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Stephen J. Harris

Directorate of Heritage and History, harris.sj@forces.gc.ca

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The Halifax and Lancaster in Canadian Service

Stephen J. Harris

In our early discussions on the bomber section of *The Crucible of War*, the third volume of the official history of the Royal Canadian Air Force, Ben Greenhouse and I wondered whether we should adopt a chronological or topical organisation. I preferred the latter; Ben the former. He was the principal author; he got his way – he was right, of course, I now admit freely; and his instructions to me were “to write an account of Bomber Command and the strategic bombing offensive on a chronological basis weaving in issues of tactics, technology, operations, morale, equipment, air battles, and policy as tightly as Goretex cloth.” We agreed, however, that I could begin by doing topical narratives, because I would have to know the full story of these topics, as it were, in context, in order to weave them into a chronological account. I knew where I could find the bombing policy story from Public Record Office documents and the Harris and Portal papers; and it was there, implicitly, in Webster and Frankland. But there was no consistent study of gun turrets, German air defences, bombsights, and the two main British heavy bombers – at least, none that were going to help me. So I did research on these topics in London and here in Ottawa and did the narratives and then incorporated both detail and my conclusions into the text. The beauty of it was that having done all that primary research on these topics to produce the narratives long before I tried to write the chapters, I was really well prepared to handle these issues.

The Halifax/Lancaster controversy was, of course, central to any Canadian book on the bomber offensive because of the traditional allegations that Harris was all too prepared to give Canadian squadrons clapped-out, second-

rate aircraft. I had to know how clapped out Halifaxes were; and I had to find out whether the allocation of aircraft was biased along national lines. What I found was that Harris exaggerated somewhat; that he did not allocate aircraft on national lines; and, perhaps not surprisingly, that bomber crews who survived a tour on Halifaxes were quite happy with their aircraft. Why not? They made it through. So, they talked about its robustness: that they came home, in some cases, with damage that would have destroyed a Lancaster. Lancaster pilots talked about its superior performance, that let them fly above all those poor Hally drivers three thousand feet below.

In the end, Robert Linnell, the producer of *Warriors of the Night* and *Last Flight to Berlin*, undertook a film documentary on the Halifax in conjunction with the Trenton restoration project. He found a Handley Page aviation engineer who said that he should use modern technology to test what he believed had been, in retrospect, a design problem that had inhibited the Halifax's performance: something which, as I understand it, could not have been known at the time. I do not know the details, but Bob Linnell said that when they tested the guy's theory, it proved to be accurate. Oftentimes we decry documentary film producers for their shoddy work. But in this case, Linnell, who began his work while we were doing *Crucible* and kept in touch with me, took official history work and, after ten years of searching, found someone who could answer his question – and mine: far too late for the official history. Harris had been right – there was a design problem that limited the Halifax's performance, but it never could have been found or corrected at the time.

So, what follows is the research report that I compiled and then used to deal with the Halifax issue in the official history.

* * * * *

When war broke out in September 1939, Bomber Command was equipped, or about to be equipped, with aircraft designed to meet Air Ministry requirements set down between 1932 and 1936. The Handley-Page Hampden and Vickers Wellington derived from Specification B.9/32, calling for a twin-engine day bomber; the Armstrong-Whitworth Whitley from Specification B.3/34, which asked for an experimental twin-engine heavy night bomber; the Blenheim from Specification B.28/35, which allowed for modification of the civilian Bristol Type 142 as a fast bomber; and the Short Stirling from Specification B.12/36. (Although as might be obvious, perhaps it is worthwhile to point out that the last number in a Specification, eg. /36 indicates the year in which the specification was issued.)

The latter was the first Air Ministry specification for a four-engined bomber, capable of reaching targets anywhere in Western Europe. It called for a minimum range of at least 3,000 miles, a speed of 230 miles per hour at 15,000 feet (the anticipated bombing altitude given the bombsights of the day), a service ceiling no lower than 28,000 feet, and a maximum bomb load over shorter distances of 14,000 pounds, falling to 2,000 over greater ranges. Had these specifications been met, Bomber Command would have had a first-class machine available in 1940, but the Stirling fell far short in several crucial areas. Its service ceiling was 16,500 feet (raised to 17,000 in the Mark III), which was lethal in heavy *Flak*, and it never achieved the speeds desired at normal bombing altitudes – which proved to be lower still than the service ceiling. Indeed, Stirling losses were such that, by 1943, the type had to be withdrawn from operations over Germany.¹

The standards called for in these specifications more or less established the theoretical limits of what Bomber Command would be capable of in the first few years of the war. But it should not be thought that the Air Ministry or Bomber Command had fixed on them as satisfying all or even most of their immediate

or long-term requirements. Specification P.13/36, for example, called for a twin-engined medium bomber capable of carrying 8,000 pounds of bombs, clearly an advance over the Hampden, Blenheim, Whitley, and Wellington,² while B.19/38, subsequently renumbered B.1/39 in March 1939, looked to the development of a four-engined machine, for use in all parts of the world, which would replace all existing medium and heavy bombers. It was to have a minimum speed of 280 miles per hour at 15,000 feet, a range of at least 2,500 miles and carry a minimum bomb load of 9,000 pounds. Defensive armament was also to be upgraded substantially over current standards, with eight Hispano 20 mm cannon housed, four each, in the dorsal and ventral turrets.³

Specification B.1/39 in particular met many of the recommendations made in the air staff's and Bomber Command's own investigation of the "ideal bomber,"⁴ but neither it nor P.13/36 produced the anticipated results. The engines intended for the latter were failures, while B.1/39 was cancelled in May 1940 by Lord Beaverbrook to allow the aircraft industry to concentrate production on existing types to meet the immediate German threat. Despite the lifting of such restrictions on the development of new designs the following year, the British aircraft industry was thrown off balance, and subsequent specifications bore little fruit until 1943, when B.14/43 resulted in the Avro Lincoln. But none of these four-engined heavy bombers were ready for operations before late 1945, some months after the Japanese surrender.⁵ Moreover, the Lincoln could not be considered as belonging to the same generation as the American B-29 or the final few bomber designs produced in Germany.

Although they were not proceeded with, the specifications issued between spring 1941 and B.14/43 still deserve some attention. Not only do they indicate the development of Air Ministry thought with regard to bombing, but perhaps more important, they may – this is speculation – have provided Bomber Command with a constant reminder of what might have been possible in the best of all possible worlds. Specification B.5/41 (which was succeeded by B.3/42 issued on 8 December 1942) aimed, for example, at the design and development of a high altitude, pressurised heavy bomber with a

Harris: The Halifax and Lancaster



A Handley-Page Halifax Mark I or II of 405 Squadron RCAF, with early style vertical stabilizers and the nose-mounted Boulton Paul turret, in flight.

service ceiling of 38,500 feet, a speed of 345 miles per hour at 31,000 feet, a bomb load of 8,000 pounds, and remote-controlled, cannon-equipped, and radar-directed barbettes as defensive armament – a machine that would have been comparable in every respect to the

American B-29. Vickers took up the challenge and produced, in the words of one authority, “the most elegant of British heavy bomber designs,” and one which was “the ultimate expression of British concepts for piston-engine design in its class.”⁶ But the third – and last – prototype of

An Avro Lancaster I.





Beaverbrook Collection of War Art, Canadian War Museum AN 19710261-3071

Marshalling of the Hallies – Paul Goranson

the Windsor, as this type was known, did not fly until 11 July 1944, and even then the problems of designing and producing the defensive barbettes had not been solved. Work ceased before further progress was made.⁷ Short Brothers were also involved in a proposal to create a Super Stirling (under Specification B.8/41) to carry 10,000 pounds of bombs at 300 miles per hour over 4,000 miles, but it too was cancelled.⁸

The reasons why these specifications failed to produce operational aircraft are complex. The tone of Correlli Barnett's *The Audit of War*⁹ suggests that the British aircraft industry as organised and managed between 1939 and 1945 was not capable of designing, developing and producing new types while trying to meet current commitments to furnish the operational commands with what they required. I suspect, too, that the rules governing the allocation of labour and materials to the British aviation industry established by the Ministry of Aircraft Production (MAP) meant that it was always easier to increase production of current types than it was to convince the MAP bureaucracy of the need to introduce new equipment. The fact that, from

late 1941, Winston Churchill consistently demanded significant increases in the *current* strength of Bomber Command undoubtedly reinforced this tendency. Finally, it also happened that by 1941-1942 Bomber Command was being supplied with two types of aircraft which, with suitable modification, seemed capable of satisfying enough of the Air Ministry's and Bomber Command's basic requirements that having to live with them did not appear to involve great sacrifice.

These two designs, the Handley-Page Halifax and Avro Lancaster, both evolved from the P.13/36 specification for a twin-engined bomber and the subsequent failure of the Vulture engine designed for them. The Handley-Page H.P.56 was cancelled before it got off the ground in 1937, a new H.P.57 with four Rolls-Royce Merlins and a larger fuselage was substituted, the prototypes flying in October 1939 and August 1940, and the Halifax entered squadron service on 23 November 1940 – a simple, straight-forward, and seemingly effortless progression.¹⁰ The path from the Avro P.13/36 design – the Manchester – to its Lancaster successor was not nearly so direct. At first it was hoped that a two-engined machine

could still be proceeded with, using either Centaurus or Sabre engines instead of the Vulture, but when these proved to have their own faults A.V. Roe moved ahead with a four-engined variant using Rolls-Royce Merlin Xs. This was opposed by Handley-Page, and was not supported at first by the Ministry of Aircraft Production, which was hoping to standardise on one four-engine design and which, for the moment, was well satisfied with the Halifax's potential. Moreover, Merlins were in great demand for the Spitfire and Hurricane as well as the Halifax. But with the connivance of Rolls-Royce and a certain amount of scrounging for materials, the Avro team led by Roy Chadwick had the prototype Lancaster ready for its maiden flight on 9 January 1941. The trials were successful, and the subsequent evaluation at Boscombe Down so positive, that immediate production orders resulted.¹¹ Operational service commenced that December.

