



Paratroopers exiting  
from a Douglas  
Dakota

**‘...There is, I’m afraid no alternative...’<sup>1</sup>**

## **The Provision of Transport and Support Aircraft to British Airborne Forces during the Second World War**

By Maj John Greenacre

**T**o be effective a new military capability requires coherent development across all its constituent lines of development. Notwithstanding this it is not unusual for one particular aspect of the capability to be identified as being fundamental to its entirety. This is often the line of development that initially defines the capability and is the primary element around which the other lines are developed. This primary element of a new capability is often characterised by a novel piece of equipment or an innovative concept. The introduction of the British airborne capability during the Second World War was concept led. There was no single obvious piece of equipment associated with the new capability, rather an entire range had to be developed to ensure effective progress; from clothing and personal arms, through vehicles and support weapons to support aircraft and gliders. All would have to rely on the priority accorded to them in order to compete for exiguous resources. Each would present differing degrees of technical and engineering complexity and therefore progress across the equipment line of development was unlikely to be even. Much of the equipment would have to be developed through trial and error as there was little experience in this area within the research community.

The requirement to acquire the entire range of equipment necessary to support airborne forces was owned by the War Office. In the case of personal weapons, communications, ground mobility and fire support equipment the General Staff also principally controlled the resources, via the Ministry of Supply, to fulfil that requirement. This meant that the War Office could allocate the priority that they saw fit

to the provision of this equipment. It could also plan its own acquisition strategy that would most efficiently meet the requirement such as adapting and modifying equipment already in service or collaborating with allies. It has been asserted that the provision of this class of equipment was an added demanding burden on the Ministry of Supply but in fact the relatively small scale and low complexity of ground equipment for airborne forces resulted in the requirement being met with comparative ease.<sup>2</sup>

In contrast, the War Office had very little control over the provision of aircraft to support airborne forces during training and operations. The General Staff were entirely reliant on the attitude and efforts of the Air Ministry and the Ministry of Aircraft Production (MAP). By their own admission, the Air Staff’s attitude to the provision of transport aircraft during the early part of the war was “based more upon expediency than in conformity with our desired principles.”<sup>3</sup> They regarded the Army’s constant requests for air transport with irritation. VCAS, Air Chief Marshal Sir Wilfred Freeman wrote to Sir Archibald Sinclair, Secretary of State for Air stating, “I am unwilling that the Army should raise the question of special transport aircraft, modification to bombers, and so forth. Special transport aircraft is “buzzing in the General Staff’s bonnet” at the present time, and if we are not careful we will find a big proportion of our heavy bomber capacity set aside for the production of this particular “bee”.<sup>4</sup>

This attitude from the Air Ministry was not surprising. In 1939 a basic rivalry existed between the Air Staff and RAF and the General Staff and army that was far from petty. It was ‘a long and

tortuous dispute between the two Services that dated back to the last years of the First World War', born out of a sincerely held mistrust of the intentions and actions of the other service.<sup>5</sup> The RAF had a precarious youth and during the austere inter-war period had to carve itself a niche from which it could defend itself against the perceived hostile intentions of the other services. Under the dominant influence of Sir Hugh Trenchard, the Air Staff developed their independent bombing doctrine and regarded any diversion from that concept as a threat to their survival.<sup>6</sup> Hence requests for support from the other services were looked on with suspicion. They still regarded the General Staff as 'wicked uncles who, although ostensibly reformed, might once again revert to predatory instincts.'<sup>7</sup> Indeed the army's desire to reclaim at least a portion of the RAF remained intact at the very highest level and continued to be revealed privately up until 1942 by CIGS.<sup>8</sup>

Having isolated themselves from what they saw as attacks on their independence, the RAF's bombing doctrine evolved into dogma. They began to believe their own publicity and 'luxuriated in the conviction 'We are, ergo we are capable of a strategic bombing offensive.'<sup>9</sup> This attitude was recognised within the army, some of whom believed that the main trouble with the RAF was that since its inception it had been encouraged to imagine that it could and should win campaigns and wars through the application of air power alone.<sup>10</sup> However the RAF's unyielding attitude towards their core doctrine of bomber supremacy and their corresponding ability to prosecute it remained open to question.<sup>11</sup> Due to lack of investment and the resultant paucity of

effective, modern aircraft the Air Staff's bombing doctrine was revealed for a set of emperor's clothes at the outbreak of war. To the General Staff it appeared that their years of prejudice had been justified. The relationship became increasingly strained; one result being that cooperation between the Air Ministry and the War Office was, to put it mildly, still in a rudimentary state in 1940.<sup>12</sup>

It would be unfair to suggest that the Air Staff had 'failed to recognise the principle that any theory or weapon of war is effective only if the means are available to exploit it appropriately.'<sup>13</sup> At the outbreak of war they were only too aware that appeasement and a dearth of defence spending had left their underpinning doctrine dangerously undermined. A twin track approach was taken to recover their position; an almost fanatical dedication to building up the bomber force while simultaneously denigrating any other concept that appeared might encroach on that main effort. The vertical, functional command structure of the RAF exacerbated the results and all the RAF Commands resented any attempted incursion into their war effort, either from elsewhere within their own service or from outside.<sup>14</sup> The idea of using bombers to drop paratroopers and tow gliders was 'naturally repugnant to the Air Staff and to Bomber Command,' in particular.<sup>15</sup> As late as 1943 there were still senior RAF officers who 'regarded every transport aircraft built at the expense of a bomber as a major tactical defeat.'<sup>16</sup> With the announcement of the inception of airborne forces they were quick to state that no new commitments could be accepted without detracting from the previously approved expansion programme. If such commitments were accepted they would have to be at the

expense of the future bomber force.<sup>17</sup> From this the Air Staff followed that it was difficult to envisage a situation in which the number of bombers required could be spared from their normal task, to be risked in such a hazardous pursuit as an airborne operation.<sup>18</sup>

The argument was taken up at the highest level; 'Frankly I regard the bombing of German industry as an incomparably greater contribution to the war than the training and constant availability of an airborne division' CAS declared 'and, as the two things at present seriously conflict, I would certainly accord priority to bombing.'<sup>19</sup> The zenith of the depletion of the bomber force as an argument against full development of airborne forces was reached in a paper presented by the COS Committee to Churchill for arbitration in October 1942. In two thousand words Air Marshal Sir Arthur Harris presented the entire argument. His statement contained many lucid points against which it appeared difficult to argue; the training burden, the technical unsuitability of most bomber aircraft, the impact on the bombing campaign of the intensive training required immediately prior to an airborne operation, even the poor meteorological conditions prevalent in northern Europe. Some of Harris's summarising remarks are worth reproducing in full.

It would require the whole of the existing Bomber Command to be taken off operations for a period of four to six weeks ...to transport one brigade for one operation; it would require about 2½ times the strength of the present Bomber Command to do the same for the airborne division as a whole.... The crux of the matter is this – is Bomber Command to continue its offensive

action by bombing Germany, or is it to be turned into a training and transport Command for carrying a few thousand airborne troops to some undetermined destination for some vague purpose? There is no possibility of compromise.... Finally, I must record my conviction that had we sufficient air resources to transport an airborne force that could have any decisive influence on the outcome of the war, they would be sufficient to bring Germany to her knees by the simple process of carrying sufficient explosives for that purpose.<sup>20</sup>

