REAPING THE WHIRLWIND – BOMBER COMMAND'S WAR

By Mr Sebastian Cox

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Abstract:
"For they have sown the wind, and they shall reap the whirlwind", Hosea vii, 7.

There is a vast and ever expanding literature on the Combined Bomber Offensive and Bomber Command's part within it. It was, is, and will remain, a subject of intense debate and controversy. It was a complex and ever changing campaign which spanned the six years of the War, almost from the first day to the last. This article cannot hope to cover all the many technical, tactical and strategic changes and the twists and turns of changing fortunes but hopefully it will help to establish a broad understanding of Bomber Command's struggle and achievements, as well as some of the factors which lay behind the decision making of those involved.

INTRODUCTION

On 18 December 1939, some six weeks after the start of the Second World War, a formation of 22 Vickers Wellington bombers led by Wing Commander Richard Kellett approached the German naval base at Wilhelmshaven. Their intent was to strike German naval units at anchor, though they were specifically forbidden to attack warships moored alongside the quays. The formation from 9, 37 and 149 Squadrons had flown in more or less a straight line from the UK and were detected by an experimental German *Freya* radar whilst still 114 kilometres short of their target and thus, despite the fact that Germany did not at that point have a sophisticated Command, Control and Coordination (C3) system in place, it was not difficult for the *Luftwaffe* to effect an interception. The defending Messerschmitt Bf 109 and Bf110 fighters made short work of the Wellingtons. In order to minimize the threat posed by the Wellingtons' defensive armament, the fighters mostly made beam attacks, or fired cannon shells into the bombers from outside the range of the latter's rifle-calibre .303 machine guns. The rear turret of Wellington N2983 of 9 Squadron was hit and the gunner killed and another shell tore the bottom from the front turret. The front gunner, AC2 Charlie Driver, remembered looking down and seeing the sea beneath him. Twelve of the 22 Wellingtons were shot down and three more were written off on landing. A previous raid had seen five out of twelve Wellingtons lost.[1] A loss rate of 50% on raids which had not even penetrated beyond the enemy coastline was militarily unsustainable and raised some very fundamental questions.

These early raids tell us as much about the RAF's pre-war assumptions, doctrine, equipment and planning (as well as the British Government's attitude and concerns) as they do about the efficiency of the *Luftwaffe*. RAF pre-war doctrine emphasised the strategic bomber, or more accurately, the view that aircraft were essentially an offensive weapon. This was, in and of itself, not an untenable view, and it did not, as some commentators have suggested since, indicate that RAF doctrine excluded any form of defensive or tactical employment of air power. However, many of the more comfortable assumptions underlying the RAF's policy and doctrine were seriously undermined by these early and unsuccessful raids. The RAF, in large part because of exiguous inter-war budgetary provision, took the view that providing escort fighters for bomber aircraft was ineffective and potentially reduced the number of bombers.[2] As early as 1923, when discussing the policy for future expansion within a fifty-two squadron ceiling, Sir Hugh Trenchard as Chief of the Air Staff (CAS) had ruled that 'no special long-distance fighter squadrons can be raised to escort our bombing squadrons' and that the bombers ought 'to defend themselves'.[3]

The events of December 1939 showed pretty conclusively that, by day at least, the supposition that, by maintaining tight formation discipline when under attack, the bombers could ward off fighter attack and fight their way through to a target was illusory. The lesson was to be relearned by the USAAF in 1943, when the same fate befell

very much larger and more heavily-armed formations of B-17 Flying Fortresses attacking the ball bearing plants of Schweinfurt, deep inside Germany. It was not, however, simply pre-war tactical policy which was brought into question. If tactical penetration was impossible, then the strategic offensive on which much of the intellectual edifice of the inter-war RAF doctrine was built was also in question. In addition the Government itself, at least temporarily, had undermined the doctrine of strategic bombing. The Wellingtons were only permitted to attack warships at anchor in the roadstead and not those alongside in dockyards. This was because the Government was anxious to avoid any form of reciprocal strategic attack on the UK which it regarded, not without reason, as being more vulnerable than Germany. It did not wish any bomb to hit German soil because it feared starting a bombing 'competition' it felt it could not win. Despite the fact that the pre-war expansion of the RAF, and in particular Bomber Command, had in part been predicated on its capacity to deter German air attack, it was thus effectively the British Government which was deterred initially – in the phrasing of the day, it drew an analogy to bare-knuckle fighting and would not be the first to 'take the gloves off'.[4]

Before the War, Bomber Command had drawn up thirteen separate plans for war with Germany, designated the Western Air Plans, or WA1 to WA13. The most important were: WA1 – attack on the German Air Force and aircraft industry; WA4 – attack on German communications, especially if Germany invaded France or the Low Countries; and WA5 – attack on German industry, especially the Ruhr. This was the first time that the RAF moved from the realm of what might be termed 'doctrinal speculation' to that of serious operational planning. The results were not encouraging. The then AOC-in-C of Bomber Command, the fiercely analytical Sir Edgar Ludlow-Hewitt, calculated that in a concentrated attack on Germany he would lose his entire force in seven and a half weeks.[5] The dense communications system of Western Germany meant the planners calculated that WA4 was unlikely to cause significant problems to German military moves and that the bomber force would suffer heavy casualties. WA1 would simply take too long to have any serious impact on the *Luftwaffe* in the event of a German air offensive against the UK. If Bomber Command could thus not directly affect the outcome of German attacks in the air or on land this left only WA5, the attack on industry, which itself most closely accorded with RAF pre-war thinking and doctrine. Here an air of unrealism infected the planners. They calculated that attacking 19 coking plants and 26 power plants in the Ruhr would paralyse Germany's war-making capacity and would require 3,000 sorties and cost 176 aircraft.[6] War would soon show that, even had the bombers been able to find the 45 plants, it would require far more than 3,000 sorties, that is 66 sorties per plant, to destroy them.

