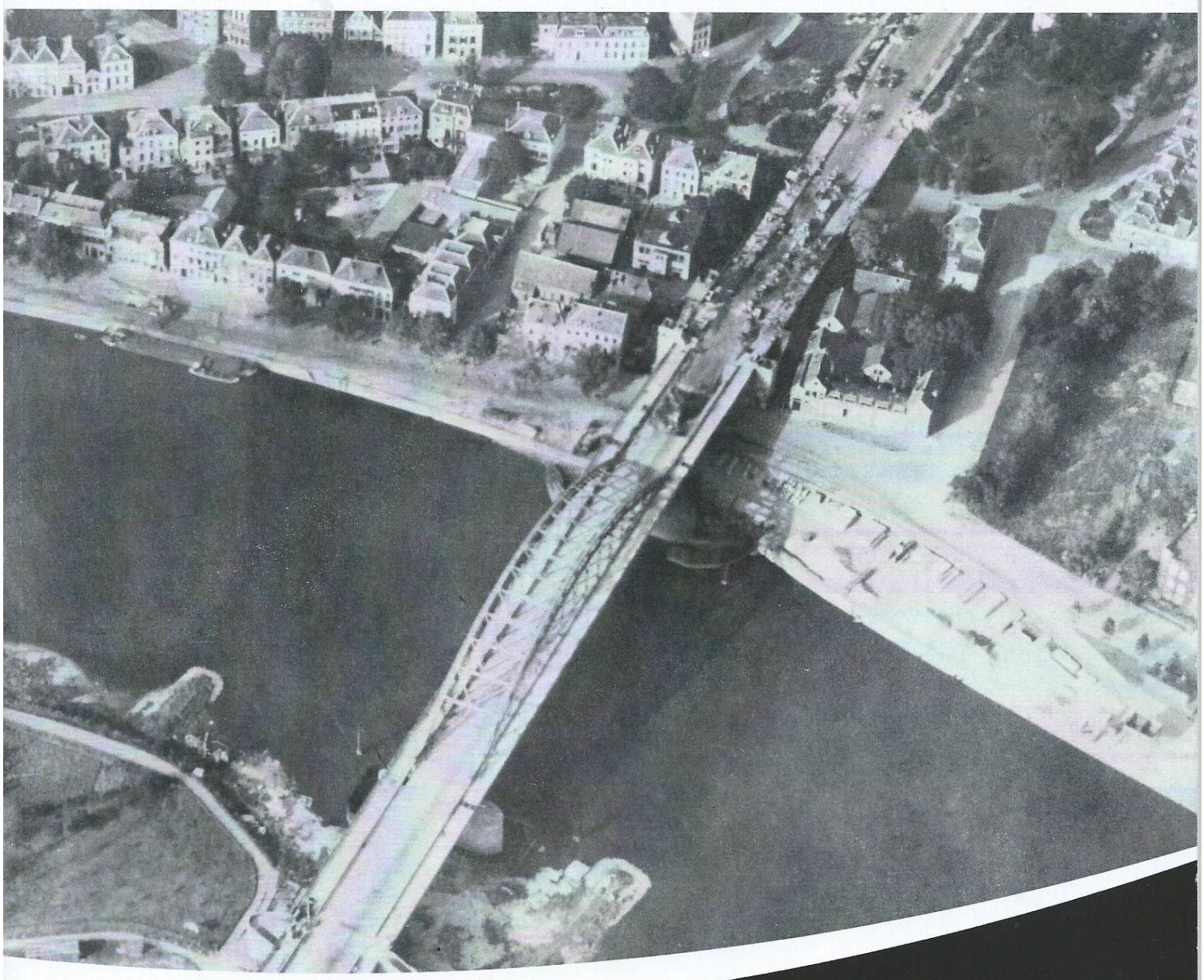
Arnhem

The Air Reconnaissance Story

Air Historical Branch (Royal Air Force)



ROYAL AIR FORCE

Author

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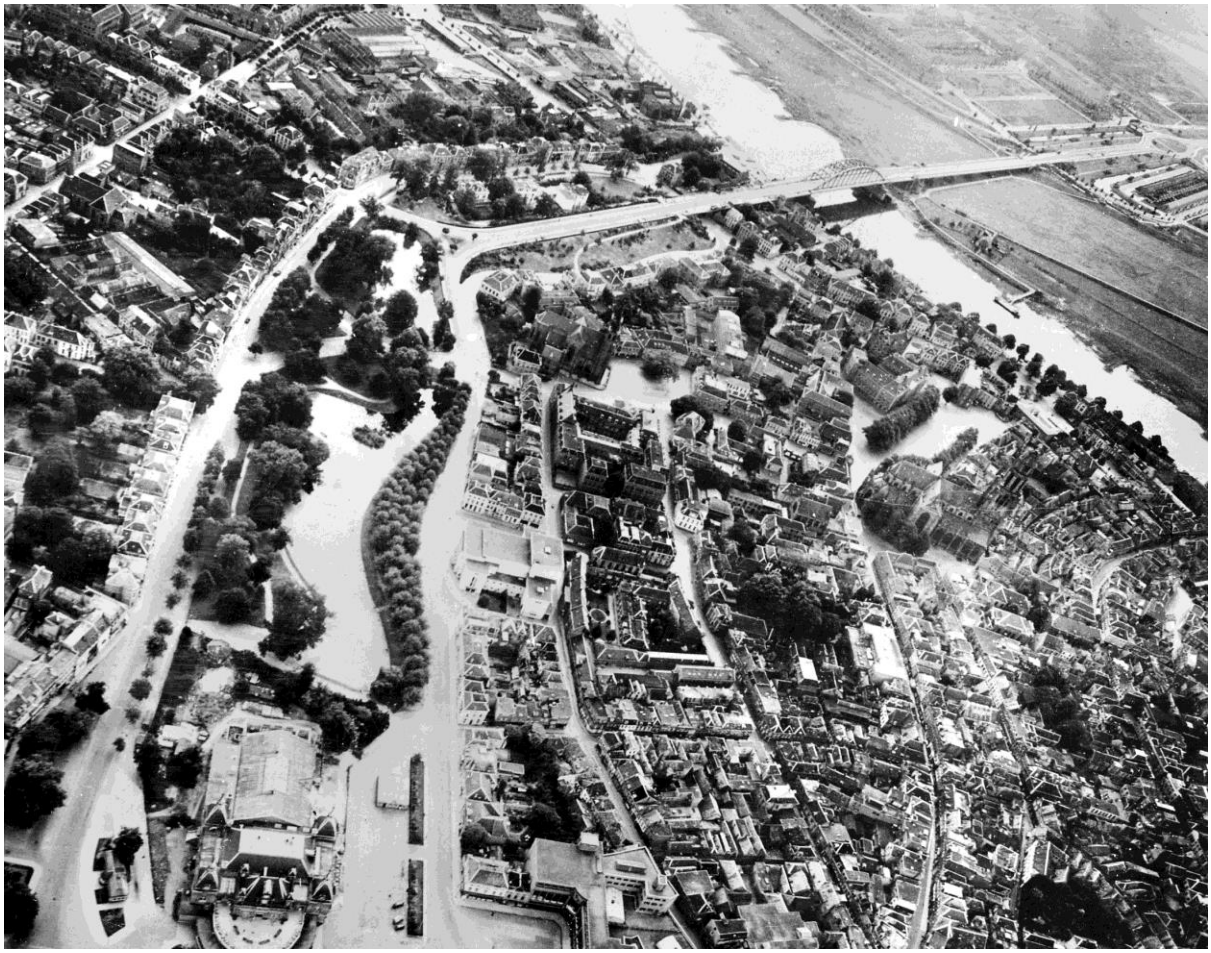
The relationship between intelligence and the failure of Operation Market Garden in September 1944 has long fascinated the military history community. The operation appears to offer the clearest possible example of intelligence failure, highly effective intelligence collection apparently being squandered through flawed processing, exploitation and dissemination. In the words of Stephen Ambrose, 'The British were outstanding in gathering intelligence, lousy in using it.'[1] Furthermore, while almost all the intelligence disciplines were drawn on by the Allies in the days leading up to the operation, the story of one particular air reconnaissance mission has come to symbolise, beyond all else, the perception that they failed disastrously to exploit such information as was available to guide operational planning. It is said that the Allies succeeded in obtaining air photographs of German armoured units near to Arnhem – their key operational objective – only days before Market Garden was launched, yet this apparently vital intelligence exerted no influence at all on their plans. In turn, this failure is sometimes employed to suggest a broader tension between the intelligence and operations spheres and upheld as an extreme manifestation of a problem that is as old as military history itself.[2]