While beginning to defend themselves against the encroachment of airborne forces' requirements the Air Ministry was already engaged in another battle to protect the bomber doctrine. The British aircraft industry had fallen into a parlous state between the wars and on his appointment as Prime Minister Churchill took swift and decisive action to rectify the poor state of aircraft production. He appointed a Minister of Aircraft Production on 17 May 1940 whose powers were confirmed in a bill of 20 May 1940. The creation of this new ministry reflected the urgency that the government now attached to the output of aircraft.<sup>21</sup> The man appointed as Minister was Lord Beaverbrook, a personal friend of Churchill for nearly thirty years. Others did not share the Prime Minister's enthusiasm for the Canadian newspaper magnate. In particular Beaverbrook began a personal battle against the Air Ministry and the Minister for Air, Sir Archibald Sinclair. Shortly after the formation of MAP Sinclair informed Churchill that he struggled to keep on good terms with Beaverbrook but that he could be relied upon to continue struggling.<sup>22</sup> Their relationship was predictably dysfunctional, after all Beaverbrook had

just removed from Sinclair the means to meet his own requirements in terms of aircraft and ammunition. Not only had Sinclair lost a crucial sector of his ministry but MAP was after more. Beaverbrook was an empire builder and with each concession that the Air Ministry made MAP demanded more. 'Let me say that your [RAF] problems of shortage of aircraft are being solved by this Ministry and by no other agency' he wrote to CAS, 'I should think that this service might be recognised by placing at our disposal forthwith all those portions of the Air Ministry now engaged on the production of aircraft. That is all I ask. And I cannot understand why it isn't given to me at once.'<sup>23</sup>



By June 1940 MAP planned that Wellington production would reach 177 aircraft per month by June 1941

Beaverbrook clearly had thoughts on where production priority should be directed, or not directed before he ever became MAP. He was of the opinion in October 1939 that 'The bomber is a disappointment in war. It cannot stand up to the fighter, and it is beaten by the anti-aircraft gun.'<sup>24</sup> He repeated his assertion in March 1940; 'If mass bombing attacks were made on London the attacking force would be fatally

damaged before they could achieve any real success.'<sup>25</sup> Beaverbrook was prejudiced against the bomber and towards the fighter and therefore against the RAF's core doctrine. Either deliberately or subconsciously he allowed this bias to influence MAP's priorities for aircraft production when he first took office. The Air Staff attempted to counter this to little effect along the lines that the 'multiplication of fighters was a heresy which appealed only to those who were ignorant about air power.'<sup>26</sup>

Beaverbrook first communicated his revised programme for production to Sinclair on 11 June 1940. The requirements of the bomber offensive were woefully catered for. The figures for the Wellington, the only modern bomber on the programme, indicated a production rate of ninety-two aircraft per month in June 1940 rising to 177 in June 1941.<sup>27</sup> This was compared with 300 Hurricanes and 135 Spitfires in June 1940 rising to 410 and 245 respectively in June 1941. The only other bombers on the programme were the aging Whitley, which was to be the mainstay of parachute training and operations during early airborne forces development, and the Albermarle which did not begin production in reasonable numbers until January 1941. The Stirling, Manchester and Halifax had been ordered in 1937 to begin production in 1940 in order to attain a target of 3500 deliveries by April 1942. None of these four engine types appeared anywhere on Beaverbrook's programme and the original target slipped by a year as a result.<sup>28</sup> The ratio of fighter production to bomber production stood at just over three to one in June 1940 rising to nearly four to one in June 1941.

Understandably the Air Staff's response was not favourable declaring that the offensive side of the RAF should not be unduly curtailed in favour of the defensive.<sup>29</sup> They were not happy that the acceleration in fighter production was not matched by similar development with regard to bombers. It was pointed out that the Air Ministry's pre-war production plans had aimed at a fighter to bomber ratio of less than two to one and now that airbases in France and the Low Countries had been denied the requirement for long range bombers to strike at Germany had increased further since those plans had been made.<sup>30</sup> MAP countered the Air Staff's alarm by explaining that the programme was the best that could be achieved with the available resources, in particular raw materials.<sup>31</sup> There is some substance to this statement as multi-engine aircraft used more high tolerance materials than single engine fighters.

The production programme was issued and debated in the days leading up to Churchill's minute calling for the formation of airborne forces. MAP's low priority for bombers would have far reaching consequences, not only for airborne development but for the air war in its entirety. Air Chief Marshal Sir Philip Joubert observed, 'Lord Beaverbrook, to put it bluntly, played hell with the war policy of the RAF. But he most certainly produced the aircraft that won the Battle of Britain. What he did in the summer of 1940 set back the winning of the air war over Germany by many months.'<sup>32</sup> What he did to the air war over Germany he also did to airborne development.

Despite fighting this defensive battle the Air Ministry was initially proactive in providing guidelines for support to

airborne forces early in the development process. Two principles were laid down to guide the provision of support to the training of airborne troops. First, aircraft could not be provided solely for the development of airborne forces, parachute dropping had to be an alternative role only. The second principle stated that aircraft used in training should also be available and capable of being used during airborne operations. It would be pointless to train with one aircraft, no matter how suitable, if it could not be employed on an appropriate scale during operations.<sup>33</sup> Having set these criteria the Air Staff then maintained that there was only one aircraft that could fill them.



Armstrong Whitworth Whitley

Six Armstrong Whitworth Whitleys had been sent to the Central Landing School (CLS) at Ringway shortly after its establishment in June 1940.<sup>34</sup> It was admitted that the Whitley was far from ideal technically. The paratroops had to leave through a hole in the floor, a difficult and sometimes dangerous procedure. The best method of exiting an aircraft was through large doors in the side of the fuselage as preferred by the Germans with their Junkers 52. This was recognised and the Air Ministry examined side door options including

the de Havilland Frobisher and Flamingo (and its military variant the Hertfordshire) and the Bristol Bombay. None of these aircraft were deemed to be suitable due to obsolescence or technical difficulties concerning the size and position of the exit door.<sup>35</sup> Despite these aircraft types being discounted at an early stage their suitability continued to be a matter of debate. The Hertfordshire in particular continued to be offered as a suitable platform for airborne forces by those closely involved in development. With some modification it was believed that the aircraft would be satisfactory and that the requisite numbers could be found for small-scale operations; however, it was accepted that modified bombers would still be required for large-scale operations.<sup>36</sup> In this case, in order to meet the Air Ministry's second principle two very different types of aircraft would have to be operated in the training environment. This burden was not acceptable at this early stage of development. It has been suggested that there was no good reason why the Handley Page Harrow could not have been utilised but the Air Ministry's figures show only fifteen of these aircraft available in Britain in early 1941.<sup>37</sup> Moreover, MAP's prognosis for aircraft production did not include the Hertfordshire or the Harrow. Therefore while there might have been sufficient aircraft for small-scale operations and limited training there would have been no possibility of sustaining or replacing damaged or destroyed aircraft. The case for the Hertfordshire, the Harrow and other similar aircraft types ebbed away.

What then were the alternatives? The ideal scenario would be the procurement of a bespoke aircraft specifically designed for airborne

operations. A set of key specifications had been listed: "(i) Long range; without auxiliary tanks. (ii) Low stalling speed. (iii) Accommodation for at least 10 men with their equipment. (iv) Easy exits (side doors being the best). (v) Availability in large numbers. (vi) Should be armed for its own defence. (vii) Should have bombcells to carry containers."<sup>38</sup> However, bearing in mind Beaverbrook's production priorities the probability of getting such a requirement acknowledged and then having the aircraft designed and manufactured was low. The Air Ministry also maintained that for some considerable time a specialist aircraft suitable for parachute operations could not have been developed and produced in quantity without serious prejudice to the production of aircraft required for other purposes.<sup>39</sup> MAP, supporting the Air Staff in this case, was entirely opposed to designing a new transport aircraft and preferred old and obsolete bombers to be used for transport and thus for airborne forces. Despite the associated technical and engineering challenges being relatively low, the ministry cautiously estimated four years as the time taken to produce a completely new type of transport aircraft, which was not unreasonable given the timescales for introduction of the four-engined bombers.<sup>40</sup> By 1942 British production of transport aircraft was negligible and arrangements for the production of future transport aircraft had not even reached the design stage. It was judged unsound to initiate plans for the production of transport aircraft in Great Britain at this point in time.<sup>41</sup> It was a question of priority and since the Air Ministry and MAP controlled the resources the War Office could do little to change the situation.