The Government's reluctance to be the first to initiate strategic bombing on the outbreak of war meant that the only pre-war plans that could be implemented were WA7, the attack on German warships in Wilhelmshaven, and WA14, the dropping of propaganda leaflets, hence the raid of 18 December 1939. That Bomber Command was woefully

unprepared for war cannot be denied, and for the first three years of the War, its ability to inflict significant damage on Germany itself was severely limited. The German offensive in the West opened on 10 May 1940 and saw the 'gloves come off' and the critical situation quickly led the War Cabinet to authorise Bomber Command to implement an offensive against the Ruhr, with oil targets at the head of the list of priorities. Bomber Command thus embarked on the offensive which was to absorb the major part of its attention for the next five years. Its early operations were to expose notable weaknesses in its aircraft, equipment, weaponry, training, tactics and procedures. Its only marked success in the next two years was paradoxically its contribution to the defensive victory in the Battle of Britain, where, in attacks on Channel ports in France and the Low Countries, it sank between ten and twelve per cent of the German barges assembled for the putative invasion of Britain and helped reinforce the considerable doubts of the *Kriegsmarine* concerning the wisdom of invasion. But the continental ports were close to Britain and, like all coastal ports relatively easy to find from the air, did not require penetration of enemy territory and were defended only by flak and not night fighters. They were, in other words, relatively speaking an easy target.

Over Germany, however, it was different, and the Command was almost entirely ineffective. Crews struggled to find their targets in the dark, to hit them even if they found them, and to damage them with the ineffective bombs they carried even when they did. The gross over-optimism of crew reports and the inadequacies of bomb damage assessment in the early years were cruelly exposed when the first detailed analytical assessment of bombing results was undertaken by a Cabinet Office official in August 1941. The so-called Butt Report showed that only one-in-five Bomber Command aircraft despatched dropped its bombs within five miles of its intended target in Germany – a five mile radius which therefore covered seventy-five square miles of ground. Over the Ruhr, the proportion dropped to one in ten.[7] The idea that this level of performance could seriously affect any particular target set was thus exposed as chimerical. The Prime Minister told the CAS, Sir Charles Portal, 'It is an awful thought that perhaps three quarters of our bombs go astray...'.[8] Awful indeed, and indicative of an offensive incapable of implementing its then stated policy of selective and precise attack on particular target sets, be they oil, railways, or aircraft factories. The Butt Report, if not literally, at least figuratively, brought the Air Staff to earth with a jolt. Current levels of navigation, target identification and bomb-aiming were utterly inadequate to achieving the stated aim. It also dented the Prime Minister's confidence in some of the Air Staff's more sanguine predictions for the offensive, and he told the CAS in October 1941 that he deprecated placing 'unbounded confidence' in it and thought it 'an unwise man who thinks there is any *certain* method of winning this war...'.[9] Strategically, however, there was little alternative to continuing the offensive, short of a complete reorientation of British strategy, which would take years to implement. Germany had just instigated a two-front war by invading the Soviet Union, but in the summer and autumn of 1941 the long-term survival of the latter seemed problematic. Other than arms supplies, direct

military assistance to Russia could only come through air attack. The British Chiefs of Staff explicitly stated in July 1941 that the economic life and morale of the Third Reich had to be destroyed by bombing before any return by the Army to the Continent of Europe would be possible.[10] *Faute de mieux*, the offensive would continue. What was now required was to make it effective.

Work had in fact already started prior to the Butt Report on providing Bomber Command with some form of radio navigation equipment to improve its navigational performance. Work on the *Gee* navigational system was already underway and had reached the trial stage.[11] The CAS, in response to Butt, issued instructions that investigation be made as to whether the airborne Air-to-Surface Vessel radars developed for use by Coastal Command could be utilised as a bombing aid by aircraft which had navigated near to an objective using *Gee*.[12] In May 1941, work had also started on the blind bombing device which came to be known as *Oboe*. Before the War and in its early period, all the scientific and industrial resources in the field of radar had been concentrated on solving the defensive activities of Fighter Command, and it was only in 1941 that attention and resource began to refocus on the offensive potential of the electro-magnetic spectrum.

Air Marshal Arthur Harris pictured at his desk at HQ Bomber Command, High Wycombe, 15 May 1942.

