Learning the Hard Way: A Comparative Perspective on Airborne Operations in the Second World War

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This article compares and contrasts the principal Allied and German airborne operations mounted in the European theatre in the Second World War, in an attempt to identify common factors in their success or failure. Pitched primarily at the operational level, it considers their general features and outcomes, and the lessons that each bequeathed. It suggests that their results were primarily determined by five factors: these were lead time, command and control, relief for the airborne troops, intelligence, and the airlift. However, although, at the time, the key lessons were soon identified, it proved very difficult to exploit them effectively. The broader success of Germany's assault on France and the Low Countries in 1940 caused the most important airborne lessons to be neglected during the planning for the assault on Crete in 1941. Similarly, a mix of short-term operational imperatives and the more general Allied victories in Sicily and Normandy led to the neglect of vital airborne lessons from both campaigns before the launch of Operation Market Garden in September 1944. Ultimately, the Allies emerged from the war with robust airborne doctrine firmly rooted in wartime experience, but five years and a succession of major operations were required before they could arrive at this happy conclusion.

Introduction

The aim of this article is to compare and contrast the principal Allied and German airborne operations mounted in the European theatre in the Second World War, in an attempt to identify common factors in their success or failure. So much has been written about airborne warfare in this period that there might at first seem to be little need for another investigation of the subject. Yet the perspective adopted in the following pages has not, to the author's knowledge, been employed before, and our grasp of some of the most fundamental airborne issues has unquestionably suffered as a result. The simple truth is that too many histories have tended to consider individual airborne operations in isolation, and have failed to set them in their correct historical context. There is little examination of recurring themes spanning more than two operations, and the majority of authors typically seek to explain the outcome of airborne missions purely by reference to the tactical-level planning and execution of the mission itself.[1]

This approach neglects the fact that past experience is one of the key determinants of human action. Attempts to explain the course of military undertakings without reference to earlier, comparable operations, and to such lessons as might reasonably have been drawn from them, must therefore result in the presentation of a very partial and misleading account of events. Moreover, on the rare occasions that a degree of historical context has been introduced, it has been confined to tactical issues, while the operational level has been neglected. Yet there is of course a very close connection between the two. Indeed, operational-level factors create the framework within which tactical-level decision making takes place, thus profoundly influencing the tactical planning process and the courses of action ultimately adopted. For both these reasons, the preparation of an objective comparative analysis pitched primarily at the operational level appeared not merely worthwhile, but long overdue. Instead of addressing the operations of the later wartime years in isolation from earlier airborne ventures, there is a strong case for seeking to identify the characteristics that they shared, for considering the lessons drawn from them, and for assessing the extent to which they were successfully applied.

At the beginning of the Second World War, airborne warfare was an entirely new and revolutionary concept. However, as in so many areas of pre-war rearmament, the Germans got a head start. They began examining the airborne concept in 1936, established a parachute training school in the spring of 1937 and first incorporated airborne troops into exercises in the autumn. In May 1938, they decided to form 7 Air Division and to train air transport units for airborne operations; at the end of the year, it was agreed that 22 Infantry Division should also be trained and equipped for air-landing tasks. Large-scale airborne exercises were staged in both 1938 and 1939. This meant that by 1940 the Germans had addressed over an extended period a range of fundamental issues. They possessed a substantial air transport fleet, and they had formulated coherent airborne doctrine based partly on the use of airborne troops to capture key tactical objectives such as bridges, and partly on their employment to seize air heads through which reinforcements could be airlifted. Techniques, tactics, recruitment and

training were all well developed.[2]

The Western Allies did not initiate action under any of these headings until 1940, and very little was achieved in concrete terms until the second half of 1941.[3] Within their armed forces there was a chronic lack of expertise at all levels – especially, of course, at the top; there was no doctrine, virtually no airlift, and no training infrastructure. All of this had to be generated out of nothing at very short notice, and this was never likely to be easy. As one senior RAF officer put it:

> We are trying to do what we have never been able to do hitherto, namely to introduce a completely new arm into the Service at about five minutes' notice, and with totally inadequate resources and personnel. Little, if any, practical experience is possessed in England of any of these problems and it will be necessary to cover in six months what the Germans have covered in six years.[4]

The German airborne contributed on a limited scale to the Norwegian campaign in April 1940, but their first large-scale operations took place in the Low Countries in May. A force consisting of 7 Air Division and elements of 22 Infantry Division was tasked in an enabling role for the German ground offensive, involving the capture of a series of bridges across major waterways. In Holland this also required the capture of Waalhaven airfield, to act as an air head. The bulk of 22 Infantry Division was given a more strategic role involving a direct strike against The Hague, which was identified as Holland's principal centre of gravity. There they were to capture the Dutch Royal Family, the government and the high command. Their mission required the preliminary seizure of three air heads – the airfields at Ypenburg, Valkenburg, and Ockenburg.

The German airborne experience in the Low Countries ranged from triumphant victory to partial success, through to abject failure. The capture of fortress Eben Emael and the Albert Canal bridges ranks among the most brilliant and audacious feats of airborne assault, while the airborne also helped German ground forces to penetrate very quickly as far west as Rotterdam. Of the factors subsequently viewed as critical to the success of the operation, the first was lead time. Planning began as early as November 1939, and this provided ample scope for extensive preparations, exercises and mission-specific rehearsals. There was time to gather very detailed intelligence, deliberate over plans, identify potential problem areas and produce practical solutions.[5]

A second key factor was command and control. The German airborne operation plans were very closely integrated into their more general planning, both on the ground and in the air, so that senior commanders never lost visibility of vital airborne issues. Indeed, soon after taking up his appointment, the responsible air commander, Field Marshal Albert Kesselring, realised that the airborne enjoyed exceptionally high-level patronage, both Hitler and Goering taking a strong personal interest in their fortunes. Their chief, General Kurt Student, found himself in 'a certain privileged position which he seized with both hands.'[6]

With this in mind, Kesselring was evidently perturbed to learn of the depth of the missions assigned to 7 Air Division and 22 Infantry Division. He therefore visited his army counterpart, General Von Bock, and insisted 'that on the third day of the offensive the Panzer forces would have to join up with Student's air-landing parties in or near Rotterdam.'