For a number of reasons, therefore, qualitative improvement in Bomber Command during the Second World War came primarily through modification of the Halifax and Lancaster, rather than as a result of the introduction of wholly new types. The rest of this research narrative will look at the kinds of modifications demanded by Bomber Command, and the extent to which they were accepted (and, where possible, why) by the Air Ministry and MAP.

* * * * *

That the Handley-Page Halifax was something less than an unqualified success was apparent before its first operational flight in March 1941, and even more so thereafter. Whether the flaws discovered in this period were attributable to the process of converting an original design for a two-engined machine to the larger four-engined version, or simply occurred in the nature of things, is not entirely clear; but they were well known by the summer, and led to a number of modifications in the type even before the Mark II variant entered service with No.35 Squadron in October.

Some involved crew comfort. Draughts from the beam guns, the ventral turret, and leaks in the bomb bay doors, fuselage, and wing seams could be unbearable. Other problems were more

serious, and involved the basic airworthiness of the type. The ailerons were heavy and sluggish above 250 miles per hour and also whenever the aircraft was pitched at a sharp angle. The wooden aileron flaps tended to warp which provided somewhat less than predictable responses. In addition, the rudders had an unnerving tendency to overbalance below 150 miles per hour, and any time the engines were throttled back, causing them to lock on and eventually produce a spiral dive from which it was difficult to recover. Below 120 miles per hour it was often difficult to obtain any response whatsoever.¹² This could be deadly to an aircraft returning home with battle damage, flying on two or three engines (when rudder overbalancing was common), or during evasive action. Furthermore, the measures required of a pilot to compensate for rudder overbalancing were, in themselves, almost self-defeating. Although much of the problem was caused by the inadequate design of the rudder itself, the rudder controls had a very light touch compared to all others. Accordingly, as the pilot fought to gain control of his aircraft by manipulating everything possible, there was "a natural tendency" for a pilot to overcorrect and make the situation even worse.¹³

Attempts to fix these problems were made early, and often. Body and bomb bay leaks were sealed; metal aileron flaps became available in August 1941; modified trim tabs were introduced to improve rudder response; and the fuselage itself was strengthened.¹⁴ But even the Mark I variants incorporating these modifications suffered from an even more fundamental problem. The Merlin X engines which powered almost all of them were underpowered and had to be overworked when pilots manoeuvred violently or fought for altitude.

The Mark II Halifax, which entered squadron service in October 1941, was fitted with the more powerful Merlin XX engine, but this was not an altogether happy development as it had a habit of failing on long-range flights. Similarly, while the Boulton Paul C Mk II mid-upper turret, which replaced the draughty ventral gun positions, may have reduced the amount of cold air leaking into the aircraft, it was extremely bulky and created considerable drag, which reduced performance further.¹⁵

Most important, however, the modifications to the rudder assembly attempted so far had not stopped overbalancing, while some of them, adopted piecemeal, actually exacerbated the situation by causing new problems. The installation of a bulbous “nose” on the rudder, for example, led to difficulty in maintaining trim. Furthermore, by fall it was found that the deterioration in performance of the Halifax II, “consequent upon progressive application of external equipment,” had gone so far that the aircraft was “incapable of meeting concurrently the operational requirements of both high loading and high altitude cruising.” This “external equipment” included, among other things, a heavy coat of camouflage paint, and fittings for 4,000 pound bombs which left the bomb bay doors partially open in flight.¹⁶

Despite the persistent design and structural problems which plagued the Halifax almost from the first flight of the prototype – and of which some seemed beyond remedy in the early months of 1942 – the alternative of concentrating on the Lancaster instead was not yet feasible. Although prototypes of the four-engined Manchester III/Lancaster I had been flying since January 1941, and production models powered by the Merlin XX (the same engine selected for the Halifax II) since October, A.V. Roe’s design was not without flaws. Skin wrinkling, and difficulties with both the wing tips and the front spars on upper wing surfaces, had been identified as the cause of fatal accidents early in 1942.¹⁷

These were soon corrected, but an Air Fighting Development Unit (AFDU) report on the Lancaster issued 30 May 1942 noted some additional difficulties. Although the Lancaster, with its Merlin XX, was powerful and manoeuvrable, promising more than the Halifax, the test pilots believed that operational crews would require considerable experience on the type before they would be capable, routinely, of putting their machine through the violent turns and dives necessary to avoid *Flak* and fighters. In addition, the design of the nose gunner’s position was “extremely inconvenient.” Lacking a foot rest, the gunner was likely, “in moments of stress,” to “tread on the bomb-aimer’s head.” Beyond that, the AFDU expressed its concern about whether the Lancaster, armed with only .303 machine guns, had any chance of surviving

in daylight operations – a valid, but for the moment irrelevant, caveat.¹⁸

It should be noted that the possibility of substituting Lancasters for Halifaxes had been raised in July 1941, a year before the AFDU report was issued and only two months after the first prototype Lancaster flew. But the reason for broaching the issue at this time had nothing to do with any dissatisfaction with the Halifax. Indeed, it was precisely because there “appeared to be little difference in performance” between the two that the matter was raised at all, and then only on account of “engine considerations.”¹⁹ With the possibility that the allocation of both Merlin and Hercules engines to bomber aircraft could be affected by production shortfalls or competing demands from Fighter Command, it was important to know whether priority could be given to either of the two heavy bombers. This was possible once it was clear that they had equal potential.

But reordering of production priorities for any reason other than shortfalls in the supply of component parts was not acceptable in the summer of 1941, particularly if it raised the possibility of a reduction in the total output of bomber aircraft. Prime Minister Churchill was “deeply concerned” in July 1941 when the forecasts he was receiving showed that there would be no appreciable strengthening of Bomber Command by the end of 1942, and concluded that this would cost the RAF “all possibility of decisive predominance indispensable to victory.” As a result, he preferred that production of existing, “well tried” bomber types should increase – even those able to make only shallow penetrations into Germany. “A machine good enough to carry two tons to the Ruhr,” he told Beaverbrook, Sinclair and Portal, “ought to have a long run in continuous production before it is discarded.”²⁰ Consequently, even Whitley’s and Blenheims received a new lease on life.

Unease about the Halifax had increased considerably a year later. Bomber Command’s Operational Research Section was convinced, for example, that a significant number of the Halifaxes which failed to return from operations between July 1941 and June 1942 had been lost because of the type’s poor flight and handling characteristics: it had difficulty gaining altitude,



A Handley-Page Halifax Mark III of 426 Squadron at dispersal.

miserable manoeuvrability at altitude, too little speed for evasive turns, and a nasty tendency to roll over if the turrets were rotated (to follow a night fighter) while the pilot was engaging in evasive manoeuvres.²¹ Moreover, the exhaust shrouds were so ineffective that Halifaxes could be seen from as far away as five hundred yards from dead astern. Unhappily, Portal informed the prime minister, finding ways to reduce the visibility of exhaust flames was a major problem of “considerable difficulty.”²²

The next month saw the beginning of what would become Air Marshal Harris’s long campaign to rid Bomber Command of the Halifax (and, quite likely, any other aircraft designed and built by Handley-Page, a firm for which he had had little sympathy since he first saw the Hampden)²³ and to concentrate all bomber production on the Lancaster instead.²⁴ Failing that, he was determined to “get to the bottom of Halifax vulnerability” which, together with the posting of some aircrew to the Middle East, had recently forced No.4 Group to be taken off operations. So far as Harris was concerned, the vulnerability was explained easily: by the “poor performance of an overloaded aircraft.”²⁵

The issue was addressed again on 2 September, during the second meeting of the committee struck to co-ordinate the bomber offensive. Harris had two suggestions. First, he asked whether it was possible to substitute 1,300 Lancasters for the 1,800 Halifaxes then scheduled to be built – a proposal which Portal found interesting, and perhaps even “an extremely good bargain” given the Lancaster’s better casualty record and its higher payload. MAP undertook to study the question. Harris then noted, however, that the superiority of the Lancaster depended entirely upon which Mark was being discussed. For the Lancaster II, equipped with Bristol Hercules radial engines, was proving to be inferior to the Lancaster I in almost every respect – range, ceiling and speed at altitude – yet was scheduled to be produced at the same rate as the I. Accordingly, he asked whether the Merlin XXs to be installed in Halifax airframes (as the Mark II) could be set aside for Lancaster I production, and the Hercules meant for the Lancaster II be transferred to the new Halifax Mark III, which would then be used for training, minelaying, “and operations in overseas theatres where first rate performance is not a vital operational necessity.”²⁶

Halifax losses on operations (and in flying accidents around Britain) continued at unacceptably high levels during the fall of 1942. Inadequate training of new pilots was discovered to be one cause, but it was also apparent that rudder overbalancing was still occurring regularly – and fatally. Still more solutions were attempted, most of them palliative, until the aircraft testing establishment at Boscombe Downe took two production models for more extensive investigation. On 4 February 1943 one of these dived, went into a flat spin, and crashed, its rudders having overbalanced so much that the top half of one was discovered to have broken away. Further study eventually produced the larger, rectangular fins to be found on all Mark III Halifaxes, and retrofitted to earlier Marks as well. The problem of rudder overbalancing had been solved.²⁷

