government not only undertook eventually to equip it with Lancaster Xs, but also exerted pressure on the Air Ministry to convert the Canadian formation to four-engined machines as early as possible, without specifying which type. (In Ottawa's view, Halifaxes were more prestigious than Wellingtons.) Overall, it may be said that No 6 Group got better aircraft sooner than some other groups.

As it was, with each conversion squadrons lost their operational currency on type and the whole process entailed considerable shifting of units from one station to another, requiring crews to adjust to new surroundings and landing patterns. Croft, Dalton, and Topcliffe were all shut down as operational bases between 19 April and 16 May to make way for the HCUs that prepared crews to fly the Halifax and Lancaster. Dishforth closed in mid-June to permit runway repair and expansion so that it could handle heavy bombers, while Burn was given back to the RAF. Two new stations, Tholthorpe and Linton-on-Ouse, were opened when they were taken over from No 4 Group. As a result of these openings and closings – as well as the conversion program – and not counting 405 Squadron's move to No 8 Group, between 2 April and 18 June 1943 five RCAF squadrons changed base at least once: 424 moved from Topcliffe to Leeming to Dalton, 426 from Dishforth to Linton, 427 from Croft to Leeming, 428 from Dalton to Middleton St George, and 431 from Burn to Tholthorpe.[68]

With all this happening (or scheduled to happen), and given its initial loss rates, it might have been best if No 6 Group had been left to settle down and establish a degree of continuity and stability. However, on 3 April 1943 the Air Ministry asked Canada to approve the transfer of three experienced Wellington squadrons to North Africa to support Operation Husky, the invasion of Sicily, for about two months.[69]

The suggestion that Canadian bomber squadrons might be sent outside Britain had first been raised in August 1942. Concerned about the growing 'dominionization' of his command and convinced that a number of bomber squadrons would be called upon to support Operation Torch, the Allied landings in French North Africa, the AOC-in-C had insisted that Canadian, Australian, Polish, and other such squadrons should not be free from the obligation to serve outside Britain. He wanted his command to remain at least two-thirds British. When a specific request for bombers was made in October 1942, Harris had proposed that the RCAF provide the two Wellington squadrons required. As things turned out, nothing came of that, largely for security reasons;* but when a need to reinforce the North African theatre arose in early December, Canada was asked for – and quickly agreed to send – the two squadrons despite the fact that their detachment would leave behind 'a small and relatively ineffectual Canadian Bomber Group': an indication, Ottawa

* Knowing that RCAF Overseas Headquarters would require the approval of the Canadian government to make such a commitment, and not trusting the security of trans-atlantic communications, British authorities did not want to risk revealing any information about Operation Torch, in which connection this request was made.

noted, of the government's policy 'not to refuse any reasonable operational request.'[70]

Although nothing happened again, an important precedent had been set. When the April 1943 appeal was made, Air Marshal Edwards pointed out that the move would 'reduce temporarily our Bomber Group which we are now striving to increase,' but he was also persuaded that the detachment of three squadrons would be 'a definite help in the pursuance of successful operations.' His agreement was nevertheless conditional. The three squadrons had to be Canadianized, serve together in the same wing under the command of an RCAF officer, and return to No 6 Group within three months. He also expected that three new Canadian bomber squadrons would be formed to replace them. The Canadian government accepted Edwards's recommendations, and the Air Ministry was so informed on 10 April.[71]

Nos 420, 424, and 425 Squadrons were selected to form No 331 Wing, part of US General Carl Spaatz's Northwest African Air Forces under Sir Arthur Tedder's Mediterranean Air Command. They exchanged their old Wellingtons for new Mark Xs which, since they would be operating from the semi-arid climate of central Tunisia, had to be tropicalized and modified to protect them against the ubiquitous dust and sand. The air- and groundcrews also had to prepare for their new surroundings. They were issued with tropical kit, suffered through the inevitable inoculations and vaccinations, and provided with emergency rations and medical supplies which contained, among other things, anti-mosquito cream and water sterilizing tablets.[72]

Establishments were increased so the squadrons could operate twenty machines instead of the standard sixteen in Bomber Command and, because of their isolation and the increased incidence of disease in Africa, they were authorized to carry five extra air crews. (The augmented groundcrew establishment did not provide for this 'sickness' and 'isolation' component, despite the fact that their life would be every bit as harsh as that of aircrews.) While most of these crews were filled by RCAF personnel, the three squadrons were still not Canadianized to the degree Edwards had anticipated. Although the Air Ministry sympathized with his position, it would not sacrifice experience for national identity. Mixed crews with a minority of Canadians might be declared ineligible for the transfer and replaced by complete RCAF crews from OTUs or other squadrons, it was decided, but no crews could be broken up (or mixed crews with a majority of RCAF personnel posted out) to enhance Canadianization.[73]

After some juggling, the aircrew Canadianization rate in the three squadrons was increased from about 73 per cent at the end of April to 80 per cent in mid-May, just before their departure for North Africa, while that for groundcrew reached 99 per cent. That was also likely to be the maximum. With replacements still required for No 6 Group as well as No 331 Wing, the Air Ministry decreed that only eighteen of the thirty Wellington crews to be sent to North Africa each month would come from RCAF sources. Accordingly, if the three Canadian squadrons suffered heavy casualties early on, before a pool


NO 331 WING OPERATIONS
IN THE MEDITERRANEAN
26 JUNE - 6 OCTOBER 1943
0 100 200 mi
0 100 200 250 km
ITALY
YUGOSLAVIA
Genoa
Bologna
LIGURIAN SEA
ADRIATIC SEA
Pisa 1 (26)
Leghorn 1 (27)
Elba
Bastia 1 (31)
Grosseto 1 (20)
CORSICA
Viterbo 3 (69)
Civitavecchia 1 (22)
Cerveteri 1 (21)
ROME
Lido di Roma 1 (3)
Cisterna 1 (24)
Frosinone 1 (30)
Castelnuovo 1 (23)
Formia 6 (129)
Foggia 1 (29)
Aversa 1 (14)
Gaeta 1 (4)
Benevento 1 (23)
Grazzanise 1 (23)
Capodichini 6 (145)
Villa Literno 1 (27)
Naples 4 (112)
Obilia 1 (18)
SARDINIA
Bagnoli 1 (27)
Battipaglia 4 (124)
Taranto 2 (41)
Torre Annunziate 2 (41)
Pompei 1 (32)
Salerno 3 (77)
Montecorvino 3 (61)
TYRRHENIAN SEA
Sapri
Villacidro 1 (18)
Cagliari 3 (41)
IONIAN SEA
Paola 1 (26)
NOTE: Bold figures indicate number of raids. Figures in brackets record sorties flown. Sorties do not include early returns, leaflet raids and electronic jamming missions.
Evacuation of Sicily
Total 6 (137)
Pizzo 2 (48)
San Giovanni 2 (43)
Messina 10 (228)
Reggio di Calabria 1 (8)
Trapani 1 (16)
Randazzo 1 (24)
Enna 1 (25)
Catania 2 (14)
Catania 1 (27)
Sciacca 1 (15)
Caltagirone 1 (6)
Syracuse 1 (15)
Gerbini 3 (53)
TUNIS
Pantelleria (Italy)
TUNISIA
No 331 Wing
Kairouan
Sousse
Monastir
MALTA (Gt. Br.)
Airfields
Transportation centres
German Evacuation August 11-17 1943
Sfax
MEDITERRANEAN SEA

of RCAF replacements had been built up, they would inevitably find themselves with a higher proportion of British and other Commonwealth crews.[74]

No 331 Wing formed at West Kirby, in Cheshire, on 7 May 1943, under the command of Group Captain C.R. Dunlap, a prewar regular who had spent three years as director of armaments in Ottawa before taking command at Leeming late in 1942.* Wing headquarters consisted of twenty officers, all RCAF, and 122 other ranks, of whom only seven were RAF. After embarkation leave, the groundcrews, wing staff, and some of the additional aircrew sailed from Liverpool on 18 May. Dunlap himself flew out to North Africa on 21 May to select and set about preparing the wing's landing fields. He found that no one in Mediterranean Air Command 'appeared to be assuming any responsibility for the matter' and that the Americans had already taken most of the good locations. (The RAF's No 205 Group, with headquarters at Kairouan and comprising Nos 231 and 236 Wings and including one Spitfire and five Wellington squadrons, was also close at hand.) However, with the assistance of US Army Engineers he eventually found two sites near the town of Kairouan, midway between Tunis and Sfax, about thirty miles inland from Sousse on the Mediterranean coast. Nos 420 and 425 Squadrons, along with 331 Wing Headquarters, would settle in at Zina, a 'great barren plain covered with dry thistles,' while No 424 Squadron would be located at Pavillier, which boasted some 'stunted olive trees' and 'a tall cactus hedge' to provide 'a modicum of shelter in the domestic area.'[75]

All the aircraft took off from England between 1 and 4 June, flying a circuitous route over the Atlantic but, nevertheless, No 420 Squadron was attacked in broad daylight over the Bay of Biscay by 'several Junkers ... in close formation.' Two aircraft went missing and were presumed shot down. One machine from No 425 was also attacked and the crew eventually forced to bail out over Portugal, where they were interned.[76]

Most of the ground parties and equipment reached the Kairouan area by 19 June, and work on building up the two stations began the next day. Tents had to be set up, latrines dug, and roads and servicing areas laid out – in temperatures approaching 128° Fahrenheit (53° Celsius). In the evening of 22 June, however, a tremendous rainstorm began which lasted until late the next day – 'something quite unprecedented in this district during the summer season.' With most vehicles immobilized, all work came to a halt, and a message was sent to hold No 424 Squadron at Telergma, on the Tunisian coast, until the ground hardened. It was not received 'due to the poor signals communication,' however, and crews began to fly in just as the rain stopped. 'Fortunately, none were damaged during the landing in heavy mud.' Although No 331 Wing was declared ready for operations three days later, on 26 June, much work still had to be done. On 12 July twenty-five Arab labourers were hired 'to dig slit trenches and do heavy work in the bomb and petrol dumps' and it was not until 13 July that British engineers completed a 'permament shower bath ...

* He retired from the RCAF in 1966 having served as chief of the air staff (1962–4) and deputy commander-in-chief of the North American Air Defence Command (1964–6).

utilizing a disused Arab well.' Unhappily, the showers 'only lasted a half hour. The supports holding the tank gave way' and could not be repaired for two days.[77]

The Sicilian campaign to which the three squadrons were assigned was a strategic compromise decided on at the Casablanca conference of January 1943. At that time the Americans would have preferred 'to close immediately with the German enemy in Western Europe or even in Southern France,' but the British feared that a cross-Channel assault launched too soon might well prove disastrous. To them, the logical course was to pursue the initiative in the Mediterranean 'to strike,' as Winston Churchill put it, 'at the under-belly of the Axis in effective strength and in the shortest time.' The Americans reluctantly accepted that the capture of Sicily and the opening of the Mediterranean shipping lanes were useful goals in their own right. However, the Allied commander-in-chief, US General D.D. Eisenhower, reaffirmed that this was not an open-ended commitment. Sicily was a worthwhile objective, he declared, in part because 'its occupation after capture would not absorb unforeseen amounts of Allied strength in the event that the enemy should undertake any large-scale counteraction.' Furthermore, it did not follow that a further advance into Italy was necessary or desirable – one reason why, when the request was made for the three Canadian squadrons, it was felt that they would be needed for only two or three months.[78]

The operations in which the three Canadian squadrons would be involved were quite different from those with which they were familiar in Northwest Europe. For one thing, this was no 'area bombing' campaign. The main targets selected were the enemy's airfields in Sicily and Italy, in order to prevent the enemy from bringing its air power to bear against the landings, and supply routes to the island in order to keep the Germans and Italians from reinforcing and resupplying their garrisons. Summer flying conditions were also much different in the Mediterranean theatre. The weather was generally much better, and crews often found themselves in clear, calm skies, which made visual pinpointing of the target much easier; however, since Gee was not available, long-distance navigation over the Mediterranean required more emphasis on dead-reckoning and astronomical observations. The opposition, however, was of a different order from that encountered over Germany. Although Flak could be heavy at times in some places, particularly along the Straits of Messina, the night-fighter organization was primitive and weak, and on most raids it was reasonable to bomb from well below 10,000 feet.[79]

The first raid by No 331 Wing took place on 26/27 June, when Nos 420 and 425 Squadrons attacked the air base at Sciacca on Sicily's southern coast, about three hundred miles from Tunisia. There was a good deal of Flak and the searchlights cooperated well with the fighters, but the two squadrons suffered only one loss and claimed one Ju 88 destroyed. No 424 Squadron began operations on 27/28 June and had a much more difficult time. One crew lost a 4000-pound bomb on takeoff, but continued on to the target unaware of what had happened. Another machine burst a tire on takeoff and crashed, dropping its bomb as well. Fortunately, neither exploded, and two other crews took

off not having noticed the accidents. Four more were not bombed-up in time, however, and had to abort their sorties. That was blamed on the armourers, some of whom had 'arrived in England just a few weeks before the Squadron moved' and had very little experience. Things were worse the next night, when the target was Messina, as the squadron lost two crews to enemy action. By the end of June No 424 was responsible for three of the seven machines missing or severely damaged since the wing began flying operations. Added to the three machines shot down en route from England to Tunisia, this meant that thirty-five aircrew had become casualties in a month.[80]