The prominence assigned by historians to this episode is not difficult to understand. Although air reconnaissance provides but one of several sources of intelligence, it is often considered to be more directly useful and persuasive than the others. Intercepted communications, or SIGINT, vital as it was in the Second World War, was subject to delays pending decryption and rigid circulation restrictions; its very secrecy sometimes inhibited full exploitation, and SIGINT leads were often so fragmentary that their true significance was overlooked. Intelligence from agents on the ground (HUMINT) depended then, as now, on their absolute reliability, which was by no means always certain. The interpretation of intelligence derived from both sources was necessarily somewhat subjective, and dependent on the training, experience and perspective of analysts and intelligence staff, and on such supporting information as was available to them. By contrast, air imagery has always appeared far more tangible, offering a visual and objective confirmation of enemy activity, which is established beyond doubt at a given place and time. Hence the implication in many studies of Market Garden that, while there might have been a case for questioning SIGINT or HUMINT, there could be no excuse for ignoring air photographs of German tanks at Arnhem.



The Arnhem road bridge, key objective of Operation Market Garden.

Most such judgements were passed before the photographs of the tanks were found. Several extensive searches of the UK air imagery archives had failed to unearth them. However, in 2014, an air photograph turned up in the RAF collection held by Wageningen University in the Netherlands that showed tanks and armoured vehicles parked in a forest named the Deelerwoud, a few miles north of Arnhem, shortly before Market Garden. It also showed six rectangular objects suggestive of supply – probably fuel – dumps, and military vehicles on the move. Imagery of the same area from earlier months showed extensive scarring of the ground in the parking area and at the location of the dumps, demonstrating that these sites had been regularly used. In the light of this discovery, there was clearly a case for reconsidering the Arnhem air reconnaissance story. What did the air imagery actually tell the Allies before Market Garden was launched, and is history correct to focus so much on the famed ‘tanks at Arnhem’ episode to the virtual exclusion of other air reconnaissance issues?

Part of the Deelerwoud photograph.

In addressing these subjects, this study considers the background to the Arnhem operation and the broad thrust of the intelligence narrative before turning the focus more specifically to air reconnaissance and assessing the potential significance of the available imagery, including the photographs of German armour. Context is all-important in considering the information available and the apparent failure to use it to full advantage.

The basic concept of achieving a Rhine crossing at Arnhem was formulated by Field Marshal Bernard Montgomery's 21st Army Group in the first week of September 1944. The origins of the plan may be identified in Montgomery's 'single thrust' strategy, which he famously promoted in preference to the broad front favoured by Eisenhower following the Allied breakout from Normandy in August. In Montgomery's view, if underpinned by absolute logistical prioritisation, this aggressive and ambitious manoeuvre offered the most likely means to defeat Hitler's Germany before the end of 1944. But Market Garden also owed much to rivalry between the British and American army groups. Montgomery was determined to beat the Americans into Germany, and the northerly orientation selected for the operation ensured absolute separation from the American advance through northeast France. His original plan, codenamed Comet, envisaged the use of a single airborne division, the British 1st Airborne, to seize bridges across the Maas, Waal and Neder Rhine, to allow Lieutenant General Sir Miles Dempsey's Second Army to advance from the Netherlands into Germany and envelop the Ruhr industrial region. Approved on 4 September, Comet was twice postponed and then, on the 10th, superseded by Market, the airborne element of Market Garden, which involved three divisions – 1st Airborne and the US 82nd and 101st Airborne.[3]

Launched just one week later, on 17 September, Market Garden ended in failure primarily because of far stronger enemy opposition than expected – notably at Arnhem itself, where 1st Airborne Division was effectively destroyed. For many years, the popular belief was that the Allied defeat resulted from the fact that 1st Airborne landed directly on top of two crack German armoured divisions, 9th and 10th SS Panzer Division – II SS Panzer Corps, commanded by General Wilhelm Bittrich. The lightly equipped British paratroopers were thought to have been overwhelmed by hordes of