But this was not the only problem afflicting the Halifax. In what has been called the “Christmas-tree syndrome,” it, like most other aircraft, had been fitted with a number of additional external equipments – navigation blisters, airdrops, cable cutting devices on the wings, and heavy coats of camouflage paint – that added considerably to weight and drag. Much of this additional equipment was removed in an officially sanctioned clean-up of the Halifax undertaken in the fall of 1942, but based on their own experience some squadrons went even further, removing the bulky Boulton Paul C turrets, for example, or the armour plating around certain crew areas. This clean-up did not

make up for the basic lack of power available on the Mk II and V, but the modifications were extended to, and improved, the Hercules-powered Mark III when it entered service in July 1943.²⁸

In the interim, however, Bomber Command was saddled with a force of Halifaxes that not only “stinks,” Harris told officials at the MAP, but was also “definitely cracking” the morale of his crews.²⁹ An Operational Research Section report issued on 31 October 1942 confirmed his prejudice. Although the Halifax seemed to be intercepted less often than the slower, and lower-flying, Wellingtons and Stirlings, and even less often than the Lancaster, once it was found by a night fighter it was more likely to be attacked than any other type – presumably because it lacked power and manoeuvrability, but also, perhaps, because its exhausts were visible so clearly and from such a great distance. As a result, it had the highest missing rate of all bombers. The Lancaster, by comparison, was being intercepted by night fighters twice as often as the Halifax, but these interceptions developed into attacks only 15 per cent of the time (as opposed to the Halifax’s 67 per cent) – presumably, again, because of its “good performance and manoeuvrability.” As a result, the Lancaster loss rate was just half that of the Halifax. (See Table 1)

Harris had every reason to be unhappy with these figures. With half the future Lancasters scheduled to be Mark IIs, which he had already declared “unacceptable,” losses of that type were

Table 1

Missing Rates of Bomber Aircraft 1 August 1941 – 31 October 1942				
Aircraft Type	Missing Rate*	Interception Rate*	Attack Rate*	Intercepts with develop into attack (%)
Lancaster	3.5	9.7	1.5	15.5
Wellington I, II, IV	4.0	7.9	2.5	31.6
Stirling	4.1	10.9	3.5	32.1
Wellington III	4.5	14.3	3.4	23.7
Halifax	6.1	4.9	3.3	67.3
* = per centage of sorties flown				

Definition: An interception is defined as contact being made between a night-fighter and a bomber without an attack necessarily developing, either because the night fighter could not follow its first contact (or saw a better target), or because the bomber was able to evade the night-fighter.

Source: Operational Research Section, Bomber Command, Report 66, “Review of Sorties, losses, and interceptions of Bomber Command aircraft in night operations during the period 1st August 1941 – 31st October 1942,” TNA PRO AIR 14/364.

likely to rise, while Merlins were still being wasted on the “deplorable” Halifax. “If we must have Halifaxes at all,” he told Portal, “let them be nothing but Halifax IIIs,” which might be of some use on easier operations and undertaking “those Naval demands for long range aircraft as may be inflicted upon us.”³⁰

One month later, at the third bomber offensive co-ordination meeting, Harris reiterated his earlier plea to reserve all Merlins for the Lancaster (so that they would all be Is) and channelling all Hercules to the Halifax (making them all IIIs). Everyone present agreed. Sinclair announced, in addition, that the Cabinet was ready to authorise a wholesale conversion of Stirling production to the Lancaster. However, although Lord Cherwell supported Harris’s request to convert Halifax production as well, noting that the Halifax dropped .95 pounds of bombs per man-hour of manufacture compared to the Stirling’s 1.2 and the Lancaster’s 3.6, Sinclair stated that the Cabinet was not prepared to go that far, and would wait until the cost of any such conversion programme was better understood.³¹

Harris returned to the attack three weeks later in yet another stiff lecture to Sinclair. The Stirling and Halifax were both major worries, he told the secretary of state, and together they “presage disaster unless solutions are found.” The manager at one Stirling factory, he continued, was “an incompetent drunk,” while Handley-Page 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 whatever ponderable 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 kicked out, lock, stock and barrel. Trivialities are all they are attempting at present, with the deliberate intent of postponing the main issue until we are irretrievably committed...

Unless we can get these two vital factors of the heavy bomber programme put right, and with miraculous despatch, we are sunk. We cannot do this by 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

jeopardy my gallant crews and the compromising of our only method of winning this war.³²

Three days later, but surely not as a result of this latest outburst, the first priority for labour within the jurisdiction of the MAP was given over to Lancaster production.³³ This should have pleased Harris, and in fact apart from a single criticism about the way Handley-Page was carrying out modifications, passed to Sinclair on 29 January,³⁴ the files are silent on the Halifax-Lancaster issue until May 1943 when, on the 13th, Harris again criticized the manufacturer, asserting that the only real improvement to have been made to the Halifax over the past year was the installation of a Perspex nose – which also happened to reduce the bomber’s armament. The crucial problem, he continued, was the inadequate flame damping mechanism on all models.³⁵

Harris had legitimate cause for concern about the Halifax II/V and the Lancaster II, and his proposal to do away with these types through the relatively simple expedient of switching engine allocations made considerable sense. Similarly, so long as a reduction in the total bomber production could be accepted, there was logic in his recommendation to shut down the Halifax programme altogether and to concentrate exclusively on the Lancaster – although given his opinion of the Lancaster II, there would obviously have been a surplus of Hercules engines had this advice been taken. If that could not be arranged, restricting Halifaxes to easier targets, leaving deep penetrations to the Lancaster, was always possible – as Harris himself had acknowledged some time before. But by now he was wedded to a massive bombing offensive against German cities and wanted the largest bomber force possible to achieve this objective. This meant employing Halifaxes under disadvantageous conditions. Similarly, cutting back on bomber production to allow a Lancaster for Halifax switch was not acceptable to the prime minister, who never rescinded his demand for quantity. Fiddling with production schedules was even more unwanted within the Ministry of Aircraft Production, which had been struggling since 1940 to meet the Air Ministry’s demands for numbers. Indeed, it was only in late spring 1943 that the Deputy Director General of Statistics, Professor Jewkes, believed there was any cause for optimism within his ministry, and that was

precisely because, “for the first time since the war started” the aircraft industry was to be given “a run of nine to twelve months in which no major switches in aircraft type” would be called for. Conditions were therefore ideal for “quantity production.” As a result, not only was it likely that the RAF’s requirements would be met in the near future, but there was also a real possibility that bomber production in 1944 would exceed what had been called for if additional labour could be secured.³⁶

Jewkes did not make policy, but his memorandum reflected opinion within MAP and, quite probably, within the Cabinet as well. The Lancaster was not going to be substituted for the Halifax in the near future. Given what was happening in the air war, there were reasons to argue that it should not be. In May of 1943 the stream tactics adopted by Bomber Command seemed capable of overwhelming the German night fighters locked into Kammhuber’s *Himmelbett* air defence system, while a start was being made to support the bomber offensive with various electronic measures and counter-measures. Losses might, therefore, be expected to fall. More to the point, in May 1943 the Halifax III, about which Harris had been mildly supportive, had not yet entered squadron service, and so had neither failed nor succeeded.

Harris, however, was still being influenced by day-to-day developments suggesting that the basic Halifax design remained inadequate. On 22 June, for example, having investigated losses over recent weeks, Bomber Command issued a report on evading *Flak* and night-fighters that highlighted all the known vices of the type. Acknowledging that mild manoeuvres were useless, Bomber Command nevertheless warned its Halifax crews in particular of the risks involved in taking “violent action.” Heavy or coarse use of the rudders was known to produce spins and even complete break-up of the airframe and as a result pilots were told that significant “displacement” from straight and level flight through progressive application of force on the control surfaces, rather than sudden, high rates of displacement, should be aimed for.³⁷

Harris was also concerned about the supply of Halifaxes, new and repaired, and of spares.

“Of all the types of aircraft handled by Bomber Command,” he told Sinclair:

The Halifax has, during the past eight months, given us more trouble particularly on the equipment side than anything else. Furthermore there has been, and still is, a most deplorable shortage of Halifax airframe spares and of ground, handling and servicing equipment, which causes innumerable difficulties and serious delays in forming and opening new units after they have been authorised...we cannot make full use of a large number of heavy aircraft if we cannot get adequate supplies of equipment to service them after they have been taken into use.³⁸

He complained to Air Chief Marshal Sir Wilfrid Freeman, now Chief Executive at MAP, two days later about the lack of progress in the fin and rudder modifications to be carried out on all Marks. Bomber Command was losing a number of crews he explained, because of the aircraft’s inability to take the evasive manoeuvres required after a night-fighter attack, and he was particularly incensed that this modification, the need for which had been understood for some time, was being delayed. What’s more, he was convinced that Handley-Page themselves had “deliberately dragged out and postponed action to correct the bad qualities of their aircraft owing to their urge for production and profit at any cost.”³⁹

Harris was perhaps being a little unfair. Handley-Page had large contracts to produce the Mark III Halifax with the new rudder assembly – production of which Harris himself had approved if Halifaxes had to exist at all – and there were more than 500 Mark IIs and Vs to retrofit without interfering unduly with aircraft production or the tempo of Bomber Command operations. It was, in short, a major undertaking, and perhaps the commander-in-chief should have been satisfied that production of the Mark III was forging ahead.⁴⁰

For whatever reason, the files are again silent on the Halifax issue until September 1943, when Harris once more took up his pen. On 7 September he told Portal that he did not believe Handley-Page’s promises to fix the “aerodynamic vices” of the Halifax, and asked that the firm be dropped. If this were not done, he was convinced

that the Halifax would soon join the Stirling as being unfit for deep penetrations. As it was, the Halifax's current "mediocre performance" had only been achieved by disarming the bomber.⁴¹ The next day he complained to Freeman:

With regard to the Halifax, that aircraft will be in the same position in which the Stirling now is by next Spring at the latest. The average Halifax already has to bomb at a ceiling of 18,000 feet or less, and that is nothing like good enough for hot targets. I have to pull Lancasters down lower and subject them to a higher casualty rate than is necessary in order to provide cover and protection for the Halifax and, when used, the Stirling.

