

Bomber Harris and Precision Bombing – No Oxymoron Here

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Criticisms as to the efficacy or lack thereof of the RAF's strategic bombing campaign against Germany have been fuelled in Canada in recent years first by the Canadian Broadcasting Corporation's docudrama miniseries, *The Valour and the Horror*, in the mid 1990s and more recently by a debate over the wording of the Bomber Command panel in the new Canadian War Museum. The essence of these debates centres on the morality of Sir Arthur Harris's apparently bloody-minded city busting tactics compared to the US Army Air Forces' ethical and restrained precision bombing of military and strategic target systems.¹

When one speaks of Harris and his apparent indifference to precision bombing one is really talking about a headquarters and a command and how those institutions approached the conduct of strategic bombing. This article aims to demonstrate that Harris and his advisors were in no sense the intellectually inflexible and anti-technologically minded donkeys that many have and continue to claim them to be. It will highlight the role of operational research in identifying both the technical and tactical problems which plagued the Command and how the commanders and senior staff at High Wycombe accepted and used the scientists' advice in attempting to employ the limited resources of the bombing force to best advantage.

¹ The most recent example of this litany is contained in Randall Hansen's *Fire and Fury: The Allied Bombing of Germany 1942–1945*, (Toronto: Doubleday Canada, 2008).

Before proceeding, it is worth noting that there is a common thread here which is apparent, at the very least implicitly, in the other articles in this issue of *The Journal of Military and Strategic Studies*. All deal with this very challenge – maximizing the effectiveness of limited resources in achieving some general or specific results. All deal with what we would today call ‘learning organization’ for in a very real sense the air forces of the Second World War had to learn what worked and what did not; the theories and concepts developed in the interwar years had yet to be proven in the harsh reality of battle. Such was the situation in North Africa during the early years of the war when, from 1940 until 1942, as described in Mike Bechthold’s “A Stepping Stone to Success: Operation Battleaxe (June 1941) and the Development of British Tactical Air Doctrine”, there was much trial and error in getting policy, procedures and practices sorted out so that the few squadrons available to the theatre commander could maximize their utility.

Today, as Harold Winton’s paper, “Airpower in the Battle of the Bulge: A Case for Effects-Based Operations”, explains these would have been called Effects Based Operations. Indeed, the Strategic Bombing Offensive which Harris controlled was all about effects in the sense that Bomber Command sought to achieve certain ‘Measures of Effectiveness’ (MOE) with the resources available. The Command philosophy was to be found in the simple but striking equation of maximum bombs on target per aircraft lost. Without optimizing this MOE the achievement of the strategic effect—removing Germany from the war—was but an unattainable wish. As Winton describes, by the winter of 1944 the crews were in fact capable of achieving precision results.

Bomber Command did not set out to conduct city busting or area bombing. Air power concepts advanced in the 1920s by Douhet, Mitchell, Trenchard and others all pointed to the ability of bombers to get through to the enemy’s hinterland and to destroy precise targets. While some science fiction writers, and Douhet himself, talked about wreaking havoc, and while Trenchard would say that any bomb dropped on German soil had an impact on morale, RAF plans were quite specific in what the air arm intended to achieve. Official RAF doctrine, found in *Royal Air Force War Manual AP 1300*, published first in 1928 and then again just after the war began, stressed that an enemy was defeated once its government and citizens had lost the will to continue. While the population was not a target, workers as part of war industry were, the aim

not being to kill them but to cause them to abandon their work. Indiscriminate area bombing was simply not acceptable; RAF leaders went out of their way to emphasize this point and the various war plans developed in the 1930s focused on specific military targets.²

Despite these plans at the beginning of the war, the RAF did not have the means to affect this philosophy. In particular navigation and target marking devices and procedures were years away from effective implementation—what there was was a fairly rudimentary daylight and even more limited night navigation using the ‘Mark 1 eyeball’ in many cases.³ This meant that when, in 1940, the command was driven to night attacks as its only means of avoiding prohibitive losses, both flyers and leaders came to the eventual realization that they could not readily find their targets in the dark. The “never ending struggle to circumvent the law that we cannot see in the dark” a phrase attributed to Sir Arthur Coningham, could not be overcome in a day.⁴