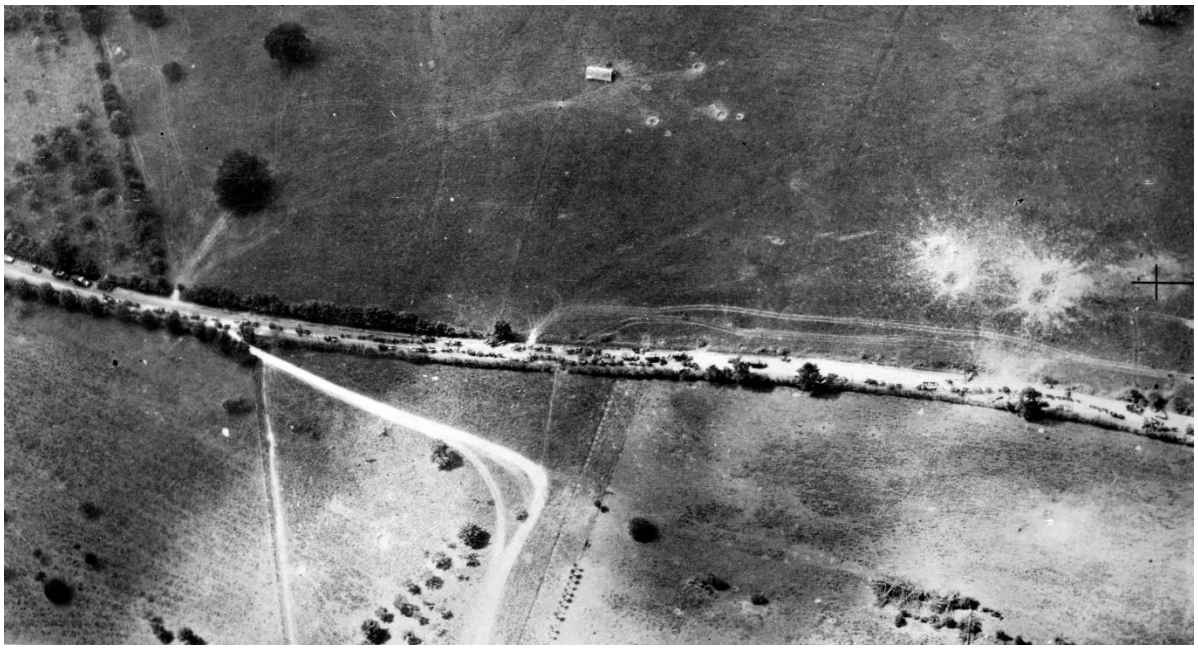
first-class SS soldiers equipped with numerous modern tanks. This general perception endured right through to the 1980s, having been reinforced by the film *A Bridge Too Far*. Gradually, however, it became clear that the composition of the German forces at Arnhem was far more complex than most published histories of Market Garden had tended to suggest. The two SS panzer divisions had been operating far below their full strength on the eve of the operation. Furthermore, while 1st Airborne were ultimately confronted by armour in considerable strength, hardly any tanks had been present in the Arnhem area on 17 September. The vast majority were sent from Germany or other battle fronts after the airborne landings.[4]

During the battle itself, II SS Panzer Corps were augmented by Wehrmacht troops and a multiplicity of other elements, including many undertrained, inexperienced, low-grade and poorly equipped personnel drawn from almost every quarter of the German armed forces. They included miscellaneous units retreating from France and Belgium, Dutch SS, Luftwaffe and naval personnel, trainees, convalescents, home defence forces and garrison troops. According to a later study,

> On the basis of information received about the enemy, the Germans anticipated airborne operations. Furthermore, the commanders in the nearby home defence zone (Wehrkreis VI and Luftgau VI) as well as in Holland had made arrangements well in advance, in order to be able in such cases to quickly organise motorised auxiliary forces (so-called 'alert units') with home defence troops and occupation forces, which would be available immediately.[5]

These preparations allowed the Germans to create ad hoc or 'scratch' formations, such as Kampfgruppe Von Tettau and 406 Division, and mobilise them against 1st Airborne and 82nd Airborne (respectively) within 24 hours of the initial landings. Not surprisingly, many of the units involved suffered heavy casualties, but they made a critically important contribution to the German victory.[6] Nevertheless, the popular view of II SS Panzer Corps' role remains influential to this day.

Destroyed German tanks in the Falaise Pocket.



German forces fleeing the Falaise Pocket, August 1944.

What did Allied intelligence discover about German forces in the Market Garden area? The preponderance of intelligence collection and assessment activity relating first to Comet and then Market was directed by 21st Army Group and Second Army, headquartered in Belgium by early September 1944. Back in the UK, First Allied Airborne Army was heavily dependent on these deployed formations for intelligence support. Airborne Headquarters did receive so-called ULTRA – high-grade signals intelligence from decrypted German messages sent via the Enigma cypher machine – but the broader intelligence required to set the ULTRA in context was often lacking.[7]

At 21st Army Group, the head of intelligence was Brigadier Edgar 'Bill' Williams. Williams was not an intelligence professional or even a professional soldier. He was, in fact, an Oxford don, who had joined the Army in 1939. He did not hold an intelligence post until 1942 and his rank of brigadier was entirely nominal. He was, no doubt, a highly intelligent and capable analyst but we may legitimately question whether he was the right man to command a large and complex intelligence organisation.[8]

The possibility of an advance through the Low Countries into Germany was first seriously considered by 21st Army Group at the end of August 1944. In topographical terms, this route was never promising. It was clear that there were too many river crossings and that an advance would be restricted to a small number of roads that could easily be blocked. But all the available intelligence on enemy dispositions appeared more optimistic. The Germans were in headlong retreat after being routed in Normandy, where they had incurred vast losses of manpower and equipment. In the Low Countries, their defences were particularly weak; moreover, the German fixed defence line, the Siegfried Line, could be bypassed by a left hook through the Netherlands.[9] It was this basic assessment that underpinned the decision to launch Operation Comet.