Since the prospects of indigenous production of a bespoke aircraft were negligible in the short and medium term another option was required to fulfil Britain's air transport and airborne requirements. CAS, Air Chief Marshal Sir Charles Portal believed that the most promising method of achieving their needs would be to exert pressure on the Americans to expand the production of their transport aircraft, rather than to attempt to modify the British aircraft production programme.<sup>42</sup> The Director Combined Operations, Admiral Sir Roger Keyes had already identified the American Douglas DC-2 and DC-3 as very suitable aircraft for airborne forces early on in the development process.<sup>43</sup> The military descendant of these aircraft, the Douglas C-47 (Dakota), was part of an American programme that the Air Ministry estimated was planned to manufacture 7,000 transport aircraft in the short to medium term.<sup>44</sup> The COS Committee agreed that the Dakota was probably the most suitable aircraft available for work with airborne forces but towards the end of 1942 Portal was forced to admit that it would probably be some time before the RAF received sufficient of them for the purpose even if the Americans could be persuaded to allocate them. He proposed to wait and deal with the requirement when Britain put forward to the Americans its entire needs for aircraft for 1943 onwards. It was clear that even by mid-1943 there would be insufficient Dakotas, or equivalent aircraft, with which to drop and tow the projected numbers of airborne troops and gliders required for future operations and training. Therefore prior to that period, as Portal had to admit, "there is, I'm afraid, no alternative to the Whitley."<sup>45</sup>

In mid-1940 the Whitley had been

singled out as one of five aircraft types on which the main effort of manufacture might be concentrated in order to maximise the acceleration of production.<sup>46</sup> Armstrong Whitworth was, with other manufacturers, instructed to continue production on current aircraft types, such as the Whitley, rather than increasing the manufacture of new types like the Manchester.<sup>47</sup> Despite this order the Air Ministry and others regarded the Whitley as already obsolete in 1940.<sup>48</sup> The RAF was eagerly anticipating the arrival of their modern four engine bombers. Agreeing to release Whitleys was therefore a means of meeting the requirements of the Prime Minister's order to begin the development of airborne forces without seriously jeopardising the Air Staff's immediate plans for expansion of the bomber force in order to ensure the success of their core doctrine. Very early on in the development process the Whitley was identified by those having to operate with it as "thoroughly unsatisfactory". Keyes pointed out its failings to Churchill.

*[The Whitley] can carry only 8 men, who would have to sit throughout the passage overseas, huddled up in the bomb tube in great discomfort, and then drop through the middle of a small hole, with no margin for error in poise, conditions which are calculated to damp the light hearted enthusiasm with which these young men volunteered for a hazardous adventure.<sup>49</sup>*

The first fatality after only a few weeks of training at Ringway did nothing to improve that enthusiasm. The first few Whitleys used for airborne training had been retrospectively fitted for the task in an ad hoc manner. From the

spring of 1941 the Whitley V came into production with integral fittings for airborne operations and the aircraft capacity rose from eight to ten men. Notwithstanding this improvement, it was projected that if every available Whitley was committed to airborne operations only 600 to 700 paratroops could be dropped, a figure far short of Churchill's original demand for a force of 5,000.<sup>50</sup> If airborne development was to maintain a desired rate of progress more aircraft would be needed. With no likelihood of receiving specialist transport aircraft before 1943 the only viable option was to expand reliance on the bomber force.

Naturally the Air Ministry resisted the suggestion that more of their bombers might be marginalized by their use by airborne forces. It maintained that it had already investigated the use of the Shorts Stirling, Handley Page Halifax and the Manchester for airborne operations and had found them incompatible. It reluctantly conceded <sup>that</sup> Ringway could conduct its own investigations into the suitability of these new types of bombers as long as this did not involve any permanent allotment of aircraft and the work did not take precedence over operational requirements.<sup>51</sup> The Air Staff were acutely aware of the interference that continuous modifications caused to the flow of MAP and industry's production programmes.<sup>52</sup>

Converting or modifying any aircraft once it is in service, while not technically difficult, presented serious engineering challenges. As the Air Ministry's Director of Operational Requirements (DOR) observed, it was a "problem which involves considerably more than providing seats for the men and space to accommodate equipment."<sup>53</sup>

Apparently minor alterations took up a disproportionate amount of time and effort and many were required before a bomber could be used to drop paratroops. Lights in the cabin to indicate the time to drop had to be fitted and connected to the cockpit, intercom from cabin to cockpit was required, rigging lines had to be fitted for parachute static line attachment, floors had to be raised and reinforced and a dispatch hole had to be built. The process could be accelerated in some cases, such as providing rear cabin dim lighting, by purchasing 'off the shelf' equipment that could be temporarily fitted and removed as required. In others progress was tortuously slow; it took eight months to make a decision on the type of rubber matting to fit in the cabin in order to make the flight more comfortable for the paratroops.<sup>54</sup> Additionally there was one overriding consideration that could render any modifications futile no matter how carefully considered. DOR commented once again.

*It should be impressed upon the War Office that aeroplanes are delicately balanced craft which cannot be loaded like Army lorries with space as the only limitation. Carefully prepared loading with scientifically designed stowages to limit movement during flight are indispensable. It requires much elaborate calculation trials and technical investigation and the preparation of numerous varied loading tables for each type.<sup>55</sup>*

*Conducting centre of gravity trials required a huge amount of technical staff effort and a lengthy period of time, particularly when the Air Ministry was reluctant to release aircraft.<sup>56</sup>*

It should be borne in mind that the

priority given by the Air Staff was to the *operational* use of aircraft, and no matter how successful any trials and consequent establishment of a force at that time, it would inevitably have spent most of its time not being employed operationally. Ringway was first given clearance to begin trials on the Vickers Wellington Ia, Ic and II in May 1941. This work was to cover "technical details of the structural alterations necessary to convert the Wellington from normal operational work to the role of paratroop dropping" and "air tests with dummy and live troops and full load tests to determine the effect under all conditions of the centre of gravity."<sup>57</sup> It was not until June 1942, thirteen months later, that the trials were complete and the Wellington was finally given clearance to conduct parachute operations and training.<sup>58</sup> Even then the aircraft was only cleared to carry and drop eight paratroops, a capacity inferior to that of the Whitley at that time. In response to this I Parachute Brigade ran its own in-service trials and a month later concluded that it was perfectly practicable to operate sticks of ten men with four containers out of the Wellington.<sup>59</sup> Commander I Parachute Brigade urged the Airborne Forces Experimental Establishment (AFEE) at Sherburn-in-Elmet to verify the findings and amend the official aircraft release, which was eventually issued in November 1942.<sup>60</sup> Therefore the entire process took eighteen months.

Even when an aircraft was finally cleared for parachuting it did not necessarily result in a commensurate improvement in its availability for training and operations by airborne forces. The parachute role was always considered secondary; even the 'obsolete' Whitley had been allocated to Coastal Command by the Air Staff for anti-U Boat operations. The Air Ministry

maintained that it would be difficult to concentrate parachute capable Whitleys in one or two bomber squadrons without involving a double move for each replacement aircraft. It was considered that the administrative difficulties of concentrating parachute aircraft in one or two squadrons outweighed the training and operational advantages.<sup>61</sup> As Whitley Vs left the production line they were allocated wherever the Air Ministry believed the priority lay. This meant the modified aircraft were spread across the RAF and were difficult to concentrate for training or operations. Prioritisation continued to cause impact even though the engineering problems had been surmounted. The situation was only alleviated when dedicated RAF formations were committed to airborne operations and even then the aircraft were frequently committed to other activities.<sup>62</sup>

The technical and engineering challenges of the modification programme were exacerbated by organisational limitations. Initially work was restricted by the improvised nature of the technical trials, development and experimentation establishment at the CLS. When the CLS was expanded to the Central Landing Establishment (CLE) in late 1940 an Experimental Flight was established alongside a Technical Development Section (TDS).<sup>63</sup> These departments, responsible for all trials, were still based on a minimum and clearly inadequate level of manpower. The TDS, run by a civilian Chief Technical Officer, was split between two productive sections, one run by a Senior Technical Officer (STO) and the other by an Engineering Officer. Under the former was a small trials section, just a handful of civilian and military officers to prepare, set up and

report on aircraft trials. The Engineering Officer had one subordinate officer, Flight Lieutenant Pithkelly, to work as Contractors' Liaison and Modifications Officer, a single man to act as the point of contact between the CLE and the numerous manufacturers nationwide who would have to embody all the modifications that had been trialled and recommended. All of those trials had to be carried out by the Experimental Flight made up of a Flight Lieutenant and a handful of pilots.<sup>64</sup> This small organisation struggled to cope with the mass of experimental work that was required in these early stages of development.