In the summer of 1941, the extent of the problem became better quantified when Mr. D.M. Butt of the War Cabinet secretariat was directed to examine the available evidence of bombing accuracy. He reviewed 650 bomb release photos taken between 2

² There are a number of excellent sources for a review of RAF doctrine and bombing plans: Sir Charles Webster and Noble Frankland, *Preparation, The Strategic Air Offensive Against Germany Vol 1* (London: HMSO, 1961); Sir John Slessor, *The Central Blue* (London: Cassell, 1956); Col. Phillip S. Meilinger, “Trenchard and ‘Morale Bombing’: The Evolution of Royal Air Force Doctrine Before World War II” *The Journal of Military History*, Vol 60, No. 2 (Apr., 1996), pp. 258, 266-7; Col. Phillip S. Meilinger, “Trenchard, Slessor and Royal Air Force Doctrine Before World War II” in *The Paths of Heaven*, Col. Phillip S. Meilinger, editor, (Maxwell Air Force Base, Alabama: Air University Press, 1997).

³ Bomber Command’s conclusion, issued on 10 April 1940, was that “Our general opinion is that under war conditions the average crew of a night bomber could not be relied upon to identify and attack targets at night except under the very best conditions of visibility, even when the target is on the coast or on a large river like the Rhine.” Worse, their statement continued, “if the target has no conspicuous aids to its location, very few inexperienced crews would be likely to find it under any conditions.” Despite these conclusions, just days later the Air Ministry instructed Bomber Command to concentrate on night operations in lieu of the prohibitive casualties associated with daylight attacks. Webster and Frankland, *SAO*, I, pp. 205-212.

⁴ Webster and Frankland, *SAO*, I, pp. 222-9. See also Martin Middlebrook and Chris Everitt, *The Bomber Command War Diaries: An Operational Reference Book, 1939-1945* (New York: Viking, 1985), pp. 56-58, 92-94, 131-33, 174-5; Air Commodore Henry Probert, *Bomber Harris His Life and Times, The Biography of Marshal of the Royal Air Force Sir Arthur Harris, the Wartime Chief of Bomber Command* (Toronto: Stoddart, 2001), p. 99; Slessor, *The Central Blue*, pp. 366-67; Marshal of the Royal Air Force The Lord Tedder, *Air Power in War: The Lees Knowles Lectures* (London: Hodder and Stoughton, 1948), p. 100.

June and 25 July and reported that “[o]f those aircraft attacking their target, only one in three got within five miles.”⁵ Numbers were lower in the smog ridden Ruhr where many targets lay.

Harris’s own experience with precision navigation and bombing was not lacking. After wartime flying in night fighters and a post war command in India in 1922, Harris took command of 45 Squadron in Mesopotamia. The unit was equipped with heavy twin-engined Vickers Vernon transports, which he soon converted into a dual transport bomber configuration by adding a bomber aimer’s position and bomb racks. Harris subsequently trained his crews for precision bombing, winning a competition against the light bomber squadrons in the country. He added night bombing to the squadron’s expertise, but not until he had developed a crude but effective target indicator which was to be dropped by his best crew. As biographer Dudley Saward concludes: “Even more than laying the keel of the future long-range heavy bomber, Harris had already conceived the principle of long-range night bombing, employing pathfinding and target marking techniques.”⁶

When Harris returned to England in 1924 to take command of 58 Squadron, he again emphasized both day and night bombing, as well as long range non-stop navigation training.⁷ In 1937, with a promotion to Air Commodore, Harris took command of 4 Group within Bomber Command. While frustrated by a lack of bombing ranges, he was able to institute a focussed programme of night and long distance flying. In September 1939, Harris returned home from Palestine to command 5 Group. In the year that followed he would see firsthand the frequent inability of crews to navigate effectively to their targets.⁸

But what of Harris’s intellect? In 1940, Sir Edgar Ludlow Hewitt, then Commander of Bomber Command, wrote:

⁵ John Terraine, *The Right of the Line: The Royal Air Force in the European War 1939-1945* (London: Hodder and Stoughton, 1985), pp. 292-4.