Unfortunately, immediately after Comet was approved, ULTRA revealed that II SS Panzer Corps had been ordered to the Arnhem-Nijmegen area. After narrowly escaping from the Falaise Pocket, they had withdrawn across France only slightly ahead Allied ground forces, straddling routes along which Dempsey's Second Army and the US First Army were advancing. They were regularly mentioned in intelligence summaries at the end of August and in early September. On 30 August, 101st Airborne Division – then preparing for an operation in the Tournai area – were warned of the presence of 10th SS Panzer Division in northern France.[10] The next day, Second Army captured German maps revealing 'as part of the enemy's intentions, a concentration area for 9th and 10th SS Panzer Divisions just east of Amiens.' In the event, the Allied advance was so rapid that this plan could not be implemented.[11]

On 2 September, Second Army identified 10th SS Panzer Division around the town of Albert, and their intelligence summary also mentioned a report that around 40 tanks

belonging to 9th SS Panzer Division had left Amiens on 30 August and were moving to St Quentin.[12] On the same day, elements of 9th SS Panzer Division were in action against First Army forces around Cambrai.[13] On the 3rd, their whereabouts were said to be 'somewhat of a mystery' but Second Army speculated that they were probably moving back towards Germany on their right flank. Even then, there was said to be evidence that the two divisions were east of Arras.[14] On 4 September, the day Montgomery selected Arnhem as the objective for Operation Comet, they did not feature in Second Army's intelligence summary, probably because they were located around Maastricht by this time, well inside First Army's area of responsibility.[15]

It was on the 5th that Enigma decrypt XL9188 relayed the following German order to the Allies: '9 and 10 SS Panzer Division Elements not operating to be transferred for rest and refit in area Venlo-Arnhem-'s Hertogenbosch.'[16] A further signal, decrypted on the 6th, located II SS Panzer Corps' headquarters and 9th SS Panzer Division in the more northerly part of this area – Arnhem.[17] This unwelcome news placed 21st Army Group intelligence in a difficult position, given Montgomery's steadfast determination to maintain the forward impetus of his advance. Their initial response to the ULTRA has not survived among the official files, but it was evidently sceptical, judging by the recorded reaction of their subordinate formations and their responses to later intelligence on II SS Panzer Corps. That the order had been issued was beyond doubt, but this did not necessarily mean that it had been implemented, such was the chaotic nature of the German retreat across northern France. Moreover, it was known that 9th and 10th SS Panzer Division were operating at a fraction of their former strength after the fighting in Normandy and along the main lines of retreat. So the ULTRA warning was not treated as a showstopper. Sanitised intelligence was passed down to corps and divisional levels, including 1st Airborne Division, referring to reports from POWs and other sources that II SS Panzer Corps had been sent to Arnhem to refit.[18]

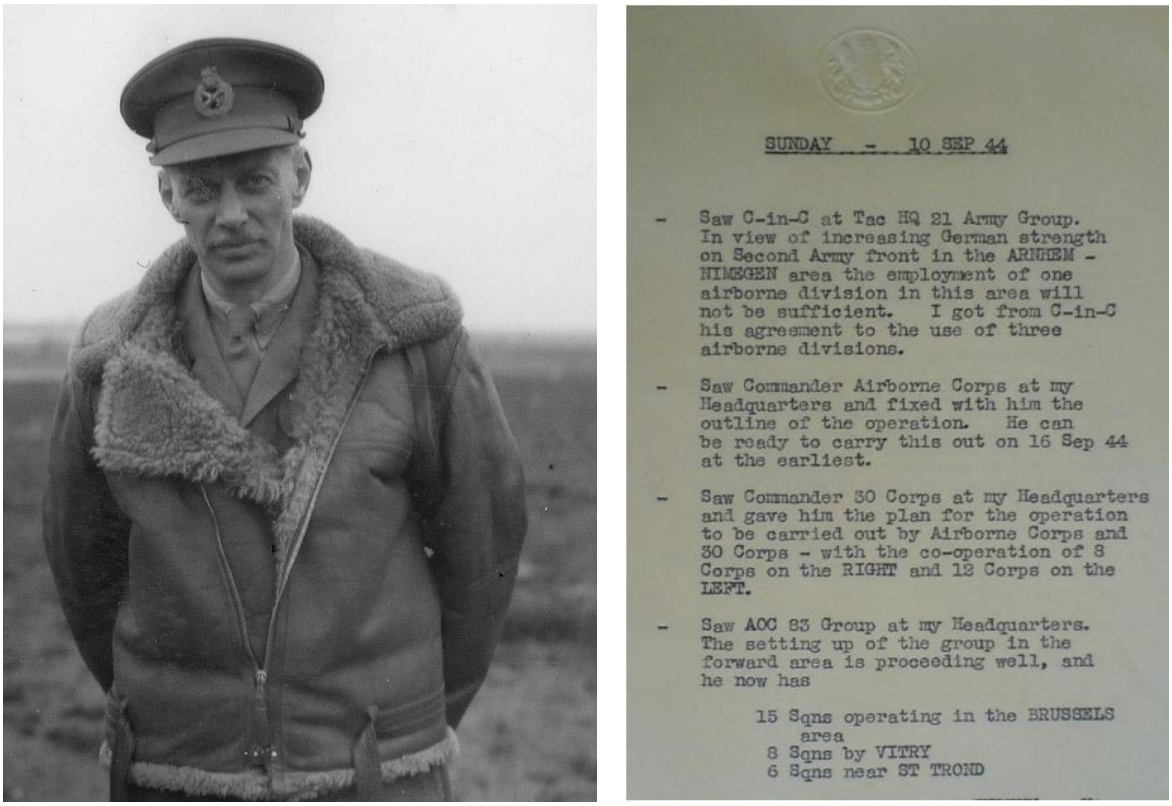
The relaxed outlook of 21st Army Group headquarters was not unanimously shared. Indeed, the ULTRA caused particular concern to Second Army's commanding officer, Dempsey. Other intelligence was also suggesting – correctly as events turned out – a larger military presence around the key objectives than originally thought and the movement of lower-grade German troops such as trainees to and through Arnhem and

Nijmegen. As one intelligence summary put it, 'Fresh units keep appearing on the scene, none of them of divisional size but all of them adding weight to the infantry defences in the area.'[19] In short, it now appeared that the planned offensive might well encounter strong opposition.