At the point where the first fruits of this increased scientific support to the offensive began to appear, there was a simultaneous change in the strategic direction and command of the bomber force. The appointment of Air Chief Marshal Sir Arthur Harris to the post of, AOC-in-C Bomber Command was a watershed in the history of the bombing offensive. Sir Arthur Harris combined a single-minded, not to say messianic, devotion to the doctrine of strategic bombing with a determination to fight all comers for the primacy of his Command, and, just as importantly, the right of the AOC-in-C to direct the force as he saw fit to achieve the broad objectives set out in the Directives he received from the Air Ministry. He took up his appointment at Bomber Command's High Wycombe Headquarters on 22 February 1942, eight days after the Air Ministry had issued a new and most significant Directive to his new Command. The Directive marked the point at which the Government and the Air Staff accepted and directed that, in the future, Bomber Command should direct its efforts at undermining both the will and the capacity of the German people to wage war, and that this required the Command to focus on the progressive destruction of German industrial cities, principally by area attacks utilising a high proportion of incendiaries.[13] We should note, in passing, that the Directive pre-dated Harris' appointment, and that he was not, as

is sometimes suggested, the instigator of the area bombing policy, even if he was to become its most ardent executor.

The Directive made specific reference to (and indeed was predicated upon) the successful introduction of the new *Gee* radio navigation aid. *Gee* allowed the navigator to fix his aircraft's position on a special chart with a degree of accuracy far greater than dead-reckoning navigation would normally achieve. Its range was, however, restricted by the curvature of the earth, and it was anticipated that the enemy would resort to jamming its transmissions within six months. The Directive contained within it, however, the first seed of future divergence and conflict between the views of the Air Staff, particularly the Directorate of Bomber Operations, and those of Sir Arthur Harris. The 14 February Directive specifically referred to *Gee* as a 'blind bombing device' and postulated that experience might show it capable, 'under favourable conditions', of permitting 'effective attack on precise targets'. The AOC-in-C was asked under these circumstances to consider the attack of precise targets within *Gee* range and specified targets beyond its range.[14] The introduction of *Gee* encouraged and coincided with the beginning of proper target marking, i.e. the technique of using a small advanced guard of aircraft to lluminate the target with flares and incendiaries for the main force of bombers following on behind. The initial technique, known as *Shaker*, simply involved *Gee* equipped aircraft dropping strings of flares across the target city accompanied by incendiaries, a following *Gee*-equipped wave carried the maximum load of incendiaries, and the larger force of non-*Gee* aircraft would use the flares and fires to guide and illuminate the bombing.[15] Efficient target marking was to prove fundamental to the success of the bomber offensive. In the early period of the War, individual aircraft navigated their own way to the target, identified it, and bombed it – or not, as the Butt Report showed. In addition to aiding in identification of the target, the *Shaker* technique highlights other developments in Bomber Command: in particular recognition of the need for concentration of the force in time and space.

A technique which relied on the leading aircraft illuminating the target with flares clearly required these aircraft to arrive first and on time, and the first of the successive waves to arrive before the flares burnt out. In addition, however, and adopting a tactic learned from the *Luftwaffe*, it was recognised that setting a city on fire through incendiary attack was a more effective and destructive technique than pure high explosives. Concentration in time ensured that the thousands of incendiaries would start myriad fires which would coalesce and overwhelm the efforts of the firefighters on the ground. Additionally, in response to Bomber Command's early efforts, the German air defences had been greatly expanded and reorganised into defensive 'boxes'. The radars located within each 'box' controlled a night fighter and directed it onto its target bomber. However, the box could only control one fighter at a time, so the effectiveness of the defences could be ameliorated and reduced by passing the maximum number of bombers through the box in the shortest possible time with the fighter only able to effect one interception.

The same was true of radar predicted flak over the target – the more the bombers concentrated in a short period, the less opportunity for the individual guns to engage successive targets. Thus, concentration of the bomber stream in time and space simultaneously allowed for better target identification and marking, more concentrated and thus more effective bombing, and lessened opportunities for the defences.

It was the question of target marking which was to lead to the first clash between Sir Arthur Harris and the Directorate of Bomber Operations (DBOps). Within a month of his arrival at High Wycombe, Harris received a proposal from Group Captain Sydney Bufton of DBOps suggesting that the crews with the best record of locating and bombing the target should be 'creamed off' into separate squadrons to form a specialist Target Finding Force, which, as the name suggested, would take on the role of finding and marking the target for the main bomber force. Harris was vehemently opposed to the idea. He had a rooted objection to what he termed 'corps d'elite'. He believed taking the best crews away from squadrons would remove an essential core of leadership and expertise from the ordinary squadrons of his Command and thus reduce their efficiency. He wanted instead to identify the squadron which performed best each month and designate that squadron as the 'raid leader' the following month. Harris was infuriated when, having turned Bufton's proposal down, the Group Captain circulated a questionnaire to selected squadron commanders in the Command behind Harris' back. Bufton, however, won the backing of both the Vice-Chief of the Air Staff, Air Marshal Sir Wilfrid Freeman, and the CAS, Sir Charles Portal. The target marking force was imposed on Harris against his will, though he refused to allow the proposed name and instead called it the Pathfinder Force (PFF). The PFF, despite Harris' attitude, proved essential to the development of effective target marking techniques. Harris is frequently severely criticised over the PFF issue and there is no doubt that he was wrong in his view that it was not needed. He had a point, however, over the removal of the strongest crews from his other squadrons. His critics tend to forget that at the time these arguments raged, Harris had only 38 operational medium and heavy bomber squadrons in his Command and that taking the best crews to form the PFF would adversely affect the performance of his other squadrons. In the event, the PFF did not necessarily have first call on the best crews.[16] The PFF was officially established in August 1942 and flew its first mission on the 18th of the month. The timing was not propitious as the Germans had started jamming *Gee* earlier in the month.[17] At this point the target markers were also still relying on ordinary flares to mark their targets as no effective target marker bombs had yet been developed. The PFF did not therefore achieve a noticeable improvement in Bomber Command's performance until 1943.