With a further expansion of the establishment in mid-1942 the AFEE was formed as a distinct trials and development unit separate from Ringway which was then left to concentrate on training. Within the AFEE the Engineering Officer gained his own workshop with 118 technicians. There was also a separate dedicated Design Section and Glider Trials also had their own TDS. Flight Lieutenant Pithkelly was now one of two officers responsible for parachute aircraft technical instructions. The same section had dedicated officers working on aircraft loading and accommodation and aircraft calculations. This section now had its own experimental flight to fly trials solely to test parachute aircraft modifications.<sup>65</sup> The trials process does appear to have improved in the second half of 1942 as a result of the formation of the AFEE. The level of activity certainly increased as the Armstrong Whitworth Albemarle, Avro Lancaster, Halifax, Manchester and others were all cleared for airborne operations between mid-1942 and spring 1943.

In addition to internal organisational limitations, the CLS, CLE and AFEE also had to deal with inter-departmental friction. This was essentially due to a lack of coordination across the many ministries and departments necessarily involved in developing aircraft capable of being used by airborne forces. With the Air Ministry, the War Office, MAP and the Ministry of Supply all involved no single ministry was given a clear lead role.<sup>66</sup> This led to nugatory work being carried out by both MAP and the War Office as each independently tried to coordinate the aircraft modification programme. MAP was directing work to be carried out by aircraft manufacturers without any clear knowledge of the War Office's detailed requirements for airborne forces. Concurrently, the War Office was making assumptions in its planning of airborne development without any technical experience of aircraft capabilities. The CLE was the natural point at which these conflicts could be resolved but prior to the formation and separation of the AFEE the establishment at Ringway was inadequate to coordinate the often opposing standpoints.

The MAP technical staff complained of a general lack of co-ordination and were doubtful that production would be ready in time. There was also a feeling that the War Office did not fully appreciate the limitations in loading placed on the whole modification project because of the essential need to balance the aircraft. MAP was extremely hesitant of the possibility of a flood of fresh requirements would ensue as the Army began to obtain more experience in the field.<sup>67</sup> The Airborne Division was accused of trying to bypass the official process for conducting trials and getting modifications accepted.

Both the Ministry of Aircraft Production and the Air Ministry are frequently faced with most embarrassing situations owing to the enormous amount of 'backdoor' business which goes on between the various Ministries and between the Army and Air Force Departments and Headquarters concerned with Airborne Forces and their equipment. As often as not these backdoor approaches are made with the object of getting something done more quickly than could be expected by the official channels and equally frequently the essential partner is short circuited. The result of course is confusion. With three Ministries concerned, any departure from official methods requires very careful handling. There also seems to be a strong belief among those concerned with the operation of Airborne Forces that ordinary Service technical procedures are not applicable to their novel equipment.<sup>68</sup>

Considering 1 Airborne Brigade's independent trials with the Wellington this criticism appears justified. The AFEE was warned against accepting these approaches and was ordered to co-operate with the Airborne Division in an advisory role only. They were able to discuss projects with the Division and advise them as regarding the practicability of their ideas. However, the AFEE was not empowered to take on experimental work on behalf of the Airborne Division.<sup>69</sup> An attempt at the end of 1941 to formalise the methods and responsibilities for trials and conversions had not yielded any benefit.<sup>70</sup> Once again the formation of the AFEE appears to have improved the situation and complaints and comments receded from mid-1942. At the end of 1942 the Director Military Cooperation

(DMC) within the Air Ministry accepted his department as being formally responsible for coordinating all technical airborne requirements stating that only those requirements placed with DMC would be accepted and placed on the official list. DMC sought to reassure the War Office whilst warning them against continuing to bypass the system when he wrote "I realise that a good deal of useful development is obtained by direct contact between members of the Airborne Division and manufacturers. While not proposing to damp anybody's enthusiasm, I suggest that no official cognisance should be taken of requirements which do not come through official channels."<sup>71</sup> The War Office accepted this approach and adhered to DMC's suggested method of categories and priorities for organising airborne technical requirements.<sup>72</sup>

Regardless of these improvements in organisation and coordination it was becoming clear that reliance on the bomber force to transport and drop Britain's airborne forces was not only going to prove highly inefficient but was not going to achieve the numbers required. The COS Committee was appraised of the situation in April 1942. By this time the Whitley was considered obsolete and only suitable for training, hence it was omitted from any projected calculations. The Wellington and Lancaster conversion programme therefore determined the numbers. It was estimated that by 1 May 1942 enough Wellingtons would be converted to drop 500 men, this number rising to 820 by 15 May. By 1 June 1,150 paratroops could be dropped by Wellington with a further 450 being dropped by Lancaster although this was subject to successful completion of

trials. Finally, by 1 July it was projected that a total force of 2,700 could be lifted and dropped, 2,000 in Wellingtons and 700 in Lancasters (still subject to the trial results).<sup>73</sup> Although this figure met the War Office requirement of being able to operate 2,500 paratroops by 31 July 1942 it still only equated to a single parachute brigade and required twenty squadrons of heavy and medium bombers in order to achieve it and Harris's bleak prognosis appeared to have been realised.<sup>74</sup> As Britain's airborne forces continued to grow towards plus of two divisions a it was clear more efficient means of transport had to be found.



Consolidated Liberator I

AHB (RAF)

The range of Douglas transport aircraft had already been identified as ideal airborne aircraft and the USA was acknowledged as the most effective source for procurement. The initial proposal for procuring Douglas DC-2s and DC-3s involved Churchill trying to influence the Dutch government in exile in order to put pressure on KLM to donate their few Douglas aircraft stranded in Britain. It was estimated that at least 1,500 Douglas aircraft were employed in civil aviation worldwide. As an alternative to the KLM plan consideration was given to

purchasing a number of these aircraft.<sup>75</sup> Despite Churchill agreeing to approach the Dutch government these initial attempts to obtain Douglas aircraft were unsuccessful. Even if a number had been secured the Air Staff believed that the employment of these aircraft on the Trans-Africa route was of greater military importance than support to airborne forces.<sup>76</sup> In fact the first American aircraft to be used by British airborne forces were not from Douglas. The Consolidated Liberator and Lockheed Hudson were the first candidates for airborne duty in mid-1941.<sup>77</sup> By October of that year examples of each aircraft had been secured for trials.<sup>78</sup> However both aircraft suffered from the same limitations as the British bombers. Neither was designed as a transport aircraft and both required extensive modification, which yielded only a poor capacity of eight to ten paratroops.<sup>79</sup>

It was the Douglas aircraft's capacity that made it particularly suitable and attractive for airborne operations and with the production of the C-47 Dakota a military variant was available. All that was required was to persuade the USA to hand them over to the RAF in sufficient quantities. Initial enquiries into the possibilities of aircraft production in the USA began very soon after Churchill became Prime Minister but in mid-1940 these were mostly informal and did not include any reference to transport aircraft, concentrating instead, unsurprisingly on fighters and bombers.<sup>80</sup> On 7 December 1940 Churchill wrote to Roosevelt stating that Britain could no longer pay cash for war supplies and asked the President to extend aid beyond that which could be immediately paid for. Congress passed the Lend Lease Bill in January 1941.<sup>81</sup> The Lend Lease programme would

not bear fruit for many months and in the interim negotiations were taking place to release to Britain aircraft that had been financed under US Army appropriations. Air Vice Marshal John Slessor chaired these negotiations for the British beginning in December 1940. The 'Slessor Agreement' apportioned over 25,000 aircraft worth nearly two billion Dollars to be delivered by the Americans to Britain by June 1942. Only 147 transport aircraft, all Dakotas, were included in this total.<sup>82</sup> In fact these figures were "unduly optimistic" and monthly production in the USA did not achieve even half that required to reach the projected totals by June 1942.<sup>83</sup> With transport aircraft afforded such a low priority their production was bound to suffer. In fact, there is little evidence that any of this initial order for Dakotas was delivered to Britain.<sup>84</sup>