The flavour of reporting in this period is accurately captured at airborne divisional level, where it was deduced as early as 6 September that the Germans were likely to have assigned a high priority to the defence of the Maas, Waal and Neder Rhine bridges, and that the numerical equivalent of one division might be encountered in the Arnhem-Nijmegen area.[20] This conclusion was based overwhelmingly on intelligence supplied from the continent. On the 7th, a divisional planning intelligence summary reported that 'one of the broken Panzer divisions has been sent back to the area north of Arnhem to rest and refit' – a direct reference to II SS Panzer Corps. They were thought to possess around 50 tanks. 'There seems little doubt that our operational area will contain a fair quota of Germans, and the previous estimate of one division may prove to be not far from the mark.' SS training units previously located in Amsterdam had been moved to Nijmegen, and it was suspected that fixed defences were being strengthened in the high ground southeast of the city.[21]

Next day, this assessment had barely changed, and the intelligence summary now noted not only a potential threat from both 9th and 10th SS Panzer Division but also the escape of many German troops from the coast into northern areas of the Netherlands.[22] A Dutch resistance group known as 'Albrecht' meanwhile reported that SS and Wehrmacht troops had moved into barracks and school buildings in and around Arnhem.[23] From such information, Dempsey became convinced that the operation plan should be changed. The enemy 'appreciates the importance of the area Arnhem-Nijmegen', he wrote in his diary. 'It looks as though he is going to do all he can to hold it.' He first proposed that the Rhine crossing be switched from Arnhem to Wesel, further to the south, but Montgomery was determined to retain Arnhem as the objective and received vital support from the British Chiefs of Staff, who saw in his plan a means to cut off V-2 launch areas on the North Sea coast from their main German sources of supply; so instead Montgomery and Dempsey agreed to enlarge the airborne force from one to three divisions, and Comet made way for Market.[24]

Dutch reports noting the arrival of elements of 9th SS Panzer Division at Arnhem reached the Allies between 11 and 13 September. A personnel collection point had been established, and 'panzer troops' had moved into the Saksen-Weimar Barracks.[25] A further document meanwhile suggested that both the 9th and 10th SS Panzer Divisions had been withdrawn to the Arnhem area. The original report has not survived, so we do not know its precise contents, but elaborating information suggested that the two divisions were probably being refitted from a depot at Cleve, east of the Reichswald Forest, in the Nijmegen sector.[26] The commander of 1st Airborne Division also confirmed that 'Dutch resistance reports had been noted to the effect that "battered panzer remnants have been sent to Holland to refit".'[27] The accuracy of this information was viewed by 21st Army Group intelligence as possible but by no means certain, and they continued to insist that, heavily written down, II SS Panzer Corps would not pose a significant threat.[28]



SUNDAY - 10 SEP 44

- Saw C-in-C at Tac HQ 21 Army Group. In view of increasing German strength on Second Army front in the ARNHEM - NIMEGEN area the employment of one airborne division in this area will not be sufficient. I got from C-in-C his agreement to the use of three airborne divisions.

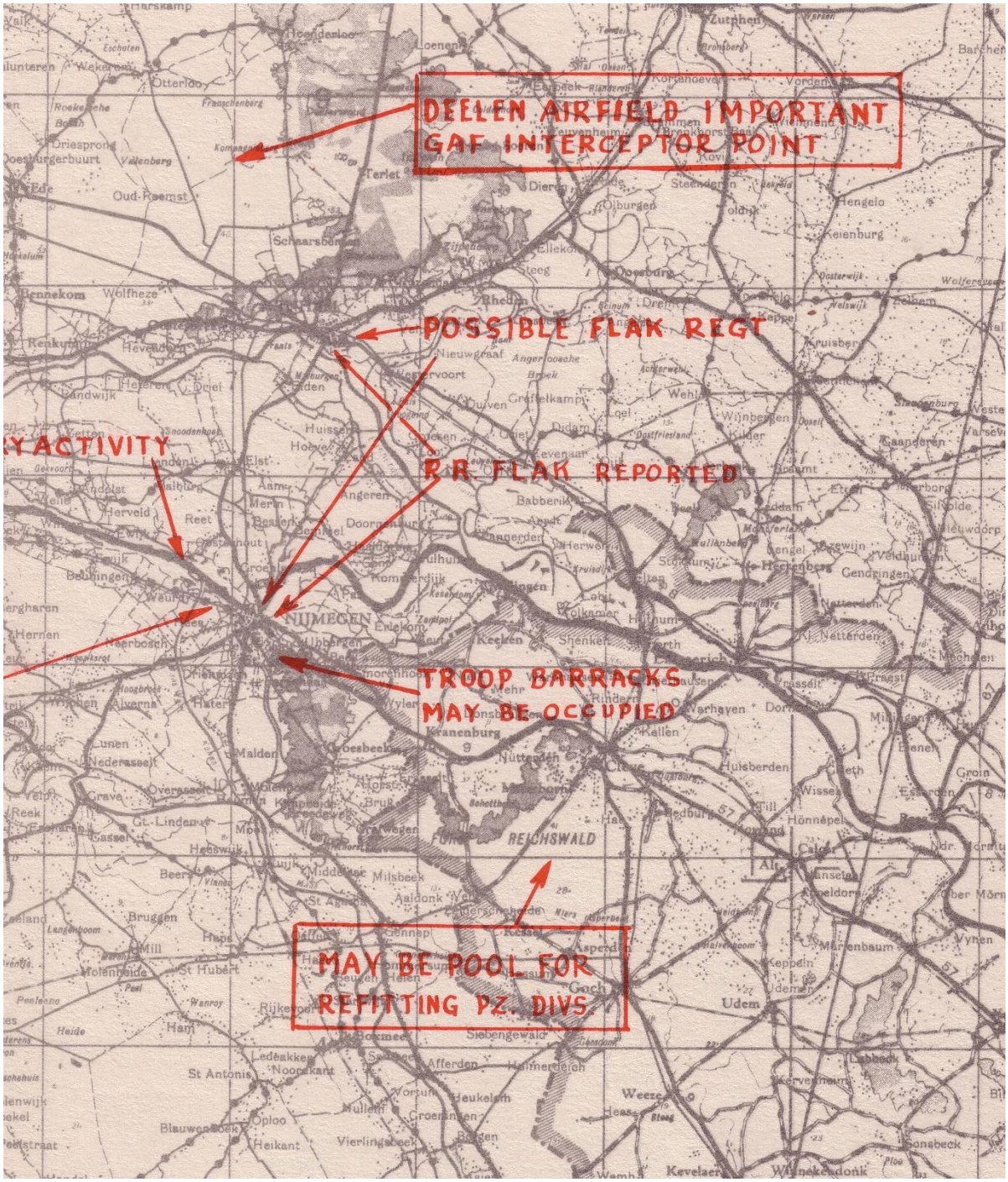
- Saw Commander Airborne Corps at my Headquarters and fixed with him the outline of the operation. He can be ready to carry this out on 16 Sep 44 at the earliest.