> Von Bock was not by any means sure that he could keep to the Rotterdam time-table, but when I made no bones about it that the fate of the air-landing group, and indeed of the Army Group's operation, hung on the punctual arrival of the mechanised army units, he assured me that he would do everything humanly possible. I made it easier for him to give me this promise by guaranteeing him the fullest air support.[7]

One of Kesselring's *fliegerkorps* was also specifically earmarked for the airborne forces, both to provide them with direct air support and to impede Dutch troop movements and counter-attacks.[8]

Kesselring's actions lay behind the third factor in the success of German operations east of Rotterdam: the airborne troops were very rapidly relieved by ground forces arriving from the frontier, not only at Eben Emael but also in western Holland, where lead elements of 9 Panzer Division made contact with the airborne in a period of about two days. Moreover, before the panzers arrived, reinforcements and supplies were brought in by air via the Waalhaven air head, and landings along the Moerdijk-Dordrecht road. Fourth, staged in daylight, the parachute drops and glider landings were for the most part both accurate and concentrated, and the airborne troops were able to form up very quickly.[9] Fifth, in the Eben Emael and Albert Canal operations, the Germans were confronted by what might be termed compliant adversaries. This does not mean that the Belgians capitulated without a fight, but that German predictions about the nature of their response were reasonably accurate. They were largely unable to offer effective resistance.[10]

However, where the Dutch were concerned, the reverse was true. Alerted by events in Norway to the threat posed by the German airborne, the Dutch responded with a series of counter-measures aimed particularly at strengthening airfield defence. The result was far tougher resistance than the Germans expected. They ultimately secured their objectives between Moerdijk and Rotterdam, but 22 Infantry Division's mission around The Hague had to be abandoned. The Dutch were alerted by German troop movements on the frontier. The daylight airlift, advantageous elsewhere, became a liability in the absence of tactical surprise. None of the air heads were captured, and only a minority of air-landing troops were actually landed. Dutch opposition in Rotterdam prevented the arrival of relief forces over land, or any link up with 7 Air Division.[11] Personnel and aircraft losses were very heavy. Of those actually delivered to the three air heads, the casualty rate was 40 per cent among the officers and 28 per cent among the other ranks.[12] But the worst losses were sustained by the Luftwaffe's air transport fleet: during the course of the airborne attacks on both the Albert Canal and western Holland, as many as 280 JU 52s may have been destroyed, and many others were damaged.[13]

German operations in the Low Countries demonstrated simultaneously the tremendous potential of airborne assault and the considerable risks involved. The next major German venture would do the same, and the mix of success and failure is once more very informative. Operation Mercury, the capture of Crete in 1941, was of course a very different type of operation – an independent airborne assault on an island. Essentially, Mercury was a Pyrrhic victory – the island was captured but in excess of 50 per cent casualties were incurred by 7 Air Division, along with further heavy aircraft losses. The high cost of the operation undermined Hitler's confidence in the airborne, and raised serious questions about German airborne tactical doctrine.[14]

What went wrong? The German reports inevitably dwelt on the far shorter lead time for Mercury, compared with the time that had been available for planning and preparation before the assault on the Low Countries. The attack on Crete was launched at only a few weeks' notice, with the final plan being completed at the very last moment; there were no opportunities for the exercises and rehearsals that had proved so valuable the previous year.[15]

But the key factor was that the German airborne found themselves confronted by an initially non-compliant adversary in possession of vastly superior intelligence. Poor intelligence – especially a serious underestimate of the number of Allied troops in Crete – led directly to Student's decision to employ the so-called 'oil spots' approach, which dispersed 7 Air Division too widely across the island. Two of the four main force elements were cut off for days without relief, and with minimal resupply. The Germans also contributed to the Allied advantage by employing eminently predictable tactics: they targeted airfields, just as they had in Norway and Holland. The British identified their main objectives months before the Germans even began planning the assault, and long before they started receiving so-called 'Ultra' high-grade signals intelligence on Mercury.[16]

The German airlift also went badly wrong. It was inaccurate, due partly to the low average quality of the air transport crews, partly to the short lead time (which reduced the standard of pre-briefing) and partly to the selection of a number of drop zones (DZs) that either lacked distinctive features or else were too close to the sea.[17] The second lift took far longer to stage than expected and became severely disorganised. Tactical surprise was lost; the Allied troops at Rethymnon and Heraklion were placed on the alert by the first lift to Maleme and were literally waiting for the German airborne to arrive.[18]

How, then, did the Germans snatch victory from the jaws of defeat? As an independent airborne operation, Mercury did not raise the command and control issues that tended to accompany complex combined and joint operations. But close integration between the airborne and the Luftwaffe at the top level was nevertheless very important. Crete was effectively isolated, so that few supplies and reinforcements reached the defenders after the fighting had started, and the Luftwaffe provided direct support to the landing forces in both offensive and defensive actions.[19]

Secondly, the Germans' adversaries became more compliant after the initial landing phase of the operation. Allied troops voluntarily yielded key terrain; counter-attacks were repeatedly delayed.[20] The effect was magnified by the ability of the Germans to secure a clear intelligence advantage within the first 24 hours or so. The vital factor here was the establishment of functional communications between the airborne in Crete and Student's headquarters on the Greek mainland. This allowed him to change his plans in accordance with information received about the tactical situation on the island – hence his decision to fly 5 Mountain Division into Maleme airfield. It also meant that he could provide some direction to the Luftwaffe on how best to exploit their crushing air superiority. By contrast, Allied commanders quickly lost control of the battle and found themselves unable to obtain an accurate and up-to-date picture of tactical developments.[21]

Third, the air-landing operation that delivered 5 Mountain Division to Maleme was far more successful than the airlifts mounted for 7 Air Division on the first day of Mercury, even though the cost in terms of destroyed and damaged aircraft was very much higher. This meant that, by the end of the second day, the Germans were benefiting from far more in terms of airborne reinforcement and resupply than their opponents were obtaining over land or sea.[22]

After Mercury, the Germans did not attempt another large-scale airborne assault against the Allies. Paradoxically, however, the operation convinced both Britain and the United States that it was essential to generate large-scale airborne assault capabilities.[23] Both now began the process of creating multi-division airborne forces, using the German airborne as a model, although they opted to invest far more heavily in assault gliders than the Germans. By the time of Operation Market Garden, in September 1944, British airborne operations were primarily glider rather than parachute operations. Partly as a result, the Allied airborne emerged far more heavily equipped than their German counterparts.[24]

How were the Allied airborne to be used? Where would they fit into Allied strategy? This remained unclear for some time. For the British, the issues were particularly challenging because of their very small air transport infrastructure. There was consequently something of a divergence of opinion between those that advocated a limited, tactical, role for the airborne, and those promoting their broader and more ambitious employment.[25] The Americans were in a better position to think big: although they also lacked transport aircraft in the early war years, they did possess the industrial capacity to put troop carriers into large-scale production. Yet their focus was initially on assigning the airborne troops to quite limited tactical tasks.[26] Nevertheless, by mid-1942 it was broadly assumed by both countries that the airborne would in some way spearhead the re-entry of Allied forces into German-occupied Europe. As the Chief of the Imperial General Staff (CIGS) put it:

> We are all agreed that for the defeat of Germany it will sooner or later be necessary for our armies to invade the Continent. To do this we shall first be confronted with the attack of strongly defended beaches. The employment of the Airborne Division in the rear may

offer the only means of obtaining a footing on these beaches.[27]

Having said that, the first British missions would today seem to have much in common with Special Forces operations, taking the form of small-scale raids against targets of strategic significance – the Pugliese aqueduct in Italy, objective of Operation Colossus, or the German radar at Bruneval. Yet both actually raised issues of longer-term importance, particularly with regard to lead time, command and control, intelligence and (most of all) air planning. This was despite the fact that the airlifts were at least sufficiently accurate to enable key missions to be executed broadly according to plan. With hindsight, then, we can identify some recurring airborne themes even in these early and limited initiatives.[28] Yet the prevailing lack of experience made it difficult to draw meaningful lessons at the time.