Harris faced many significant problems other than target marking in turning Bomber Command into an effective force. In particular, aircraft production had lagged behind and his Command was constantly being called upon to provide reinforcement to other commands. In all, diversions of aircraft from Bomber Command, (either from production or the Command itself), amounted to 510 aircraft. His medium bomber force shrank

as Whitleys and Hampdens were phased out and seven squadrons were transferred to other commands. Meanwhile, the heavy bomber force, partly because of production problems, did not grow as intended. By September 1942, his force had actually shrunk from the 44 Squadrons in March (not all operational) to 38 squadrons, but of these seven were non-operational and three were understrength, so his Command was effectively no more than thirty squadrons strong.[18] At the same time, Harris was coming under intense political pressure to demonstrate that his Command was effective. Politicians and senior officers of the other Services were pointing to the major commitment of manpower and resources and asking what there was to show in return for this investment.[19] In order to demonstrate the potential of his Command, Harris was determined to show what could be achieved if the promised expansion of the bomber force occurred. He therefore drew on the full resources of his Command, including operational training units, as well as drawing reinforcements from other commands, to mount the three one-thousand bomber raids. The effort required to mount these raids is best illustrated by the fact that the figure for the average monthly operational availability of aircraft and crews in Bomber Command in 1942 was between 331 and 427, and 250 bombers airborne on one night would previously have been considered a strong force.[20] The bombs from the first thousand bomber raid on 30 May 1942 may have fallen on Cologne, but the intended target was just as much Whitehall. The bombing destroyed 600 acres of the city in one raid and, as Harris intended, demonstrated the results which could be achieved if a force of sufficient strength was dispatched against a single target.[21] He achieved the headlines he wanted, and showed what might be achieved if his force was strengthened rather than weakened. In September, the Prime Minister instructed the Secretary of State for Air to prepare a programme which would ensure that Bomber Command achieved a front-line strength of fifty Squadrons by 31 December 1942.[22] Harris had successfully silenced some of his Command's domestic critics, ensured its future expansion, and, under pressure from the Air Staff, taken a significant step towards improving its performance.

The year 1943 was the year that Bomber Command 'came of age'. The first true blind bombing aid, *Oboe*, was introduced, allowing a limited number of aircraft to be controlled from a ground station which transmitted a signal of sufficient accuracy that it could indicate when they should drop their bombload. Although its effective range was limited to targets in western Germany, this at least included much of the Ruhr Valley, and *Oboe* held the real prospect of very accurate target marking. The main bomber force also began to receive their own airborne mapping radar known as *H2S* – a development of air-to-surface vessel search radar, it was crude by modern standards, but it did allow skilled crews to identify particular built-up areas and being carried in the aircraft it was, unlike *Gee*, almost immune to jamming. In addition, purpose-designed marker bombs, known as target indicators (known colloquially as 'TIs'), were introduced. TIs burst and scattered burning roman candles across an area of some 250 square yards and were difficult for the Germans to extinguish or replicate as part of their target spoofing

attempts. They were also much more visually distinctive to the bomber crews than the strings of flares previously used. The first tentative steps were also taken to introduce electronic countermeasures against German radars and night fighter radios. These developments held the distinct promise of making both the Pathfinder Force and, by extension, the main force, much more effective. By the end of 1943, all the medium bombers, including the sturdy Wellington, had been phased-out of Bomber Command, and the Stirlings were excluded from attacking German targets from November after suffering unacceptably high losses. The force increasingly composed only Halifaxes and the incomparable Lancaster.

The acute concern within Government regarding the U-boat threat in the early part of 1943 saw Bomber Command divert much of its effort in the first two months of the year to bombing the French ports of Lorient and St Nazaire. The degree of anxiety the U-boat threat induced is well illustrated by the wording of the Directive Sir Arthur Harris received which stated '...the War Cabinet has given approval to a policy of area bombing against U-boat operational bases on the west coast of France.'[23] Harris' frustration is clear from his *Despatch*, wherein he wrote: 'These attacks ... left little undestroyed in either town except for the U-boat bases, which were protected by the heaviest concrete shelters'.[24] Harris' protests at the futility of attacks were to no avail.