Meanwhile where the Halifax is concerned we get, so far, nothing but the usual spate of unfulfilled promises from the Handley Page concern. The only "improvements" in the Halifax we are at present getting are its partial disarmament (!) and a slightly better coat of paint, with one or two minor modifications towards some improvements in its reliability.

If the Halifax cannot be made to go much higher than it does at the moment, i.e. to work at over 22,000 feet as a normal matter with a reasonable load, then it is no good going on with it. Its losses are mounting daily and while a certain proportion of them are due undoubtedly to the aerodynamic vices of the aircraft, most of them are due to its poor performance. Even when it gets to a target it hauls little, if any, more than half the load of the Lancaster while putting the same number of crew in jeopardy.

I do not know whether the new modifications to the tail so long promised and yet to materialise will eradicate its vices and make a saving on casualties from that cause. All past experiences

with the Handley Page concern have long ago convinced me that none of their promises will ever materialise and that all their swans are ducks – or sparrows. But whatever improvement is to be expected from the new tail the lack of ceiling of the aircraft is a fatal bar to its long continued use in the front line.⁴²

A number of things may have motivated Harris to write at this time – and to have said nothing since May. First of all, much of the summer had been taken up with asking for, and then planning to use, Window. Secondly, the loss rate fell immediately after the first Hamburg raid. And finally, the summer of 1943 saw the first operations of the Halifax Mark III – whose performance it would take some time to assess. By early September, however, the first flush of success using Window was waning: losses had mounted by that time and the counter-measure was clearly not the panacea some had hoped it would be. In addition, the Halifax Mark III was proving, in its first operations, not to be another Lancaster. But neither Freeman nor Portal accepted Harris' latest attack. To the former, the commander-in-chief was simply wrong in thinking that MAP could supply better aircraft than Bomber Command was already getting,⁴³ while Portal believed that Harris was being overly pessimistic. By the middle of 1944, the CAS pointed out, all the Halifaxes suffering from the vices Bomber Command was complaining about would be "out of production."⁴⁴

Additional evidence that all was not well with the Halifax III was not long in coming, as on 21

A 434 Squadron Lancaster X, 'S for Smitty,' photographed late in the war.



CFJIC PC 2513

September the chief engineer at Bomber Command reported the first production models had a maximum ceiling at least three thousand feet less than advertised,⁴⁵ forcing them to fly in lethal *Flak* and night-fighter zones. Air Commodore H.J. Roach was not sure what was wrong – poorly designed air intakes were one possibility – but inclined to the view that the Hercules engine's automatic mixture control was at fault, causing loss of power at altitude.⁴⁶ Harris appears not to have reacted to this information immediately, but by the end of the October he was heard from again, by both Sinclair and MAP. To the former he noted simply that the Halifax III was a "failure" and almost as useless as the Stirling.⁴⁷ To Air Marshal R.S. Sorley, Controller of Research and Development at MAP, he offered more technical details. Experienced pilots, he observed, were reporting ceilings as low as 18,000 feet on the Halifax III, and the only solution advanced so far – to extend the wing tips – had been pointed out by Bomber Command fully a year before but not acted upon.⁴⁸ (He was right. Harris had told F.J. Linnell on 16 October 1942 that the Halifax's problems could be traced to the shape of its wing.⁴⁹) Beyond this, crews were complaining of temperatures ranging from -11 to -27 degrees Celsius – much too severe for accurate work – in the navigation compartment as compared to a range of -3 to +20 degrees Celsius in the Lancaster. This too had been brought to the attention of MAP a year before, and nothing had been done.⁵⁰

That the Halifax III could not compare with the Lancaster I, and maybe not even with the II, is a common enough assertion supported by considerable testimonial evidence. For example, Flying Officer Jim McIntosh has written that when 432 Squadron RCAF converted from Lancaster IIs, the worst of that type, to Halifax IIIs, they went to an aircraft that looked to be "thrown together rather than designed" and in which everything was made "to frustrate rather than aid." However, McIntosh adds – in a singularly remarkable account – his Halifax III reached 25,000 feet easily, and one night he bombed from 29,000 feet, far above *Flak* and most enemy night-fighters – and far higher than any other Halifax pilot claims to have flown. Moreover, his crew liked the Halifax's large escape hatch.⁵¹ There is, in addition, some evidence that the Halifax may have been more

robust than the Lancaster – and less likely to burst into flame if hit.

By late 1943, however, with the Battle of Berlin raging and bomber losses climbing steadily, Harris was not likely to be persuaded by anyone favouring the Halifax. He had a grudge against Handley-Page anyway, and was unwilling to accept that anything useful was likely to emerge from that concern. What was important now, given the resurgence of the German air defences, was the safety of his crews, and that could be served best, in his view, only if they were flying Lancasters. Accordingly, on 2 December he approached Freeman again, repeating many of the old arguments about the vulnerability of the Halifax, but also picking up, more firmly than before, Lord Cherwell's claim that Halifaxes were not cost-effective. Lancasters he declared, would always be able to carry 5,000 pounds more payload than the Halifax over any range or the same weight of bombs five hundred miles further. As a result, he felt confident asserting that:

One Lancaster is to be preferred to four Halifaxes. That Halifaxes are an embarrassment now and will be useless for the bomber offensive within six months if not before. That all attempts to boost up the Halifax to Lancaster class will fail – if only because the Lancaster will by then be boosted beyond the class at which the Halifax has long aimed and always fallen far short of. I issued the same warning about the Stirling. It is now useless and flooding the market. I cannot too strongly warn you yet again that a continuance on Halifaxes leads us straight and soon for disaster.⁵²

An Operational Research Section study then underway at High Wycombe (but not issued until February) confirmed what Harris was saying when it found that the loss rate for Halifaxes was not dropping despite the adoption of the larger, rectangular tail fin.⁵³ Read one way, the data supported his contention that the tail and rudder modifications carried out over the past half year had not decreased the Halifax's vulnerability and that, as a heavy bomber, the type was beyond repair. It would stink forever.

But there is a flaw in his logic – the same flaw that permeates the whole Halifax story when it is seen exclusively from Harris's point of view. The reason why the Halifax loss rate loss was not falling during the Battle of Berlin was not

that the rectangular fin made no difference, but rather because Bomber Command was attacking difficult, distant targets defended by a *Luftwaffe* night fighter force recovering quickly from the impact of Window and other electronic counter-measures. Playing with statistics is a fool's game, but had Bomber Command been doing something else during the winter of 1943-1944, a drop in the Halifax loss rate might well have occurred, in which case the pre-existing bias against the type would have been less easy to support with so-called mathematical precision. But once Harris was committed to the Battle of Berlin, loss rates had to climb, and the bias against the Halifax was confirmed. That, in turn, served to deflect attention away from a second question, which probably should have been asked first. Allowing that the Halifax was less than ideal, would an all-Lancaster force have been able to sustain these operations at significantly less risk? In short, because of the prejudice against the Halifax, confirmed nightly over central Germany, it was easier to blame Bomber Command's failure to meet its objective on the Halifax's mediocrity than to question whether,

with the resources at hand, the Battle of Berlin was a reasonable operation of war having any chance of success. (See Tables 2 & 3).

Perhaps because of this, Harris's singleminded campaign against the Halifax began to bear fruit that December. In the middle of the month, the Deputy Director Organization (Planning) felt compelled to examine again the effect of abandoning the Halifax, and did so without questioning the essential validity of Harris's charges against the type. Rather, he explained, if substituting Lancasters for Halifaxes was not possible, the Air Ministry's reply should be based on the fact that production would fall by 1,000 bombers should the switch to Lancasters be made – which amounted to ten squadrons or, looked at another way, 29,500 tons of bombs that would not be dropped on Germany. To his credit, the DDO (P) admitted that “what we cannot answer is the fact that some of the loss” he was projecting would be “offset by increased efficiency of an all Lancaster force,” although just how much he did not hazard a guess, but this did not matter. Any change in the production schedule made in December 1943 would have had no impact until 1945 at the

Table 2

Bomber Command Loss Rate by Type (%) October 1943 – December 1943					
	All of Bomber Command		6 Group Only		
Target	Lancaster	Halifax	Stirling	Lancaster	Halifax
All Targets	3.5	5.1	3.3*	4.5	6.1**
Berlin	4.6	6.7	12.9		
Central Germany	3.8	7.3	5.8		
* includes a high proportion of Gardening operations and those involving shallow penetrations. ** if losses in 431 and 434 Squadrons are ignored, the 6 Group loss rate is only 4.7%.					