Whether it was because the initial attacks on enemy airfields had achieved their objective or because the targets selected were more dispersed, losses on operations due to enemy action fell from five (5.3 per cent of sorties) in June to three (0.5 per cent) in July – although there were also six forced landings in the latter month. Missions themselves were also more varied. Between 2 and 8 July, in generally good weather, the wing operated against airfields at Catania, Villacidrio, Olbia, and Gerbini – the enemy's main fighter base on Sicily – and photographs taken on the 9th showed that the Gerbini and its satellites had been rendered 'completely unusable.' They also attacked the railroad yards and barracks at Cagliari, on the island of Sardinia; a seaplane base at Lido di Roma, where the Tiber flows into the Tyrrhenian Sea; and Trapani, on Sicily's far west coast.[81]

No 424 Squadron was nevertheless enduring a period of bad luck during this period, which may have accentuated the sourness expressed in its diary. It lost four of the six No 331 Wing crews killed or missing in the first three weeks of July, one of them on the 6th when a fully fuelled and bombed-up Wellington caught fire in the dispersal area and exploded, killing three crew who had been sitting under the wing and wounding a number of others. 'Fragments from the bursts flew all over the camp setting grass fires,' and a few seconds later a second machine was also on fire. It too blew up. What caused the fire was never discovered, but it was suspected that, as in the case of a No 420 Squadron Wellington that blew up two days before, the intense heat of the day might have had something to do with it.[82]

Dysentery, diarrhoea, malaria, and what was called jaundice were also taking their toll, and there had been tremendous grumbling about food – 'bully beef three times a day' – since the squadron's arrival in Tunisia. Indeed, in late June the grousing had reached the point that the commanding officer (Wing Commander G.A. Roy, formerly a flight commander in No 425) felt compelled to call a muster parade at which he promised to find extra food by fudging the squadron's ration strength. In the meantime, all ranks were encouraged to contribute a portion of their pay to a squadron fund to buy additional foodstuffs on the local economy. Here they made good use of the linguistic talents of the wing's Protestant chaplain, Flight Lieutenant Herbert Ashford, who knew both French and Arabic and who 'brought back to the squadrons many little things to make life easier – straw mats on which to lie, earthenware bottles from which to drink comparatively cool water, as well as chickens and other delicacies to relieve the monotony of issue rations.' However, complaints

continued about rations, the unit's water supply, and what some saw as the unfair rating of Mediterranean Air Command sorties as counting only three-quarters of a trip towards completion of the thirty-trip operational tour.[83]

There were also problems simply maintaining the effort on the ground, and attempts to solve these challenges led to one sergeant in No 420 Squadron being recommended for a British Empire Medal.

> Sergeant [E.K.] McLeod has been Senior NCO in charge of the Motor Transport Section during his squadron's stay in North West Africa. From the start he has been faced with a shortage of M[otor] T[ransport] Drivers and equipment. On many occasions he has improvised fitting spares obtained from British, American, and enemy vehicles lying derelict in the surrounding country to his own … At the same time his shortage of MT Drivers has forced him to work his men to the limit throughout the period of the squadron's stay. Despite this, his men have never complained but rather have taken a great pride in their section and have given him their full support. In consequence, motor transport serviceability has remained at a very high standard and no transport facilities have ever gone lacking for the squadron.[84]

However, like many others, this award was not approved; perhaps because there were just too many non-flying personnel working every bit as diligently as McLeod to ensure that aircrew could carry out their operations with as few inconveniences and interruptions as possible.

Sicily was invaded on 10 July, and the three RCAF squadrons were assigned to targets over the whole island, supporting the landings, bombing marshalling yards and troop concentrations at Catania, and attacking the seaplane base and marshalling yards at Syracuse and the aerodrome at Cataglieroni from as low as 4000 feet. Perhaps the most important assignment, however, was that flown by six crews from the three squadrons that, equipped with the Mandrel jamming device, patrolled off the coast, hiding the invasion fleet behind an electronic curtain. With Allied troops (including the 1st Canadian Infantry Division and the 1st Canadian Army Tank Brigade) safely ashore, the squadrons operated every night until 15 July against enemy strongpoints and airfields.[85]

Twice they won praise for their efforts from Spaatz and James H. Doolittle, who led the strategic component in the Northwest African Air Forces. On the first occasion, on 11/12 July (the day American and Canadian forces linked up at Ragusa), No 424 Squadron took advantage of the bright moon and light defences to strafe the airfield at Monte Corvino, near Salerno, after their bombing runs and claimed forty enemy aircraft destroyed – most of them, by now, Italian. The next day Nos 420 and 425 Squadrons pounded German troop concentrations and the roads around Enna, whose capture had become something of a 'friendly rivalry' between the Canadian and American armies. By mid-month the wing had mounted 253 sorties on twelve nights. There were only six early returns, and despite the ever-present dust and sand of Tunisia, which had to be scrupulously removed from vital components like guns, fuel tanks, and the bomb-bay door closing mechanism, maintenance standards in this

period of intensive operations were amazingly high. Of the fifty-six or fifty-seven Wellingtons normally on strength in the wing, an average of fifty-two were available for operations each night – 91 per cent.[86] A serviceability rate so good in Northwest Europe would have earned high praise.

On 15 July the Canadians began to attack Italian targets, concentrating on airfields, port facilities, and railway yards in the Naples area, about four hundred miles from Kairouan and two hundred from the Sicilian battlefields. (Poor transportation facilities in southern Italy meant that Naples was a major loading point for the shipment of war materiel to the Axis forces in Sicily.) Flak near major cities like Naples was accurate and sometimes intense, and on 16/17 July Nos 420 and 424 Squadrons reported as many as forty searchlights operating around the Capodichino airfield. Three nights later, when all three squadrons returned to Capodichino, the defences had been strengthened further, and crews estimated there were now up to seventy-five searchlights in the area, with a particularly efficient group of about ten near Mount Vesuvius. A number of night-fighters were seen, but there were no losses. Naples was attacked again on 20/21 July, through heavy Flak and good visibility, but the area was covered in cloud on 21/22 July and the bombing at Capodichino was not well concentrated.[87]

On 25 July Italian dictator Benito Mussolini was brought before his party's Fascist Grand Council to be dismissed and placed under house arrest, giving rise to hopes that Italy might soon withdraw from the war. That same day No 331 Wing was given a brief respite from operations, its first since mid-month. With the scirocco winds blowing off the desert and daytime temperatures rising to 125° Fahrenheit, the opportunity to go swimming at Sousse or the wing's rest camp (set up by the YMCA) at Monastir was more than welcome. Moreover, on 28 July 'Sheikh Amor Bouguerra Sheikh du Sidi Amor Bou Hadjela Caidat Kairouan, head of one of the villages near Monistair [sic], visited Group Captain Dunlap and presented the G/C with 8 live chickens, one live sheep and about 7 dozen eggs' – a most agreeable supplement to an increasingly boring diet.[88]

This late July layoff certainly lifted the spirits of Sergeant L. MacLauchlan, one of No 424's hard-working ground crew. 'Life out here is certainly different, to say the least,' he informed his old BCATP station:

> ... but we have become accustomed to the sun and sweat, sand and flies ... No wet canteen to go to when work is done, though. We get a half bottle of beer per week sometimes ...
>
> Our '48s' [two-days' leave] are spent at a rest camp on the Mediterranean, where we live the life of Riley. Not quite like Port Stanley [a summer resort on Lake Erie], perhaps, no music or pretty figures but lovely water and cool breezes. And if you care to, you can bargain with the countless Arabs for grapes, melons and almonds, and if you are lucky, a bottle of 'Vino Rouge.' Altogether not a bad life ...
>
> The usual topic of conversation, believe it or not, is not women, but food. Beef steak and ice cream lead the list by a good margin. Also I believe a nice cool ale is a favourite subject.[89]

Losses were not really a problem by late July. Earlier in the month, however, the combination of accidents, sickness, June's battle casualties, and the three crews missing from the flight from England to Tunisia had forced Dunlap 'to accept a fairly large number of RAF crews from the Middle East pool,' 'de-Canadianizing' his command from about 80 per cent to 74 per cent. Although he knew that turning to the British pool for replacements was contrary to Air Marshal Edwards's policy, Dunlap believed that, under the circumstances, his action would meet with the latter's 'full approval' because it allowed the Canadians to fulfil all their operational commitments. He was wrong. Convinced that the RCAF replacement crews sent out in June had somehow been sidetracked and probably posted to RAF units, Edwards was 'greatly distressed'; not about to allow No 331 to become an RCAF formation in name only, he directed that the ceiling on the number of RCAF crews to be sent out each month should be raised beyond the eighteen authorized by the Air Ministry.[90]

Edwards's concern was such, in fact, that the matter was raised while Sir Charles Portal was in Quebec City attending the Quadrant conference of Allied leaders in August, and it was only then that it was realized that Dunlap's problem was a temporary one brought on by the late arrival of the first batch of RCAF replacements. In fact, from 6 July Dunlap was reporting that his Canadian replacements were pouring in, and it was relatively easy, in time, to restore the Canadianization rate to 80 per cent, about the maximum possible given the shortage of Canadian wireless operator/air gunners. The only problem arose with No 425 Squadron. Since its arrival in North Africa it had received no French-Canadian crews. During the first week of July, however, when Canadianization rates were lowest, it was still 70 per cent RCAF, compared with 65 per cent in 420 Squadron and 80 per cent in No 424.[91]

When the wing returned to operations in August, the Allied armies were pinching the enemy into the northeastern corner of Sicily. (The 1st Canadian Division was taken out of the line on 6 August, to prepared for the assault on Italy, and the 1 Canadian Army Tank Brigade four days later.) What mattered now was to prevent any escape to the mainland, and as a result the three Canadian squadrons were busy attacking barges, military transport, and the beaches over which the enemy was trying to flee. Despite over a thousand sorties by Allied aircraft (including 350 by the Canadians) and nightly incursions into the Straits by patrol boats of the Royal Navy, the movement of some 40,000 German and 62,000 Italian troops to the mainland could not be prevented. Moreover, the cost was high. The Germans moved in considerable Flak to protect their withdrawal, and it was said that the intensity of the fire at times rivalled that found over the Ruhr. The Canadians alone lost five machines (and twenty-five airmen) in these attacks.[92] Another was very lucky. On 13 August Pilot Officer A.G. Grout of No 424 Squadron took off to bomb the beaches at Cape Bardi.

At approximately 0210 hours the port oil pressure gauge started to fluctuate between 90 degrees and 60 degrees. The oil and cylinder head temperatures were normal. This fluctuating continued for approximately five to ten minutes, then the gauge dropped

to zero … The target being ten to fifteen minutes away … we decided to go ahead and bomb.

After bombing the target we set our course out, being in the neighbourhood of 7,500 feet we gradually let our height decrease to 6,000 feet. Reaching this height and approximately ten minutes from the target the port engine began to sputter and cut out immediately …

… I noticed flame showing from the port engine exhaust pipe. This died down, but soon started again, only it seemed much worse than before. Thinking that the engine had a small fire … I … started the prop, so it turned over very slowly. The fire died down and seemed to go completely out. Waiting a few seconds, I then stopped the prop from windmilling. A few minutes after doing this the fire started again, but it seemed to be much fiercer … We decided to head for the main-land [Sicily] …

Reaching the mainland the fire seemed to be out of control … The coast was covered by cloud and we were below the hilltops which protruded above the clouds. Our height was approximately 2,000 feet. The starboard engine was overheating and the aircraft would not hold height. I had ordered the crew to stand by for bailing out. We hit the coast and turned west.

The fire on the port engine by this time was very fierce and protruded underneath the wing. The fabric caught fire and I could see the leading part of the wing blazing. I ordered the crew to bail out … As the wireless operator left the aircraft a large mountain loomed up, I had to bank very steeply to the left and I opened the starboard engine to its fullest power. As I missed the wall, I dived out of the aircraft … [which], a few second later, exploded against a ravine wall.

… by 0600 hours I had climbed out of the ravine and I then started to look for the rest of the crew … At approximately 0830 to 0900 hours I ran across some American Army men who accompanied me in my search for the rest of the crew … In the meantime the bomb aimer and rear gunner had found each other and together they located the wireless operator, who had either broken or badly sprained his ankle … Helped by Italians they carried the wireless operator to the coast. On reaching the coast, the Americans took them in a railway station, giving the wireless operator more first aid.

Eventually Grout joined up with these three, and they boarded an American transport aircraft for Tunis. 'We were on course for approximately thirty minutes when the aircraft ran into a [barrage-] balloon cable. The bomb charge on the cable blew approximately two square yards out of the wing of the C-47 [Dakota]. Losing control of the aircraft, the pilot finally picked up the stalled wing and landed at a fighter drome called Lacata. During the bomb charge exploding, shrapnel pierced the fuselage and struck the bomb aimer … in the arm, behind the ear, and cut the ear itself.'[93] With the bomb-aimer and the wirless operator both in hospital, Grout and his rear gunner finally made it back to Kairouan, where they met up with the navigator who had arrived the day before, having been found by another American soldier in Sicily and flown on to Tunis separately.