The main focus of Harris' effort in the first half of 1943 was the Ruhr. Utilising the new marking techniques and equipment to the full, Bomber Command bombarded Essen and other Ruhr cities relentlessly. The opening attack in the 'Battle of the Ruhr' was a raid on Essen on 5 March. The marking by *Oboe* Mosquitoes was followed by a main force attack which lasted 40 minutes with 362 aircraft bombing the city. The Krupps works were badly hit, with 53 buildings struck by bombs.[25] Seven days later, Bomber Command returned with another raid of 384 aircraft. In all, over 2,000 tons of bombs hit Essen in a week. Other cities followed: Duisburg, Bochum, Dusseldorf, Gelsenkirchen, Cologne and Dortmund were all hit more than once.[26] In May, 617 Squadron led by Guy Gibson destroyed the Möhne and Eder dams, inundating the Ruhr and further disrupting its economy. Professor Adam Tooze, in his monumental study of the German war economy, records steel production dropped by 200,000 tons. Between February 1942 and May 1943, the economic policies of Reich Minister for Armament and Production, Albert Speer, had seen average monthly growth of 5.5% in armaments production. From May 1943 onwards, as the effect of the bombing campaign fed through, growth stagnated and flat-lined. Tooze concluded that the Battle 'had negated all plans for further increase in production. Bomber Command had stopped [Albert] Speer's armaments miracle in its tracks.'[27] This victory did not come without cost. Bomber Command mounted 43 major attacks on German targets during the Battle, totalling 18,506 sorties at a cost of 872 aircraft. The loss rate over Germany was 4.7%, which was perilously close to the 5% figure at which losses were reckoned to render the force ineffective.

An Avro Lancaster of 1 Group, Bomber Command, silhouetted against flares, smoke and explosions during an attack on Hamburg, 1943.

Bomber Command's travails over the Ruhr (known ironically to the crews as "Happy Valley") were ameliorated, if only temporarily, in the next major assault, known as the 'Battle of Hamburg'. It was to be followed by the 'Battle of Berlin' which was to tax Bomber Command to the limits of its endurance. The 'Battle of Hamburg' ran from 24 July to 18 November 1943 and involved 33 major attacks totalling 17,021 sorties and the loss of 695 aircraft, or 4.1% of the force. The reduced loss rate was almost entirely the result of the decision to deploy the countermeasure *Window* against the German radars, the first operational use of what we now know as 'chaff'. In four attacks spread over ten days, with two smaller American daylight raids in between, Bomber Command dropped 8,622 tons of high explosive and incendiaries on the city, starting a devastating firestorm where temperatures reached 1,000 degrees centigrade. It took the city more than six months to recover and shook the Nazi leadership, with Albert Speer telling Hitler that six more such attacks would halt German armament production.[28]

This did not happen, in part because Harris attempted to wreck Berlin in the same manner that his Command had devastated Essen, Hamburg and the Ruhr valley. Berlin, however, required much deeper penetration into Germany, was a much larger city which did not give a good return on *H2S*, was beyond *Oboe* range, and was more heavily defended than any other target. In the autumn and winter, it was also frequently blanketed by cloud. Bomber crews named it 'The Big City'; a label which simultaneously reflected the awe it inspired in them and the difficulty they encountered in attacking it successfully. For all their mighty efforts against it, and the enormous destruction they wrought, the existing marking techniques, weather, and the city's geography conspired to defeat their efforts to lay waste to it as they had cities in Western Germany. The 35 major attacks during the winter campaign, totalling 20,224 sorties, saw more than a thousand aircraft lost.[29] The Germans had devised effective methods to neutralise *Window*; indeed, they now tracked the 'bomber stream' by following the radar image of the *Window* cloud and using passive receivers to track the bombers' own *H2S* radar transmissions. The controllers gave a running commentary on the bomber stream's position and direction and fed the fighters into it to make individual interceptions. They inflicted a horrifying 16.8% casualty rate on the Halifax Mark II and Mark V aircraft (which had inferior performance to the Lancaster and Halifax IIIs) in a raid on Leipzig in February, and Sir Arthur Harris felt he could no longer justify sending them into Germany, a decision which removed ten squadrons from the frontline.[30] The last attack of the 'Battle of Berlin' saw the *Luftwaffe's* greatest ever triumph against Bomber Command, when 95 Lancasters and Halifaxes were lost on the raid of 31 March 1944 against Nuremburg – a disaster which saw more Bomber Command aircrew lost than Fighter Command suffered in the entire Battle of Britain.[31]

From April 1944 onwards, Bomber Command's effort was to be directed firmly to the direct support of the Normandy invasion. Harris tried one last-ditch effort to persuade the Air Staff that his force was unsuited to making relatively precise attacks in France and that it should continue the assault on Germany. His arguments were unconvincing, and Portal instructed him to mount three raids on French marshalling yards, which showed very clearly how precise Bomber Command could be using *Oboe* and given the right weather. Harris was placed under the direction of General Eisenhower and the Supreme Headquarters Allied Expeditionary Force (SHAEF) which effectively meant Air Marshal Sir Arthur Tedder, Eisenhower's British deputy. Despite his frustration, Harris carried out his responsibilities under his new masters loyally. He still mounted occasional raids into Germany, as he was permitted to do under the Directive, but his Command also played a major role in disrupting the French railway system in concert with the tactical air forces. The effort was successful in imposing major delays on German troop movements towards the invasion area. Harris' bombers were also used in direct support of the Allied armies, bombing German positions close to the Allied frontlines, or French towns through which German troop movements had to pass. Despite occasional errors resulting in friendly casualties, these operations were on the whole very successful,

though overall the Allied bombings in France were regrettably responsible for the deaths of more than 60,000 French civilians. Given his frequently troubled relationship with the Air Staff, of which more anon, it is more than a little surprising to note Harris' view on being placed under the command of an American soldier principally in support of a land campaign which he had frequently derided as unnecessary. Describing his tenure of command at High Wycombe as analogous to a ship beset by competing winds attempting to blow it off course, he wrote: 'As the harassed mate of this sorely beset vessel ... I recall only one period of calm sailing in those three and half bitter years – a veritable centre of the hurricane – when all went well, when all pulled together, when there was at last continuity of contact between the compass course required and the lubber line – and that was during the all too short period [!] when Eisenhower was Admiral and Tedder the Captain on the bridge.'[32] Eisenhower in turn, commenting on Harris' reputation for being awkward, stated 'he actually proved to be one of the most effective and co-operative members of the team', a view that Tedder shared.[33]