Further bids for transport aircraft do not appear to have been made until the spring of 1942. In April CAS stated that 312 transport aircraft had been ordered from the USA for delivery during 1942. A month later Portal assured Major General Frederick Browning, General Officer Commanding 1 British Airborne Division that 650 aircraft would be delivered during the year but contradicted himself by warning those involved in airborne development that they would be deluding themselves if they imagined that these aircraft would be available by the end of 1942.<sup>85</sup> The first Dakota equipped for parachute dropping would not be delivered to the AFEE for initial trials until August 1942 at the earliest and as the initial trickle of aircraft began to arrive those trials imposed further delays.<sup>86</sup>

To date British paratroopers had been despatched through a hole in the floor of

their aircraft. The side door exit of the Dakota required minor modifications and then extensive trials in order to ensure that British parachute equipment, which differed from American, could be operated safely. New parachute drills had to be written. This work took place between August and October 1942 although the final report was not released until March 1943.<sup>87</sup> The consequence of these delays was that the Dakota was not available for operations with the RAF in appreciable numbers until the formation of Number 46 Group on 17 January 1944. This fact, coupled with a lack of suitable bombers available in North Africa at the end of 1942, meant that during the airborne operations as part of Operation TORCH British paratroops had to jump from United States Army Air Force (USAAF) aircraft of 51 Wing. These operations were characterised by poor air planning, confusion on the mounting airfields and drops that were scattered and not entirely accurate. Despite their best efforts much of this can be blamed on 51 Wing, which did not have sufficient experience with British troops and had an inadequate combined airborne-air ground base organisation.<sup>88</sup> It was largely luck that prevented higher casualties on the drop zones.

The flow of aircraft to Britain steadily increased to monthly deliveries of twenty-five to forty-five aircraft from the end of 1942 and into 1943.<sup>89</sup> However the RAF Dakota never quite achieved the ubiquity with which it has often been credited.<sup>90</sup> Taking the 1 British Airborne Division fly-in to Arnhem during Operation MARKET GARDEN as an example, on initial examination it would appear that the Dakota bore the bulk of the workload with approximately sixty percent of the 1,089 aircraft that flew



**The Dakota could carry more paratroopers than any of the heavy bombers then in the RAF inventory**

troops, equipment and stores into the battle being of that type. Among the aircraft dropping paratroops dominance was almost total with ninety-seven percent of the aircraft being Dakotas. However all of those aircraft came from the USAAF; none were flown by the RAF. When the figures for re-supply flights are scrutinized the picture is different. Of the 611 re-supply sorties flown by the RAF less than forty percent were flown by Dakota the rest being by Stirling.<sup>91</sup> The situation was similar with glider towing sorties with only thirty six percent being flown by Dakota, the remainder being flown by a variety of bomber types.<sup>92</sup> This arrangement of aircraft, with practically all paratroops being dropped by Dakota while bombers towed the majority of gliders, represents an efficient solution. In terms of carrying paratroops the Dakota was two and a half times more efficient

than the bombers in this role while one aircraft was required to tow one glider whether Dakota or bomber. In fact this efficiency occurred more through accident than design. It had been decided that all paratroops across the entire operation would be dropped by the American Troop Carrier Command in order to simplify administration and the allotment of troops to airfields in England.<sup>93</sup> Troop Carrier Command only operated the Dakota. Additionally some gliders were too heavy to be towed by the Dakota and therefore they had to be paired with the heavy bombers.

If the provision of aircraft to support paratroopers was difficult the challenge of providing aircraft to tow gliders was more so. In general terms the problems were the same: there was no chance of a specialist tug aircraft being procured, any assistance from America would not become apparent until the end of 1942 and therefore prior to that time RAF aircraft would have to be modified for purpose. However, two factors particular to supporting glider operations aggravated those problems already described for parachute aircraft. First, the conversion of an aircraft for towing gliders was a more daunting engineering prospect even than modification for parachute operations. The stress placed on an airframe by pulling a fully loaded glider weighing up to sixteen tonnes was phenomenal; considerable structural modification was required followed by lengthy trials. By mid-1941 design work was proceeding to devise a means of avoiding the removal of the rear turret in the Wellington III when it was being used as a glider tug. This was expected to take five or six weeks and a trial installation would then have to be carried out before the towing

modifications could be incorporated in production aircraft. Halifax and Lancaster trial installations were also progressing but it was estimated that it would be five or six months before production aircraft could be fitted for towing.<sup>94</sup> Second, the number of aircraft required for glider towing within an airborne formation was greater than that for parachute dropping. It was estimated that an air-landing brigade would require twenty-five percent more aircraft than a parachute brigade.<sup>95</sup> In fact the Arnhem example suggests that the figure was more like seventy-five percent.<sup>96</sup> Attempts were made to reduce this number by trialling double tows, i.e. two gliders behind one tug, but the experiments were not entirely successful, particularly for the heavy gliders, and the decision was made to adhere to one glider per tug.<sup>97</sup>

There was one prevailing issue that aggravated all other factors when dealing with the development of the air-landing component. Glider development lagged behind that of the parachute element. Essentially the Air Ministry, War Office and MAP were attempting to develop a capability that was a technological unknown. Due to a lack of practical knowledge and experience, mistakes were made which often did not come to light until they had become severe problems. As with parachute training and operations, the Air Ministry had allocated only the Whitley to support air-landing development. While there were advantages in operating only one aircraft type to tug gliders and drop paratroops, as heavier gliders were developed it was discovered that the Whitley was inadequate as a tug. The Prime Minister's secretary to the COS Committee, Major General Hastings

Ismay considered that the provision of a suitable towing aircraft was not being pressed forward with the urgency it deserved and was concerned enough to urge Churchill to become personally involved. The Prime Minister was deeply unimpressed to discover that the Whitley, the only aircraft with which the Airborne Division was equipped, had proved to be unsuitable for towing gliders, leaving Britain's air-landing troops with no aircraft suitable for this purpose. He demanded an explanation.<sup>98</sup> CIGS outlined the General Staff's view that the Whitley aircraft could not tow a fully laden Airspeed Horsa owing to a defect that meant the engines could not be sufficiently cooled when in this configuration. This resulted in training being confined to General Aircraft Hotspur gliders. This was not satisfactory due the Hotspur being a non-operational glider, designed for glider pilot training only.<sup>99</sup> CAS attempted to paint a less negative picture of a situation, which he justifiably claimed, was a result of the very little practical experience of glider towing. He did not however consider that the Whitley was entirely unsuitable for training purposes. He conceded that it could not, without overheating, tow a fully laden Horsa but was content that MAP was trying to improve the cooling and that their efforts would be helped by the colder weather of winter. Churchill was unimpressed by Portal's explanation and noted; "There may well be a scandal about this. What action do you propose?"<sup>100</sup> The Minister of Production, Oliver Lyttelton, supported the Air Staff in this case stating that it was quite untrue that the Whitley could not take off with a fully loaded Horsa. He had to admit that the operational range would be reduced to



A Dakota taking off with a Horsa glider on tow

180 miles but was confident that this was sufficient for training purposes.<sup>101</sup> However, the use of the Whitley was patently not sufficient for use during air-landing operations, restricted as it was by climate and range, and therefore, following the Air Ministry's own criteria, it was also unsuitable for training.

One thing all the ministries involved did agree on was that the answer to the glider-towing problem lay with the Dakota. However, the wait for initial deliveries of the aircraft had the same impact as it had on parachute development, and in a similar response alternative available aircraft were pressed into service. The full inventory of heavy bombers was considered for conversion and many were modified with aircraft becoming available from the end of 1941 onwards. In addition to these, more novel combinations were considered and trialled, including the Bristol Beaufighter towing the Horsa and the Supermarine Spitfire towing the Hotspur, although neither was used operationally.<sup>102</sup> By mid-1942 the specifications of standard British towing equipment had been forwarded

to Douglas so that C-47s coming off their production line and destined for the RAF would have the necessary modifications built in.<sup>103</sup> The Dakota still required trials when it arrived in Britain as the Horsa glider was considerably heavier than the standard American glider, the Waco CG-4A. By the end of 1942 the Dakota had only been cleared as a tug for the Horsa in "British winter conditions."<sup>104</sup> The numbers slowly rose and trials continued into 1943 but the Dakota was not operationally available in significant numbers until the beginning of 1944.