- Saw Commander 30 Corps at my Headquarters and gave him the plan for the operation to be carried out by Airborne Corps and 30 Corps - with the co-operation of 8 Corps on the RIGHT and 12 Corps on the LEFT.

- Saw AOC 83 Group at my Headquarters. The setting up of the group in the forward area is proceeding well, and he now has

  15 Sqns operating in the BRUSSELS area
  8 Sqns by VITRY
  6 Sqns near ST TROND

Dempsey recorded the genesis of Market Garden in his diary.



A Market Garden intelligence map; note the reference to REFITTING PZ. DIVS. [29]

From then on, Second Army closed ranks with 21st Army Group where intelligence was concerned. When Lieutenant Colonel Anthony Tasker, head of intelligence at First Allied Airborne Army headquarters, journeyed to Belgium on 12 September, he found far greater optimism and a pronounced tendency to play down reports of enemy activity around Arnhem. Many of the units formerly suspected of being in the area had

allegedly moved up to the front line. The only German reinforcements to have appeared in the Low Countries 'had been put in to thicken up the line' they were attempting to form on the Albert Canal. Tasker found 'no direct evidence that the area Arnhem-Nijmegen is manned by much more than the considerable flak defences already known to exist.'[30]

The airborne divisions were briefed accordingly. Another very cautious intelligence summary circulated within 1st Airborne on 13 September had warned of the potential presence of German troops in and around Arnhem and of some 10,000 troops to the north, which 'may represent a battle-scarred Pz Div or two reforming.'[31] However, the information supplied to Tasker subsequently suggested that there was little cause for concern. The next day's summary duly concluded that 'a more optimistic estimate can be made of enemy forces actually in the Divisional area.'

> The main factor, on which all sources agree, is that every able-bodied man in uniform who can be armed is in the battle – the Germans are desperately short of men and it is improbable that any formations capable of fighting will be found in an L[ine] of C[ommunication] area, however important it may be. The barracks and billeting areas in Ede and Arnhem are not likely, then, to contain fighting troops unless they are in transit from NW to SE or regrouping in the area, and there are precious few troops left in Northern Holland now to move. Identifications in the Albert Canal area satisfactorily prove that practically all the enemy troops which could have been in Northern Holland are now actually engaged.[32]

The airborne forces were thus left with a very misleading picture of the reception awaiting them.

Meanwhile, on the 14th, a further Dutch Resistance report sent to the British intelligence service, MI6, firmly identified 9th SS Panzer Division at specific locations just northeast of Arnhem.[33] The Dutch reports were by this time causing alarm at the Allied Supreme Headquarters, where Major General Kenneth Strong was head of

intelligence. Strong, unlike Williams, was a career intelligence officer, who had worked his way up through one G2 post after another in the British Army. When he reported that 9th and 10th SS Panzer Division had been sent to the Netherlands to refit, the potential threat was taken so seriously that Eisenhower's chief of staff, Lieutenant General Walter Bedell Smith, raised the issue personally with Montgomery and proposed further changes to the airborne plan. Specifically, he recommended the deployment of a second airborne division at Arnhem, if necessary, at the expense of the American landings further south. But Montgomery, having already strengthened the airborne plan, refused to accept that any further measures were necessary. Bedell Smith later recalled that he 'ridiculed the idea' and 'waved my objections airily aside'.[34]

As for Williams, he clung to his conviction that the two German divisions were too weak to jeopardise Market Garden's ultimate success. Even after the first contact between Allied troops and II SS Panzer Corps during Market Garden, he stood by his original assessment, insisting that 9th SS Panzer Division 'cannot be in a very formidable state'.[35] Williams was correct to the extent that 9th and 10th SS Panzer Division were heavily depleted and had few tanks, but he and Montgomery substantially underestimated their residual combat capability.[36] As Montgomery noted in his memoirs, 'The 2nd SS Panzer Corps was refitting in the Arnhem area … We knew it was there. But we were wrong in supposing that it could not fight effectively; its battle state was far beyond our expectation.'[37] Bittrich's troops were, for the most part, well led, well trained and very experienced. Moreover, although they had lost nearly all their tanks, they still possessed armoured cars and half-tracks, other motorised transport and some heavy weapons, together with ample resources of excellent small arms and plenty of ammunition; and they were sustained by over-land supply lines, which their airborne adversaries inevitably lacked. Furthermore, before the Allied landings in Normandy, II SS Panzer Corps had been intensively schooled in counter-airborne warfare.[38]

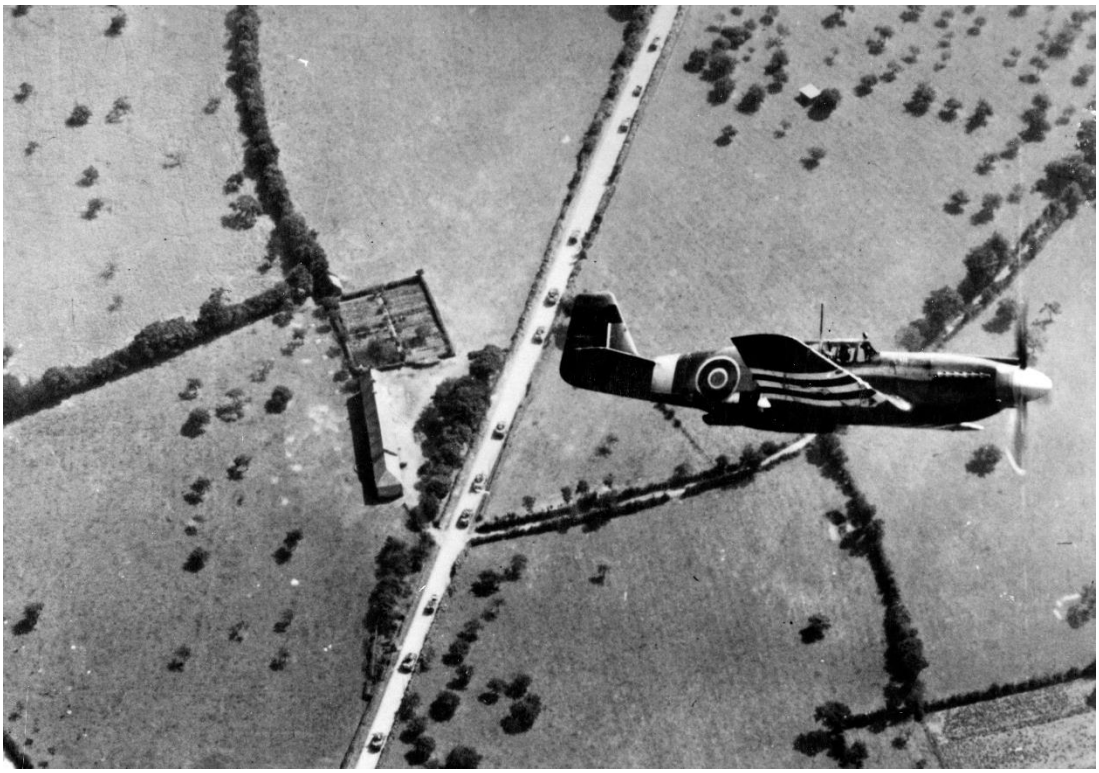
Hence, although only part a severely degraded SS Panzer Corps confronted the British airborne at Arnhem, this formation would still prove itself a formidable adversary. Equally, having also been assigned the status of 'alert units', their component battalions were prepared to react quickly to emerging threats.[39] Ultimately,