On 25 September 1944, overall responsibility for directing the Combined Bomber Offensive passed from SHAEF back to Sir Charles Portal and his American opposite number. Bomber Command's effectiveness was greatly restored from the position at the end of the Battle of Berlin because the German early warning chain had been pushed back to the Reich by the Allied armies advance into Belgium. Not only were the radars further back, but the bomber stream could approach over allied territory reducing both warning time and time exposed to the defences. In addition, ground stations for radio aids such as *Oboe* and *Gee* could be located in liberated territory, extending their ranges. This final phase of the War is amongst the most controversial and sees Sir Arthur Harris once more at loggerheads with the Air Staff. He has been severely criticised by many historians with some going so far as to characterise him as disobeying orders.[34] The criticisms rest largely on the statistics relating to the division of the bombing effort between different target sets during the last months of the War. Critics point to the statistics quoted in the British Official History which stated that 53% of Bomber Command's effort in the last three months of 1944 were devoted to area attacks on cities, and just 14% to oil and 15% to communications, despite the higher priority accorded to the latter in the bombing Directives.[35] Historians are also understandably and inexorably drawn to the extensive correspondence which flowed between the AOC-in-C of Bomber Command and the CAS in the autumn and winter of 1944-45, wherein Sir Charles Portal sought to persuade Sir Arthur Harris to devote more of his effort to oil and which therefore appears to support the case against the latter.

Yet the issue is far from clear cut. Three Directives were issued to Bomber Command in late 1944, on 25 September, 13 October and 1 November. The first and third Directives placed oil as first priority, but specifically referred to mounting area attacks on industry when 'weather or tactical conditions are unsuitable' for priority targets. The October Directive made specific reference to the need to attack communications

in the Ruhr under plans designated Hurricane I and II.[36] For Bomber Command, Hurricane I specified 'undamaged parts of the major industrial cities of the Ruhr' and under the more weather-dependent Hurricane II, 'the Ruhr-Rhineland synthetic oil plants'. Thus, although 75% of Bomber Command's effort was directed to industrial attacks and only 6% to oil targets in October, 65% of the total dropped in area attacks was aimed at the Ruhr and Cologne, or 44.5% if Cologne is excluded, and 97% and 95% respectively was dropped between 13 and 31 October and thus conformed to the Hurricane Directive. In November, Bomber Command's effort against oil rose to nearly 25%, and if we include categorised area attacks on Gelsenkirchen and Wanne Eickel, which were principally oil targets, the percentage increases to 33%.[37] By the end of the month, 'all of the RAF's synthetic oil targets were suspended because they were no longer operating'. In December, the percentage effort against oil fell to just over 10%, but according to the Air Ministry's statistics, a further 34% was aimed at transportation – second in priority to oil – and a further 27% was aimed at town centres specifically associated with rail facilities, and during the month Bomber Command had also been required to bomb such facilities to disrupt the German Ardennes offensive. Bearing these more nuanced statistics in mind, the following careful wording from the British Official History takes on added significance: 'There is always difficulty in making functional distinctions about the Bomber Command effort...For example, in area attacks against ... the Ruhr, which were recorded under the heading of industrial areas, substantial damage was sometimes done to Benzol plants which, of course, belonged to the oil plan.'[38] Bomber Command was also under remit to assist the Admiralty if required, and it mounted occasional attacks on ports and U-boat pens in this period, and 9 and 617 Squadrons using 12,000 pound *Tallboy* bombs famously sank the battleship *Tirpitz* in her Norwegian lair, and have argued ever since as to who struck the mortal blow.

The early months of 1945 saw Bomber Command devote between 25 and 30% of its effort to oil.[39] There was little in the way of respite for German cities, however. Although this further destruction is sometimes characterised as wanton, particularly in the case of the infamous raid on Dresden in February, it was in large part driven by strategic considerations and was certainly not simply undertaken at the whim of Sir Arthur Harris. Several factors underlay the continuing use of the Allied bombers against German cities. The weather continued to affect the bombers' ability to undertake precision attacks. Allied confidence had also been severely shaken by the German Ardennes counter-offensive, and this, together with fears regarding the potential impact of Germany's new jet fighters and very quiet Type XXI U-Boats on Allied command of the air and sea, meant added pressure to end the war quickly. The opening of the major Soviet offensive on the Eastern Front, the success of which the Western Allies fervently wished for, led to proposals to bomb German cities behind the Eastern front to disrupt communications. Berlin, Dresden, Chemnitz and Leipzig were specifically referred. Added pressure came directly from the Prime Minister who pressed hard for such attacks, not least because he was shortly to meet with Stalin at Yalta. It was this combination