The capture of Sicily, it will be recalled, had not been intended as a prelude to the invasion of Italy, but was undertaken as a limited operation to secure the Mediterranean for Allied shipping. At the Washington conference of May 1943 (Trident), however, the pull of Italy proved irresistible, although the decision to carry the war to the mainland involved considerable compromise. In return for supporting an extended campaign in the Mediterranean (against which they had protested so vigorously five months before), the Americans extracted significant concessions from the British, who finally agreed to conduct a major cross-Channel amphibious assault in May or June 1944. The strategic goal in the Italian theatre would be met when the Allies occupied the country as far north as Naples and the airfield complex around Foggia – and perhaps took Rome.[94]

The initial plan called for a landing only at Reggio di Calabria, in the Italian toe, but with Mussolini's fall from power a second assault was added in the Gulf of Salerno so that Naples could be taken more quickly. Operations in Calabria would begin on 3 September, and those around Salerno two days later. The original commitment of No 331 Wing was to have ended on 31 July, but it had now been extended to 15 September so that the three Wellington squadrons could participate in the bombing operations required during the first two weeks of the Italian campaign. That meant another few weeks in Tunisia, where the rainy season was about to begin (not a pleasant prospect for men under canvas) or, as Dunlap learned on 4 September, it might mean a move to Malta 'until such a time as Italy stops fighting.'[95] That was an event that grand strategists thought might occur at any moment.

Initially, the Canadians concentrated on the railway yards around Naples and the airfields at Foggia, but they also attacked the steel works at Bagnoli, Torre Annunziata (near Naples), and the railway yards and roads behind the Salerno beaches in the last few days before the landings. These operations achieved their intended effect. By the time the invasion began, the bombing of a few nodal points had virtually paralysed the elemental southern Italian railroad system and no supplies could be brought through Aversa, Concelo, Benvento, Foggia, Battipaglia, Sapri, Paola, Pizzo, or Catanzaro to any of the Allied landing areas. Then, as the month drew to a close, Taranto and Salerno were the targets. General Doolittle visited the wing on 1 September, and went on a night-bombing operation to the Aversa marshalling yards with Squadron Leader A.J. Lewington's 'illuminator' crew from No 420 Squadron to see first-hand how the Wellington force used flares to mark its objectives.[96]

Once the armies were ashore on the Italian mainland (1st Canadian Division playing a key role in the Reggio assault,) No 331 Wing turned to tactical bombing behind the Salerno beachhead in order to blunt any German counter-attack. 'Enemy communications and supplies were assaulted without respite. The main roads were literally plastered with bombs.' The Germans fought with such ferocity at Salerno, however, that for a time the success of the landing seemed threatened, and a request was made to retain the wing for an indefinite period, until the Allied bridgeheads had been secured and the advance north

had begun. Again Edwards agreed, the Canadians being warned that they might actually move to mainland bases in November and spend some time there. Just as they should have been packing up to return to England, the three RCAF squadrons contributed to a mission which, according to Sir Arthur Tedder, 'may have saved the day.'

> On the night of 14/15 September, the road from Battipaglia to Eboli [the main axis for a heavy German counterattack spearheaded by strong armoured formations] was buried beneath 237 tons of bombs delivered in one raid by 126 Wellingtons. This was the greatest effort yet made by night bombers in this theatre. It was also the justification for the request we had put to Portal for the retention of the three Canadian Wellington squadrons. I had told him…shortly before the main German counterattack against the centre of our bridgehead was launched, that in my opinion, and in Eisenhower's, we could not afford any reduction in our night bomber effort until the situation was clearer.[97]

The Canadians flew forty-three sorties and dropped eighty-two tons of bombs on the line of march of three German divisions: the 15th and 29th Panzergrenadier and the Hermann Göring Panzerdivision. Attacking from altitudes of 2800 to 10,000 feet, crews reported the whole area covered by a thick pall of smoke. The next night they concentrated on the Torre Annunziata-Pompeii road, where the enemy also threatened to break through to the Salerno beachhead. The main problem, it turned out, was congestion over the target area, and a number of crews made up to four runs before dropping their bombs.[98] 'I have recently seen some account of the exceptionally good work done by the Canadian Wellington Wing in the Mediterranean,' Sir Charles Portal commented to Edwards when he learned of these efforts. 'I am told that the scale of effort in relation to the size of the force has probably been higher than has ever been achieved anywhere in the past and included operations on 78 of 80 successive nights, with a nightly average of 69 sorties … Tedder has signalled in very warm terms about this outstanding achievement. I have already asked him to convey my appreciation to all concerned but I should like to let you know personally how greatly I am impressed by this splendid record of No 331 Wing. We are all greatly looking forward to the time when, with newer and better equipment, they will resume their operations against Germany.'[99]

That time was not far off. The German counter-attacks failed, bludgeoned by naval gunfire and the bombing, and although air operations subsequently shifted to the north, to Rome and Corsica, which the enemy was now evacuating, by 8 October it was all over for No 331 Wing.[100] The front had stabilized sufficiently for the three squadrons to be withdrawn after a total of 2182 sorties on 82 nights out of 102 spent in the theatre – and after losing only eighteen machines (0.8 per cent) on operations and another eighteen to accidents, mostly involving takeoff and landing. Leaving their aircraft behind, the squadrons travelled by bus to Tunis on 18 October, boarded two 'very dirty' trains to Algiers, where they spent two days, and set sail for England on 27

October. They disembarked at Liverpool, to music by the RCAF Band, in snow and rain on 6/7 November, travelled to their bases at Dalton, Skipton, and Dishforth, rekitted, enjoyed some leave, and then began to re-equip on Halifaxes to take part in the battle of Berlin.

18

No 6 Group Falters, Spring and Summer 1943

Issued by the combined Anglo-American chiefs of staff under the authority of US president Franklin D. Roosevelt and British prime minister Winston Churchill, the Casablanca directive of 21 January 1943 established the framework of Allied bombing policy for 1943–4. As a prelude to the planned cross-Channel invasion, now postponed until 1944, and allowing for 'exigencies of weather and tactical feasibility,' the Allied air forces were to attack four main sectors of the German war economy: submarine yards on the Baltic coast and U-boat bases on the Biscay coast (the focus of operations for most of January and February), the aircraft industry, transportation, and oil. The assault on these targets would place a premium on accurate and precise bombing. To that end, the US Eighth Air Force based in England (which was only just beginning to mount raids involving more than one hundred machines in March 1943, but would be sending three hundred to German targets by July) was committed to a daylight bombing offensive. By the end of the year American crews would be all too familiar with targets like the oil refineries at Gelsenkirchen, Bochum, and Hüls; the Messerschmitt factory at Regensburg; and the ball-bearing industry at Schweinfurt.[1]

Having spent the better part of thirty months failing to find or significantly damage these types of targets – and the better part of a year (since Sir Arthur Harris became AOC-in-C) arguing that the attempt to destroy them was not worthwhile – Bomber Command was not particularly happy with lists of specific objectives. 'Ever since the beginning of the war,' Harris recalled in his memoirs, High Wycombe had been told repeatedly to attack 'a whole class of objectives which at Bomber Command we always called "panacea" targets. These were targets which were supposed by the economic experts to be such a vital bottleneck … that when they were destroyed the enemy would have to pack up … The enthusiasm of the experts was so great that I was actually told that I should be fully justified in accepting such losses to achieve the destruction of Schweinfurt … as would put the whole of the bomber force out of action for two months. They paid no attention to the fact that Schweinfurt was too small and distant a town for us to be able to find and hit in 1943.'[2]

However, since the Casablanca conference involved compromise at every turn, ways were found for Bomber Command to continue with the night-

bombing offensive preferred by Harris and Sir Charles Portal alike. Berlin was included in the list of specific objectives as were 'other targets in [the] enemy war industry,' and together these provided more than enough leeway to keep doing what they were already doing for those wedded, by necessity or inclination, to area attacks. But there was more. The first sentence of the Casablanca directive told the 'bomber barons' that their 'primary objective will be the progressive destruction and dislocation of the German military, industrial and economic system and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened.'[3]

Portal and Harris could scarcely have found better words to justify Bomber Command's effort to date, although the latter felt it necessary to do so. In a memorandum to the Air Ministry, he misquoted the directive to suggest that the 'progressive destruction and dislocation' of the German military, industrial, and economic system was specifically aimed at 'undermining' morale – further vindicating, in a very small way, his fixation with area bombing.[4]

Just what the CAS and Harris wanted to accomplish had been made clear in October 1942, as part of the autumnal ritual in which Portal laid out his hopes and plans for the coming year to the other chiefs of staff and the War Cabinet – occasions used to squeeze more resources out of the British economy and to protect Bomber Command from what they both considered to be the depredations of the army and navy. Despite the slowing down of expansion, forced by production delays and, to a lesser extent, by the transfer of aircraft, squadrons, and crews to other commands and theatres, Portal's vision for 1943 still looked forward to the creation of an Allied bomber force of four to six thousand machines which, able to deliver fifty thousand tons of bombs a month by the end of the year, would 'shatter the industrial and economic structure of Germany.' Indeed, by that time the CAS estimated that six million dwellings would have been destroyed, rendering twenty-five million people homeless, and that 900,000 Germans would be dead, with another million injured. 'Proportionate destruction,' he added, would occur in industrial sectors.[5]

Given the way most manufacturing centres had developed, however, the areas most susceptible to attack were not the industrial parks on the outskirts but the downtown cores, full of old buildings and narrow streets, where flames could spread easily. This was where the greatest weight of bombs should fall, his DBOps advised, and where the aiming points should be located, using fire as the main instrument of destruction, to cause 'fear of death … injury and the loss of private property.'[6] With parameters like those, the Ruhr/Rhineland industrial basin, within range of all navigation aids, close enough to sustain operations through the shorter nights of spring and summer, and sufficiently dense that near misses would still count, was a natural choice for an area offensive. Almost a year to the day since the start of the last great attempt to knock it out, the second battle of the Ruhr began on 5/6 March 1943 with an attack on Essen.

Some things had changed, however. This time, Harris has explained: 'In no instance except in Essen [where the sprawling Krupp facilities were practically an area target in themselves] were we aiming at any one factory during the

Battle of the Ruhr; specifically, the destruction of factories … could be regarded as a bonus. The aiming points were usually right in the centre of the town … The objective … was to reduce production … at least as much by the indirect effect of damage to services, housing, and amenities, as by any direct damage to the factories or railways themselves.'[7] Furthermore, where previous operations had involved an average of two hundred aircraft, of which about thirty were four-engined machines, in 1943 Harris would routinely send six hundred crews to the target, and could call upon three hundred Stirlings, Halifaxes, and Lancasters. Some nights as many as eight hundred sorties were mounted, without all the special administrative arrangements and intercommand negotiations required for the 'thousand' raids launched the previous summer. At minimum, and all other things being equal, the bomb load carried on each attack should, on average, be five times greater than in 1942.[8]

Harris and Portal expected the weight of bombs falling in the target area to increase by much more than a factor of five because of Oboe and H2S, and because of the Pathfinder Force's growing repertoire of flares, target indicators, and marking techniques. (Although it had been modified to use multiple frequencies, Gee was still susceptible to jamming, and its greatest value by 1943 was probably to guide crews back to their bases in Britain.) Better marking, it was hoped, might treble the number of crews bombing within three miles of the aiming point, leading to a fifteen-fold increase in the bomb tonnage dropped in the target area – enough to remove cities like Essen and Duisburg from the economic order of battle.[9]

Technically, Oboe worked as well as anticipated but, requiring two-way communications between a limited number of ground stations and airborne transponders, it would never be available for use by all main-force crews – who, in the event, could not fly high enough to exploit its maximum range. (At the outset, only six Oboe-equipped machines could be dealt with in one hour.) The solution, of course, was for the Pathfinders to use Oboe as their principal navigation and target-marking aid; for this purpose the perfect instrument was the high-flying de Havilland Mosquito, with a ceiling well above 30,000 feet, which was so much faster than the Luftwaffe's night-fighters that it could fly straight and level for the ten minutes required for an accurate bomb-release signal with relative impunity. High Wycombe consequently began an intensive campaign to acquire Mosquitoes for the Pathfinders; when the battle of the Ruhr began, twenty-two were on strength in No 8 Group.[10]

H2S, the downward-looking radar which could be fitted to, and used, by any number of aircraft, was originally intended to be a blind-bombing device for all crews, but its limitations became apparent soon after its introduction on 30/31 January 1943. Although it had been thought that each built-up area would have its own distinctive H2S 'signature,' in areas like the Ruhr ground detail displayed on the cathode-ray screen often appeared as a featureless blob, and any hopes that crews would be able to identify specific aiming points were soon shattered. Indeed, even No 8 Group's more conservative estimate that H2S-assisted marking and bomb-aiming would allow three-quarters of the main force to bomb within two miles of the aiming point (and about one-third within

a mile) was also wildly optimistic. Based on preliminary analysis, it seemed likely that the probable systemic error for blind-bombing with H2S would be somewhere in the order of half the diameter of the target being attacked; when the device was used as a navigation aid it was accepted that crews were liable to be off-track by as much as 10 per cent of the distance flown. Added to disappointing serviceability rates (70 per cent) early in its career, there was reason enough for main-force crews not to forget their other navigation aids: Gee (when it was not jammed), astro, and those landmarks that could be seen.[11]

Once at the target, it was the bomb-aimer's task to hit it. The Mark XIV course-setting bombsight introduced gradually – much too gradually for Harris's liking – beginning in the summer of 1942 allowed a single crew member to enter all the relevant variables of the bomb-aiming equation into the sight's computing device: air and ground speed, wind velocity and direction, altitude, atmospheric pressure, the ballistic characteristics (if any) of the bombs being carried, and their terminal velocity. It was felt, as a result, that the Mark XIV sight should produce 'at any time during the bombing attack the point on the ground [which when] covered by the graticule cross represented the point of impact of a bomb released at that instant.' There was, inevitably, a margin of error, but this was estimated to be no more than 150 yards from 20,000 feet. Perhaps just as important, the new sight afforded pilots some tactical freedom. Sufficiently stabilized that perfectly straight and level flight was not required, the Mark XIV sight meant that moderate evasive manoeuvres over the target would no longer nullify the two- or three-hour flight to get there.[12]

The introduction of these new technologies was complemented by advances in Pathfinding techniques and equipment. Best results continued to come from visual pinpointing of the aiming point followed by ground-marking, a method code-named Newhaven, but the clear skies (and absence of smog) required for

this procedure could not be counted on, especially over the Ruhr. Accordingly, when haze or thin cloud obscured the aiming point but ground flares could nevertheless be seen, No 8 Group used Oboe and/or H2S (depending on the target's distance) to determine when to release their ground markers, and then backed up their marking throughout the attack to reduce the 'creep-back' occurring when, eager to avoid the Flak concentrations in the target area, crews tended to bomb short. Known as Paramatta, and Musical Paramatta when Oboe was involved, this method was necessarily less precise than visual marking; and since main-force crews were instructed to bomb what they perceived to be the centre of concentration of the target indicators, there was inevitably a wider spread of bombs.