With Churchill insisting that Operation HUSKY had to take place in June 1943 the British airborne element suffered in the same manner as Operation TORCH. Sufficient converted bombers could not be released either from the Middle East or from Britain and so the majority of 1 Air-Landing Brigade had to be towed into battle by the American Troop Carrier Command. Of the 145 tugs that took part seventy-five percent were American C-47s with the remainder being made up of RAF Halifaxes and Albermarles. From the American towed gliders only thirty-four percent successfully landed on Sicily with over fifty percent ditching in the Mediterranean.<sup>105</sup> Churchill believed that this constituted "a serious disaster."<sup>106</sup> There were several reasons for this poor performance, the chief among them being the unfamiliarity of the American pilots with airborne operations; a situation forced by the lack of RAF aircraft available in the theatre along with their experienced crews. The Deputy Supreme Commander of Operation HUSKY, General Sir Harold Alexander, was in no doubt of the lessons that had to be learned. RAF pilots, crews and machines had to

be made available and put aside for airborne forces with whom they should live, work and train to the exclusion of everything else.<sup>107</sup>

One result of the British airborne experience during Operation HUSKY was that a lack of confidence in the C-47 Dakota began to manifest itself:

*The C-47 is a very poor plane for transporting paratroops. It is helpless in the presence of armed enemy air of any description, one bullet in the gas tank will bring it down in flames and it mounts no weapons of any description, which has a bad effect on the morale of both passengers and crew. This nervousness was evidenced in many cases in HUSKY by the pilots' failure to reduce speed over the dropping ground with resultant increase in the hazard to the paratrooper when his parachute opened.<sup>108</sup>*

The problems with dropping paratroopers also applied to glider operations over Sicily. Many gliders were dropped short in the sea because of tug pilots' reluctance to approach too close to the coast where the anti-aircraft fire was believed to be concentrated.

Another event also had significant impact on the use of the Dakota as a glider tug. The sixteen-tonne General Aircraft Hamilcar glider began to enter service in the second half of 1943. As training with the giant glider began in November 1943 it became clear that the Dakota did not have the power to tow it. Therefore at a time when the War Office was content that, with the growth in numbers of the Dakota, parachute fittings could be discontinued in some bombers, glider-towing fittings had to be retained.<sup>109</sup> This decision was essential in order

to enable the large scale air-landing operations in North West Europe in 1944 and 1945. The thirty-six percent of Dakotas used to tow British gliders during Operation MARKET GARDEN was the highest achieved, the figures for the British portions of Operation OVERLORD and Operation VARSITY being twenty-eight and twenty-four percent respectively.<sup>110</sup> The majority of the workload was still borne by the modified bomber fleet.

The provision of transport aircraft during the Second World War was based on expediency rather than planned principles and this included support to Britain's airborne forces. Britain's aircraft industry was in a parlous state immediately prior to the outbreak of war and struggled to keep up with the huge increases in aircraft requirements from 1939 onwards. Even when indigenous aircraft production was at peak capacity it never achieved its full potential. The industry suffered from the defects inherited from its small-time origins, weaknesses resulting from the haste of its expansion, the retarding force exerted by the trade unions and restrictive practices in manning and demarcation.<sup>111</sup> The aircraft industry appeared to have an inherent limit to capacity. At peak effort human resources were strained and "unpredictable and intangible influences" appeared to hold back output.<sup>112</sup> In the case of transport aircraft this was exacerbated by the very low priority that the case attracted. The Air Ministry were utterly dismissive of the notion that a specialist aircraft type could be provided from national resources. By the time that the Air Staff realised that the requirement for specialised transport aircraft was of sufficient importance to justify the necessary diversion of productive

capacity from heavy bombers it was too late.<sup>113</sup> The estimate of four years for design and production precluded any new type entering service in time to be of use. Instead the Air Ministry was relying on the production capacity of the USA to fulfil the RAF's transport aircraft requirements. However, the Air Ministry at the very highest level knew that this was an unrealistic prognosis in the short and medium term. Portal realised that very large increases in the output of the American aircraft industry could not be made in 1942 because of the time taken to create new capacity.<sup>114</sup> Joint estimates of the quantity of aircraft that the USA could supply to Britain were dangerously over-optimistic. When the American production programme failed to deliver transport aircraft at the agreed rate it caused a clash between the Air Ministry and MAP as to which was to blame. Portal attempted to appease the General Staff and deflect criticism towards Beaverbrook by stating 'the disappointments experienced by Army Cooperation Command are due, not to a lack of good will on the part of the Air Ministry, but to hard realities of the aircraft supply position over an acutely difficult period.'<sup>115</sup> The Air Ministry prepared defensive briefs, concerned that an attempt might be made to pursue the matter back beyond the spring of 1942 accusing the Air Staff of neglecting air transport during the early stages of the war and therefore leaving MAP with no choice but to accept production in the USA. It would require detailed examination to refute this thoroughly as the Air Staff had already accepted in 1941 that the main source of supply of transport aircraft would have to be the USA. They were then left exposed when American production only allowed a very small number of transport aircraft to be allotted to Britain during 1941.

The situation never recovered as American production of transport aircraft lagged continually behind the projected programme.<sup>116</sup>

The general neglect of transport aircraft, deliberate or otherwise, suited the aspirations of both the Air Ministry and MAP and allowed them to proceed with their core plans for expansion either in bombers or fighters respectively without being distracted. This was perfectly legitimate in the first part of the war when the requirements for those two classes of aircraft were vital to defend the homeland and carry the war to Germany. However, as the war progressed and manoeuvre became more imperative than either defence or attrition the priorities did not change in accordance. Therefore, anyone with a requirement for large scale transport by air, and this of course included Britain's developing airborne forces, was forced to adopt a 'make do and mend' strategy. The War Office could do little to influence the situation because, although it owned the requirement, the Air Staff controlled the resources to fulfil it. The Air Ministry's 'expediency' translated into a requirement for improvisation as less than suitable aircraft had to be pressed into service. Paratroopers and glider pilots were forced to adapt to cope with working with British and American procedures across the multiple aircraft types required to generate the necessary lift capacity. A deficiency of aircraft directly reduced the size of an airborne force that could be committed to an operation. In the case of MARKET GARDEN it necessitated spreading 1 Airborne Division's deployment over three days, which contributed to the failure of the operation. If this was unacceptable then aircraft had to be provided from other sources. This

substitution of aircraft by the USAAF and Troop Carrier Command had significant operational consequences during TORCH and HUSKY. Following TORCH CIGS implored the COS Committee to accelerate the provision of transport aircraft by every available means and Alexander clearly identified similar lessons post HUSKY.<sup>117</sup> Cooperation did improve between American aircrew and British airborne troops as development progressed. With the exception of D Day where the short flight distance allowed RAF crews to fly multiple sorties in the same day between England and Normandy, American aircraft were required to lift British airborne forces in all the major airborne operations of the Second World War.