⁶ Dudley Saward, *‘Bomber’ Harris: The Story of Marshal of the Royal Air force Sir Arthur Harris* (London: Cassell, 1984), pp. 27-31.

⁷ Charles Messenger, *Bomber Harris and the Strategic Bombing Offensive, 1939-1945* (London: Arms and Armour Press, 1984), p. 17.

⁸ Messenger, *Bomber Harris*, pp. 26-40.

[Harris] has an exceptionally alert, creative and enterprising mind balanced by long practical experience together with energy and force of character to give his ideas practical shape and realisation. He has rendered great service in respect of improvements in the technical equipment of the aircraft in his command, and also in the creation and organisation of novel methods of dealing with the extremely difficult problems of crew training...his ideas are inspired by an unusually well developed imagination...⁹

Henry Probert, Harris's most recent biographer, says: "...there emerges the picture of an operational commander with great driving force, constantly engaging his mind on how to rectify problems and do things better, and possessing deep knowledge of his business."¹⁰ This does not seem to be the man that critics have labelled as "slow to grasp the possibilities and limitations of the new generation of radar technology"¹¹ and "a typical example of a prescientific military man..."¹²

When Harris arrived at High Wycombe in February 1942 his challenges were significant. In addition to a paucity of capable aircraft and crews, he noted that: "There were technical and tactical problems affecting the employment of the force which could only be surmounted by intensive research, continual experiment, and unshakable resolution."¹³ But that same month these very problems had contributed to the promulgation of a new directive from the Air Ministry. The Command was to "focus attacks on the morale of the enemy population, and, in particular, of industrial workers."¹⁴

⁹ Probert, *Bomber Harris His Life and Times*, p. 95. (From the Papers of Air Chief Marshal Sir Edgar Ludlow Hewitt, Folder 11)

¹⁰ Probert, *Bomber Harris His Life and Times*, p. 104.

¹¹ Max Hastings, *Bomber Command* (New York: The Dial Press/James Wade, 1979), p. 245.

¹² Freeman Dyson, *Disturbing the Universe*, (New York: Harper and Row, 1979), 29.

¹³ Air Chief Marshal Sir Arthur T Harris, *Despatch on War Operations 23rd February, 1942, to 8th May, 1945*, edited by Sebastian Cox, (London: Frank Cass, 1995), p. 8. See also Wing Commander H.R. Allen, *The Legacy of Lord Trenchard* (London: Cassell, 1972), pp. 107-11.

¹⁴ Webster and Frankland, *SAO, IV*, 143-8; See also Harris *Despatch*, pp. 7-8, 192; Webster and Frankland, *SAO, I*, 322-4; Brereton Greenhous, et al, *The Crucible of War, 1939-1945 The Official History of the Royal Canadian Air Force Volume III* (Toronto: University of Toronto Press, 1994), p. 576.

Some six months before Harris took over the Command an operational research section (ORS) was established to find the solutions to the very problems confronting Harris. Operational research was a new domain where scientists worked alongside the uniformed staff for the purpose of quantifying issues and resolving real time problems.¹⁵ At its essence, operational research sought, according to Sir Robert Watson Watt the inventor of radar, to achieve: “maximum effect from available resources.”¹⁶

ORS teams had already been established at Fighter and Coastal Commands and in the former had contributed significantly to the operational introduction of radar. At Bomber Command, Dr Basil Dickins, an experienced defence scientist, was named section head and received a broad mandate from the Air Officer Commanding-in-Chief (AOCinC) to make the operations as effective as possible “in terms of [maximizing] bombs on target per aircraft lost”.¹⁷

To make good on this remit the ORS needed access to all manner of information: “tactics, use of and requirements for navigational and bombing aids, weapons effectiveness, training and aircraft maintenance etc...”¹⁸ This in turn required a close and trusted relationship with the commander as well as the staff of the headquarters.¹⁹ Dickins later recorded that this rapport came quickly:

From its inception the commander-in-chief and the deputy commander-in-chief gave the O.R.S. their fullest encouragement and did much to facilitate the conduct of its investigations. Frank expressions of opinion and advice offered, even though not previously asked for, were always welcomed.²⁰

¹⁵ Air Ministry, *The Origins and Development of Operational Research in the Royal Air Force* (London: HMSO, 1963), p. 9.