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Source: 6 Group Operational Research Section, Addendum to review of bomber losses in night operations with special reference to No. 6 (R.C.A.F.) Group, 13 January 1944, DHH 181.003 (D4223)

Table 3

Bomber Command Losses By Type (%) June 1943 to December 1943				
	Bomber Command Except 6 Group		6 Group Only	
Target	Lancaster	Halifax	Lancaster	Halifax
Ruhr/Eastern Germany	2.4	4.2	4.7	5.8
Berlin/Central Germany/Baltic	4.1	5.5	3.9	5.9
France/Italy/Gardening	N/A	1.7	N/A	0.9

Source: *Ibid.*

earliest, and Cabinet had decreed that manpower should not be wasted on projects whose effect would not be felt *before* 1945.⁵⁴

This good, safe, bureaucratic reasoning was reinforced at a special meeting convened on 21 December to discuss the future of the Halifax. Harris, of course, told a familiar story, except that instead of discussing this or that specific problem associated with the Halifax, for which solutions might be found, he dismissed the aircraft altogether. Nothing was wrong with it, he said, except its “inherent vices,” vices that would prevent it from ever flying above 20,000 feet. Undoubtedly reflecting his own weariness with the issue, the Controller of Research and Development, Air Marshal Sorley, responded simply that the Halifax III and VII, while not as good as the Lancaster, would be better than any

previous Halifax – which was really no answer at all. Portal, ever the diplomat, announced that he would like to see a switch in production made, but that this was not an easy thing to manage. Halifaxes, meanwhile, could do useful work against less distant targets. This was an important consideration, he added, if 1944 was the crucial year in the war, in which case it was not the time to inflict a five to six month loss in bomber output on the air force.

Freeman was less helpful. No matter how desirable it might have been, a switch in production from the Halifax to the Lancaster was not possible, he said, because the aircraft industry did not have the necessary jigs, an argument confirmed in general terms, by Corelli Barnett. For once Harris seems to have listened, as by the end of the meeting he was not only

Halifax aircraft of RAF Bomber Command cross the coast near Calais, France during a daylight attack in support of the Canadian operation to capture Calais, 25 September 1944.



Laurier Centre for Military Strategic and Disarmament Studies (LCMSDS) Photograph Collection

Table 4

Manhours to Produce One Aircraft per Month Including Spares		
Type	Airframe Only	Complete Aircraft
Lancaster with British Engine	330	1100
Lancaster with U.S. Engine	330	900
Halifax	420	1350
Stirling	850	1800
Wellington	370	770
Mosquito	170	450

Source: DDGPS memorandum, "Labour absorption estimates," 20 May 1944, TNA PRO AVIA, 10/269 (3/4 of way through).

talking in terms of specific problems relating to the Halifax, but also suggesting solutions to them. The main fault with the aircraft was still its low ceiling, he stated, and Bomber Command itself would do everything it could to help, including the removal of the front turret.⁵⁵ As a result, the Assistant Chief of the Air Staff (Technical Requirements), Air Vice-Marshal J.D. Breakey, who had been upset by Harris's continuing criticism of the Halifax, was hopeful that at last agreement had been reached "that there is absolutely no point in continuing the interminable arguments on the relative performance of the various marks of Halifax or Lancasters."⁵⁶ The Halifax was mediocre, but its mediocrity was irrelevant.

Still, doubts about the Halifax's future remained. At a meeting of the Defence Committee (Supply) held on 3 January 1944 Sir Archibald Sinclair explained that, although the Air Ministry was bound by War Cabinet decisions to "ensure the maximum impact" of bombing on the enemy in 1944, and despite the fact that "a large proportion" of the bomber force was composed of Halifaxes, he was "prepared to pay a heavy price in Halifaxes" to "see a greater production of Lancasters." Sir Stafford Cripps replied that although he was aware of this, a decrease in Halifax production would not in itself increase output of Lancasters. Moreover, he continued, returning to an old theme, the data upon which discussion had been based related primarily to outdated marks of the Halifax, not the III or IV, whose performance should be substantially better.

Lord Cherwell, always a supporter of the Lancaster, did not agree. "If more labour were made available," he argued, "it seemed clear that the output of Lancasters could be increased," particularly if better use could be made of factory space. Already the hours worked on the second

shifts were less than the first, and he was "inclined to think that there was scope for an increase of up to 50% if existing capacity were worked to the full." Moreover, since the Halifax was "only one-third as effective as the Lancaster...it would be better to increase Lancasters at the expense of Halifaxes, even if it meant using a large quantity of labour somewhat inefficiently to do so."

There was some room for inefficiency in manufacturing Lancasters, as the DDGPS at MAP was able to show the following May (See Table 4).

Sir Stafford Cripps countered that Cherwell's suggestions involved amending the official "designation" of the Halifax as a priority item and explained that if its status was reduced, it would be subject, by law, to serve constraints on the allocation of labour and raw materials. Production would probably fall below the levels Cherwell had anticipated. More to the point, he added, output in the Lancaster plants could not be increased, "because the machine shops producing components... were [already] working 150 hours a week. To make any appreciable difference... it would be necessary to bring in a great deal more capacity right down the line."

Mr. Bevin, Minister of Labour agreed with Cripps. Anyway downward revision of the Halifax's designated status would create an impression "among all who had to work the administrative machinery for supplying labour" that "it had sunk into the class of aircraft to which no particular importance was attached." "This would be psychologically unfortunate," he continued, and "would inevitably lead to a decrease in output of Halifaxes." Therefore, he concluded, putting forward a compromise, "the right course would be to explain to all concerned that while both were of the greatest importance, the Lancaster was the more important of the

two.” His colleagues accepted this formulation on the understanding that “the Lancaster would be placed in a category by itself – the Halifax, Spitfire, and Mosquito being also designated, and placed equal to each other but below the Lancaster.”⁵⁷

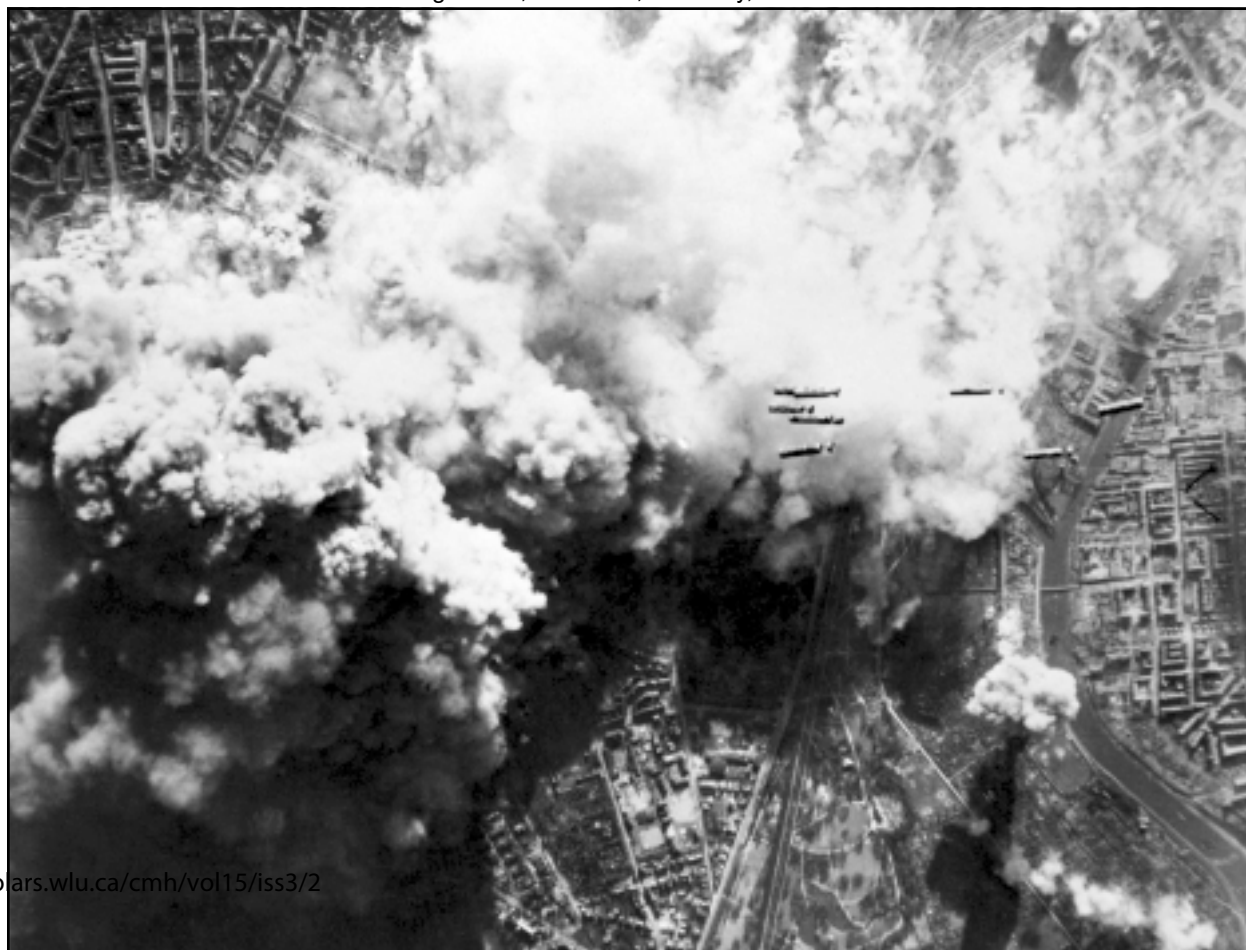
Two days later Sir Wilfrid Freeman contacted the Lancaster plants, attempting to “squeeze... the absolute maximum” out of them. Their answers were ready on 18 January. So long as additional machine tools could be found, A.V. Roe estimated that it could make an extra 67, Metropolitan Vickers 27, Armstrong Whitworth 40, Vickers Armstrong 10, and Austin Aero 3. This would mean that 1,928 Lancaster IIIs and 1,369 Lancaster IVs would appear between January 1944 and December 1945.⁵⁸