The Allies first employed airborne troops on battalion scale in North Africa late in 1942. There was very strong high-level pressure to test the airborne in combat, although there were many question marks over their readiness, especially where airlift was concerned. Only a single battalion was employed on the same day as the Torch landings, and not in a direct supporting role. This mission – against an airfield at Oran – failed because the airlift failed; the airlift failed because it involved the assignment of a 1,100 mile overnight flight from the UK to wholly inexperienced and poorly briefed USAAF crews. The whole concept was thrown together at excessively short notice, and was completely at odds with the advice supplied by Eisenhower's senior air force officer. The outcome was further influenced by non-compliant adversaries in the form of the Vichy French air and ground forces. Although launched in the expectation that French forces at Oran would not offer resistance, the troop carriers that finally found their way to the objective came under attack from French aircraft and anti-aircraft batteries, and a number of the airborne elements ultimately landed were taken prisoner by French ground troops.[29]

Airborne forces were otherwise used to support the subsequent advance towards Tunis. Airfields were consistently chosen as tactical objectives (mimicking German practice) though not as air heads, as the Allies had no means of airlifting troops en masse. Effectively, the airborne were to be employed in a reconnaissance role, ahead of the main ground offensive. Three of these four missions broadly achieved their goals, but they did not provide much insight into the challenges of mounting airborne assaults in more complex joint environments. Two (at Youks les Bains and Souk el Arba) encountered non-compliant adversaries in the best possible sense – French troops who offered no resistance – and a third (Bône) was unopposed.[30] So the only genuine airborne assault was 2 PARA's mission to Oudna and Depienne, which ended in a disaster that had five basic causes. The first was the absence of integrated command and control, there being no airborne representation or expertise at the headquarters of First (British) Army,[31] while the second was the absence of lead time: the operation was launched at such short notice that many paratroops did not even know where they were going to drop. The third was poor intelligence about the objectives and about the likely enemy response, the fourth was the cancellation of First Army's offensive, which

would otherwise have brought relief to 2 PARA (who were dropped 50 miles behind the front line) and the fifth was the misdirection of the airlift to Depienne when Oudna was in fact the principal target.[32]

Given the novelty of airborne operations at this time, it was inevitable that there should have been a good deal of trial and error in North Africa. The greater problem again lay in identifying lessons from the experience, which might then have influenced the Allies' approach during Operation Husky, the landings on Sicily, in the following year. Major General (later Lieutenant General) F.A.M. 'Boy' Browning, who was then commander of 1st Airborne Division, argued correctly that there was a critical need to secure airborne representation at higher command levels, but this proved easier said than done. Otherwise, it was unfortunate that the North African operations offered only a limited insight into what was destined to become perhaps the greatest operational airborne challenge – namely the planning and execution of accurate and concentrated airlifts. After the initial mission to Oran, all the lifts were staged in daylight, and they were thus accurate judged by the standards of later night missions over Sicily and the American sector in Normandy.

In Husky, the Allied airborne were to be employed far more in accordance with the role originally envisaged for them: they were to form the vanguard of an amphibious assault on the coast of mainland Europe. But translating this general scenario into practicable brigade-scale airborne assault plans, including the first mass glider landings, proved extremely challenging. Despite Browning's warnings, airborne planning was not properly incorporated into the more general Allied command and control machinery, which was in any case chaotically dispersed across multiple headquarters.[33] Hence the airborne plan did not retain sufficient visibility at higher command levels. Second, given the far greater scale and complexity of the airborne operations on Sicily, insufficient time was allowed for planning and preparation – especially where the glider assault was concerned. Both the glider and the glider tug pilots were inexperienced, and were especially unfamiliar with night formation flying, night navigation and (where the glider pilots were concerned) night landing. There had been literally no training in remote glider release by night, without a flare path for guidance. Furthermore, the British glider pilots and air-landing troops had not previously used the American Waco gliders they were predominantly to employ in the operation, as few British Horsas were as yet available.

Glider training for the operation progressed very slowly because of the delayed arrival of Wacos and Horsas in North Africa. Ultimately, it was not until June that the glider pilots began training with the USAAF's 51st Wing on even a limited scale. When the training period ended, the British glider pilots had received an average of only 4.5 hours flying on the Waco, including an average of just 1.2 hours night flying. As one British observer remarked, 'Practically none of our glider pilots have sufficient training, and it is too late to rectify this omission now.' Where parachute training was concerned, the situation was not much better.[34] A later report on airborne training before Husky recorded: 'Neither the parachute nor the glider exercises simulated the conditions of the coming operations closely enough to give any very definite

indication of their probable results.'[35]

The aircrew training issue was linked inextricably to a third, broader problem, which was that the challenges involved in executing the airlifts were vastly underestimated. Routing posed enormous problems, and the routes devised could not ultimately protect the troop carrier formations from both friendly and enemy anti-aircraft artillery (AAA).[36] However, beyond this, the various operations would only have succeeded if the Allies had possessed large numbers of experienced aircrew who had been intensively trained to execute tactical air transport and glider assault operations at night, in imperfect weather, over long distances and in combat conditions. Very few aircrew in the RAF, the Glider Pilot Regiment, the USAAF or indeed the Luftwaffe boasted these qualifications in July 1943.[37]

Thus it is hard to avoid the conclusion that the Sicilian operations were conceptually flawed. Some members of the Allied airborne community, especially from within the RAF and the Glider Pilot Regiment, argued this point strongly before Husky was launched, but to no avail.[38] And so it was that only a small minority of airborne personnel were delivered accurately to their objectives. The landings were otherwise widely dispersed, and many gliders came down in the sea. The airborne missions on Sicily played an important part in deepening the Allied beachhead. But rapid relief and fire support from the beaches were also crucial to such success as was achieved, and the airborne at first encountered only weak Italian opposition.[39] The airborne experience hinted at what might be possible in more favourable circumstances, but the true significance of Husky lay elsewhere. Far more important was the fact that the Sicilian operations offered some perspective; the key problems involved in planning and executing airborne missions started to become more apparent. It was now easier to record lessons and make recommendations. Husky was thus followed by a veritable outpouring of lessons identified and doctrine papers, which formally recognized many of the issues we have already considered.[40]

On integrated command and control, it was stated that airborne plans must be kept visible to the most senior commanders throughout the planning process, and not delegated to the extent that the high command lost sight of airborne considerations. The US War Department decreed:

> Airborne and troop carrier units are theatre of operations forces. Plans for their combined employment must be prepared by the agency having authority to direct the necessary co-ordinated action of all land, and air forces in the areas involved. This responsibility should not be delegated to lower headquarters since positive co-ordination can be ensured only by the one agency in control of all elements.[41]

The main British inquest into the fiasco, conducted jointly by the War Office and the Air Ministry, emphasised the critical importance of lead time: 'Airborne operations must be planned sufficiently far in advance to allow for the necessary training and rehearsals.' No less

essential was rapid relief or reinforcement of the airborne by ground forces. As their supplies of food and ammunition would inevitably be limited, airborne troops 'should not … normally be used in a role requiring their separation from the main force except for a short period.'[42]

Air issues had to be addressed with far greater care, with much more influence being given to theatre air commanders. It had to be recognized that successful lifts and landings were weather dependent; the higher command had therefore to rule on whether airborne missions were essential to the success of broader ventures, such as amphibious operations. If essential, these other operations might have to be delayed until weather conditions were suitable for the airlift.[43] Aircrew training, especially in night navigation, required far greater attention. The joint War Office and Air Ministry report pointed out that airborne operations were highly complex.