¹⁶ Max Davies, and Michel Verhulst, eds. *Operational Research in Practice Report of a NATO Conference*, (London: Pergamon, 1958), p. 2.

¹⁷ B.G Dickins, *Operational Research in Bomber Command*, n.d. Shephard Military Operational Research Archive, Laurier Centre for Military Strategic and Disarmament Studies, p. 3.

¹⁸ Dickins, *OR in Bomber Command*, p. 13.

¹⁹ *Ibid.*

²⁰ *Ibid.* See also Gp Capt A.H. Stradling, *The Brass Hat: Being Hints on How to Make the Job Easier* (Aldershot, UK: Gale & Polden Limited, 1951), pp. 8-9, for a description of the intellectual flexibility and openness of mind necessary in a good staff officer.

To do effective analysis the scientists needed data from both successful and unsuccessful operations, and obtaining this information was a significant task made all the more challenging by the fact that Bomber Command was involved in a major raid – the equivalent to a land or sea battle—several times a month. This meant that records from literally thousands of aircraft had to be collected, collated and interpreted. This was no simple task, but the results were crucial.

If the actual raid as a whole can be reconstructed and studied, it will be found to differ more or less from the raid as planned; such differences either may be of the order expected (from past experience) by the planners, or they may be critically large so as to be significantly discrepant from the planners' intentions. The problem is to reconstruct the raid, compare it with the plan, and (if possible) to account for major discrepancies between them.

In reconstructing the raid, the chief difficulty is that essential data are both scanty and (when available) variously unreliable. Thus, the analyst is forced to accept a sample drawn from the raid (considered now as a population of data relating to aircraft tracks) and this sample may be inadequate in size and or biased [sic] in nature.²¹

By the time Harris arrived, the scientists were well into their research. In a February 1942 report, "Visual Recognition of Ground Features as an Aid to Target Identification at Night", they wrote that: "consideration of the conclusions reached in the report suggest (a) more training in map reading, and practical experience of its use at operational heights during training is required, and (b) a careful study of the target area by crews is essential."²² Wing Commander Navigation, the staff officer responsible for these very matters, responded enthusiastically: "I would...like to publish an abbreviated report in the monthly navigation bulletin which as you know is sent to all training schools both in the UK and the Dominions, as I consider that this brings the

²¹ Dickins, OR in Bomber Command, pp. 18-9.

²² PRO AIR 14/1758 Minute 27 OIC ORS to W/C Nav 19 February 1942 covering ORS Report 31 "The Visual Recognition of Ground Features as an Aid to Target Identification at Night", 14 February 1942.

training aspect to the fore.”²³ Just days later Harris’s deputy, Sir Robert Saundby, approved the package for distribution.²⁴

Dickins and his scientists had been equally busy studying navigation devices. In late 1941, they recommended an operational technique to get the most out of Gee, a new system designed to help navigate to the target area. Their proposal added a target marking scheme which impressed the Air Staff at the Command. The response from A/Cdre T.M. Williams, the Deputy Senior Air Staff Officer (or D/SASO), was positive and immediate. “This is the first time that I have seen a detailed paper on the possible operational employment of ‘Gee’. It is very useful and I am sure will form the basis for drawing up a detailed programme of experiments.”²⁵

Throughout the first half of 1942, the scientists tracked the effectiveness of the crews using Gee. In July they produced a detailed review of 12 attacks against Essen. Technical issues apart, they also linked accuracy to crew morale: only the most determined crews were likely to fight their way to the target while others might shy away.