Following the first few raids when Musical Paramatta was employed, it seemed that 60 per cent of crews would bomb within three miles of the aiming point. Additional experience gained at Essen and elsewhere soon proved that this, too, was in error, and that the estimate should be reduced by about 20 per cent. Although disappointing in terms of anticipated performance, even the revised figure, when it was combined with the five-fold increase in average bombload now being carried, would result in a substantially greater weight of bombs falling around the aiming point. Since cities like Düsseldorf, Dortmund, Duisburg, Frankfurt-am-Main, and Wuppertal could all be fitted into circles three miles in diameter, it was expected they would receive a heavy weight of bombs if only half the crews, on very large raids, achieved the three-mile standard. Whether that would lead to the results Portal and Harris anticipated was another question.

Without doubt, however, the most important innovation from the perspective of its force-multiplying potential was the development of sky-marking assisted by H2S (Wanganui) or Oboe (Musical Wanganui). Until its introduction, the many dark or cloudy nights that offered the best chance of evading the enemy's defences resulted in bombing more or less by guess and by God. The glow of fires far below, diffused by cloud, smog, and smoke, was frequently the sole clue as to the location of the aiming point, and it was then that bombing was most scattered. Common sense dictated that Wanganui could not produce results comparable to Newhaven. Flares and target-indicators dropped by parachute drifted in the wind and often had to be released at some distance from the aiming point to compensate for such drifting, but well-placed sky-markers – and here Oboe's superiority to H2S was overwhelming – provided a focus for bomb-aimers so much better than the reflected glare of ground fires that Harris could almost begin to consider Bomber Command an all-weather force. The great limiting factor that remained (and which was not solved before the end of the war) was that none of his bombers could fly above storms, and thus did not operate when the meteorologists forecast unsafe flying conditions.[13]

Hand in hand with these navigation aids there appeared a whole new range of target indicator bombs and flares with improved ballistic properties for greater accuracy; brilliant pyrotechnics to distinguish them from ground fires; and more intense colours, which not only caught the eye but were also more

difficult for the Germans to duplicate. On a given raid, then, the target would be marked and illuminated by a blaze of red, green, and yellow TIs – 'Christmas trees' to the Germans – as well as by the brilliant white of ground-markers, all released in the particular pattern set down for that night.[14]

To further enhance coordination and control, No 8 Group not only used flares to mark the turning points en route to the target but, from 1 January 1943, all groups used the same wind forecasts provided by Bomber Command.[15] Although the adoption of common winds was generally for the best, it may have occasionally worked to No 6 Group's disadvantage. Because of their location, the Canadian squadrons often did not join up with the rest of the main force until just before the Dutch coast, having approached it on a tangent. If the forecast winds were considerably in error they could be well off-track before even reaching their intended rendezvous and so fail to enter the bomber stream as scheduled; like anything else that worked against concentration, this problem played to the strengths of Himmelbett.

As it was, the German air defence organization had been considerably strengthened in the twelve months separating the two battles of the Ruhr. Although Hitler still would not give priority to the production of night-fighters, and the Luftwaffe was allocating most Me 110s, Ju 88s, and Do 217s to the Russian front, the number of machines available to Kammhuber had doubled from about two hundred in March 1942 to four hundred a year later, and many more of them were equipped with AI radar. Furthermore, the training program Kammhuber had put in place in 1941 was finally paying dividends, so there was no shortage of trained crews. The area covered by Himmelbett had also been extended. The creation of Jagddivisionen in France and southern Germany and the provision of both static and mobile Würzburg radars had helped to fill gaps in the defensive line there. In the north the radar-picket and fighter-control ship *Togo* was keeping station in the Baltic, covering the northern flank against both Gardening and bombing operations, and some consideration was being given to employing submarines in the same role.[16]

Coordination of the night air battle had also been improved. The large control rooms at the Jagddivision headquarters (ultimately established at Deelen, Stade, Metz, Döberitz, and Schleissheim) and at the central Luftwaffenbefehlshaber Mitte in Berlin were provided with sufficient communications links and relays to make it easy (and safer) to pass control over an interceptor from one Himmelbett 'box' to another, and so to give each night-fighter crew more time to stalk and shoot down its prey. In some areas, night-fighter boxes were now routinely grouped in sets of three, with up to three machines operating in each box. Slowly, ways were being found to cope with larger, more concentrated raids, so that the defences were not swamped as they had been at Cologne, but the cost was tremendous. In October 1942, for example, when General Friedrich von Paulus's 6 Armee was fighting its way into oblivion at Stalingrad, Kammhuber asked not only for six hundred more ground control radars but for 150,000 additional men as well, a request that infuriated Reichsmarschall Hermann Göring. It would be 'cheaper to at-

GERMAN NIGHT FIGHTER DEFENCES
AND BOMBER COMMAND

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tack the British directly,' he observed, 'than to build up this gigantic organization.'[17]

The heavy investment in men and materiel necessary to create a nationwide Himmelbett network was one reason why, despite the recent improvements, there was dissatisfaction within the Luftwaffe with what Kammhuber had achieved by March 1943. Although the number of bombers shot down by fighters was growing steadily, it had not reached the 10 per cent of sorties which the Germans – looking back on their own experience during the Battle of Britain – believed was the point at which losses became intolerable. Moreover, night-fighter losses had also been climbing in 1942, and would continue to do so in 1943, rising sharply from thirty-one in February to forty-three in March, sixty-four in April, sixty-eight in May and June, and 107 in July. With the supply of new aircraft so limited, at this rate there would be no expansion of the night-fighter force, but, at best, only the replacement of battle casualties.[18]

There was also discontent with Kammhuber's unyielding commitment to ground-controlled interception. Unofficial experiments in pursuit (or route) interception, in which fighters were infiltrated by ground control into the bomber stream and then left to fly with it to the target, shooting down what they could on the way, had taken place in the fall of 1942, without much suc-

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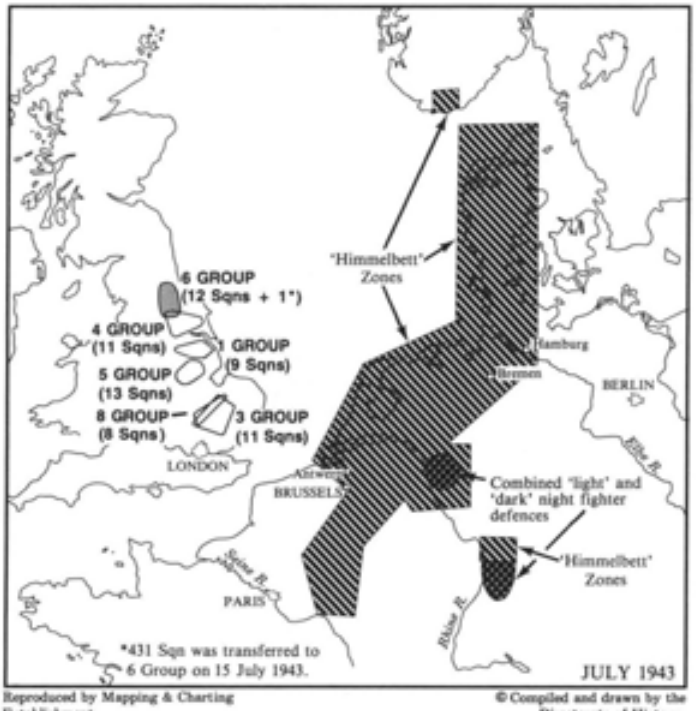

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cess. But the idea of what would come to be called Zahme Sau (Tame Boar) night-fighting was revived in the spring of the new year by Oberst Viktor von Lossberg, a former bomber pilot. Although he agreed that Zahme Sau was 'tactically correct,' Kammhuber rejected the idea for the moment, both because he did not want to weaken his Himmelbett organization and because he believed that, with the AI radar then available, it would be 'more or less left up to chance' whether crews would find the bomber stream and then individual bombers.[19]

Others, meanwhile, were urging Kammhuber to supplement Himmelbett with day-fighters (flown by former bomber and transport pilots) over the target at night, to take advantage of the illumination provided by searchlights and by the flares and target-markers dropped by Bomber Command. Kammhuber was unalterably opposed to such Wilde Sau tactics, seeing only the potential for chaos, but his reluctance to try new ideas was beginning to tell against him. 'For a year, our night-fighter system has remained at the same level, hasn't made one step forward,' Göring complained in mid-March; 'on the contrary, its successes have in fact become fewer and fewer … even at those places where the radars are located.' This was an exaggeration, of course, but that mattered little. Aware of Göring's opinion, in April Generaloberst Hubert Weise, commanding Luftwaffenbefehlshaber Mitte, told Major Hajo Herrmann,

a former bomber pilot and principal advocate of Wilde Sau, to test his theories just as the battle of the Ruhr was testing Kammhuber's ability to defend Germany's industrial heartland by relying primarily on Himmelbett.[20]

With the promise of reasonably good weather and skies, Bomber Command sent 442 aircraft to Essen on 5/6 March, including seventy-seven from No 6 Group. All told, the main force carried 1014 tons of bombs, five times the average taken to Essen a year earlier, and not much less than was dropped during the thousand-bomber raid on the city in June 1942. The target, even if attacked indirectly, was production from the Krupp complex which, despite all the raids so far, was still turning out tanks, bombs, and the highly effective, dual-purpose 88 millimetre anti-tank and anti-aircraft gun.[21]

The five main-force groups were informed that this was a special operation and they were told to take great care to find the red TIs which, it was predicted, should be 'within 100 yards of the aiming point.' Indeed, those who had not seen any red target indicators up to fifteen minutes after the scheduled start of the attack were to turn left, circle to the east, and begin a second run-in to the target. If all went well, the AOCs were told, 'this most important target will be entirely destroyed.' To emphasise the point, it was laid down that all crews for whom cameras could be made available would take photographs, while each squadron was to designate a senior pilot to report on what he had seen immediately on his return to base.[22]

Harris's insistence on obtaining so much information so quickly from so many sources betrayed his anxiety about Oboe's ability to support a sustained and effective campaign against the Ruhr. When the night was over he had much to be pleased with. To be sure, some things had gone wrong: three Pathfinder Mosquitoes had been forced to turn back because of technical problems; and fifty-six crews from the main force (12.6 per cent) returned early, among them eight from No 6 Group (9.2 per cent).[23] Yet the marking had been very good and the bombing, which took just under an hour, was well concentrated around the aiming point, with more than three-quarters of all photographs taken within three miles of it.[24] Crews, meanwhile, reported seeing a solid ring of fire about two miles in diameter, one describing the city as 'an immense pot boiling over.'[25]

Reconnaissance photographs taken the next day confirmed these assessments. 'Exceptionally severe and widespread' damage was reported, with the heaviest coming in the town centre, where it was estimated that three-quarters of the buildings had been damaged or destroyed. At Krupp, thirteen main buildings had been hit, and another fifty-three shops 'affected' by the attack, the Germans themselves estimating that about one-third of the complex was a 'total loss.'[26] The battle of the Ruhr had got off to a fine start, and the AOC-in-C later concluded that, with Oboe, 'the key to successful night raiding in the Ruhr, which Gee had failed to provide, had at last been found.'[27] Things had gone right even from the standpoint of evading the enemy's defences. Only 3.2 per cent of the total sorties dispatched failed to return, not bad for Essen on a nice spring night.[28]

Harris congratulated his crews in a typically vehement message.