> Aircraft crews participating must therefore be trained to an operational standard. In particular, pilots require intensive training in low flying, navigation over sea, and in judging distances by moonlight. All the aircraft crews must have some preliminary operational experience and be able to drop human bodies as accurately as bomber crews drop their loads.[44]

American doctrine similarly stressed the critical importance of accurate troop carrier navigation and its dependence upon thorough training. 'Troop carrier units must be qualified for both day and night operations. This in turn dictates a high order of training requirements.'[45]

The post-Husky post mortem was thus very thorough: the clearest and most concise Allied airborne lessons and doctrine papers of the Second World War all appeared in the months after the capture of Sicily. The only surprising omission from both the British and American reports was the issue of intelligence, and there is no obvious explanation for this. Its importance may have been overshadowed by other matters after Husky, but it had certainly given the airborne some serious food for thought in North Africa. It was nevertheless recognised that the response of Axis forces had to be more seriously considered during the planning of future operations: 'Ground opposition was less determined than it is likely to be in other theatres of war.'[46]

It was one thing to write lessons and doctrine papers; but implementing key findings and recommendations was never likely to be so straightforward. The various papers prepared in late 1943 and early 1944 were of course written with the Normandy landings in mind, in an attempt to increase the chances of success and ensure that mistakes were not repeated. To what extent was this goal achieved?

First, steps were taken to ensure that the airborne plan was more effectively integrated into broader land, maritime and air planning, and it remained reasonably visible to the most senior commanders in the months before June 1944. The basic airborne concept of mounting one

operation at the base of the Cotentin Peninsula and another in the Caen area was included in the initial joint plan for the Normandy landings and evolved from then on. The Allied Army Group and Army commanders, Montgomery, Dempsey, and Bradley, were kept fully appraised of airborne developments, and the various airborne and air formations involved were regularly represented at a so-called Airborne Air Planning Committee, through which their activities were co-ordinated.[47] Second, a high priority was attached to achieving a rapid link-up between the airborne and the troops from the beaches. This was, for example, part of the rationale for prioritising the capture of Pegasus Bridge.[48] Third, the long lead time, spanning more than six months, was hugely beneficial where planning and preparation were concerned. As with the German airborne operations of 1940, lead time provided the basis for evaluating plans, collecting intelligence, and training personnel.

Yet even in this respect we have to add an important caveat, for the American airborne plans were substantially altered at a very late stage because of a revised intelligence appraisal concerning the strength of enemy defences in their sector. The objectives assigned to 82nd Airborne Division were only finalised a week before D-Day, and mission-specific preparations conducted before that time were thus rendered null and void. As an illustration, the air plan drawn up for the main airborne command rehearsal, Exercise Eagle (11-12 May 1944), was designed 'to be, so far as practicable, exactly similar to that for the operation, i.e., the same pathfinder procedure, the same number of aircraft, the same length of flight, the same landing times and relative position of dropping zones etc., to be adopted.' But the late alteration of the airborne plan necessitated corresponding last-minute changes to both the air routing and DZ locations of 82nd Airborne, so that at least half the final USAAF lift plan for D-Day diverged very considerably from the arrangements prepared for the exercise.[49]

In other ways, too, it would prove difficult to act on the post-Husky recommendations. Responsibility for the airlifts to Normandy was nominally placed under the Allied air commander-in-chief, Air Chief Marshal Sir Trafford Leigh-Mallory. But his task was essentially to execute the lifts so as to meet the requirements of the senior land commanders; they alone determined how, when and where the airborne would be employed. For a variety of reasons, Leigh-Mallory was never happy with their initial concept for the two American divisions. He believed airborne troops would be landing so close to enemy forces that they were likely to come under attack before they had formed up, that troop carriers would have to be routed over defended areas to reach their assigned DZs, and that some of the DZs chosen might well be obscured by fires, lights and smoke produced by naval or air bombardments. There was some basis for all of these objections and they were supported by several Allied doctrine papers.[50] Nevertheless he accepted the plan because of the importance that the generals attached to the capture of particular locations.

Then – at the end of May – he was confronted by the various late changes in the US sector. He feared they would leave the troop carriers and gliders even more vulnerable, and argued

very strongly against revising 82nd Airborne's mission. The result was a major top-level disagreement. The land view eventually prevailed, but Leigh-Mallory instigated changes in the lift plan designed to reduce aircraft exposure to German AAA.[51]

The Allies expended a considerable effort on raising the standard of air navigation. The Pathfinder system was introduced to aid the location of landing areas at night.[52] But the task of improving aircrew performance was massively complicated by the immense scale of the operation, which involved the deployment of the bulk of three divisions. This necessitated an extremely rapid short-notice expansion of the air fleet – transport aircraft and gliders – and thus the dramatic acceleration of aircrew training. The inevitable result was that many undertrained and inexperienced personnel were committed to battle.[53] In addition, some of the DZs selected were not very distinctive from the air – particularly in the US sector. Moreover, the bocage terrain in this sector was unsuited to assault glider landings, especially at night. In recognition of this fact, the initial American glider operations were scaled down and a follow-up lift was instead scheduled for the evening of D-Day, before nightfall.[54] However, this approach meant that the gliders might potentially have to land in daylight in the middle of a hotly contested battleground.

Then finally there was the weather issue. The Allied high command might ostensibly have accepted that the airborne lift was weather-dependent, but Eisenhower's concerns lay elsewhere during the approach to D-Day. His ultimate decision to launch the operation was based overwhelmingly on maritime rather than air considerations.[55] The wind was too high for parachute drops, and visibility conditions over the American sector in Normandy were also unfavourable.[56]

The Normandy airborne operations achieved partial mission success, a higher proportion of objectives being secured in the British rather than the American sector because of the greater accuracy of the British airlift. The British achievement was of course capped by the brilliantly executed coup-de-main seizure of Pegasus Bridge – another illustration of the value of ample lead time, which allowed the mission to be intensively rehearsed over several months.[57] The main airlift was accurate enough to ensure effective defence of the Ranville area and the subsequent expansion of the bridgehead up to the so-called Ranville Heights;[58] the larger glider lifts were extremely accurate – especially on the evening of D-Day.[59] Fire support and reinforcements were soon available from the beaches.[60]

Yet this still left the bridgehead substantially smaller than expected. This was partly due to the fact that the airlifts to the more outlying landing areas were far less accurate than the lifts to Ranville.[61] But it was primarily because German actions did not comply with British expectations. British planning was based on the assumption that the Germans would accept the establishment of the eastern flank on the Dives River, whereas Rommel was in fact determined to hold the Ranville Heights – between the Orne and the Dives, and the Germans also fought very hard to maintain their control of the coast.[62]