...The crews who do penetrate the defences and seek out the aiming point receive such a battering that their determination has to be of the highest order to persevere to the target. The reception given these crews does not, of course, encourage the weaker crews to go in themselves. The process is in fact cumulative—the better the attack is going and the more concentrated it is, the easier it is for the following crews to increase concentration still further.²⁶

However, if the attack was accurate and concentrated from the beginning the majority were likely to press their attack.²⁷ They therefore recommended: higher concentration; practice so that crews would be comfortable and accomplished at using TR 1335; the use of flares to illuminate a check point from which a short timed run to the target could be accomplished; and the employment of marker bombs, dropped on

²³ PRO AIR 14/1758 Minute 28, W/C Nav to OIC ORS 20 February 1942.

²⁴ PRO AIR 14/1758 Minute 29, OIC ORS to SASO, 26 February 1942.

²⁵ PRO AIR 14/695. Loose Minute2, D/SASO to OIC ORS, CSO, 2 December 1941.

²⁶ PRO AIR 14/1769 “Note on Attack on Essen March 8/9th – June 8/9th” 26 July 1942.

²⁷ Ibid.

the aiming point by selected crews.²⁸ The reaction was markedly positive. The Chief Navigation Officer called it “a most constructive report, the remarks about morale being particularly apposite.”²⁹ And Group Captain Operations commented:

I think this paper is very sound and I have no fault to find with any of the arguments. I think we have proved conclusively the inefficacy of our present methods of attacking Essen and if we are to attack it again it is essential that we should radically alter our methods.³⁰

Saundby fully endorsed the report and wanted it circulated throughout the command.³¹ Harris directed that “it should go to the [groups] with a note telling them to study it & brief the crews from it on the next Essen attack.”³²

By early 1943, the scientists were able to report that, while there had been improvements in the previous year, “nevertheless, a proportion of the force still fails to find the target, and on some occasions even expert crews are unsuccessful. The elimination of such errors would, of course, lead to an increase in the effectiveness of the bombing offensive....”³³ They called for a range of actions from improving the ergonometics of the bomb aimer’s compartment to a revision of bomb aimer selection processes and standards as well as training policies and procedures. They concluded: “it is the cumulative effect of a number of factors, each by itself appearing rather insignificant, which has contributed to the failures experienced.” They called for “a steady and parallel attack on all” and recommended the formation of a standing committee to conduct a regular review of all issues.³⁴ The report passed quickly through the staff to Harris who asked Saundby to set right the technical problems. As well, he

²⁸ Ibid.

²⁹ PRO AIR 14/1769 Minute 40, CNavO to OIC ORS, 17 July 1942.

³⁰ PRO AIR 14/1769 Minute 41 G/C Ops to OIC ORS, 20 July 1942.

³¹ PRO AIR 14/1769 Minute 43 SASO to OIC ORS, 24 July 1942.

³² PRO AIR 14/1769 Minute 47 CinC to SASO, 19 August 1942.

³³ PRO AIR 14/4545 ORS Report 64, “A Review of the Problem of Visual Identification of Targets and Landmarks at Night”, 31 January 1943. [This is the date of the final version of the report.]

³⁴ Ibid.

said: “we should concentrate on the pathfinders & on aids for them first with a view to lighting up the target by flares, markers and fires.”³⁵

Throughout the next 12 months, as the battles of Hamburg, the Ruhr and Berlin were fought, the scientists continued to analyse the results not only of Gee and Pathfinder Force ops, but of the new navigation and targeting aids Oboe and H2S as well. While there were improvements in tactics and techniques, and some marked successes, there were also disasters.