> The attack on Essen has now inflicted such vast damage that it will in due course take historical precedence as the greatest victory achieved on any front. You have set a fire in the belly of Germany which will burn the black heart out of Nazidom and wither its grasping limbs at the very roots. Such attacks, which will continue in crescendo, will progressively make it more and more impossible for the enemy to further his aggressions or to hold where he now stands. The great skill and high courage with which you pressed home to your objectives has already impressed the inevitability of disaster on the whole of Germany, and within the next few months the hopelessness of their situation will be borne in upon them in a manner which will destroy their capacity for resistance and break their hearts.[29]

No 6 Group could certainly share in the triumph. It had a lower early return rate than the rest of Bomber Command; forty-one photographs, while showing 'little or no ground detail,' were assessed as being within the main area of concentration; and at least one night-fighter was beaten off. Its loss rate (three crews, or 3.9 per cent) was slightly higher than the overall figure, but the absolute number was low.[30]

The next three raids, relatively deep penetrations to Nuremburg, Munich, and Stuttgart, involved only heavy bombers and so limited No 6 Group's participation to the three Halifax squadrons, Nos 408, 419, and 405 – the latter having returned from Coastal Command and not yet left for No 8 Group. But as all three cities were beyond Oboe range and there was little or no moon, marking had to be done entirely by H2S. The bombing was not accurate, and only Munich suffered more than slight damage. Like the rest of Bomber Command, the Canadian squadrons emerged from the first two raids relatively unscathed, but Stuttgart was a different story. Of thirty-five Canadian sorties, five returned early and another five were lost, four from No 405 Squadron alone. There was also an alarming report from No 419 Squadron that one of its aircraft had been stalked and attacked by a Wellington, a verdict with which Bomber Command initially agreed, accepting the possibility that the Germans had salvaged and repaired a machine lost sometime earlier. Only later was it realized that the enemy aircraft was probably one of the new (and largely unsuccessful) Messerschmitt Me 210s.[31]

Following these three long-distance operations, Bomber Command returned to Essen on 12/13 March in another Oboe raid. No 6 Group dispatched ninety-three crews, of which seventeen returned early – four from No 424 Squadron – and three were lost. The raid was successful, however, with most bombs falling across the Krupp complex on the western side of the city centre. Five hundred houses were also destroyed.[32] After a week's hiatus from operations over Germany because of the full-moon period, and taking advantage of cloud predicted for the target, Harris chose on 26/27 March to attack Duisburg in an operation that went badly awry when five of the nine Oboe sky-marking Mosquitoes had to return early because of technical problems. The main force was left to do the best it could in an entirely unfocused raid, the participants

themselves reported that their bombing had been 'scattered over a considerable area of the Ruhr.'[33]

Then, at the behest of the War Cabinet and in line with the Casablanca policy of attacking Berlin 'when conditions are suitable for the attainment of specially valuable results unfavourable to the morale of the enemy or favourable to that of Russia,' there followed two raids on the German capital in order to 'rub in' the effects of Soviet Marshal S.K. Timoshenko's successful offensive at Smolensk. The first occurred on 27/28 March, just a day or so after Sergeant C.E. McDonald – a fighter pilot from 403 Squadron shot down near Lille in August 1941, who had just escaped from his prison camp – incredibly spent a day 'sightseeing' in the German capital as he made his way (successfully) to Gibraltar. He saw 'very little bomb damage' as he toured the city, and might not have seen much after the raid either. Involving a main force of 396 heavy bombers, including thirty-one Halifaxes from Nos 405, 408, and 419 Squadrons, the attack was judged a failure largely because the Pathfinders had marked two separate aiming points, neither accurately. The Germans recorded only ten high-explosive bombs falling on the city, yet perhaps because the bombing was so scattered there were two lucky hits. A troop train full of men on leave from the Russian front was struck, killing eighty and wounding one hundred; and a Luftwaffe stores depot eleven miles southwest of the city was destroyed, along with its radio and radar sets and components. Losses, fortunately, were low: nine overall, and just two from No 6 Group, although six crews returned early.[34]

The next raid on Berlin came two nights later, when 149 Wellingtons, half of them from No 6 Group, were also sent to Bochum. Both attacks failed miserably. Icing, very strong winds that the meteorologists had not predicted, and poor marking led the main force well south of the capital, while Bochum was spared on account of long gaps in the marking and (so far as the Canadians were concerned) because sky-marking had been selected instead of Oboe-assisted ground-marking. 'Comment on the operation,' No 6 Group reported, was 'generally subdued.' Bomber Command lost 6.4 per cent of the force sent to Berlin, and 8 per cent at Bochum. The news for No 6 Group was more depressing still. Just six of the twenty-three crews sent to Berlin had found the target, fifteen returned early, and two were missing. At Bochum, meanwhile, twenty-two returned early, and six were missing, just over 8 per cent of those dispatched. That brought the month's losses against German targets to thirty-three, 4 per cent of those involved – not a critical rate but one which, in light of the forthcoming transfer of No 405 Squadron to 8 Group and the formation of No 331 Wing, represented a considerable drain of experienced crews.[35] St Nazaire and Lorient were also bombed at this time in relatively small raids that turned out to be the last attempts to destroy the submarine pens there until 1944. No 6 Group sent 106 crews to St Nazaire on 28/29 March to flatten what was left of the town, and nineteen to St Nazaire and Lorient on 2/3 April. They reported accurate marking on both occasions, and the port areas of both towns were engulfed in flame. The U-boat facilities were not touched, how-

ever, and, as most of the civilian population had already been evacuated, there were few casualties.[36]

A sense of frustration had begun to replace the optimism engendered by the first few raids of the campaign against the Ruhr. Oboe was not doing as much as had been anticipated to increase the numbers bombing within three miles of the aiming point, while H2S was a major disappointment on the deep penetrations carried out so far. At Munich and Stuttgart it appeared that less than a third of the attackers had come within a three-mile zone. Yet, as High Wycombe's radar officer tried to point out, such grumbling about H2S was unreasonable. The equipment had been designed to 'enable bombs to be dropped on a specific built-up area,' he explained, and it was never intended that 'all aircraft using it could drop their bombs on a specific point within a built-up area.' But that was easier said than understood or accepted by Harris and his deputy, Saundby, and despite evidence to the contrary the battle of the Ruhr continued to be predicated on the assumption that H2S was sensitive and reliable enough to allow most crews to do significantly better than they were doing. When they failed to measure up, ineptitude rather than the inherent limitations of their equipment tended to be cited as the reason.[37]

No 6 Group participated in all ten of the major raids undertaken in April. Thick cloud predominated early in the month, forcing the Pathfinders to resort to sky-marking, but better weather later on allowed for reasonably accurate attacks on Mannheim and Stettin in mid-month, and again at Essen on 30 April/1 May. Indeed, at Stettin, a major port far to the east (in what is now Poland), the city's clear H2S response and good visibility combined to produce a concentrated attack in which 81 per cent of bombing photographs were taken within three miles of the aiming point. Immense fires were seen, one hundred acres of the central core were destroyed, and public utilities were knocked out for a week.[38]

Balanced against this success, however, was the egregious failure at Stuttgart, attacked on 14/15 April in 'good visibility with no cloud' and where 'the moonlight made the river and town identifiable.' RCAF crews reported that the 'marker flares were also well placed' and that, by the end of the operation, 'the whole town appeared to be a blazing mass.' But there was significant 'creep back' from the aiming point, and less than a fifth of the bombing photos were plotted within three miles of it. Things were even worse at Pilsen, site of the large Skoda works, two nights later. Despite a full moon, the Pathfinders somehow mistook an asylum at Dôbrany, seven miles away, for their objective, marked it thoroughly, and so produced a heavy raid on an otherwise sleepy Czech village on the Berouka river. The Canadians were fooled every bit as much as everyone else. 'In good weather with small amounts of cloud,' No 6 Group reported, '... the raid on the Skoda works appears to have been most successful. The works themselves were clearly identified and received the great majority of the bombs, although some incendiary bursts and one large fire were seen in the town.' (This may have been the German army barracks hit that night, clearly by accident, killing two hundred.) Even without such mistakes,

however, April was a cruel month for No 6 Group. Although the number of crews claiming to have attacked the primary target rose to 83 per cent, that was still the lowest rate in Bomber Command, and 7 per cent off the pace being set by No 4 Group. The early return rate also remained high, about 15 per cent of sorties.[39]

Much more alarming was the fact that the group's loss rate on these major raids had climbed to 8 per cent, while that for Bomber Command as a whole was 5 per cent, troubling enough in itself. Moreover, the most costly raids had come in quick succession. Eight crews were missing at Stuttgart, and another eight failed to return two nights later, four from Mannheim and four from Pilsen, the latter all from No 408 Squadron.[40]

Harris looked carefully at Bomber Command's performance throughout the month and grew increasingly unsatisfied. With bombing concentrated from four to five miles from the aiming point the attack on Stuttgart had been a complete failure, he observed on 16 April; and he was persuaded that his crews were allowing themselves 'to be misled' to the point that they would bomb 'any concentration' of fire or explosions (or decoys) without checking their positions.[41] A week later he complained that the main force was bombing early, even before No 8 Group had begun its marking,[42] and on 5 May he sent yet another rebuke to his AOCs, telling them that they must control their formations with a firmer hand.

> There is irrefutable evidence that some of the less skilled or weaker brethren fail to get into the target in circumstances which are inexcusable provided even an approximate ETA was kept and the captain was doing his best.
>
> There is also irrefutable evidence that if and when a determined and skillful effort is made by all members of a force of more than 300 heavy bombers to get into the average target almost complete destruction results.
>
> When, however, such efforts are not made or are not successful repeated visits to the same target have to be made with a resulting far greater incidence of loss affecting particularly the stouter and more skilled crews. This we cannot allow, and I must ask you … to stiffen up the procedure of cancelling [credit for] sorties [against completion of an operational tour] whenever negligence or lack of determination are suspect.
>
> We cannot allow our best crews to suffer avoidable casualties or the operational effort to be diminished by such negligence or lack of determination.

He was also concerned that too many crews were missing the aiming point because they were taking evasive action which, over 'hotly defended' targets, was 'meaningless.'

> The collision risk is seriously increased. It results in no saving of aircraft. Attempts by turning away to avoid *Flak* bursting ahead are just as likely to lead to a hit from other bursts off the original track. Violent evasive action makes it impossible for gunners either to see or to hit attacking fighters. Heavy bombers cannot 'outmanoeuvre' properly handled fighters. Finally, evasive action in the target area makes

accurate bombing impossible and necessitates, therefore, repeat attacks; these in turn lead to an overall higher total of casualties in achieving a given object …

I need hardly point out the vastly improved bombing which would result if in fact we find that evasive action does not pay and that a straight run across the target exposes the aircraft to less risk than the longer run caused by weaving or violent evasion.[43]

Harris soon had reason to be happier. Along with accurate raids on Turin and the Schneider armament works at Le Creusot, 170 miles south of Paris, Bomber Command on 16/17 May pulled off one of the great public-relations coups of the war. Nineteen Lancasters from No 617 Squadron, including twenty-nine RCAF aircrew, struck at the Möhne, Eder, Sorpe, and other dams in the Ruhr, breaching the first two and unleashing a spectacular, if brief, flood that reached as far as Essen. The supply of power to the Ruhr was interrupted and crops were destroyed but, 'measured against the frightful losses which the terror attacks caused in the German cities,' General Kammhuber recalled, '… the dam attacks were less significant,' a fact Harris may have admitted in his memoirs when he acknowledged that Operation Chastise was only 'one incident in the Battle of the Ruhr.' The Eder dam, for example, was not even an industrial or hydroelectric reservoir, while the Sorpe, probably the most important of all, was not given high priority. But nothing like this was said at the time, when it was important to think that Chastise 'must undoubtedly have caused great alarm and despondency in Germany.'[44]

Along with Chastise, and reflecting the continuing expansion of Bomber Command, High Wycombe undertook sixteen major operations averaging six hundred sorties each between 5 May and 24 July, when the battle of the Ruhr came to a close. Record bombloads were carried on 23/24 May, when 826 aircraft (including 662 four-engined machines) were sent to Dortmund; because of the better summer weather, estimates of the numbers bombing within three miles of the aiming point rose to as high as 80 per cent. On 29/30 May, when this figure was reached at Wuppertal because the Pathfinder backers-up (including No 405 Squadron) were able to fill the void left by gaps in the Oboe primary marking, the Barmen district suffered a ferocious attack which severely damaged or destroyed 8000 housing units, and it was felt that no new raids were required on that part of the town. At Duisburg, where Bomber Command had stumbled near the end of March, 77 per cent of 572 main-force crews were within the zone on 12/13 May. Given near-perfect marking, they devastated the city centre, damaging 18,000 houses, knocking out four steel plants, and sinking almost 19,000 tons of shipping.[45]

Josef Goebbels, Hitler's propaganda minister, confided ruefully to his diary that 'one does not need to be a great mathematician to prophesy when a large part of the industry of the Ruhr will be out of commission.'[46] Harris, for his part, was buoyed by the recent results and sent a quite different message to his crews than the one issued only a month before. After congratulating them for their work at Berlin, Stettin, Munich, and Nuremburg, he explained that 'all

that and much more has been merely incidental to your main task of destroying the Ruhr.'