of factors which led directly to the raid of 13/14 February on Dresden. Much of the city's defences had been withdrawn to protect oil refineries, and the bombers were directed during the raid by a 'master bomber' using VHF radio to communicate directly with them. The absence of flak allowed him to bring the bombers down to around 14,000 feet which, along with the lack of opposition, made the bombing much more concentrated. The fires started by the bombing combined with perfect meteorological conditions to create a firestorm which is estimated to have killed 25,000 people. It quickly became a matter of controversy at the time, with Churchill trying to distance himself despite his own significant responsibility for instigating the attack, and has remained so ever since. It was, however, in the context of the strategic situation and its location a legitimate target. Dresden prior to the raid was a notably beautiful city. In this context it is interesting to note that the following day Bomber Command, using precisely the same technique and a roughly similar force of bombers, and for precisely the same reason, attacked the unprepossessing German industrial city of Chemnitz. The weather was less propitious, the marking was scattered and difficult to see, and the raid was in essence a failure which has never been heard of since. Lady luck smiled on ugly Chemnitz and not beautiful Dresden. Some of Bomber Command's later attacks, notably those against Wurzburg and Pforzheim were, unlike Dresden, of doubtful strategic value.

In this final period of the War, Bomber Command continued to attack oil, transportation targets and German cities as well as assisting the Allied armies directly, notably in support of the Rhine crossings. Among other notable precision attacks, it drained the Mittelland and Dortmund-Ems canals more than once, and downed the important railway viaduct at Bielefeld using *Tallboy* and its bigger brother, *Grand Slam*, bombs. The transportation attacks, greatly favoured by Sir Arthur Tedder, were eventually successful in more or less isolating the Ruhr,cutting off coal supplies to much of the rest of German industry and reducing the once proud *Reichsbahn* to a shadow of its former self.[40]

Bomber Command had come a very long way from its early and inauspicious efforts over Wilhelmshaven in 1939. By the War's end it could put more than a thousand bombers into the air directed against two separate targets and, using a variety of bombing aids (particularly over western Germany) and marking techniques, was by the standards of the day capable of remarkable precision. In its last year of operations it made a major contribution to the success of the Normandy invasion, in concert with the USAAF it reduced German oil production from a peak of around 380,000 metric tons in March 1944 to 20,000 metric tons in mid-February 1945, which effectively meant that the Reich's much vaunted Panzer divisions were rendered static and incapable of operational or even occasionally tactical manoeuvre, whilst the *Luftwaffe*, already a shadow of its former self, was effectively grounded.[41] As we have seen, in the Battles of the Ruhr and Hamburg Bomber Command capped, and in some instances reduced, German war production. The diversion of resources to counter the Allied bombers was

also enormous. German aircraft production was increasingly skewed to producing only fighters so that by the end of 1944, bomber production had almost ceased. The fighters themselves were pulled back into Germany with 1,650 aircraft defending the airspace by January 1944. This left around 400 for the whole of the vast expanse of the Eastern Front to the great benefit of the Soviet Air Force.[42] Similarly, by February 1944 there were 13,500 heavy flak guns, 7,000 searchlights and 21,000 light flak guns defending the Reich. Production of heavy flak weapons in 1944 was 8,402, and light flak a staggering 50,917. In the first two quarters of 1944, anti-aircraft ammunition absorbed 17 and 16% of the *Wehrmacht's* ammunition budget. As flak pieces required twice as much productive labour as ordinary artillery weapons, even more artillery pieces could have been produced had the effort been applied in that direction. However, German flak was famously dual capable and proved equally formidable in the anti-tank role. Some 1.2 million men and women were also employed in the flak arm, but 44% were civilians or auxiliaries and, of the service personnel, 56% were older than 39 years or medically unfit for combat.[43]

None of the achievements of the Combined Bomber Offensive would have been possible without the extraordinary courage and perseverance of the crews flying night after night over Germany often in the knowledge that their chances of surviving a tour were not good. Some 125,000 aircrew are believed to have served in Bomber Command and 55,573 paid the ultimate price. This was a British Commonwealth effort, with significant numbers hailing from Canada, Australia and New Zealand as well as Poles, Frenchmen and not a few Americans.

NOTES

[1] The details of the raid come from the Official History, Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany 1939-1945* (London, HMSO, 1961) [hereafter *SAOG* and volume number], Volume 1, pp.199-201, and John Terraine, *The Right of the Line: The Royal Air Force in the European War 1939-45* (London, Hodder & Staughton, 1985) pp.103-107.
[2] See Air Historical Branch, Air Publication 1300, *The RAF War Manual Part 1 – Operations*, (1928 Edition, reprinted with amendments 1935), Chapter VII, para 6 and Chapter VIII, para 25.
[3] Quoted in The National Archives [hereafter TNA] AIR41/39, Air Historical Branch Narrative, *The Bomber Offensive Against Germany*, Volume 1, p.27.
[4] The Prime Minister announced in the House of Commons in June 1938 that Britain would only bomb military objectives, and the Air Staff had itself concluded that restrictions on bombing were advantageous to Britain. See *SAOG*, Vol 1, p.99.
[5] *SAOG*, Vol 1, p.95.
[6] *Ibid*, p.97. It is interesting to note that the planners also stated that the destruction of the Mohne and Sorpe dams could cause equal disruption, though the bombs of the time were not capable of breaching them.