at Arnhem, 9th SS Panzer Division formed a highly experienced nucleus around which a far larger German force was constructed, while 10th SS Panzer Division brought similar combat experience to bear during their protracted defence of the Nijmegen bridges. Yet Montgomery's subsequent reflections still tend to exaggerate the role of II SS Panzer Corps in the Allied defeat. In part, it was convenient to maintain that the gallant British airborne had faced overwhelming odds, represented by two divisions of first-rate German troops equipped with armour and heavy weaponry in abundance; but in addition, like so many others, he lacked an accurate understanding of how the Germans had really won the Battle of Arnhem.

The air reconnaissance resources available before Market Garden were divided between the mainly tactical squadrons, based on the continent, and the strategic squadrons of 106 Group in southern England. The squadrons in France and Belgium came under Second Tactical Air Force (Second TAF), which operated in support of 21st Army Group; within Second TAF, 83 Group provided air reconnaissance for Second Army. They did not execute tasking for the airborne forces, which were still based in the UK. Intelligence derived from imagery captured on the continent (and other sources) could, however, be passed back to the airborne.

The volume of air reconnaissance activity mounted by 83 Group over the Netherlands in the days preceding Market Garden appears to have been limited, considering the importance of the operation. Montgomery's relations with the commander of Second TAF, Air Marshal Sir Arthur Coningham, were poor, and he was largely excluded from the planning process.[40] The airbases available in Belgium during the first half of September were predominantly, of necessity, reserved for combat aircraft, and only one reconnaissance squadron was deployed forward. The remainder flew from Avrilly, south of the River Seine – a considerable distance from Arnhem. Poor weather also caused several missions to be cancelled. Furthermore, the RAF reconnaissance aircraft were confronted by an adversary that was, by this stage of the war, highly proficient in the use of camouflage, concealment and dispersal, tactics all too easily effected in the heavily wooded and urban environments that typified Allied objectives in Market Garden. So it is hardly surprising that the reconnaissance missions flown by 83 Group over Arnhem observed little activity beyond the build-up of flak defences.[41]

Air Marshal Coningham (far left) of Second TAF, and Montgomery (far right) with King George VI, Brussels, October 1944.



A Second TAF reconnaissance Mustang over Normandy.

A 541 Squadron Spitfire XI.

16 Squadron photograph of the Arnhem landings on 17 September 1944.

In the UK, the airborne forces meanwhile gained authority to request air reconnaissance from the strategic squadrons based at RAF Benson. For the Netherlands, this chiefly meant 541 Squadron, which was equipped with Spitfire XIs and had a particular responsibility for (and familiarity with) the Low Countries. And yet, as a strategic squadron, 541 inevitably had many other fish to fry: they were normally reserved for gathering imagery of genuinely strategic targets and larger fixed facilities, and these commitments restricted the capacity that they could offer to support Market Garden.[42]