In that you have largely succeeded already. Cologne is over half destroyed. Düsseldorf protests a lugubrious claim to be even harder hit. The Duisburg, Ruhrort, Hamborn complex is at least as busy licking its wounds as in war production ... Essen ... is shattered and for all practical purposes a dead city ... and as for Barmen – the night photo plot and what the crews saw together assure us of what will be revealed when the smoke blows away ... You have unhoused untold numbers and probably the majority of the key skilled workers in those areas and you are making conditions intolerable for all of them. The direct damage to war industries ... has had the most profound effect on every enemy warlike activity ... You will now proceed to knock him flat.[47]

Despite confusing marking on the 11th, when one Pathfinder Mosquito released its flares fourteen miles away, 83 per cent of the main force bombed within three miles of the aiming point at Düsseldorf, causing a fire zone of fifteen square miles, destroying sixty factories, killing 1189, and rendering 140,000 homeless. Results at Krefeld ten days later were much the same, with half the town centre (including 6000 houses) burnt out. The Eberfeld half of Wuppertal was hit hard by a very concentrated attack on 24/25 June, when 6000 houses were destroyed and a small firestorm was created over an area of almost three square miles. There were failures, of course, when cloud obscured the target or the Pathfinder marking was inaccurate or thin, but such was the size of the main force now being sent out that considerable damage could still be done even when the bombing was scattered. The most powerful illustration of this kind of serendipitous battering occurred on 28/29 June. Despite 10–10ths cloud and the late arrival of the Pathfinders, a scattered attack on Cologne killed 3400, destroyed 6400 houses, and knocked out forty-three factories – much greater damage than was done four nights later when 80 per cent of an even larger main force were plotted within three miles of the aiming point.[48]

In terms of the number of houses that could be destroyed, factories damaged, or civilians killed – 2900 in April, 7700 in May, 9100 in June, and 45,000 in July[49] – Bomber Command was becoming an increasingly effective bludgeon. But it was an unpredictable bludgeon, and an indiscriminate one as well. Not all factories were of equal value to the German war economy; not all the labourers who lost their houses were involved in crucial war work; and not all streets blocked by debris were important thoroughfares. In addition, although the Ministry of Economic Warfare (MEW) concluded that bombing was having an effect on all branches of the German economy by June 1943, it also noted that much of the damage to industrial premises could be compensated for by the surplus of plant capacity which existed in Germany.[50]

What MEW did not know was that Germany was just beginning to rationalize its war industries, so that some of the damage Harris was so ready to gloat about had been done to non-essential industries. After ten months of bombing,

perhaps as little as six weeks' production had been lost in the Ruhr. Moreover, the fall in output was only temporary: production in badly bombed areas often recovered within a month or two. More to the point, the dispersal of important factories, which had begun on a small scale in 1942, accelerated in 1943, so that Bomber Command's attacks on cities would be aimed at increasingly insignificant sectors of the enemy's economy. For these reasons, Albert Speer, Hitler's armaments minister, concluded that area bombing alone was not a major threat to war production. The 'dehousing' effort, by comparison, had more long-lasting and potentially serious effects, since there was no surplus stock of residential accommodation in Germany. People just had to 'double up'; but even though the number of homeless, and presumably miserable, German civilians was growing, postwar analysis of their morale suggests that its decline, while cumulative, began in earnest only in mid-1944, and even then could not be attributed only, or even primarily, to the bombing.[51]

Of more immediate concern, despite avoiding the full-moon periods so helpful to the Luftwaffe, Bomber Command's loss rate on these major raids had climbed steadily until it reached 5.4 per cent in June, while that for all night operations was 4.3 per cent. (For Stirling and Halifax crews, the rate was 6 per cent.) In attacking the Ruhr, Harris had taken on the strongest parts of Germany's air-defence system, and he had not won. [52]

For No 6 Group, May, June, and July 1943 were worse months even than April. Although the early return rate on major raids fell from almost 19 per cent in March to about 11 per cent in July, the percentage bombing the primary target remained the lowest in all of Bomber Command. While the groundcrews were doing better work and had reduced the number of technical failures leading to early returns despite the culling out of veteran technicians for No 331 Wing, a representative from the Royal Aircraft Establishment visiting the Canadians as late as September 1943 heard frequent complaints about 'the lack of adequately trained personnel' which, he observed, 'must result in poor servicing of equipment and an increase in the number of faults.'[53]

There were two distinct periods when No 6 Group's missing rate rose to 11.5 per cent – 11–13 May and 21–25 June – and the worst night of all for the group as a whole came on 12/13 May, when eight of sixty sorties (13.3 per cent) did not return from Duisburg. Night-fighters were out in force, but Flak was also very heavy. It claimed one of two No 426 Squadron crews lost that night, killing the second pilot,* but not before the navigator, Flight Lieutenant G. Miller, made a splendid effort to keep the Wellington airborne. 'With the hasty use of linen maps' he managed to mend the severed fuel lines and then 'spliced the elevator controls with aerial wire.' The pilot, as a result, was able to fly his crippled machine as far as the Belgian coast when, too much fuel having been lost, he ordered his crew to bail out.[54]

* Although bomber aircraft no longer carried two pilots as part of their regular crew, new pilots fresh from OTUs accompanied experienced crews on at least one raid before becoming operational with their own.

Six jumped, and five were captured. The sixth, Flight Sergeant O.W. Forland, the rear gunner, who in civilian life had been a riveter in an aircraft factory – and perhaps should not have been permitted to join the RCAF because of that – evaded capture. Landing in marshlands away from the rest, he quickly took off his flying clothes and began to head south. Suffering from a slight knee injury incurred when he hit the ground, however, he soon decided he could not continue, crawled into a ditch, and slept. Having recovered somewhat, he walked for twelve hours the next day until, seeing three German soldiers, he had to hide quickly.

In my haste to avoid them, I dropped and lost my second compass. That night I slept in the woods. Next morning, 14 May, I crossed the Spa-Stavelot railway line near Hochai. There I saw a working man. I can speak no language but English, but I showed him my [RAF] badges and he managed to confirm my opinion as to the points of the compass. A little later I came to signposts marked Malmedy and Liege. I followed the post marked Liege.

I now cut off the uppers of my flying boots, and bound the rubber soles to my walking shoes with strips torn from my [escape] purse. Though I realized the risk I ran, I decided to walk along the road even though [it was] in broad daylight.

About 1630 hrs I met a man pushing a bicycle. I showed him my map, and said inquiringly 'Liege?' He took me a little off the road, and indicated to me that I was twenty kilometers from Liege. He also was obviously warning me to avoid Spa, as it was full of German troops. He offered me one hundred Belgian francs, and eventually himself took me to an isolated farm nearby. Here I showed the farmer my identity discs, and was given food, and made welcome. Next morning, 15 May, a woman came to see me. She spoke to me in German and then in English, took away my identity discs, and asked me a number of questions about the aircraft, and the names of the other members of my crew. She seemed very doubtful of my identity. Finally I showed her some Canadian cigarettes, which appeared to convince her. Later she told me that had I been a German masquerading as a Canadian, I would not have resisted the temptation to smoke these myself.

She then removed my RAF uniform, and the farmer gave me civilian clothes. I retained my Oxford walking shoes [which were worn under the Canadian pattern flying boots]. I remained here till 1 Jun 1943. During this time I was photographed by the woman, who visited me several times. She told me that one member of my crew had been captured by a German forest guard immediately after landing, and had unfortunately told his captor that the crew comprised six persons instead of the normal complement of five. Since the Germans found one dead body in the aircraft, and later captured three other members of the crew, they continued to conduct a local search for the sixth man, who was myself. For this reason I had to spend a good deal of my time sleeping in the woods rather than in the farmhouse. The farmer told me that German m[otor]c[ycle] police with binoculars constantly patrolled the district during daylight.

On 1 June 1943 my subsequent journey from here was arranged for me.[55]

Forland left Gibraltar on 12 July and was back in England on the 14th, just over two months after bailing out.

Although he has left us no account of how he managed to move through occupied Belgium and France into Spain and thence to Gibraltar, he was not the first to follow this route, nor the last. Set up by a twenty-five-year-old artist, Andrée de Jongh, and her father Frédéric, an escape line under the aegis of British military intelligence (MI9) code-named Comet had existed in Belgium since 1941; Andrée and her father had personally escorted well over a hundred evaders from Belgium through Paris over the western Pyrenees to Spain. It is quite likely that Flight Sergeant Forland was aided by this group. If so, he was lucky on a number of accounts even if he had adhered to the advice MI9 gave to all aircrew: get clear of the landing area, avoid towns, and seek help at isolated farm houses and churches. The fact that he had to lie up the first night may have saved him from the initial German hue and cry. Beyond that, the Germans had begun to penetrate Comet in late 1942, arresting Andrée de Jongh and her sister early in 1943; probably just before Forland passed through Paris, Frédéric was betrayed and caught while in the company of five British airmen and an American. He was taken away and shot; the others were sent to prison camps. However, the de Jonghs had chosen their helpers carefully, and Comet lasted until 1944.[56]

Flak was an ever-present risk about which even veteran airmen could do very little. In most circumstances, a turn to the left or the right, a climb, or a dive could just as easily carry a bomber into the next burst as maintaining a straight course. Encounters with night-fighters were different. Even when using AI radar, the enemy could be eluded if seen in time and if the bomber took appropriate evasive action. Alertness was the key, yet it seems that it could not always be taken for granted over six or seven hours in the air. Pilots have recalled how they annoyed their gunners (but perhaps kept them alive) by frequently asking for situation reports. Help was forthcoming with the introduction of Monica in the spring of 1943. A tail-mounted radar which detected aircraft approaching from the rear and automatically emitted warning bleeps into the intercom, it took some pressure off the gunners. But because Monica did not differentiate between enemy fighters and other bombers in the stream, crews could not be absolutely sure of what was following them and some, at least, became twitchier than ever when, especially in highly concentrated attacks, their earphones chirped away continuously. A more discriminating device was clearly wanted, and, in part because of a brave and successful mission flown by five Canadians and an English wireless operator from the RAF's No 1474 Flight based at Gransden Lodge,* such equipment also became available in the spring of 1943.

Air Intelligence had long suspected that the enemy was using AI radar. Indeed, they even surmised that its frequency range was about the same as that of Würzburg – one reason why it was so hard to find – but until they had

* This seems an appropriate moment to recall once again that a majority of RCAF aircrew served in British or other Commonwealth squadrons during the course of the war. This history, which is concerned with the RCAF as an operational organization, regrettably does not normally recount their experiences.

obtained hard evidence of its existence and its performance characteristics there was little point in trying to develop appropriate counter-measures. The issue became more pressing in the autumn of 1942, when losses to fighters mounted as the Luftwaffe responded well to the bomber stream tactics introduced following the late May raid on Cologne. It took only a little persuasion to convince High Wycombe that it was worth the risk to send out reconnaissance aircraft as bait and to try to find the German AI through electronic eavesdropping.

At first this was done entirely independently of regular bombing operations, as specially trained and equipped crews flew off on their own over the Kammhuber line. Precisely for that reason, the effort failed. The Germans guessed what these probes were about and refused to be drawn. On the night of 3/4 December 1942, therefore, a different approach was taken. Pilot Officer T. Paulton's Wellington would accompany the bomber stream almost as far as Frankfurt, the main force's target for the night, and then veer north in an attempt to persuade the enemy that it was nothing more than a hapless straggler, ripe for the picking. The ploy worked perfectly. Shortly after the turn the bomber was picked up by a Lichtenstein-equipped Ju 88 whose AI radar was readily identified, and Flight Sergeant William Bigoray, the wireless operator, was able to send out two messages giving full details of the transmissions his crewmates were reading. However, they paid the price. The fighter closed in for the attack and, despite Paulton's best attempts to throw it off with violent evasive manoeuvres, his machine was hit several times before the enemy apparently ran out of ammunition. Four of the crew were wounded, two of them seriously; both turrets were put out of action; the engines raced dangerously at full boost, the throttles having jammed or been shot away; the starboard aileron was blown off; the hydraulics were wrecked; and the navigator could scarcely read his blood-spattered maps. Struggling with the controls, Paulton was nevertheless able to reach England where, having dropped Bigoray by parachute (the wireless operator's shattered legs could not cope with scrambling out of a downed machine), he successfuly ditched in the Channel off Deal on the Kentish coast. Bigoray landed safely and, together with the rest of the crew, who were quickly rescued, was able to confirm the data that he had transmitted while still airborne, north of Frankfurt.[57*]

Lichtenstein's wavelength had been found – it *was* in the same frequency range as Würzburg's – and on the basis of that information it was a relatively easy matter to produce Boozer, a passive receiver/detector tuned to the same frequency. Superior to Monica because it could not give off false alarms – with Boozer there was no doubting whether the targeted radars were being used – the device nevertheless had significant limitations. Responding as it did to both Würzburg and Lichtenstein, Boozer was no better than Monica in providing crews with specific and direct warning of an impending attack on their aircraft;

* Pilot Officer Harold Jordan, RAF, who had initially discovered the Lichtenstein transmission and who was blinded during the engagement with the Ju 88, received the DSO; Paulton and Pilot Officer William Barry, the navigator, received the DFC; and Bigoray and Sergeant Everett Vachon, the rear gunner, were awarded DFMs.

and wherever the Flak was radar-directed, Boozer was just as likely as Monica to give off a continuous – and consequently useless – alarm. And, of course, it produced no warning whatsoever of the approach of fighters that were not using their radar, or had none to begin with.[58]

The twin-engined fighters that were the mainstay of Himmelbett made extensive use of radar. On 3/4 July, however, something new was introduced, as single-engined fighters without any radar were encountered in strength within the Kammhuber line.* 'Warned by MONICA that an aircraft was closing in,' Warrant Officer G.F. Aitken, rear gunner in a 419 Squadron Halifax, directed his pilot 'to dive, climb and bank to port and starboard so I would have a fighter search.'