#### Bibliography:

- \_\_\_\_\_, (1941) *Bomber Command: The Air Ministry Account of Bomber Command's Offensive Against The Axis, September 1939-July 1941* (London: HMSO)
- \_\_\_\_\_, (1945) *By Air to Battle: The Official Account Of The British Airborne Divisions* (London: HMSO)
- \_\_\_\_\_, (1943) *Combined Operations 1940-1942* (London: HMSO)
- Atkinson, R., (2002) *An Army at Dawn: The War in North Africa 1942-1943*, New York: Henry Holt
- Barnett, C., (2001) *The Audit of War* (London: Pan)
- Buckingham, W.F., (2005) *Paras* (Shroud: Tempus)
- Chatterton, G., (1962) *The Wings Of Pegasus* (London: MacDonald)
- Churchill, W.S., (1949) *The Second World War: Volume II, Their Finest Hour* (London: Cassell)

- Crookenden, N., (1978) *Airborne At War* (London: Ian Allen)
- Crookenden, N., (1976) *Dropzone Normandy* (London: Ian Allen)
- Danchev, A. and Topman, D. (ed.), (2001) *War Diaries 1939-1945: Field Marshall Lord Allenbrooke* (Los Angeles: California Press)
- Ferris, J.R., (1989) *Men, Money and Diplomacy* (New York, Cornell)
- Frost, J., (1991) *Nearly There: The Memoirs Of John Frost Of Arnhem Bridge* (London: Leo Cooper)
- Gale, R., (1968) *Call To Arms* (London: Hutchinson)
- Gilbert, M., (2004) *Continue to Pester, Nag and Bite – Churchill's War Leadership* (London: Pimlico)
- Grey, C.G., (1941) *Bombers* (London: Faber & Faber)
- Hastings, M., (1979) *Bomber Command* (London: Michael Joseph)
- Hollis, L. and Leason, J., (1959) *War At The Top* (London: Michael Joseph)
- Ismay, H. L., (1960) *The Memoirs Of Lord Ismay* (London: Heinemann)
- Hall, D.L., (2002) 'From Khaki and Light Blue to Purple', *Journal of RUSI*, 147, No. 5, October 2002
- House, J.M., (2001) *Combined Arms Warfare in the Twentieth Century* (Kansas: Kansas University Press)
- Howlett, P., (1995) *Fighting With Figures*, (HMSO, London)
- Keegan, J. (ed), (2005) *Churchill's Generals* (London: Cassell)
- Kennedy, J., (1957) *The Business Of War* (London: Hutchinson)

Lamb, R., (1991) *Churchill as War Leader – Right or Wrong* (London: Bloomsbury)

Lewin, R., (1973) *Churchill as Warlord* (London: Batsford)

Miksche, F.O., (1943) *Paratroops: The History, Organisation And Tactical Use Of Airborne Formations* (London: Faber & Faber)

Morrison, A., (2002) *Silent Invader* (Shrewsbury: Airlife)

Newnham, M., (1948) *Prelude To Glory* (London: Sampson Low)

Otway, T., (1990) *The Second World War 1939-1945, Army: Airborne Forces* (Reprint - London: Imperial War Museum)

Pack, S.W.C., (1977) *Operation Husky* (Vancouver: David & Charles)

Postan, M.M., (1952) *British War Production* (London: HMSO)

Richards, D., (1977) *Portal Of Hungerford* (London: Heinemann)

Slessor, J., (1956) *The Central Blue* (London: Cassell)

Smith, C., (1992) *The History Of The Glider Pilot Regiment* (London: Leo Cooper)

Steer, F., (2000) *Arnhem: The Fight To Sustain* (London: Leo Cooper)

Taylor, A.J.P., (1972) *Beaverbrook* (London: Hamish Hamilton)

Weeks, J., (1976) *Airborne Equipment* (London: David & Charles)

Wood, D.H., (1996) *A Noble Pair of Brothers* (Privately Published)

Woods, R.B., (1990) *A Changing of the Guard: Anglo-American Relations, 1941-1946* (Chapel Hill:

The University of North Carolina Press)

#### Notes

1 National Archives, PREM 3/32/4, Portal to Churchill, 5 October 1942. Portal offering the Whitley as the only possible solution for the support of British airborne forces.

2 M.M. Postan, (1952), *British War Production*, (HMSO, London), pp 129 & 276.

3 NA, Air Ministry Papers, AIR 20/2926, note by VCAS, 21 August 1941.

4 *ibid*, letter from Freeman to Sinclair, 14 April 1942.

5 D.I. Hall, 'From Khaki and Light Blue to Purple', *Journal of RUSI*, 147, No. 5, October 2002, p.81.

6 W.S. Churchill, *The Second World War: Volume II, Their Finest Hour* (London: Cassell, 1949), p.144.

7 J. Kennedy, (1957) *The Business Of War* (London: Hutchinson), p.xv.

8 'The situation is hopeless and I see no other solution besides the provision of an army air arm' and 'The Air Ministry is now so divorced from the requirements of the army that I see no solution except an army air arm.' A. Danchev and D. Topman (ed.) (2001), *War Diaries 1939-1945: Field Marshall Lord Allanbrooke* (Los Angeles: California Press), p.258, (Diary entries for 18 and 19 May 1942).

9 M. Hastings, (1979) *Bomber Command* (London: Michael Joseph), p.56.

10 J. Frost, (1991) *Nearly There: The Memoirs Of John Frost Of Arnhem Bridge* (London: Leo Cooper), p.77.

11 H.L. Ismay, (1960) *The Memoirs Of Lord Ismay* (London: Heinemann), p.178.

12 Churchill, *Their Finest Hour*, p.339.

13 Hastings, *Bomber Command*, p.56.

14 R. Gale, (1968) *Call To Arms* (London: Hutchinson), p.127.

15 *ibid.*, p.125-126.

16 Kennedy, *The Business Of War*, p.xv.

17 WO 193/788, COS 40(1057), *Future Plans – Basic Requirements*, 20 December 1940.

18 AIR 32/2, draft CLE paper, *Training and Organisation of Air-Landing Troops*, July 1940.

19 AIR 75/45, *Airborne Forces*, draft note by CAS, 25 September 1942.

20 CAB 121/97, COS (42) 434, *Airborne Forces*, 21 October 1942.

21 Postan, *British War Production*, P.137.

22 NA, Papers of the Office of the Prime Minister, PREM 3/38, Sinclair to Churchill, 1 July 1940.

Having been second in command when Churchill commanded the 6th Battalion, Royal Scots Fusiliers, Sinclair was perhaps one of the only men who could criticise Beaverbrook in this manner:

23 AIR 8/480, Beaverbrook to Newall, 10 July 1940.

24 A.J.P. Taylor, (1972) *Beaverbrook* (London: Hamish Hamilton), p.398.

25 *ibid*, p.402.

26 Ismay, *Memoirs*, p.178.

27 NA, PREM 3/38, MAP revised production figures, 11 June 1940. All figures quoted in this section are sourced from this document.

28 R. Lewin, (1973) *Churchill as Warlord* (London: Batsford), p.51.

29 PREM 3/38, Air Ministry to MAP, 20 June 1940.

30 *id.*

31 PREM 3/38, Beaverbrook to Sinclair, 21 June 1940.

32 Taylor, *Beaverbrook*, p.431.

33 NA, AIR 2/7338, note by D Plans, 12 August 1940.

34 D.H. Wood, (1996), *A Noble Pair of Brothers*, (private publication), p.14.

35 NA, AIR 2/7338, *op cit.*

36 NA, AIR 39/38/1, note by AOC-in-C No.70 Group, 9 April 1941.

37 W.F. Buckingham, (2005) *Paras*, (Tempus, Stroud), p.102-103, and NA, AIR 20/2926, *Aircraft Available in RAF transport squadrons*, 21 August 1941.

38 NA, AIR 32/2, *Notes on Parachute and Airborne Forces*, 4 February 1941.

39 *ibid*, minutes of meeting held at the Air Min, 5 September 1940.

40 NA, AIR 2/7882, COS (42) 142nd meeting, 6 May 1942.

41 *ibid*, minutes of a meeting held in the Air Ministry, 28 May 1942.

42 NA, Cabinet Office Papers, CAB 121/97, minutes of War Cabinet staff conference, 6 May 1942.

43 NA, CAB 120/262, Keyes to Churchill, 27 July 1940.

44 NA, CAB 121/97, *op cit.* The Douglas C-53 was also used for airborne operations but only at the end of the war and not in significant numbers.

45 NA, Prime Ministerial Papers, PREM 3/32/4, Portal to Churchill, 5 October 1942.

46 NA, AIR 20/4078, letter VCAS to Hollis, 25 May 1940.

47 *ibid*, minutes of meeting between Air Min and MAP, 15 May 1940.

48 NA, AIR 19/168, letter Air Min to MAP, 28 July 1940.

49 NA, CAB 120/262, Keyes to Churchill, 27 July 1940.

50 *ibid*, letter DCO to COS Committee secretariat, 23 August 1940.