Sinclair, meanwhile, was beginning to have doubts about the statements he had made to the Defence Committee (Supply) a few days before. Having defended the Halifax on the assumption that the Mark III was demonstrably better than the II or V, he was “shocked” to discover, speaking to members of the Pathfinder Force, that some IIIs, at least, seemed not to enjoy a 20 mph advantage in speed, or a 2,000 foot advantage in

ceiling. He quickly sought reassurance from Portal that his original briefing was correct, and that the Halifax III was not as bad as the Pathfinders’ experience seemed to suggest. On the other hand, he accepted their “interesting” advice that because of improvements to the German *Flak* – 105 mm guns were replacing 88s – a few thousand feet in ceiling made little difference. The German guns, he was told, fired “with great accuracy” to 30,000 feet – higher than any British heavy bomber could fly.⁵⁹

In his reply, Portal told Sinclair that “the information given to you in the first place” was “correct” despite the fact that a table comparing the Halifax III with the II showed a service ceiling advantage for the former of only two hundred feet. The crucial difference was that at 20,000 feet the Mark II had only a four miles per hour gap between its minimum and maximum cruising speeds, while that of the III was 22. Even at 18,000 feet, the gap for the Halifax II was only ten miles per hour, while that for the Halifax III was 31. This meant that from 18,000 feet up, the III had a reserve of power lacking in the II, and which forces most Mark IIs to fly lower.⁶⁰ This answer satisfied Sinclair.⁶¹

A Lancaster of Bomber Command adds its payload of cluster bombs to the target area, Hannover, Germany, 25 March 1945.



Canadian Forces Joint Imagery Centre PL 144266

On 24 January the Directorate of Bomber Operations at the Air Ministry offered its opinion, arguing that Bomber Command had “found that improvements in performance over the Halifax II have in fact been realised in practice.” Indeed, the superiority of the Mark III was even greater than forecast, with operational ceilings turning out to be 22,000 feet compared to 18,500 for the Mark II. Moreover, it was flying 15 miles per hour faster. This additional height and manoeuvrability along with improved flame dampers “should,” in DB Ops’ view, “result in an improvement in the casualty rates.” For the moment, however, based on only 181 Mark III sorties, the Mark III was actually doing worse than the II and the Lancaster, the casualty rates standing at 10 percent, 8.8 percent and 4.2 percent.⁶²

On 27 January, probably as background for another meeting of the Defence Committee (Supply), the Directorate of Bomber Operations presented a more complete evaluation and defence of the Halifax III. Accepting Churchill’s reasoning that “the weight of bombs dropped per aircraft missing” was the “true measure” of relative value, the statistics presented were hardly comforting. (See Table 5).

Yet DB Ops insisted on making the best possible case for the Halifax. The type compared favourably with the American bombers, he noted,

further improvements. Moreover, with the coming of summer distant attacks would be made less frequently, which meant that there should be fewer losses to fighters. Accordingly, the Halifax could be expected to pay “a very good dividend.” Even the Mark II was doing well “in conditions of shallow penetration and lightly defended targets,” and on this account perhaps all Halifaxes could be used for army support after the invasion, reserving the Lancaster for strategic work. Accordingly, the Halifax would be “indispensable...until the end of this summer.”⁶³

Here was a reasonable operational justification for the Halifax – one that was as sensible as Harris’s suggestion in November 1942 that Halifaxes be limited to relatively easy operations. So long as there was no intensive campaign of area bombing against the cities of Germany, it seemed that the Halifax could be a useful machine after all. The recommendation was accepted by the Defence Committee (Supply) that same day. Over the summer, Lancasters would be used on deep penetration raids, and the Halifaxes set aside for “the heavy bomber tasks connected with ‘OVERLORD’.” This decision made even more sense given Sir Stafford Cripps’ statement that factory space would not permit more Lancasters to be made and that, in any event, additional Merlin engines could not be found.⁶⁴

Table 5

Type	Tons Dropped per Aircraft Missing	
Lancaster	107.2	
Halifax	48.0	
U.S. Heavy Bombers	41.0	
Type	Month/Targets	Tons Dropped Per Missing Aircraft
Lancaster	December 1943 Leipzig, Berlin, Frankfurt	126
Halifax	December 1943 Leipzig, Berlin, Frankfurt	30
Lancaster	January 1944 Berlin, Magdeburg	103
Halifax	January 1944 Berlin, Magdeburg	18

Source: J.M. Whitworth (for DB Ops) to P.S. to S. of S., 24 January 1944, TNA PRO AIR 19/352.

and there was reason to expect a higher performance from the Halifax through the year. The improvements already made in the Mark III version had placed it “almost on a level with the existing Lancaster types for performance (except for weight of bombs carried)” and that should reduce future losses. The Halifax IV, expected in September, was once again expected to show

Two months were to pass before the end of the Battle of Berlin and the beginning of pre-invasion bombing – two months in which Bomber Command losses remained dangerously high, and those of the Halifax II and V squadrons unacceptably so. They were withdrawn from operations after the raid on Leipzig, 19/20 February, when the overall Halifax loss rate was

13.3 percent.⁶⁵ One might have expected Harris' outrage to take over during this period, but nothing in the files suggests this. I found no memoranda to Portal, Sinclair, or Freeman of any importance on the subject of the Halifax; and there is no crowing over the end of Halifax II/V operations. At the worst time of the war, Bomber Command's chief, unaccountably, was not lashing out.

There was, of course, still concern about the numbers of bombers being lost, and ways to avoid casualties (short of calling off the battle) were still being sought. The need to provide better escape hatches received considerable attention following a thorough investigation of prisoner of war records (provided by the Germans and the Red Cross) which indicated that of the 6,498 aircrew missing between January and June 1943, only 1,209 (19 percent) were known to have survived. For once there was no reason to complain about the Halifax, as its aircrew survival rate was the best of all heavy bombers. The Lancaster, with its small front escape hatch, its poor rear exit, and its propensity to break up in mid-air, was the worst. A call therefore went out to provide the Lancaster with a floor hatch and to redesign all others so that they would not jam because of air and wind pressure.⁶⁶

(These opinions were confirmed by a second ORS study issued in September. This found that one reason why many aircrew had not been able to leave their aircraft was that far too often the escape hatch was caught in the slipstream and forced back into a position where it blocked the hatchway. On 7 September 1944, therefore, the ORS recommended that if modifications were not made to the assembly, crews should be told not to jettison the escape hatch cover, as was originally the case, but to throw it out of the way inside the aircraft.)⁶⁷

This was also a time when considerable effort was being made to up-gun the heavy bomber, not only to provide additional protection at night, but also for defence against the day fighters that would be encountered during army support operations on the continent. Installing heavier guns and turrets was a problem in all bombers, but particularly so in the Halifax, which was always near the limit of its power to weight equation. Thus when 4 Group attempted to fit a

.5-inch under-gun mounting in March 1944 (on operations against Frankfurt) they found that the Halifax's performance above 20,000 feet fell off sharply [indirect testimony that it would fly that high routinely?] while the gunner suffered from "extreme cold."⁶⁸ Moreover, refinements to the original fitting made during the month accomplished little. Tests of the .5-inch mounting conducted on 18/19 March recorded temperatures of -21 degrees Celsius, and found that the gunner's range of vision was limited because he had to sit too far back to get a good view. In addition, to maintain acceptable flight standards, 4 Group concluded that 500-600 pounds of bombs would have to be sacrificed. The AOC, Air Vice-Marshal Carr, concluded, as a result, that "the disadvantages of this mounting" so outweighed the advantages that its introduction should be "discontinued."⁶⁹

Later in March Bomber Command's operational research section concluded that, because of its vulnerability and smaller bombload, it took 2.6 Halifaxes to equal one Lancaster.⁷⁰ (See Table 6).

From 6 Group, meanwhile, came word that the accident rate in Halifax III squadrons was double that of the Lancaster II/V. This was surprising since the III was supposed to be more air-worthy than the II or V, but 6 Group had an explanation ready. The accident rate could be blamed on the fact that recent conversions to the III, rather than on "any insuperable defects in the aircraft itself." The justification for this came from 433 Squadron, veterans on the Halifax III, whose pilots had a very low accident rate.⁷¹

It was not until the end of March that I can find evidence of Harris's personal involvement in the Halifax question, when he again sent papers to both Portal and Freeman making the most of the Operational Research Section's comparison of his two heavy bombers. The ratio of 2.6:1 was actually kind to the Halifax, he explained, because it did not take into account specific tactical dispositions he had been making (to its "further discredit") to save Halifax crews. Halifaxes were "deliberately and necessarily" placed in the bomber stream so that they would not only receive additional protection from the bundles of Window dropped by the Lancasters above, but also so that they would be "wrapped

Table 6

Harris: The Halifax and Lancaster

Comparison of Halifax II, III, and Lancaster III			
Detail	Halifax II	Halifax III	Lancaster III
Service ceiling	20,000 feet	21,000 feet	22,500 feet
Cruise ceiling	18,500 feet	21,000 feet	22,500 feet
Time to 18,000 feet	45 mins	34 mins	32 mins
Operational range with 4000 pounds of bombs	1640 miles	1700 miles	2350 miles
6000 pounds of bombs	1420 miles	1500 miles	2150 miles
8000 pounds of bombs	1240 miles	1350 miles	1900 miles
Maximum practical range	1975 miles	1940 miles	2610 miles
Bombload at 1500 mi range	5,500 pounds	6,000 pounds	11,500 pounds
True maximum speed at feet	256 mph 12,600 feet	240 mph 18,400 feet	255 mph 16,200 feet
Max cruise at 16,000 feet	219 mph	235 mph	254 mph
18,000 feet	216 mph	239 mph	247 mph
20,000 feet	214 mph	233 mph	237 mph