I could see nothing. The pips from MONICA became more rapid so I told the pilot to do some violent evasive action. At the same instant a Me 109 came in from port quarter from underneath and fired a medium burst. [I] told the pilot to dive and corkscrew. The front of the aircraft was hit. The fighter broke away to starboard, [and] when he got above [the] horizon I got a glimpse and fired [a] short burst. The pips became rapid again and I told pilot to dive port. The fighter broke away to starboard and climb[ed], when he got above [the] horizon I pressed the tit but all guns refused to fire. I immediately cocked two guns, when the pips became more rapid once more. I told pilot to dive port once more, and the fighter fired medium burst which missed our aircraft. Fighter broke away to starboard and climbed. I got [a] bead on the E[nemy]/F[ighter] but guns would not fire. I told pilot to climb starboard and cocked the other two guns and at same time [a second] E/F came in from below and astern and fired long burst which hit starboard outer [fuel] tank which immediately broke into flame. The guns refused to work on this attack also. All incidents happened approx. [twenty miles] north of Brussels. Guns were tested over sea and worked perfectly.

The pilot ordered his veteran crew to bail out, but he and two others did not get clear. The five who did were captured, and 419 lost eight men whose average experience was over twenty missions.[59]

No 419 had been something of a hard-luck squadron over the past few weeks, losing twelve crews – a little over half its establishment – in just over a month and twenty-two (on attacks on German targets) in four. No 408 lost even more, twenty-eight, over the same period, while Nos 428 and 429 had just under twenty crews each fail to return. The other RCAF squadrons, all of which had either been taken off operations while they converted to new types or had entered the battle late, lost fewer than fourteen.[60] No commanding officers were replaced as a result of these casualties, however, because, quite sensibly, losses were just one of a number of factors including discipline, morale, serviceability, and accident rates, as well as the number of early returns, that were considered when decisions of that sort had to be taken.

* These single-engined fighters were part of the Wilde Sau experiments being conducted by Major Hajo Herrmann, and Herrmann himself recorded his first victory this night.

However, No 6 Group's loss rate as a whole over Germany since early March – 8.8 per cent – was cause for concern and, as we shall see, it kept operational research scientists at High Wycombe and Allerton Hall busy for a number of months. Focussing completely on Canadian participation in the battle of the Ruhr not only distorts what RCAF squadrons were doing, however, but exaggerates the risks they ran. Of the 911 aerial mining sorties flown by No 6 Group in 1943, 258 came during this period.[61]

By the end of 1942 it was estimated that Gardening had sunk or damaged 340 ships (in fact, the number was 383). Furthermore, minelaying had forced the enemy to divert considerable resources – perhaps as many as 500 ships and 20,000 sailors and technicians – to finding counter-measures, had delayed the sailing of coastal convoys, and had caused them to be routed away from recently mined areas.[62] It had slowed delivery of raw materials to industry in the Ruhr and had interfered with the supply of men and materiel to the Eastern front. At the same time, aerial mining remained a favourite method of easing new crews, squadrons, and even No 6 Group itself into operations. Beyond that, Gardening was a useful foil that allowed Harris and Portal, when asked by the Admiralty to do more for the navy, to reply that Bomber Command was already doing enough. In 1943, therefore, Bomber Command undertook to lay at least 1000 'vegetables' a month.[63]

Although far removed from the heart of Germany's air defences, minelaying was not always easy or entirely free of risk. The most important 'gardens' were located in the main shipping channels where the water was neither too shallow (under thirty feet) nor too deep (over one hundred feet) for the effective employment of mines. But unless the minefield was within Gee range, it was not possible to pinpoint the target area without working from a reference point on land, preferably no more than twenty miles away. When crews could not find their reference point, from which they made a timed run to the 'garden,' they were instructed to bring their mines back or (if that was was not possible) to drop them 'safe' in deep water at least seventy miles from Britain.[64] Since Gardening sorties were often scheduled when the meteorologists' forecasts for inland objectives were unpromising, and weather systems often extended from central Germany to the far north, groundcrews sometimes had considerable unloading to do. On 27/28 April, for example, twelve of thirty No 6 Group sorties returned early, having failed to find their pinpoint; and on 21/22 May, five of seven from No 429 Squadron came back fully loaded.[65]

Until March 1943, mines had to be laid from 4000 feet or below for the sake of accuracy and because of the weapon's arming mechanism. Considering the weight of small-calibre Flak the enemy had positioned in the north, particularly to defend Kiel, Lübeck, Rostock, and Stettin, the narrow channels around the Baltic islands, and the mouth of the Elbe, flying at such altitudes was dangerous. On 15 March, modifications having been made to the inner workings of most mines, the maximum altitude for Gardening was raised to 6000 feet – with the proviso that this should not serve as an excuse for inaccuracy. Whatever additional protection that provided was short-lived, however, as a

new type of mine incorporating acoustic and magnetic triggering and firing mechanisms to make minesweeing more difficult was introduced in April, and it had to be planted from between 1000 and 3000 feet.

Coincidentally, at about this time it was realized that flying so low involved risks besides Flak. Accurate altimeter readings depended upon the correct atmospheric pressure being set in the device, but as crews passed through frontal zones, particularly near and over the ocean, atmospheric pressure was found to change enough to throw the altimeter off by as much as four hundred feet. Some crews had crashed because of that. Others, having had close calls and subsequently overcompensating for them, flew higher than they should. Beginning in May, then, everyone was issued with new pyrotechnics – 'Calibrators, Altimeter Flash'- which they were to release whenever they had any doubts about the veracity of their altimeter reading, enabling them to make corrections if there was a discrepancy.[66]

No 6 Group mounted 111 Gardening sorties on six nights in March 1943, and 103 on six nights the next month. Most of these were aimed at U-boats operating from the Biscay and Brittany ports, and they culminated in a large operation (Pruning, 160 sorties) on the 27th/28th. The next night the focus shifted to the Heligoland Bight and the Baltic. In Operation Weeding, Bomber Command flew 226 Gardening sorties, of which thirty-seven were by No 6 Group crews. Meant to complement the sustained offensive on the Ruhr as well as the recent heavy bombing raid on Stettin, Pruning and Weeding were tremendously successful, accounting for twenty-four ships sunk and damaged. There were also reports that all ships on the Elbe–Hook of Holland route subsequently sailed with a 'numbered wreck-buoy attached,' to facilitate quick salvage. Although Pruning occurred almost without incident, Weeding took crews close to intense Flak over Heligoland and around the mouth of the Elbe, claiming most, if not all, of the twenty-two aircraft (10 per cent) lost. In No 6 Group three failed to return (8 per cent), two of them from No 428 Squadron.[67]

Bomber Command (and No 6 Group) could not afford many nights like 28/29 April. Even special Gardening operations like Weeding were meant to ease freshman crews and new squadrons into operations – and to provide useful, but relatively safe, employment for older aircraft unfit to be risked on deep penetrations. They were not supposed to cost over 10 per cent of sorties dispatched. With the coming of summer and its shorter nights (when the risk of interception was greater), and given all the indications that the German defences in the Baltic had been strengthened, the intensity of minelaying fell off; much of it was now restricted to operations against less heavily protected French Biscay and Britanny ports. As a result, only three crews from No 6 Group went missing between May and July, 2 per cent of sorties, bringing the overall Gardening loss rate since February to 3.8 per cent.[68]

The relative success of recent minelaying operatins was about the only good news to arrive at Allerton Hall, for No 6 Group's performance in almost every category was among the worst in Bomber Command. Serviceability hovered

TABLE 4
Bomber Command Loss Rates on Night Operations, by Group, February–July 1943

	Percentage of sorties dispatched					
Group	No 1	No 3	No 4	No 5	No 6	No 8
February	1.4	3.3	1.3	2.7	1.8	1.4
March	2.1	3.2	2.9	2.2	2.8	3.7
April	4.4	5.1	5.4	3.2	5.1	5.2
May	3.4	5.3	5.7	3.8	6.8	3.5
June	4.8	4.9	4.4	3.8	7.1	5.1
July	2.5	3.8	3.4	2.7	4.3	2.7

around 60 per cent; the number of crews lacking in moral fibre and declared to be 'waverers,' although only .45 per cent in June, was the second highest in the command; and the number of Gee sets unserviceable at any given time was about 15 per cent, 6 per cent higher than the next worst group, No 4. Similarly, while the number of crews reporting they had attacked the primary objective on Gardening and bombing operations rose slowly but steadily from April's 83 per cent to 89 per cent in July, all other main-force groups did better.[69] The clearest and most disturbing data, however, related to casualty rates (see table 4).

All this evidence suggested very strongly that something was wrong in the Canadian group. Growing pains had been anticipated, of course, and by no one more than the AOC-in-C himself, who already had his doubts about the competence of senior dominion airmen: 'A serious aspect of the matter is the very poor type of Commanding Officer which the Dominions seem to produce. Mostly hangovers from a prehistoric past. At the best they are completely inexperienced, and at the worst they are awful. I heard a comment the other day that the Canadian fighting crews were venting strong objection to being commanded by officers whose experience was limited to "six months flying training and 28 years political intrigue."'[71] Harris was undoubtedly indulging in exaggeration to make his point, but his concern was not entirely unfounded. With such small pools of prewar regular officers to pick from, dominion air forces, including the RCAF, were hard-pressed to provide individuals whose service backgrounds approached those of their British counterparts. Brookes, unwittingly, may have reinforced his AOC-in-C's suspicions. As late as April 1943, a month after the battle of the Ruhr began, the Canadian AOC observed that while the other group commanders arrived for a conference at High Wycombe 'armed with heaps of charts and graphs,' he took nothing, 'and in listening ... picked up plenty of information.'[72] While Brookes's willingness to learn was admirable, the impression it left with Harris may have been counter-productive.

There are also indications that early in the life of No 6 Group Brookes and his staff, like ambitious schoolboys eager to impress, tried to compensate for their lack of professional standing by doing more than they were asked to do. In January and February 1943, for example, the Canadian AOC boasted to his

diary that he had committed more, and sometimes many more, crews to individual operations than High Wycombe had asked for. The same desire to please and impress – and to get results when others could not or chose not to – may explain why, during the same period, operations were cancelled (because of weather) much later in the day by Brookes's headquarters than they were by other groups farther to the south, where flying was almost always less risky in good or bad conditions. The medical officer from No 420 Squadron was certainly aware of this tendency and complained that, by holding squadrons at readiness until the last moment, hoping they might fly despite already bad or deteriorating weather, the AOC was placing the glory of his group first rather than concerning himself with flying safety or the additional strain he was causing his crews on an almost daily basis.[73] It was also possible that No 6 Group headquarters lacked the confidence to decide when the weather was too bad to permit operations.

Whatever the reason, both practices had ceased by April, so they cannot be held accountable for the heavy losses sustained during the later stages of the battle of the Ruhr. By then, however, other problems had come to light. For one thing, the impression that Canadian squadrons would invariably receive 'obsolescent equipment' was so well entrenched that it was seen not only to have an 'adverse effect on … morale,' but also 'to produce a lack of desire on the part of RCAF personnel to serve in Canadian units.' (There was little truth to this perception, but like many such intuitive beliefs it was difficult, if not impossible, to counter.) At the same time, the group's flying accident rate remained high, even after squadrons had a chance to settle into their new stations where – the point is worth making one more time – 'with the hills at 1,200 to 1,500 feet five miles on our east side, and others at 1,800 to 2,400 feet on the west side only twelve miles distant, descending simply on [radio] contact was a chancy business.'[74]

However, Brookes and his senior staff officer, Air Commodore C.R. Slemon, were persuaded that the root cause of accidents was bad flying discipline. That also seemed to explain No 6 Group's higher losses: ignoring the routes laid down by command, too many pilots were straying from the protective cover afforded by the bomber stream. At the same time, however, one of the OTUs backing the Canadian group was complaining that navigators recently graduated from the BCATP and arriving from Canada were not only slow in chart work, astro-navigation, and map-reading, but that the pilots they teamed up with had little sympathy for navigational burdens - an endemic problem, it seems, since the same criticism had been voiced for some time. Harris's suggestion that, in addition to all this, some Canadian crews had 'unjustifiably failed to press home their attack' was undoubtedly the most damning and worrying comment on No 6 Group's operations. Admitting that squadron and station commanders had doubts about the 'keenness' of some of their crews, the AOC replied they would be more vigilant in identifying those who were failing to pull their weight.[75] Greater attention would also be paid to the tactics of bombing and evading enemy defences, something Brookes agreed had been neglected.[76]

As they cast about to find the reasons for No 6 Group's comparatively lacklustre performance to the end of May, the AOC and his staff quickly recognized the significance and the implications of the absolute (and relative) inexperience of their airmen. If, as was generally acknowledged, crews did not reach their peak efficiency until half-way through their first tour, then the Canadian group had 'a great weakness of operational experience' which was bound to affect performance. More than half had flown fewer than ten operational sorties, Brookes told High Wycombe's air officer for training on 3 June, and three-quarters had yet to reach their fifteenth, in large measure because of the requirement to post experienced RCAF flying personnel to No 331 Wing.[77] Since losses were heaviest among the least experienced crews, he scarcely needed to add, the higher toll would probably continue.