51 NA, AIR 39/38/1, letter DMC to AOC-in-C AC Comd, 7 March 1941.

52 M.M. Postan, *op cit*, p.341.

53 NA, AIR 2/7566, letter Air Min Director of Operational Requirements (DOR) to DMC, 5 February 1942.

54 NA, AIR 39/83, series of letters and minutes from 29 June 1942 to 2 February 1943.

55 NA, AIR 2/7566, *ibid*.

56 NA, AIR 21/57. This file contains approximately fifty pages of calculations, diagrams and tables pertaining to just one modification for the Whitley.

57 NA, AIR 39/82, instructions issued by CLE, 12 May 1941.

58 *ibid*, instructions Air Min DOR to AOC-in-C AC Comd, 18 June 1942.

59 NA, AIR 39/83, report by commander 1 Parachute Brigade, 20 July 1942.

60 *ibid*, instructions Air Min DOR to AOC-in-C AC Comd, 8 November 1942.

61 NA, AIR 39/82, letter DMC to AOC-in-C AC Comd, 15 July 1941.

62 Kenneth Frere, letter to the author, 19 May 2005. Mr Frere was an RAF pilot flying with 38 Group RAF and confirms that during this period he was employed SOE operations, leaflet drops and tactical bombing sorties.

63 T. Otway, (1990) *The Second World War 1939-1945, Army: Airborne Forces*, (Imperial War Museum, London), pp 29-30.

64 NA, Treasury Papers, T 162/755, establishment of CLE, August 1941. Flt Lt Pitkelly's efforts in the post were singled out for praise in Otway's official history.

65 NA, T 162/755, establishment of AFEE, undated.

- 66 NA, MAP Papers, AVIA 15/1530, letter ACAS Technical to Air Min DWO, 18 February 1942.
- 67 NA, AVIA 15/1530, letter Air Min Director Technical Development (DTD) to Air Min Chief of Research and Development (CRD), 18 February 1942.
- 68 NA, AIR 2/7566, letter from ACAS Technical to AOC-in-C AC Comd, 23 December 1942.
- 69 NA, AVIA 15/1530, letter ACAS Technical to Commanding Officer CLE, 21 February 1942.
- 70 NA, AIR 2/7566, notes on meeting held at AFE, 18 November 1941.
- 71 *ibid*, Investigation of Requirements, DMC to War Office (Air 2), 28 October 1942.
- 72 *ibid*, minutes of meeting to discuss airborne forces requirements, 5 December 1942.
- 73 NA, CAB 121/97, extract from COS(42) 122nd meeting, 17 April 1942.
- 74 NA, AIR 2/7470, note by ACAS (Policy), 24 April 1942.
- 75 NA, CAB 120/262, Keyes to Churchill, 27 July 1940.
- 76 NA, AIR 2/7338, note by D Plans, 12 August 1940.
- 77 NA, AIR 2/7470, note by Air Min, DOR, 25 July 1941.
- 78 NA, AIR 2/7566, note by Air Min Research and Development, 10 October 1941.
- 79 NA, AVIA 15/1288. File contains extensive notes on the modifications required for both the Liberator and the Hudson as the result of trials conducted between October and the end of December 1941. In these notes it is suggested that the Liberator might have a capacity of sixteen paratroops but there is no evidence that this was achieved.
- 80 NA, AIR 19/168, telegram from British Consul General, New York to MAP, 27 July 1940.
- 81 R. Lamb, (1991), *Churchill as War Leader – Right or Wrong*, (Bloomsbury, London), pp.77-78.
- 82 NA, AIR 20/2905, telegram British Air Commission (BAC) to MAP, 29 March 1941.
- Although this figure appears low one hundred and forty seven Dakotas would equate to a lift of 3,675 paratroopers, in excess of the War Office's requirement for July 1942.
- 83 J. Slessor, (1956), *The Central Blue*, (Cassell, London), p.328.
- 84 It is possible that any transport aircraft from US sources were prioritised to overseas commands and did not arrive in the UK. P. Howlett, (1995) *Fighting With Figures*, (HMSO, London) pp.174 & 175 shows only five US transport aircraft arriving in Britain in 1942 but fifty-two being directed to overseas commands.
- 85 NA, CAB 121/97, COS(42) 142nd Meeting, 6 May 1942 and CAB 120/262 COS Committee memorandum by CAS, 3 May 1942.
- 86 NA, AVIA 15/1530, summary of technical development on airborne forces requirements, MAP CRD, 25 June 1942.
- 87 NA, AIR 39/83. Extensive notes on modifications and trials carried out on the C47 Dakota by AFEE.
- 88 T. Otway, *op cit*, pp 74-81.
- 89 NA, AIR 8/916, MAP note on aircraft deliveries from USA, 3 July 1941.
- 90 As an example see C. Smith, (1992), *The History Of The Glider Pilot Regiment*, (Leo Cooper, London), p 29.
- 91 Figures extracted from F. Steer, (2000), *Arnhem: The Fight To Sustain*, (Leo Cooper, London), pp 93 -136.
- 92 Figures extracted from D.H. Wood, *op cit*, pp 68-70.
- 93 T. Otway, *op cit*, p 266.
- 94 NA, AIR 2/7470, note by Air Min DOR, 25 July 1941.
- 95 NA, CAB 121/97, memorandum by CIGS, Airborne Forces, 15 August 1942.
- 96 D.H. Wood, *op cit*, pp 68-70.
- 97 NA, AIR 2/7470, Air Min note, Towing 25-Seater Glider, 12 April 1941.
- 98 NA, PREM 3/32/4, minute from Churchill to CIGS and CAS, 30 September 1942.
- 99 *ibid*, letter CIGS to Churchill, 3 October 1942.
- 100 *ibid*, letter CAS to Churchill, 5 October 1942.
- 101 *ibid*, letter MAP to Churchill, 27 October 1942.
- 102 G. Chatterton, (1962), *The Wings Of Pegasus*, (MacDonald, London), p.133
- 103 NA, AVIA 15/1530, summary of technical development on airborne forces requirements, MAP CRD, 25 June 1942.
- 104 NA, AVIA 15/1530, MAP Airborne Forces Programme Monthly Progress Report, 30 November 1942.

- 105 Figures extracted from D.H. Wood, *op cit*, p 43 and C. Smith, *op cit*, pp 55-66
- 106 NA, PREM 3/32/5, Churchill's note on minute Portal to Churchill, 11 August 1943.
- 107 NA, CAB 120/262, Extract from report by General Alexander, 21 July 1943.
- 108 NA, War Office Papers, WO 204/4257, Observations from the Sicilian Campaign, 26 August 1943.
- 109 NA, AIR 2/7566, minute from WO, Director of Air to Air Min, Director Operations, 14 January 1944).
- 110 Figures extracted from D.H. Wood, *op cit*, pp 60, 63 and 81.
- 111 C. Barnett, (2001), *The Audit of War*, (Pan, London), p 148.
- 112 M.M. Postan, *op cit*, pp 314-315.
- 113 NA, AIR 20/2926, conclusions of conference held in Air Min, 14 January 1942.
- 114 NA, PREM 3/482/2, letter from Portal to Churchill, 2 January 1942.
- 115 D. Richards, *Portal Of Hungerford* (London: Heinemann, 1977), p.205.
- 116 NA, AIR 2/7882, briefing note to Air Min PUS, 9 October 1944.
- 117 NA, PREM 3/32/4, COS (43) 17, 11 January 1943.

## **This article has been republished online with Open Access.**

Ministry of Defence © Crown Copyright 2023. The full printed text of this article is licensed under the Open Government Licence v3.0. To view this licence, visit <https://www.nationalarchives.gov.uk/doc/open-government-licence/>. Where we have identified any third-party copyright information or otherwise reserved rights, you will need to obtain permission from the copyright holders concerned. For all other imagery and graphics in this article, or for any other enquires regarding this publication, please contact: Director of Defence Studies (RAF), Cormorant Building (Room 119), Shrivenham, Swindon, Wiltshire SN6 8LA.

 **ROYAL  
AIR FORCE**  
**Centre for Air and  
Space Power Studies**

**OGL**