The 22/23 October attack on Kassel had been a clear success. The scientists zeroed in on the prediction and use of winds aloft, as the poor use of wind data by navigators was a chronic problem leading invariably to scattered bombing. On this occasion the predicted winds had been accurate and the navigation got better as the raid progressed. In terms of the bombing itself the report noted that 90 percent of the PFF sorties had dropped their marker bombs within two minutes of planned time and 80 percent of the main force achieved the same concentration; the four waves had arrived relatively intact and so the rate of attack remained generally at the planned 30 aircraft per minute, unlike the scattering experienced in other raids.³⁶

As alluded to earlier, raid success also depended on the crews being able to successfully avoid enemy action and this called for constant analysis and adjustment of tactics. In early February 1944, Dickins presented a study to Saundby suggesting that it was time to overhaul tactics.³⁷ A committee was quickly struck and the study was examined and endorsed.³⁸ Saundby sent it on to Harris who replied immediately, saying: “I agree. Most of this has already been in our minds and some of it has been tried. We sh’d from now on work as far a[sic?] practicable on these lines.”³⁹ Feedback

³⁵ PRO AIR 14/1855 Minute 7, AOT to SASO, 23 January 1943; Minute 8, SASO to OIC ORS, 29 January 1943; Minute 16, CinC to SASO, 16 February 1943.

³⁶ PRO AIR 14/1753 ORS Report 89 “Analysis of Navigation – Raid Against Kassel October 22/23rd, 1943” 30 December 1943.

³⁷ PRO AIR 14/3948 Minute 8 OIC ORS to D/CinC, 10 February 1944, covering ORS B 197 “Review of Bomber Losses in Relation to Enemy Defensive tactics in Night Operations”, 7 February 1944.

³⁸ PRO AIR 14/733 Loose Minute Ops 1 (d) to A/Cdre Ops through G/C Plans, 7 February 1944; “Minutes of a Conference Held on February 20th 1944, Held at Headquarters, Bomber Command, to Discuss New Tactics to be Employed to Confuse the Enemy”, 21 February 1944. See also PRO AIR 14/1453.

³⁹ PRO AIR 14/1801 Minute 11, CinC to D/CinC 25 February 1944. Harris did not forget the requirement to increase the size of the PFF and in September asked the scientists to revisit the question. They found

from the Groups was equally positive⁴⁰ and a letter from the command was promulgated on 22 March describing the new tactics.⁴¹

Ironically and tragically, just one week later on 30 March, a raid against Nuremburg “showed the extent to which Bomber Command’s position was precarious.” The attack came in across the north with a straight leg of some 250 miles which passed close to two fighter beacons. No diversions or spoofs had been planned. Of 795 sorties allocated to the target fully 95 crews, 12 percent, failed to return. ⁴² Arguably, the application of the scientists’ recommendations might have saved many fliers.

As important as these actions were, focus had shifted to the invasion of the continent. Planning for Bomber Command’s part in *Operation Overlord* had actually begun during the previous winter. On 31 December 1943, Harris sent Saundby a short memo calling for the preparation of an appreciation of Bomber Command’s potential to support the invasion. In fact, he wished to limit the Command’s participation, and therefore directed that the appreciation should emphasize that:

Pin point bombing by the heavy bombers is as a rule ineffective. Some of the aids are accurate enough for the purpose but if anything more than a very small force is used...a big drag back or a throw off is bound to occur as soon as the target is obliterated by bomb smoke or incendiary glare. It is our experience that even small towns are a questionable objective for the Bomber Force and that if it is to be used with real economy the big towns are the best objectives because no matter what the drag back or throw off some damage is done somewhere. Railways are as a general rule an entirely unprofitable target and do not lend themselves to being put out of action except for a few hours.

that the training model for the PFF was highly inefficient; a new introductory course was proposed. Dickins, *OR in Bomber Command*, p. 62.

⁴⁰ PRO AIR 14/1801 Letter AOC 5 Group to A/V/M Walmsley HQ BC 4 March 1944; Letter 100 Group Addison to A/V/M Walmsley HQ BC, 6 March 1944; Letter AOC 3 Group to A/V/M Walmsley HQ BC 7 March 1944; Letter AOC 4 Group to A/V/M Walmsley HQ BC 8 March 1944; Letter AOC 8 Group to A/V/M Walmsley HQ BC 9 March 1944.

⁴¹ PRO AIR 14/1801 Letter SASO to Groups, 22 March 1944.