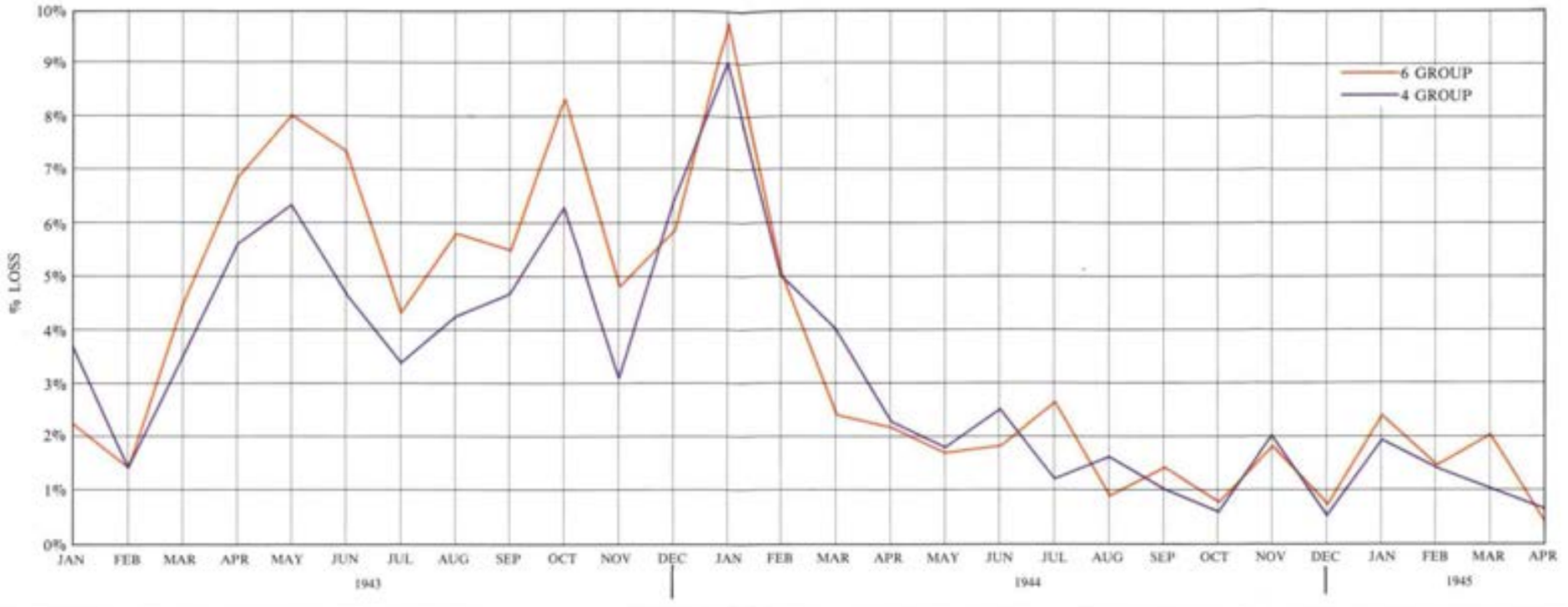
Brookes's statistics could not be gainsaid, and the direct relationship between loss rates and inexperience was well known, but for some reason Harris was not satisfied with the AOC's responses and he asked his operational research section (ORS) to look closely at No 6 Group and to find explanations for everything that seemed unsatisfactory. Quite correctly, the ORS maintained that studies of this sort could not be undertaken in isolation: the Canadian group's northern location and the types of aircraft it flew were obvious variables likely to influence its performance. Accordingly, the ORS decided from the outset to compare No 6 Group's data with that of its closest neighbour, No 4 Group, which also happened to be flying Wellingtons and Halifaxes.

The ORS draft report submitted on 10 July 1943 raised the possibility that there were significant differences between the two groups over which their AOC's had some measure of control and influence. Not only had the Canadians' loss rate increased 'both absolutely and in comparison with that of No 4 Group,' but they were also being attacked more often by night-fighters. Although that could be attributed to the fact that No 6 Group entered the main bomber stream 'very close to the enemy coast' on missions to the Ruhr and so benefited less from its concentration – a situation attributable to the group's northerly location – the ORS speculated that the Canadians were employing 'inferior' tactics.

No 6 Group's early return rate was also cause for concern, particularly the large number caused by problems with oxygen supplies, guns and turrets, and icing. These, it seemed, could be the result of widespread deficiencies in maintenance and training stemming in part from the Canadians' failure to make good their early instruction at the hands of No 4 Group. Echoing Harris's remarks, the ORS suggested that early returns might also reflect 'lowered morale' in the group, but because of the incomplete nature of the evidence the scientists did not want to draw firm conclusions. On one issue, however, they agreed with Brookes. Although there was no obvious reason why Canadian Halifax losses were so high, the sudden jump in Wellington losses from 4.4 per cent in April to 7.1 per cent in May and 9 per cent in June had much to do with the combing out of experienced crews for No 331 Wing in North Africa.[78]

Raising almost as many questions as it answered, the uncompromising language in this speculative report was too tough for Air Vice-Marshal R.H.S.

LOSS RATES, BY GROUP, ON HALIFAX NIGHT OPERATIONS, JANUARY 1943 - APRIL 1945



SOURCE: Air Force Headquarters, Operational Research Centre, Losses; heavy bomber operations in Bomber Command: HQS. 19-17-6, vol. 1. DHIST 79/220.

LOSS RATES, BY GROUP, ON LANCASTER NIGHT OPERATIONS, JANUARY 1943 - APRIL 1945

Saundby, Harris's deputy, to send to Allerton Park, and Brookes received a carefully edited and revised version. Although its thrust remained essentially the same, the language of some of the more contentious points was softened considerably. The 'inferior tactical handling' of No 6 Group became 'a difference in their tactical doctrine'; the new draft referred to a 'lowering of the standard in training' rather than generally deficient training; and instead of suggesting that the Canadians had 'failed to make good' their instruction under No 4 Group, it spoke only of a 'lack of training.' Most significantly, however, the unambiguous statement that the transfer of crews to No 331 Wing had hurt the group was altered to allow only that it 'may have caused a drain of experienced crews.' In that respect, Saundby may well have wanted to undercut Brookes's argument that the withdrawal of squadrons to North Africa, the result of a British initiative, had been the primary reason for No 6 Group's problems.[79]

The ORS had not explained what differences there were in the tactical handling of Nos 4 and 6 Groups and, in fact, the researchers had acknowledged that there were similarities in the operational instructions the two headquarters passed on to their squadrons. Both told their crews to strive for height, a natural thing for them to do anyway in order to avoid Flak and hide from fighters among the Lancasters. But once No 4 Group determined that fully loaded Halifaxes had little tactical freedom because they were bound to an 'excessively' narrow height band, it quickly reduced their bombload by as much as a ton. Introduced at a time when No 6 Group losses were soaring, information about this change in procedure seems not to have been passed on to the Canadians by either No 4 Group or High Wycombe. Instead, echoing the old formula about bad flying discipline in the RCAF, the only specific advice given to Brookes was that there was too much 'straying from the main bomber route' in his group and that the 'greatest improvement may well be obtained by giving close attention to this point and thus improving the concentration.'[80]

Canadian authorities did not take the ORS study lightly when they first received it. Air Marshal Edwards, for example, thought that No 6 Group might have to be withdrawn from operations altogether until a logical solution could be found, while Brookes admitted that 'causes under our own control,' including 'weakness in navigation' and in the techniques of evading Flak and fighters, were responsible for at least some losses. After looking at the data more closely, however, the AOC became increasingly convinced that he had been right in the first place and that his group's lack of experience was primarily responsible for most of the problems identified by the ORS. Furthermore, when the waverer rate dropped to .13 per cent in August, the lowest of all the night-bomber groups, Edwards began to think the same, telling Brookes that 'we can pride ourselves on being in a rather happy courageous state.'[81]

Again at Harris's prompting, the ORS conducted a second study which by and large confirmed what Brookes was saying. A third study, completed in October, provided additional proof that Brookes's original assessment had been correct. The conversion of a number of squadrons to Halifaxes had been an unhelpful distraction at best, while 'a large part of the increase in Wellington

losses after the end of April was due to the influx of new crews … consequent on sending three squadrons overseas' and to the fact that 'pilots not considered good enough to operate heavy aircraft may find their way to Wellington squadrons.' As for the Canadians' tactics, the ORS concluded that while 'frequent straining after maximum height … appeared to be of rather doubtful merit,' Brookes's operational plans nevertheless 'appeared to be sound … to differ only slightly from those adopted by 4 Group … [and] on the whole … there is no reason to suppose that the tactical planning of the Group is inferior to that of other groups.'[82]

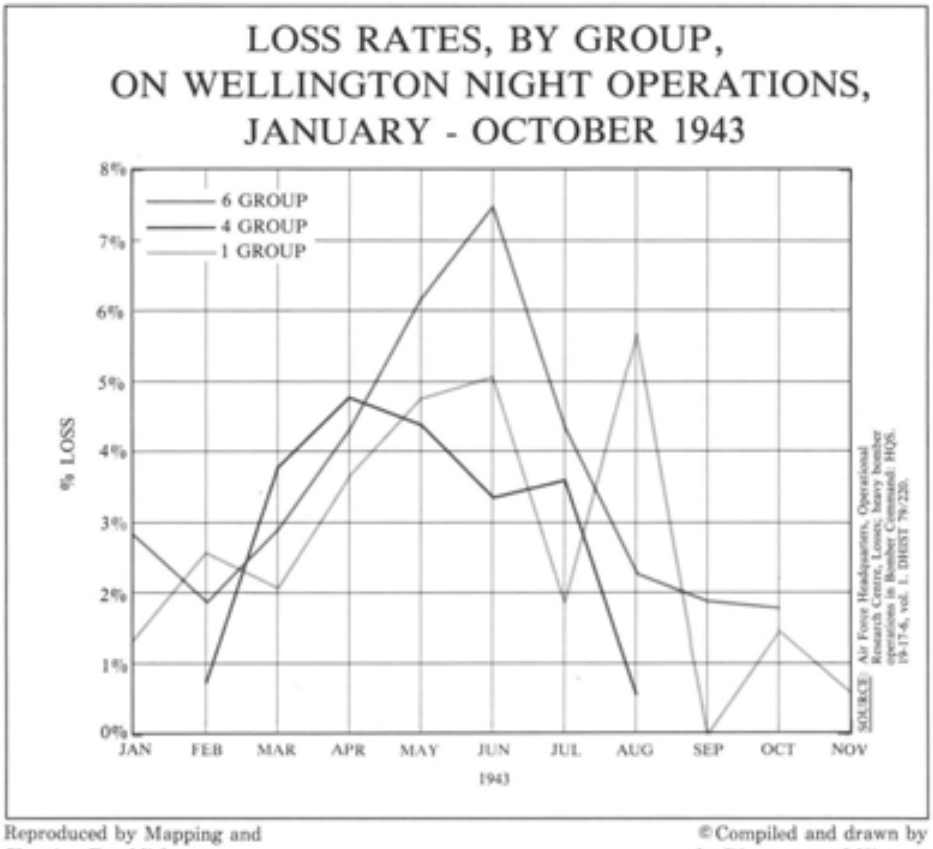
The formation's brief history might still be a handicap. 'Many of the Group Air Staff and Specialist Officers are comparatively inexperienced at their work,' the report concluded,

> and although it is not suggested that this has led to bad results, the realisation of the fact by themselves and in the squadrons may have retarded the development of a real confidence in the Group tactics and general policy.
>
> What this means in terms of measurable actions is hard to say but there appears little doubt that a Group under a Commander and Air Staff who have already reputations for success and containing squadrons with a long period of steady development must be more successful than a Group which has only had a short history and which has been perpetually distracted by growing pains …
>
> Probably the best thing to be done for the Group is to let it alone giving the Commander an assurance that his past difficulties have been due to 'teething troubles' and that he should now be able to settle down to develop a well-knit efficient Group.[83]

A parallel inquiry conducted by the operational research organization recently established at RCAF Overseas Headquarters agreed in general with these conclusions, but found additional reasons for No 6 Group's tribulations: the frequent changes of station that accompanied conversion from medium to heavy bombers; a 'sudden' influx of Canadian groundcrew 'relatively untrained in handling certain parts of operational aircraft'; and the formation's northerly location. All but the latter, it concluded, should be resolved with the passage of time.[84]

That seemed to have happened as early as January 1944. No 6 Group's Halifax loss rate was now lower than No 4 Group's, and its Lancaster II loss rate was lower than No 3 Group's. Indeed, the Canadians compared unfavourably with other groups only when operating against targets in the Ruhr and southern Germany, in which case the fact that their bases were 'at the extreme north of all the bomber groups' was assumed to have had 'an adverse effect.' It had taken a number of months, but now at least there were satisfactory answers for what had happened during 1943's battle of the Ruhr.[85] Of them all, inexperience had been the most important.

That was all very well, but another issue lay just below the surface of all these discussions which, in the context of Canadian casualties, no one was eager to raise. Even if No 6 Group's data had been as good as No 4's, Halifax crews still stood a significantly greater chance of being shot down than Lan-



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caster crews. That was not news to Harris. Aware of the disparities in missing rates between the two types since at least the summer of 1942, he warned the Air Ministry on 30 December of that year that Bomber Command would be 'sunk' unless the Halifax Mark II and V were modified in the immediate future and steps were taken to replace them with Lancasters and Halifax Mark IIIs, a type for which the AOC-in-C still held out some hope. He did not expect much from Sir Frederick Handley-Page, who, he complained, was 'always weeping crocodile tears in my house and office, smarming his unconvincing assurances all over me and leaving me with a mounting certainty that nothing … is being done to make his deplorable product worthy for war or fit to meet those jeopardies which confront our gallant crews. Nothing will be done until H-P and his gang are also kicked out, lock, stock, and barrel. Trivialities are all that they are attempting at present, with the deliberate intent of postponing the main issue until we are irretrievably committed.' Moreover, he did not think that anything could be achieved through 'polite negotiation with these crooks and incompetents. In Russia it would long ago have been arranged with a gun, and to that extent I am a fervid Communist! If I write strongly it is because I feel strongly, as I know you do, for the