nambour, Qld, 24 Nov 1924.

No. 460 ended the year with an attack on the Scholven-Buer synthetic refinery at Gelsenkirchen. Previously attacked by No. 4 Group in daylight on 6th October 1944⁴ and by the U.S.A.A.F., this plant was one of the most important still in partial production. A relatively large force of 337 aircraft from Nos. 1 and 6 Groups was dispatched on 29th-30th December in clear weather. Punctual well-concentrated marking was maintained by the pathfinders so that main-force crews, unhindered by fighters or flak, could press home a deliberate attack. Explosions and fires were seen through the low thin-lying sheet of stratus cloud below the bombers and one very large explosion sent flames shooting upwards and was followed by a mushroom of black smoke which rose to 12,000 feet. In all 1,625 tons of bombs fell that night on Scholven-Buer, a tonnage exceeded at this stage of the oil campaign only by the Leuna attack earlier in December.

One of the oil targets on Bomber Command's list, Kamen, was not attacked during the last quarter of 1944 because it remained inactive throughout this period as a result of the successful raid during September. As has been seen all other nominated Ruhr targets received one or more attacks until their estimated level of production was reduced sufficiently to remove them from the priority target list. There were undoubtedly failures in Intelligence and failures in interpretation affecting choice of targets, failures in planning and failures in execution of individual raids, but the sum of Bomber Command's effort against oil targets was very impressive. At the beginning of the period the command was reluctant to engage in any oil raids at all—the basic philosophy of the campaign was utterly opposed to the Bomber Command doctrine of concentration on area attacks. Once committed, however, the various groups of Bomber Command competed in finding solutions to the unfamiliar problem (in both a mental and physical sense) of attacking spot targets.⁵ The basic list of Ruhr targets was ideal for Bomber Command during the months of summer and autumn. Short trips were made covered by electronic noise or silence screens to confuse enemy defences; very large bomb-loads relative to the size of the attacking force were dropped so that, providing the target was identified, sheer relative weight of attack could “knock out” the active and passive defences of a small spot target. Late autumn and winter, as Speer predicted, brought weather which would enable German industry to recover from the earlier blows. But it was precisely in these months of bad weather that Bomber Command, the reluctant partner, eclipsed U.S.A.A.F., the protagonist of oil attacks, in ability to strike targets under any conditions. Alien as may have been the strategic philosophy, Bomber Command not only kept its own allotted priority

⁴ The RAAF squadrons Nos. 462 and 466 had not been included in this force but in one attacking Sterkrade the same day.

⁵ No. 1 Group regarded itself as the “old reliables”. No. 3 had G-H. No. 4 was ever willing to prove that Halifax units could do equally well as Lancaster units. No. 5 had a record of forceful experimentation in attack to sustain and expand. No. 6 was a compact national group of RCAF squadrons. Competition was keen, and, although cross-fertilisation of ideas was not always in evidence, the general result was enthusiasm and application to the task by crews of all units.

list of Ruhr oil targets (admittedly the minor commitment) virtually out of production, but by December was called in to attack major U.S.A.A.F. targets which that force could no longer reach because of seasonal and tactical considerations. Bomber Command also took responsibility for ancillary oil targets such as storage units and the marginal "last ditch" benzol plants to which Germany looked for essential oil production as her major units were progressively damaged.

Oil was obviously an important but by no means an overriding target for the individual aircrew of Bomber Command. Logs, debriefing reports and private diaries all reflect a marked difference of attitude, both on successful and unsuccessful trips, towards oil and area targets during this period. The Australian airman, no less than his other national comrades in Bomber Command, had been psychologically and physically conditioned during training for a victory through sheer weight of general bombing attack on the German economy. However, while he may not have grasped at that time the precise significance of the oil campaign, the record of each raid amply demonstrates the degree of technical training, the pride, determination and application of individual airmen, crews, squadrons and groups which alone (subject to material problems⁹) permitted such an unprecedented level of endeavour and achievement. Australians played little or no directional role in these matters, but as individual contributors in almost every group effort, and in infinitely changing circumstances, the Australian airmen acquitted themselves well.

⁹ Shortage of aircraft, airfields, bombs, navigation aids, transport fuel, pyrotechnics and the thousand-and-one other considerations which could limit operations had by this time been largely solved by Anglo-American supply agencies and by the reallocation of available manpower, planning and procurement facilities in favour of Bomber Command.