⁴² Webster and Frankland, Vol 2, 207. See also Greenhous et al., *The Crucible of War*, p. 766.

...with the type of bombing we do at night the bombing of Occupied French towns outside the battle zone would be deplorable and is in fact at present forbidden by the Government.⁴³

In February Harris provided his thoughts on the Allied Expeditionary Air Force's own concept for the use of bomber forces.⁴⁴ The scheme called for more bombs than the Command was capable of delivering (between 29 and 34,000 tons per month, versus the Command's upper limit of 22,500) and a degree of precision that was wildly optimistic. He wrote, in part:

- (ii) I wish particularly to draw attention to the fact that the standard of accuracy in the attack of gun positions on which the entire success of the operation is admitted to depend [emphasis in original] has never been achieved under the best weather conditions by the use of Oboe technique. If weather conditions are such as to prevent ground markers from being clearly visible, the attack has no prospect of success whatever.
- (iii) Within Oboe range we have never in practice attained the degree of concentration round a specific point on which the estimates in this paper depend.

Many of the railway targets which the plan requires to be destroyed are outside Oboe range and some of these are in small towns which it would be extremely difficult to find and bomb successfully by any other method. It is therefore useless to hope that they could be destroyed by a single attack.⁴⁵

While calculations provided by the Allied Expeditionary Force (AEAF) suggested that one ton of bombs would be required to destroy one acre of rail yard, the scientists' detailed figures showed that 110 Oboe or well over 1000 H2S sorties would be required for a 50 acre yard. These calculations took into account a range of factors including

⁴³ PRO AIR 14/734 Loose memorandum, CinC to D/CinC, 31 December 1943.

⁴⁴ PRO AIR 14/734 Memorandum by AOCinC Bomber Command on Paper entitled: 'OVERLORD' – Employment of Bomber Forces in relation to the Outline Plan. (Reference AEA/MS.22007/Air Ops. Dated 12th February, 1944), 14 February 1944.

⁴⁵ PRO AIR 14/734 Memorandum by AOCinC Bomber Command on Paper entitled: 'OVERLORD' – Employment of Bomber Forces in relation to the Outline Plan. (Reference AEA/MS.22007/Air Ops. Dated 12th February, 1944), 14 February 1944.

aborts and gross errors. The bottom line, wrote Harris, was that: “attacks on marshalling yards requiring a density of 4 hits per acre are an extremely difficult proposition. The density required is equivalent to 640 tons per square mile, a figure 2-3 times that ever achieved by Bomber Command in its most successful attacks.”⁴⁶

Solly Zuckerman (later Lord Zuckerman) the AEAf's own OR specialist challenged Harris's thinking, but preliminary data from the first 15 raids showed that the average bombing error across the command had been between 480 and 680 yards.⁴⁷ And the longer trends were less inspiring. The detailed report followed some days later and in it an average error of 680 yards was noted. The report also stated that these new values had had an effect on the efficiency of the attacks but that effectiveness was not what had been hoped for.

The result of applying these new parameters is that the overall requirement is increased by a factor of 1.43. The actual weight of attack dispatched on the 11 targets considered in this report was 1.72 times the original estimated requirement, or 1.20 times the revised requirement, and even so, 4 of the 11 targets required further attention by tactical daylight forces in respect of priority buildings insufficiently damaged. *The reason for this excess over the theoretical requirement* [emphasis added] is that sometimes the priority buildings will be underhit (and the target will require further attack), and sometimes they will be overhit with a consequent wastage of bombs.⁴⁸

If there was any doubt that the crews and the Command were incapable of guaranteeing specific results surely this was it.⁴⁹

The scientists also continued to analyse raids against Germany and at the end of the year they were able to comment on the results of six such attacks.⁵⁰ Thirty-seven

⁴⁶ PRO AIR 14/734 Appendix C to Memorandum by AOCinC Bomber Command on Paper entitled: 'OVERLORD' – Employment of Bomber Forces in relation to the Outline Plan. (Reference AEAf/MS.22007/Air Ops. Dated 12th February, 1944), 14 February 1944.