In the American sector, the degree of mission success was more limited. The key factors here were the same, but with the more general inaccuracy of the airlift being decisive. Only a minority of paratroops landed on their DZs, and both glider operations also went badly wrong, partly because of the terrain, partly because of navigation and visibility factors, and partly because gliders came under attack while landing.[63] German resistance was certainly strong – in some areas far stronger than expected – but the effect was magnified by the wide dispersal of the airborne troops. Of the two American divisions, 101st Airborne secured a higher proportion of their tactical objectives primarily because they lay closer to the coast,so that the paratroops were more quickly relieved by units arriving from Utah Beach.[64] Part of the 82nd Airborne became cut off to the west of the River Merderet – beyond the reach of friendly forces; predictably they incurred very heavy casualties, as did the units tasked to rescue them.[65]

This is not to deny that the effect of the American landings was considerable. German command and control was thrown into confusion, and the US airborne played an important part in protecting the Utah beachhead during the first day of the campaign. Nevertheless, after what had happened in Sicily, a number of senior American commanders inevitably drew very negative conclusions from the Normandy operation. Indeed, Bradley appears to have lost confidence in the airborne medium completely. This reaction was unnecessarily extreme. The problems encountered by the Americans in Normandy had less to do with airborne warfare per se than with their inability to exploit past experience. Although they had accurately identified the most important airborne lessons of the Sicilian debacle, it had proved extremely difficult to apply them. Normandy did not imply the abandonment of the airborne concept, but it did suggest that the Allies needed to think far more carefully about how the airborne were to be employed.

The primary airborne lesson drawn by the Allies from the Normandy campaign emerged more from the planning of the operation than from its execution. Eisenhower decided to create a single Allied airborne headquarters responsible both for the airborne forces and their supporting air transport. This was duly established, and was named Headquarters, First Allied Airborne Army.[66] It was disliked by the British airborne community and the British Army, who saw it as a US-dominated institution.

As far as the execution of the Normandy airborne missions was concerned, the American troop carrier commanders afterwards decided that there should be no further night operations.[68] This new departure was also favoured by the airborne forces themselves, not only on grounds of accuracy, but also because night assembly in Normandy had proved to be extremely difficult, even where the airlifts had been reasonably accurate.[69] The other major recommendation came from the commander of 101st Airborne, and concerned the all-important link-up between the airborne and the conventional ground forces. Major General Taylor wrote that 'the previous conception that an Airborne Division can maintain itself independently for two or three days should be revised downward for action in "FORTRESS EUROPE".'[70]

After Normandy, the Allies had to alter their expectations of how the airborne would be used. As we have seen, it had previously been envisaged that they would operate in support of amphibious landings to open new fronts on mainland Europe. This had now been achieved so the question arose, what should they do next? The view gained currency that they should be committed to multiple successive operations to maintain the momentum of the advance into Germany.[71] According to this scenario, after the breakout from Normandy, Allied forces might run into a German block – perhaps a river line or some other kind of defensive position. Airborne troops would then be deployed into the German rear to help unhinge their defences and get the advance moving again. Superficially, this approach sounds eminently sensible. However, past experience had of course emphasised the immense value of lead time in the planning and execution of airborne operations, whereas the new concept implied that they might have to be launched at virtually no notice. This contradiction, which appears very obvious in retrospect, is not addressed in the surviving documents. It brings us to Operation Market Garden.

Much has been written on the ultimate failure of Market Garden, with the main focus again being on tactical planning issues. Yet it is once more important to consider the operational level too, and the manner in which operational factors shaped lower-level decision making. Equally, no satisfactory explanation of the Allied defeat can be constructed without reference to earlier airborne experience. To begin with, despite the progress made before the Normandy landings, Market Garden again suffered from a lack of integrated command and control: Montgomery obtained Eisenhower's authorisation for his already detailed and restrictive operational concept before it was presented to First Allied Airborne Army. This was done to prevent the American airborne and troop carrier commanders raising objections.[72] However, past experience suggested that senior land, airborne and air commanders should have been brought together into a properly joint planning process at the earliest possible stage, i.e., when the Market Garden concept was being developed, and *before* the plan was placed before the Supreme Allied Commander.

The lack of integrated command and control led directly to the Allies' failure to achieve optimal employment of the contributing force elements – particularly the RAF and the USAAF. Montgomery did not seek the advice of a single senior air force officer about what the airlift could – or could not – be expected to achieve. There is no documented discussion of air interdiction measures to isolate the Market Garden battle area, nor of the more general role of air support. Equally, because of his initial failure to consult key stake-holders, the basic airborne concept was founded on a number of flawed assumptions, such as the notion that 101st Airborne Division could reasonably be dispersed over a 50-mile area serviced by seven different DZs.[73] Their subsequent opposition to this scheme led to a key change of plan, which very sensibly concentrated the division within a smaller area but which, in the process, removed any airborne threat to German forces south of Eindhoven.[74] Resistance in this area would halt the British ground advance for much of the day on 18 September, thus playing an important part in the failure of the entire operation.[75]

Second, once again, the airborne found themselves confronted by a non-compliant adversary. Indeed, Market Garden was an intelligence disaster in terms of both collection and interpretation. A succession of references suggesting the potential presence of German armour in the Arnhem area did not give rise to any systematic or concerted efforts to find out more, and the combat power and response times of enemy units around Arnhem and Nijmegen were seriously underestimated.[76] Of the key German formation, II SS Panzer Corps, Montgomery would later record, 'Its battle state was far beyond our expectations.'[77] Responsibility for both of these failures must be assigned to the main British headquarters on the continent, on which the airborne forces were heavily dependent for the supply of intelligence. The staff at both 21st Army Group and Second Army headquarters inevitably lacked airborne expertise and did not understand the particular importance of good intelligence to the successful prosecution of airborne warfare.

Third, there was the familiar issue of the link-up between the airborne and the ground forces. The simple truth is that 1st Airborne Division's objectives lay too far behind the front line. The route north to Arnhem was both narrow and vulnerable; it was intersected by a series of major water obstacles and by two substantial conurbations. In these circumstances, there was always a danger that 1st Airborne might become cut off. However, it is not clear that the risks were fully appreciated. Browning's famous pledge that they could hold out at Arnhem independently for four days was at odds with virtually all past airborne experience – Allied and German – and with specific lessons identified in earlier operations.

But it is the issue of lead time that sets Market Garden apart from other Second World War airborne operations. As it was launched at only a few days' notice, there was minimal scope for planning and preparatory activity, and preliminary exercises or rehearsals were out of the question. The commander of First Allied Airborne Army believed that the UK air transport bases were too far from the airborne objectives, but there was insufficient time for his forces to be deployed to continental airfields.[78] Equally, there was no opportunity to discuss, debate or test any of Market Garden's other potential weaknesses. Decisions had simply to be taken and implemented.