Source: DCAS to Secretary of State, 4 April 1944, TNA PRO AIR 19/352, citing Bomber Command data.

up” in a Lancaster blanket on the flanks, in front, and to the rear – a formation that undoubtedly increased casualties among Lancaster crews. The commander-in-chief concluded that, unless the *Luftwaffe* had been defeated, none of his Halifaxes would be useful come the fall.⁷²

Portal was in no mood to pursue this matter further. In his directive to the ACAS (TR) he advised that Harris was to be told that the Air Ministry was also keeping a careful accounting of bomber losses, and that after having done everything possible the ratio between Lancaster and Halifax production in the future would be no better than three to two. One might hope that the *Luftwaffe* would be so weakened that the Halifax III could still be used over Germany, but if not Portal was prepared to rely on Harris' 300 Lancasters to carry the war to Germany, leaving the Halifaxes for operational training, Gardening, and shallow penetrations into France. The CAS assumed that Harris would see the wisdom of this argument, and that he would agree that it was a waste to employ Lancasters against easy targets.⁷³ As Harris had forecast in November 1942, and the Defence Committee (Supply) had agreed in January, the time had come to divide the bomber force into two.

At this point the story-line to the Halifax controversy disappears. From the files I have seen, Harris made no further interventions – convinced, probably, that his campaign to rid Bomber Command of the Halifax had failed. At the same time, Bomber Command's losses fell dramatically from 1 April 1944, so that the statistical bias against the Halifax disappeared

somewhat. Indeed, 5 Group probably suffered more casualties from this time on because of the nature of the targets it was assigned – and 5 Group flew Lancasters. But some interesting bits of information on the Halifax and Lancaster have emerged from the files – bits that we should be familiar with before we begin to write our operational narratives. I just ask for some forbearance on account of the choppiness of the last few pages of this narrative.

One thing that emerged over the summer of 1944, for example, was that in a number of respects the Halifax was a more robust aircraft than the Lancaster once either had been hit by *Flak* or by a night-fighter. This contradicted earlier suggestions about Halifax vulnerability, but the evidence is compelling. Bomber Command's Operational Research Section noted on 28 June that on the basis of examining 24,000 Halifax sorties and 11,000 Lancaster sorties, it was clear that the hydraulic turrets on the latter were four to five times more likely to be put out of action than the electro-hydraulic system in the Halifax's Boulton Paul turrets.⁷⁴

No.6 Group studies conducted later in the summer indicated that Hercules engines on the Halifax were better protected than the Merlins on the Lancaster, whose coolant systems were notoriously prone to battle damage.⁷⁵ However, one observer who toured 6 Group found that the Halifax was not well loved. “The boys do know the score between the two aircraft, tho' only in a general way,” Reinke commented in his diary on 21 July. For public consumption, the crews of 426 Squadron were claiming that the

Characteristics of the Various Marks of Halifax

	Maximum Weight (pounds)	Engines	Maximum Speeds (miles per hour at x feet)	Service ceiling at maximum weight	Armament		
					Nose	Mid	Tail
Mark I	55,000-60,000	Merlin X (XX in Series III)	255 at 7,000; 262 at 18,000; economical cruise, 195 at 15,000	18,000	Boulton Paul C Mk II with 2 x .303 Brownings	Pillar mounted Vickers gas operated 2 x .303	Boulton Paul E Mk I 4 x .303
Mark II	60,000	Merlin XX or 22 (on series 1A)	254 at 12,750; 261 at 19,500; economical cruise, 190 at 15,000 feet; Series 1A: 250 at 13,000, 253 at 19,000, 205 at 20,000	21,000-22,000	Boulton Paul C Mk II or Gimbal mounted Vickers gas operated 1 x .303 or turret deleted	Beam guns deleted, replaced by Boulton Paul C Mk II turret with 2 x .303 or, in some models, turret deleted or, in others, Boulton Paul A Mk VIII turret with 4 x .303 Brownings	Boulton Paul E Mk I with 4 x .303 Brownings
Mark III	65,000	Hercules XVI radials	277 at 6,000; 281 at 13,500; 225 at 20,000	20,000	gimbal mounted Vickers CO 1 x .303	Boulton Paul A Mk VIII with 4 x .303 or turret deleted	Boulton Paul E Mk I with 4 x .303 Brownings
Mark V	61,500	Merlin XX or 22 (Series 1A)	same as Mark II or Mark II Series 1A	21-22,000	same as Mark II or Mark II Series 1A		
Mark VII	65,000	Hercules XVI	277 at 6,000; 281 at 13,500; economical cruise, 225 at 20,000	20,000	same as for Mark III, except latest production models have Boulton Paul D Mk I 2 x .50 rear turret		

Canadian Squadrons and Halifax Aircraft

- 405 Squadron flew Halifax II from April 1942 to September 1943
- 408 Squadron flew Halifax V from August 1942 to December 1942; Halifax II from December 1942 to August 43, when it switched to Lancasters; returned to Halifax III July 1944
- 415 Squadron flew Halifax III from July 1944
- 419 Squadron flew Halifax II from November 1942 until April 1944
- 420 Squadron flew Halifax III from December 1943 until May 1945
- 424 Squadron flew Halifax III from December 1943 to January 1945
- 425 Squadron flew Halifax III from January 1944 to May 1945
- 426 Squadron flew Halifax III from April 1944 to May 1945, but was also equipped with Halifax VII from June 1944
- 427 Squadron flew Halifax V from May 1943 to February 1944, then Halifax III until March 1945, then Lancaster I
- 428 Squadron flew Halifax V from June 1943 until June 1944, but also had Halifax II from November 1943 to June 1944. May have had Halifax III until February 1945, when it switched to Lancaster I

- 429 Squadron flew Halifax II from August 1943 to January 1944 but also had Halifax V from November 1943 to March 1944; then Halifax III to March 1945
- 431 Squadron flew Halifax V from July 1943, then Halifax III from March 1944 to October 1944
- 432 Squadron flew Halifax III from February 1944 to May 1945 but also had Halifax VII from June 1944
- 433 Squadron flew Halifax III from November 1943 to February 1945
- 434 Squadron flew Halifax V from June 1943 to May 1944, Halifax III from May 1944 to December 1944

Canadian Squadrons and Lancaster Aircraft

- 405 Squadron flew Lancasters from 1943
- 408 Squadron flew Lancasters July 43 to July 1944
- 419 Squadron flew Lancasters from spring 1944
- 420 Squadron flew Lancasters from April 1945
- 424 Squadron flew Lancasters from January 1945
- 427 Squadron flew Lancasters from February 1944
- 428 Squadron flew Lancasters from February 1944
- 431 Squadron flew Lancasters from October 1944
- 433 Squadron flew Lancasters from January 1945
- 434 Squadron flew Lancasters from December 1944

modifications introduced on the Halifax VII had made it almost as good as the Lancaster; but at night, in the bar, they made clear their “dislike and fear of the Halifax” although they admitted it was more spacious, inside, than the Lancaster.⁷⁶

The British official history has dealt with the problems raised by the possibility of an all-Mosquito bomber force. Crowding the night sky, and the likelihood that the Germans would have found some way to attack the Mosquito, are the arguments put forward by Webster and Frankland against a Mosquito force. The problem was addressed in the Air Ministry in June 1944, and additional reasons were found to downplay the idea. For one thing, Mosquitoes were in demand everywhere, which meant that there were not enough to allocate to every command in the numbers wanted. Secondly, although it had clear advantages over the heavy bomber, it did not carry a useful load of high explosives and incendiaries to mount area attacks in which 70 per cent of the damage was caused by fire.⁷⁷ Finally, I have found two fascinating items on Lancaster production. One is dated 2 June 1944, and is a memorandum from Professor Jewkes (DDGPS) to the Chief Executive, MAP. The memo points out that the argument that cuts to Halifax production would not necessarily free labour for the Lancaster was misleading. With American propellers and engines on hand, and reserves of undercarriages and avionics, increased production was, in fact, almost guaranteed. The only areas where there might be problems was the turrets, which were different, and in which industry there was no surplus.⁷⁸ But the cut in labour allocations to the aircraft industry made later that summer effectively squelched any such shift.⁷⁹ Bomber Command would fly the Halifax, whatever its faults, until VE-Day.