[7] The full text of the Butt Report is at *SAOG*, Vol 4, Appendix 13.
[8] Quoted in Air Historical Branch Monograph, *Signals*, *Volume 3*, *Aircraft Radio*, [hereafter AHB *Radio*] p.26.
[9] Quoted in *SAOG*, Vol 1, pp.184-5.
[10] COS (41)155(O) Chiefs of Staff memo of 31 July 1941 quoted in *SAOG*, Vol 1, p.181.
[11] For details of the design and development of all the navigation and blind bombing aids discussed here see AHB *Radio*, *passim*.
[12] *Ibid*, p.26.
[13] The Directive is printed in full at *SAOG*, Vol 4, Appendix 8, pp.143-8.
[14] *Ibid*.
[15] *SAOG*, Vol 1, p.386 contains a fuller description of the technique.
[16] On the arguments surrounding the establishment of the PFF see *SAOG*, Vol 1, pp.418-432; Sir Arthur Harris, *Despatch on War Operations 23rd February 1942 to 8th May 1945*, (Frank Cass, London, 1995), pp.9-11 and the introduction by Sebastian Cox pp. xiii-xiv; for a sympathetic portrayal of Bufton's struggle with Harris see Hugh Melinsky, *Forming the Pathfinders*, (The History Press, Stroud, 2010), pp.66-77.
[17] AHB *Radio*, p.160-161.
[18] TNA AIR41/42, Air Historical Branch Narrative, *The Bomber Offensive Against Germany*, Volume 4, pp.7-12.
[19] For example a speech by Sir Stafford Cripps in the House of Commons on 25 February 1942. *SAOG*, Vol 1, pp.328-9.
[20] Harris, *Despatch*, table 2, p.45.
[21]Air Historical Branch, Bomber Command Operational Research Section, *Night Raid Report Number 74*.
[22] TNA AIR41/42, p.12.
[23] *SAOG*, Vol 4, p.152, Directive of 14th January 1943.
[24] Harris, *Despatch*, pp.14-15.
[25] Martin Middlebrook and Chris Everitt, *The Bomber Command War Diaries: an operational reference book*, (Viking, Harmondsworth, 1985), pp.365-6.
[26] Air Historical Branch, *Air Ministry War Room Monthly Summary of Bomber Command Operations*, March 1944.
[27] Adam Tooze, *The Wages of Destruction: the making and breaking of the Nazi economy*, (Allen Lane, London, 2006), pp.598-600.
[28] *SAOG*, Vol 2, p.211.
[29] *SAOG*, Vol 2, pp.193-197. Sixteen of the thirty-five attacks targeted Berlin.
[30] Middlebrook & Everitt, p.447. A few Halifax IIs continued to operate with the Pathfinders.
[31] Martin Middlebrook, *The Nuremburg Raid*, (Allen Lane, London, 1973), pp.278-9. 545 aircrew died, one more than in the entire Battle of Britain, and 159 became PoWs, some of whom were wounded, and fifteen men evaded and made it back to the UK.
[32] Quoted in Henry Probert, *Bomber Harris – His Life and Times*, (Greenhill Books, London, 2003), p.303.

[33] *Ibid*, pp.302-3.
[34] "Disobeying orders". The accusation appears in both Randall Hansen, *The Fire and the Fury*, (Penguin Books, New York, 2009), p.246, and Anthony Verrier, *The Bomber Offensive*, (Batsford, London, 1968) p.277. Stephen Garret in his book, *Ethics and Air Power in World War II* (New York, St Martin's Press, 1997), p.56, wrote of Harris 'carrying out a different strategy despite his superior's specific instructions to the contrary'.
[35] *SAOG*, Vol 3, p.184. Amongst other historians to quote these statistics and to use them as the basis for criticising Harris are: Terraine, *Right of the Line*, p.675, Max Hastings, *Bomber Command*, (Michael Joseph, London, 1969), p.334,
[36] Directives in *SAOG*, Vol 4, pp. 172-179.
[37] Figures and percentage contained in or calculated from Air Historical Branch, *War Room Monthly Summary of Bomber Command Operations*, October and November 1944.
[38] *SAOG*, Vol 3, p.189.
[39] Air Historical Branch, *Air Ministry War Room Summaries of Bomber Command Operations*, January to March 1945.
[40] On the bombing of the Reichsbahn see the generally excellent study by Alfred Mierzejewski, *The Collapse of the German War Economy, 1944-1945: Allied Air Power and the German National Railway*, (University of North Carolina Press, Chapel Hill NC, 1988), *passim*. Mierzejewski's work is only marred by his attribution of some Bomber Command raids to the USAAF.
[41] Air Historical Branch, Chiefs of Staff Committee, Technical Sub-Committee on Axis Oil, AO(46)1, *Oil as a Factor in the German War Effort, 1939-1945*, March 1946. Figure 5.
[42] E R Hooton, *Eagle in Flames: the fall of the Luftwaffe*, (Arms and Armour Press, London, 1999), p.265.
[43] Edward B Westermann, *Flak: German Anti-Aircraft Defenses 1941-1945*, (University Press of Kansas, Lawrence KS, 2001) pp.234-6, 295-6.