This was especially true where the airlift was concerned. Ostensibly, this might appear to have been one of the more successful features of Market Garden. Executed in daylight, the various lifts achieved far greater levels of accuracy and concentration (approximately 90 per cent for 1st and 101st Airborne on the first day of the operation) and the task of assembly on the ground was also much easier. The vast majority of airborne troops were formed up and ready for action within an hour of landing.[79] And yet the assumptions that underpinned the airlift plan were again seriously mistaken. The Allies possessed very large numbers of transport aircraft by September 1944, but not nearly enough to convey in a single lift three whole airborne divisions with substantial headquarters and support elements and immense quantities of equipment and stores. For this reason, when the Market Garden concept was being hatched, it was accepted that ventures of this scale would require multiple consecutive

airlifts, along lines already established for two earlier operations (Operation Linnet and Operation Comet), which had ultimately been cancelled.[80]

Yet to attempt a long-distance multiple-lift operation against deep and defended objectives near the German frontier was fraught with risk. The Germans would inevitably begin mobilising as soon as the first airborne landings began, while many airborne troops would have to be wastefully tied to the defence of DZs, instead of being sent directly to their objectives. By the time the second lift arrived, the tactical situation would be completely transformed, and the original Allied plan would no longer be worth the paper it was printed on.

Had more time been available, the obvious disadvantages of the multiple lift approach might have been more clearly identified, alternative approaches might have been considered, and it might not have been necessary to recycle the Linnet and Comet lift plans on an inflexible 'one size fits all' basis.[81] Different arrangements might potentially have involved a single airlift carrying the maximum possible number of combat troops. For a relatively small sacrifice in terms of support elements and supplies, two full combat brigades could easily have been landed simultaneously at Arnhem on 17 September 1944 and, without any need to defend the landing area pending follow-up lifts, they could both have been despatched to their objectives immediately.[82] As it was, in the rush to finalise their plans, the Allies confused their priorities in Market Garden. There was too much focus on the problem of completing a full-scale airlift, and not enough on the key challenge, which was to deploy as many combat troops as possible, as rapidly as possible, around the key airborne objectives.

It is hardly surprising to learn that the chief lessons identified after Market Garden's failure were meticulously applied by the Allies during the preparations for Operation Varsity – the Rhine crossing – in March 1945.[83] A lead time of several months provided ample scope for every aspect of the plan to be subjected to detailed scrutiny and deliberation. Command and control was properly integrated, with senior land, airborne and air commanders being intimately involved from the very beginning. Among other things, this allowed air power to be far more effectively exploited in support of the operation. The airborne plan was a lot less ambitious than the Arnhem plan: the objectives lay only a short distance across the Rhine, and the landings did not in any case commence until the first river crossings had been successfully completed by British ground forces. The bulk of the Allied air transport fleet was deployed forward to bases on the continent and the scale of the airborne operation was deliberately restricted so that the participating airborne divisions could be delivered in a single daytime lift.

A highly detailed and accurate intelligence picture was constructed in the weeks before the operation, and the Germans were compliant; indeed, their capability was if anything overestimated.[84] This was crucial to the rapid achievement of airborne tactical objectives and it was important in other respects because, while the parachute drops were reasonably accurate in Varsity, the glider landings went badly wrong. The selected landing zones were so

close to the Rhine that they were obscured by the Allied smoke screen, and by smoke from the land battle. Considerable quantities of glider-born equipment was destroyed or damaged or landed too far from the LZs to be quickly recovered and deployed.[85] Luckily, it wasn't needed to overcome German resistance.

Conclusions

This article set out to identify the key influences upon the success or failure of airborne operations in the European theatre in the Second World War. It is appreciated that, analysed in detail, there were many important differences between the various operations considered here; theoretical frameworks and models should never be applied too rigidly to explain the course of successive historical events, which may be shaped by a multiplicity of disparate factors. Nevertheless, surveying the airborne experience over an extended period, it is impossible not to be struck by the extent to which outcomes were determined by five basic themes, which were also regularly identified and commented on by Allied and German reports at the time. These should by now be very familiar to the reader, but they can be summarised as follows.

1) ***Lead time***. Lead time was an important factor in the more successful operations. Over time, preliminary airborne operation plans could be scrutinised and discussed, increasing the likelihood that potential weaknesses would be identified and rectified. Time also created scope for intelligence gathering, and for training, exercises and rehearsals. Lead time was demonstrably crucial to the Germans in the Low Countries, to the British in Normandy, and to both Western Allies in Operation Varsity. Equally, the Germans blamed their problems in Crete, at least in part, on the fact that the operation was launched at short notice, and lack of lead time was likewise viewed by the Allies as a major cause of the failure of the airlifts in Operation Husky and of the overall failure of Market Garden.

2) ***Integrated command and control***. If the airborne operation was part of a broader venture involving land, air and perhaps maritime forces, integrated command and control was essential and had to be exercised from the earliest stage of planning, i.e., the conceptual stage. Subsequently, it was vital to keep the airborne plan and especially the *airlift* plan visible at higher command levels throughout the various preparatory phases. Any loss of visibility could result in critical decisions being taken without their implications for the airborne being properly considered or appreciated.

3) ***Relief, reinforcement or re-supply***. Airborne forces could only operate independently for limited periods. Assuming they were not to be evacuated, plans had therefore to provide for their reinforcement or re-supply at a rate comparable to or exceeding that of their adversaries. This would normally involve actual relief via a rapid link-up between the airborne and conventional ground forces, and anything with the potential to prevent that link-up could seriously jeopardise the outcome of the entire undertaking. Particular care was required in this respect if the airborne troops were to be landed in deep locations or on the wrong side of major obstacles, such as rivers.

4) ***Intelligence***. Airborne troops were normally conveyed by large, slow and vulnerable aircraft; they usually lacked much in the way of heavy weaponry and mechanised transport, and their supplies were of course limited. Against more numerous ground forces equipped with heavy weapons, and enjoying the benefits of mechanisation and overland supply, the airborne often found themselves at a considerable disadvantage. For this reason, airborne operations had to be preceded by careful intelligence preparation, so that the nature and scale of the enemy's response could be predicted with reasonable accuracy.

5) ***The airlift***. To stand a reasonable chance of success, the airborne forces had to be conveyed to their objectives accurately and en masse. The effectiveness of airlifts was influenced by a wide range of variables and represented one of the most challenging aspects of airborne warfare for both Germany and the Allies between 1939 and 1945. Aircrew training was a critical factor, and airlift planning required exceptional care and attention to detail, and the closest possible collaboration between the air forces and their airborne passengers at every stage in the planning process.

Finally, it is impossible not to be struck by one broader point that emerges from this study – the extreme difficulty of translating past lessons into easily applicable doctrine to guide future airborne planning. Politics, personality issues, inter-service arguments and short-term operational pressures all influenced the extent to which past experience could be drawn upon. The Germans proved unable to learn appropriate lessons from the failure of their operations around The Hague in 1940, which might potentially have led them to employ very different tactics in Crete in 1941. Equally, for the Allies, it was hard to learn from German experience in the Low Countries, for there was little intelligence on what the airborne had achieved, or on how they had achieved it. The same was not true of Operation Mercury; indeed, during the fighting in Crete, the Allies obtained a wealth of information on the German airborne, which was very closely scrutinised by the British War Office and RAF intelligence.[86] Yet it is unclear how, or even whether, this influenced early Allied airborne plans. Moreover, as we have seen, the Allies' first attempts to use airborne troops at battalion scale in North Africa offered few obvious lessons for the larger operations in Sicily in 1943.