Notes

1. See Peter Lewis, *The British Bomber since 1914: Fifty Years of Design and Development*, (London, 1967), pp.267-82, 294-7. Data on the performance of the operational types of these aircraft can be found in Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, 1939-1945*. Vol. IV: *Annexes and Appendices*, (London, 1961), pp.448-53.
2. Lewis, *The British Bomber*, pp.299, 309.
3. Lewis, *The British Bomber*, pp.311-12.
4. Bomber Command Staff, “Considerations affecting the design of the ideal bomber aircraft for the Royal Air Force,” January 1938, with comments and minutes by DID, DSR, DD/RD, DRM, and Bomber Command Engineering Staff, 27 Jan – 18 June 1938, The [British] National Archives [TNA], Public Record Office [PRO] AVIA 10/15.
5. *The British Bomber*, pp.341ff.
6. Lewis, *The British Bomber*, pp.348-9.
7. Lewis, *The British Bomber*, p.349.
8. Lewis, *The British Bomber*, p.339.
9. Correlli Barnett, *The Audit of War: The Illusion and Reality of Britain as a Great Nation* (London, 1986).
10. Lewis, *The British Bomber*, p.309.
11. Lewis, *The British Bomber*, pp.328-9.
12. K.A. Merrick, *Halifax: An Illustrated History of a Classic World War II Bomber* (London: Ian Allen, 1980), pp.11, 13.
13. “Halifax: Over-balance of Rudder,” undated, unattributed paper in the Directorate of History and Heritage, National Defence Headquarters, Ottawa, ON [DHH] 181.009 (D2184).
14. Merrick, *Halifax*, pp.11, 37.
15. Merrick, *Halifax*, p.21.
16. Merrick, *Halifax*, pp.35, 37. See also James Goulding and Philip Moyes, *RAF Bomber Command and its Aircraft 1941-1945* (London: Ian Allen, 1978), p.70.
17. James Goulding and Philip Moyes, *RAF Bomber Command and its Aircraft, 1941-1945*. Vol. II (London: Ian Allen, 1978), pp.76-8.
18. AFDU report 47, “Tactical trials – Lancaster aircraft,” 30 May 1942, DHH 181.009 (D4150).
19. Notes of meeting at MAP, 7 July 1941, TNA PRO AVIA, 15/1434.
20. Churchill to MAP, Secretary of State for Air, and CAS, 12 July 1941, TNA PRO AVIA, 15/1434.
21. Operational Research Section, Bomber Command, report 48, “Losses of Halifax aircraft July 1941 – June 1942,” 30 July 1942, TNA PRO AIR/1794.
22. Portal to Churchill, 12 August 1942, TNA PRO AIR 19/169.
23. Dudley Saward, “Bomber” Harris: *The Story of Marshal of the Royal Air Force Sir Arthur Harris, BT, GCB, OBE, AFC, LLD, Air Officer Commanding-in-Chief, Bomber Command, 1942-1945*, (London: Buchan & Enright, 1984), p.70.
24. DDO [Deputy Director Organisation (Planning)] to S.9, 17 December 1943, TNA PRO AIR 2/7781.
25. Harris to Portal, 14 August 1942, Harris Papers, DHH, 87/51, folder H81.
26. Notes of 2nd Meeting on Coordination for the bomber Offensive, 2 September 1942, TNA PRO AIR 19/354; “Coordination for the Bomber Offensive; Lancaster II and Halifax III; note by Commander-in-Chief, Bomber Command, *Ibid*.”
27. Brian J. Rapier, *Halifax at War*, (London: Ian Allen, 1987), ch. 7.
28. Merrick, *Halifax*, pp.37-41; Goulding and Moyes, *RAF Bomber Command and its Aircraft*, pp.73-5; Rapier, *Halifax at War*, ch. 7.
29. Harris to F.J. Linnell (MAP), 16 October 1942, Harris papers, DHH, 87/51, folder H91.
30. Harris to Portal, 12 November 1942, Harris papers, DHH, 87/51, folder H81.
31. Notes of 3rd meeting on coordination for the bomber offensive, 8 December 1942, TNA PRO AIR 19/354. The

- precise mathematical basis of Cherwell's figuring is not included in the minutes of the meeting, but from the way the topic was introduced, I suspect that it was based on a gross averaging of factors including survivability, pounds carried, and man-hours to produce. That is to say, Cherwell knew how many operations Stirling averaged, what average bomb-load they could carry over this period, and how many man-hours it took to produce them – and then figured from there.
32. Harris to Sinclair, 30 December 1942, TNA PRO AIR 14/3512, folio 35. Also in Harris papers, DHH 87/51 folder H78.
 33. H.R. Chapman to Regional Controllers (except Northern Ireland), 2 January 1943, TNA PRO AVIA 10/269.
 34. Harris to Sinclair, 29 January 1943, TNA PRO AIR 14/3513.
 35. Harris to Sinclair, 13 May 1943, TNA PRO AIR 14/3513.
 36. DDG Stats P (Professor Jewkes), "The supply of labour and the future of the aircraft programme," 19 May 1943, TNA PRO AVIA 10/269.
 37. Bomber Command to Groups, "Notes to pilots on the handling of controls of heavy bombers in evasive manoeuvres," 22 June 1943, DHH 181.009 (D7652).
 38. Harris to Sinclair, 28 June 1943, TNA PRO AIR 14/3513, fol. 28.
 39. Harris to Freeman, 30 June 1943, Harris papers, DHH, 87/51, folder H85.
 40. Merrick, *Halifax*, pp.58ff.
 41. Harris to Portal, 7 September 1943, TNA PRO AIR 14/1142, and DHH, Harris papers, 87/51, folder H82.
 42. Harris to Freeman, 8 September 1943, TNA PRO AIR 14/1142, folio 195a.
 43. Freeman to Harris, 10 September 1943, Harris papers, DHH, 87/51, folder H58.
 44. Portal to Harris, 14 September 1943, Harris papers, DHH, 87/51, folder H82.
 45. Chief Engineering Officer, Bomber Command, to C.-in-C., 21 September 1943, TNA PRO AIR 14/1143, folio 34B.
 46. *Ibid.*
 47. Harris to Sinclair, 27 October 1943, TNA PRO AIR 15/352.
 48. Harris to Sorley, 28 October 1943, Harris papers, DHH, 87/51, folder H91.
 49. Harris to Linnell, 16 October 1942, Harris papers, DHH, 87/51, folder H91.
 50. Harris to Sorley, 28 October 1943, Harris papers, DHH, 87/51, folder H91.
 51. "Pilot: How would you like to drive 8,000 horses," in Mike Garbett and Brian Goulding, *Lancaster at War: Vol II* (London: Ian Allen, 1979), p.58.
 52. Harris to Freeman, 2 December 1943, TNA PRO AIR 8/836.
 53. Cited in Bomber Command, Operations Record Book, February 1944, pp.449 ff.
 54. DDO (P) to S.9, 17 December 1943, TNA PRO AIR 2/7781.
 55. Minutes of meeting held on December 21st to consider the future use of the Halifax in Bomber Command, TNA PRO AIR 8/836.
 56. ACAS (TR) to Director of Policy (A), 28 December 1943, TNA PRO AIR 2/7781.
 57. Extract from minutes of meeting of Defence Committee (Supply) held at No. 10 Downing Street, 3 January 1944, TNA PRO AIR, 19/352.
 58. Freeman to [Lancaster producers], 5 January 1944, and minutes of Lancaster Special Group Meeting, 18 January 1944, TNA PRO AVIA 15/1465.
 59. Sinclair to Portal, 11 January 1944, TNA PRO AIR 19/352.
 60. Portal to Sinclair, 15 January 1944, TNA PRO AIR 19/352.
 61. Sinclair to Portal, 16 January 1944, TNA PRO AIR 19/352.
 62. J.M. Whitworth (9 for D.B. Ops.) to P.S. to S. of S., 24 January 1944, TNA PRO AIR 19/352.
 63. D.B. Ops, "Note on operational value of the Halifax," 27 January 1944, AIR 19/352.
 64. Extract from minutes of the Defence Committee (Supply) meeting held on Thursday, 27th January [1944], D.C. (s) (44) 2nd. Meeting, TNA PRO AIR 19/352.
 65. Martin Middlebrook and Chris Everitt, *The Bomber Command War Diaries: An Operational Reference Book, 1939-1945* (London: Viking, 1985), p.473.
 66. See Bomber Command Operations Record Boo, Operation Research Section entry, March 1944, p.552.
 67. Bomber Command Operational Record Book, Operational Research Section narrative, September 1944, pp.1368-9.
 68. Arm 2 to SASO, Bomber Command, 7 March 1944, TNA PRO AIR 14/1645.
 69. 4 Group Bomber Command, 26 March 1944, TNA PRO AIR 14/1645.
 70. Operational Research Section, Bomber Command, report 124, "Note on the relative value of Halifax III and Lancaster III aircraft to Bomber Command, 20/21 December 43 – 1/2 March 44," 13 March 1944, TNA PRO AIR 14/1795.
 71. 6 Group Operational Research Section, "Flying accidents in No. 6 (R.C.A.F.) Group, from October 1943, to February 1944," 23 March 1944, TNA PRO AIR 14/1795.
 72. Harris to Freeman, 28 March 1944, TNA PRO AIR 14/1795; Harris to Portal, 28 March 1944, TNA PRO AIR 2/778.
 73. Portal to ACAS (TR), 30 March 1944, TNA PRO AIR 2/7781.
 74. Operational Research Section, Bomber Command, report S163, "Preliminary note on the vulnerability of turret systems in Halifax aircraft," 28 June 1944, DHH 181.003 (D422).
 75. 6 Group, "Damage sustained by aircraft in No. 6 Group due to enemy action, period July 31st – August 31st 1944, ... August 31st – September 30th, 1944, ... November 1st – 30th, 1944," TNA PRO AIR 14/3310.
 76. Reinke diary, 21 July 1944, DHH.
 77. B.Ops 1, "Note on the employment of Mosquito Aircraft in the strategic bomber offensive," 13 June 1944, TNA PRO AIR 19/282.
 78. DDGPS to Chief Executive, MAP, 2 June 1944, TNA PRO AVIA 10/269.
 79. See AVIA 10/269.

Stephen J. Harris is the chief historian at the Directorate of History and Heritage, National Defence Headquarters. Currently, he is working on the history of Operation Echo/Allied Force, the air war over Serbia in 1999. His latest publication, as co-editor with Robin Higham, is *Why Air Forces Fail: The Anatomy of Defeat* (Lexington, Kentucky: The University Press of Kentucky, 2006).