⁴⁷ PRO AIR 14/3936 Minute 1 OIC ORS to D/CinC, 9 June 1944.

⁴⁸ RAF Air Historical Branch, Bomber Command ORS S Series Reports, S 159 “Summary of 15 Oboe Groundmarking Attacks on Marshalling Yards 6/7th March – 10/11th April, 1944”, 15 June 1944.

⁴⁹ See also Air Ministry *Operational Research in the RAF*, 55-7. The optimization of technology and tactics that Zuckerman took for granted did not come into being much before the close of hostilities in May 1945.

percent of the sorties had been ineffective either due to early returns, gross errors or other problems. Of those that bombed effectively, the systematic error was 1080 yards and the overall average error was 1460 yards—almost a statute mile.⁵¹ While it was noted that the 1460 yard scatter was more than double the error for lightly defended targets, it was still much better than the 2550 yard average from the previous year.⁵² The report offered a number of reasons to explain the difference between the figures for the summer and the year end: increased defences over Germany; the greater size of the targets; the fact that targets were found and marked using H2S rather than Oboe; and the need for a larger number of TIs which would make the bomb aimers' ability to define the aiming point more difficult.⁵³

These statistics weighed heavily on the Command's ability to guarantee success on deep and small targets, targets called for by oil and transportation target systems now directed by higher headquarters. If ever Harris had had a case to make for not wanting to be held accountable for a target set that remained at or beyond the limit of his Command's capacities, these results were surely convincing reasons why the Command should not have been given the task. While that decision was clearly one to be made at the highest levels of strategic command, the scientists had very expertly provided the best possible advice on which to base that decision. That the task did come to the Command was simply a command prerogative, but at least the decision could be made with knowledge of the issues.

The relative precision of Bomber Command's efforts compared to the claimed accuracy of the US Army Air Forces has been discussed by other researchers, notably William Hays Parks in his 1995 analysis *'Precision' and 'Area' Bombing: Who Did Which, and When?* where he shows that Bomber Command was actually more precise than its

⁵⁰ PRO AIR 14/3936 ORS S 197 "Bombfall Distribution in Night Area Attacks on German Cities",19 December 1944.

⁵¹ The systematic error was the error induced by marking imprecision. If the PFF misidentified the aiming point, or was sloppy in marking then the entire raid was thrown off.

⁵² If ever there was a reason to have told Zuckerman to back off in his criticisms of the Command's reluctance to engage precision targets this could easily have been it.

⁵³ PRO AIR 14/3936 ORS S 197 "Bombfall Distribution in Night Area Attacks on German Cities",19 December 1944.

American counterparts. But Hays Parks and others still find it puzzling that Harris remained seized of the notion to continue with area bombing against major centres.⁵⁴

Did he recognize that even with the best of all training and equipment his crews could not always be counted on to find and bomb the pickle barrels; was he after 80 percent effectiveness every night, rather than brilliant success mixed in with the unmitigated disaster? Perhaps he recognized that the law of 1940—that his crews could not see in the dark—still held true.

Perhaps historians have not properly taken into account the human factor. We have presumed that Harris simply allowed his crews free rein and that he endorsed city busting. Clearly this was not the case. Instead we see a nation, and an air force, driven into area bombing as the only means to carry the offensive to Germany. We have a commander, a staff and a group of scientists dedicated to solving the problems which prevent precision attacks. Why could not Harris or his subordinates simply cause the accuracy to improve? We might ask the same sort of question of Monty about the weeks that his armies took to fight their way out of Normandy.

Commanders might well know what needs to be done, and might have the resources to do it, but the fighting falls to young soldiers who do not necessarily have the expertise to carry out the orders as directed and who, subject to the fog and friction of combat, can and do make errors. That Harris and his flyers did as well as they did, and better than many seem ready to admit, was little short of remarkable.

⁵⁴ William Hays Parks, ““Precision” and “Area” Bombing: Who Did Which, and When?”, *Journal of Strategic Studies*, 18/1 (March 1995);, pp. 145-74.