Sicily *did* produce innumerable lessons, which the Allies realised would be directly applicable to Normandy, but they were only partially exploited; further dispersed and inaccurate airlifts were the main consequence. Effective steps were then taken to ensure that the Market Garden airlifts were by far the most accurate that the Allies staged during the war, but Market Garden was to the Allies in most other respects what Crete had been to the Germans – a retrograde step. In recognition of this fact, Varsity at last involved the scrupulous application of airborne lessons identified, both from Market Garden and earlier ventures. The Allies emerged from the Second World War with practical and robust airborne doctrine firmly rooted in wartime experience, but five years and a succession of major operations were required before they could arrive at this happy conclusion.[87]

Notes

[1] In the author's view, despite their age, the most useful comparative works on Allied airborne operations remain four official studies, Air Publication (AP) 3231, *The Second World War 1939-1945, Royal Air Force, Airborne Forces* (Air Ministry official monograph, 1951), Lieutenant Colonel T.B.H. Otway, *Airborne Forces* (War Office official monograph, 1951), John C. Warren, *Airborne Missions in the Mediterranean 1942-1945* (USAF Historical Division Research Studies Institute, Air University, 1955) and, by the same author, *Airborne Operations in World War II, European Theatre* (USAF Historical Division, Research Studies Institute, Air University, 1956).
[2] AP 3231, pp. 225-228.
[3] Otway, *Airborne Forces*, p. 25.
[4] Ibid, p. 23.
[5] Lieutenant Colonel E.H. Brongers, *The Battle for the Hague*, 1940 (Aspekt, Soesterberg, 2004), pp. 29-32; I.H. Lyall Grant, 'The German Airborne Attack on Belgium in May 1940', *Journal of the Royal United Services Institution*, Vol. CIII, February 1958, pp. 94-102; *Airborne Operations: A German Appraisal*, Office of the Chief of Military History, Department of the Army, 1950 (AOGA), p. 14; W. Speidel, *The German Air Force in France and the Low Countries* (US Air Force Historical Research Agency study 152), Vol. 2, Part 1, p. 131.
[6] Field Marshal Albert Kesselring, *The Memoirs of Field Marshal Kesselring* (William Kimber, London, 1953), p. 55.
[7] Ibid, p. 53.
[8] Ibid, pp. 53-54.
[9] Jean Paul Pallud, *Blitzkrieg in the West Then and Now* (After The Battle, London, 1991), pp. 121-122, 125, 128, 130.
[10] Lyall Grant, 'The German Airborne Attack on Belgium in May 1940', pp. 100-102.
[11] Jean Paul Pallud, *Blitzkrieg in the West Then and Now*, pp. 113, 118, 128; Maurice Tugwell, *Airborne to Battle: A History of Airborne Warfare* (William Kimber, London, 1971), pp. 48, 50, 59-61.
[12] Tugwell, *Airborne to Battle*, pp. 48, 50, 59-61.
[13] Brongers, p. 269.
[14] Shelford Bidwell, 'Operation Mercury – The Invasion of Crete', in Ste. Croix (ed.), *Airborne Operations*, p. 61; Anthony Beevor, *Crete: The Battle and the Resistance* (Penguin, London, 1991), pp. 154-155; 229-230; some sources record a figure of 170 lost transport aircraft.
[15] D.W. Pissin, *The Battle of Crete* (USAF Historical Study 162, 1956), **http://afhra.maxwell.af.mil.**, pp. 8, 64; AOGA, pp. 13, 14, 21.
[16] Tugwell, *Airborne to Battle*, pp. 84-87; Beevor, *Crete*, pp. 72,88, 111-112, 132-133, 136-137, 152-153.
[17] Pissin, pp. 118, 127, 130, 137; AOGA pp. 80-81.
[18] Beevor, *Crete*, pp. 130-132; report by Luftflotte 4, The Invasion of Crete, 28 November 1941; AOGA, pp. 12, 13.
[19] Report by Luftflotte 4, The Invasion of Crete, 28 November 1941, pp. 1, 16, 22, 25.
[20] Beevor, *Crete*, pp. 87-94.
[21] Tugwell, *Airborne to Battle*, pp. 102-103.
[22] Beevor, *Crete*, pp. 153-155, 166

[23] Tugwell, *Airborne to Battle*, p. 122.
[24] Otway, pp. 21, 37-39, 45-48, 94-95; Tugwell, *Airborne to Battle*, pp. 233-234. According to Otway, the glider-borne air-landing troops were the most heavily armed infantry in the British Army.
[25] Otway, *Airborne Forces*, p. 51.
[26] G.L. Rottman, US Airborne Units in the Mediterranean Theatre, 1942-44 (Osprey, Oxford, 2006), p. 24.
[27] Air Publication (AP) 3231, p. 48.
[28] Ibid, pp. 28-29, 57-58. For example, the principal lessons report on Colossus concerned intelligence, aspects of the airlift, lead time and the need for unified command and control.
[29] Warren, *Airborne Missions in the Mediterranean*, 1942-1945, pp. 5-13.
[30] Ibid, pp. 14-17.
[31] Otway, *Airborne Forces*, p. 81.
[32] Ibid, pp. 78-81; Major-General John Frost, *A Drop Too Many* (Cassell, London, 1980), pp. 74-100.
[33] Otway, *Airborne Forces*, p. 118. Headquarters nodes with at least some influence over airborne matters included Allied Forces Headquarters, 15th Army Group, Eighth Army, Seventh Army, Mediterranean Air Command, 12th US Troop Carrier Command, Browning and his staff, and the airborne divisional headquarters.
[34] Warren, *Airborne Missions in the Mediterranean*, pp. 22, 26-28.
[35] 38 Wing RAF Report on Training and Operations in North Africa and Sicily, May/July 1943 (AHB copy).
[36] Warren, *Airborne Missions in the Mediterranean*, pp. 2, 40-41, 51-52; Ste. Croix (ed.), *Airborne Operations*, pp. 85-86.
[37] Warren, *Airborne Missions in the Mediterranean*, pp. 26-28; 38 Wing RAF Report on Training and Operations in North Africa and Sicily, May/July 1943.
[38] Warren, *Airborne Missions in the Mediterranean*, p. 23. 'In vain did the British Airborne Forces adviser, Group Capt. T.B. Cooper, RAF, protest that a glider assault on a dark night with inexperienced crews was not practicable. The decision stood.' See also AP 3231, p. 95; Chatterton, *Wings of Pegasus*, p. 42.
[39] Otway, Airborne Forces, p. 120; Warren, *Airborne Missions in the Mediterranean*, pp. 33-36; Tugwell, *Airborne to Battle*, pp. 165-166.
[40] These papers included Joint War Office/Air Ministry Report on the Employment of Airborne Forces, Appendix D to Appendix V/19, Wing Commander W.D. Macpherson to SASO, 27 November 1943, Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices (AHB copy), U.S. War Department Training Circular 113, un-numbered SHAEF memorandum dated 19 January 1944, and Combined Chiefs of Staff Paper 496. See also US Army Air Forces Board Project (T) 27, Long Range Study of Airborne Operations, 29 April 1944 (AHB copy).
[41] US War Department Training Circular 113, 9 October 1943.
[42] Extract from Joint War Office/Air Ministry Report on the Employment of Airborne Forces, Part A, Lessons of Airborne Operations in Sicily, Appendix D to Appendix V/19, Wing Commander

W.D. Macpherson to SASO, 27 November 1943, Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices.
[43] Ibid.
[44] Ibid.
[45] US Army Air Forces Board Project (T) 27, Long Range Study of Airborne Operations, 29 April 1944, pp. 7, 10.
[46] Extract from Joint War Office/Air Ministry Report on the Employment of Airborne Forces, Part A, Lessons of Airborne Operations in Sicily, Appendix D to Appendix V/19, Wing Commander W.D. Macpherson to SASO, 27 November 1943, Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices.
[47] Warren, *Airborne Operations*, pp. 3, 6-9.
[48] Stephen Ambrose, *Pegasus Bridge, D-Day: The Daring British Airborne Raid* (Pocket Books, London, 2003), pp. 51-52.
[49] Minutes of the 9th Meeting of the Airborne Air Planning Committee, 28 April 1944, Appendix V/39; Bradley to Montgomery, 26 May 1944, Appendix V/43; Williams to Leigh-Mallory, 27 May 1944, Appendix V/44; notes of a conference held at SHAEF, 27 May 1944, Appendix V/45; all sources contained in Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices.
[50] Memorandum on the Employment of Airborne Forces in Operation Overlord, April 1944, Appendix V/8, Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices.
[51] Notes of a conference held at SHAEF, 27 May 1944, Appendix V/45, Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices.
[52] AP 3231, pp. 96-97; Warren, *Airborne Operations*, p. 4; Otway, *Airborne Forces*, p. 131.
[53] Warren, *Airborne Operations*, pp. 7-9, 18-20, 23, 24; notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, by PS to Air C-in-C, AEAF (held at AHB), p. 310; AP 3231, p. 108.
[54] Warren, *Airborne Operations*, pp. 9-10, 22.
[55] Carlo D'Este, *Decision in Normandy* (Penguin, London, 2001), pp. 109-110.
[56] The wind was gusting at up to 30 mph; see AP 3231, p. 125.
[57] Ambrose, *Pegasus Bridge*, pp. 57-59.
[58] AP 3231, p. 132.
[59] Ibid, p. 134.
[60] Lloyd Clarke, *Orne Bridgehead* (Sutton Publishing, Stroud, 2004), pp. 88, 91.
[61] AP 3231, pp. 125-128.
[62] Otway, *Airborne Forces*, pp. 174-175; Clarke, *Orne Bridgehead*, p. 168.
[63] Warren, *Airborne Operations*, pp. 58, 61-69.
[64] Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, by PS to Air C-in-C, AEAF, p. 316.
[65] Warren, *Airborne Operations*, pp. 39, 42, 47-48, 52, 57-58.
[66] Ibid, p. 81.

[67] The Commanding General and the Chief of Staff was American, and Americans were placed in charge of personnel, intelligence, operations, planning and communications – in other words five of the six main divisions within the headquarters. See Otway, *Airborne Forces*, p. 204.
[68] Warren, *Airborne Operations*, p. 61.
[69] Otway, *Airborne Forces*, pp. 178-179.
[70] Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, by PS to Air C-in-C, AEAF, p. 316.
[71] AP 3231, *Airborne Forces*, p. 146.
[72] Hamilton, *Monty*, p. 451.
[73] TNA WO 219/4997, memorandum by Brereton, 11 September 1944. The employment of multiple small pinpoint drop zones directly contravened Allied tactical doctrine; see extract from Joint War Office/Air Ministry Report on the Employment of Airborne Forces, Part A, Lessons of Airborne Operations in Sicily, Appendix D to Appendix V/19, Wing Commander W.D. Macpherson to SASO, 27 November 1943, Notes on the Planning and Preparation of the Allied Expeditionary Air Force for the Invasion of North West France in June 1944, appendices.
[74] Warren, *Airborne Operations*, p. 89.
[75] Margry (ed.), *Market Garden Then and Now*, pp. 254-260; TNA WO 171/1256, War Diary, 2nd Irish Guards (Armoured Battalion), 18 September 1944.
[76] For the first reports of II SS Panzer Corps' move to Arnhem, see TNA DEFE 3/221, XL 9188, 5 September 1944; TNA DEFE 3/221, XL 9245, 6 September 1944.
[77] Field Marshal the Viscount Montgomery of Alamein, *Memoirs* (Collins, London, 1958), p. 297.
[78] TNA WO 219/2186, Brereton to Eisenhower, 1 September 1944; TNA WO 219/2121, memorandum by SHAEF planning staff, 4 September 1944.
[79] Warren, *Airborne Operations*, pp. 102, 112-114; TNA AIR 37/1217, Urquhart to Hollinghurst, 27 September 1944.
[80] Warren, *Airborne Operations*, p. 89; Report by First Allied Airborne Army, Operations in Holland, September-November 1944, 22 December 1944.
[81] On the basis of plans drawn up for Operation Linnet, it was thought that the vast majority of airborne troops committed to Market Garden could be conveyed by the first two lifts, leaving only a relatively small proportion of the force to be carried by the third lift. However, the Linnet plan depended on the use of 'double-tow' arrangements for the American airborne, i.e, two gliders being towed by each tug aircraft. This technique was practicable for the Linnet objectives, which lay on the Belgian-French border around Tournai, but not for the Market Garden objectives, which were considerably further from the UK. Consequently, half of the American gliders had to be transferred to the third lift, which thus became far more important to the successful execution of the Allied plan.
[82] Even with a large part of the initial glider lift committed to the carriage of headquarters, support and artillery elements, and to equipment and supplies, it was still possible to deploy almost the whole of 1 Air-Landing Brigade on 17 September (along with 1 Parachute Brigade). Only a single company remained in the UK pending the second lift on the 18th.
[83] No. 38 Group RAF Report on Operation 'Varsity', 20 May 1945 (AHB copy), para 110.
[84] All of these issues are covered in Warren, *Airborne Operations*, pp. 156-173.

[85] Otway, *Airborne Forces*, pp. 304-305, 318.
[86] HQ RAF ME Intelligence Branch, German Airborne Attack on Crete, 1 November 1941 (AHB Copy); War Office, Periodical Notes on the German Army No. 38, XI Air Corps and the Attack on Crete, 20 March 1942 (AHB Copy).
[87] See War Office, Army/Air Operations Pamphlet No. 4, *Airborne Air transported Operations*, 1945 (AHB Copy).