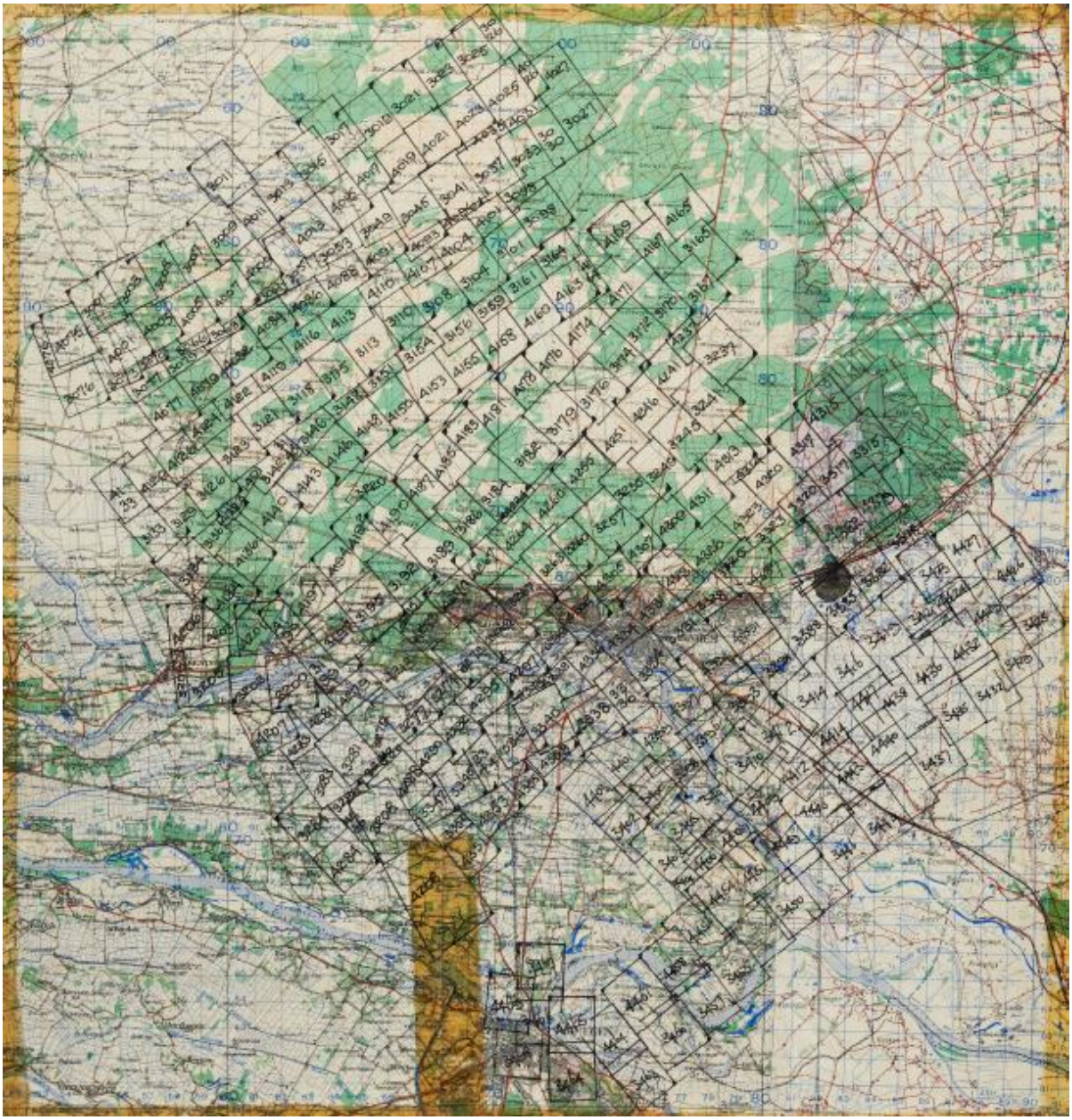
Measures also taken to increase the availability of air reconnaissance for the airborne forces involved the temporary secondment of a 16 Squadron Spitfire detachment from the continent. The detachment first returned to the UK – to RAF Northolt – on 7 September to support Operation Comet. However, after Comet's cancellation, it was apparently sent back to France, and it only returned to Northolt when Market Garden began. Although the detachment ultimately captured some of the most famous low-level images of the Arnhem battle, depicting both the landings and the fighting at the bridge, and lost two aircraft in the process, it did not collect imagery for First Allied Airborne Army while the operation was being planned.[43]

If the air reconnaissance directly available to the airborne forces was quite limited before Market Garden was launched, resource constraints were only part of the problem. Poor weather prevented any collection over the Netherlands on 7, 8, 14 and 15 September, and coverage was limited on the 16th.[44] Nevertheless, at first, the RAF still had the capacity to accept quite specialised work for the airborne intelligence staff at very short notice. On 6 September, immediately after Operation Comet was approved, 541 Squadron flew three low-level sorties that focused on the main bridge objectives at Arnhem, Nijmegen and Grave. These missions were exceptional: the vast majority of 541 Squadron tasking was executed at high altitude and obtained vertical imagery. The use of low-level tactics to take oblique-angle photographs was clearly recorded in the squadron diary and the imagery was also preserved in the UK archives.[45]

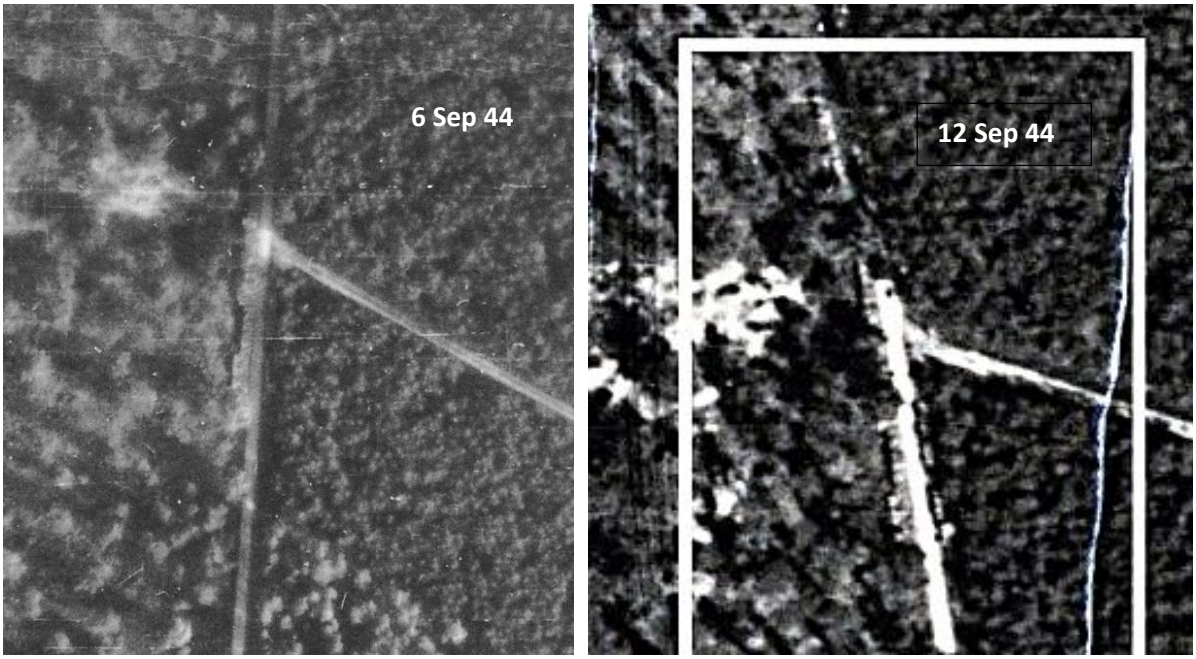
541 Squadron low-level oblique, Arnhem road bridge, 6 September 1944.

541 Squadron low-level oblique, Nijmegen road bridge, 6 September 1944.

Yet the three low-level sorties that photographed the bridges were not the only missions flown for the airborne forces on 6 September. Mission 106G/2658, also flown by a 541 Squadron Spitfire, was a high-level mid-morning sortie that collected vertical imagery right across the Arnhem area and as far south as Nijmegen. Beyond that, there was no particular focus: the pilot simply flew repeatedly across the target area before returning to RAF Benson with more than 900 images (see Plot 1).



Plot 1: 106G/2658 of 6 September 1944.

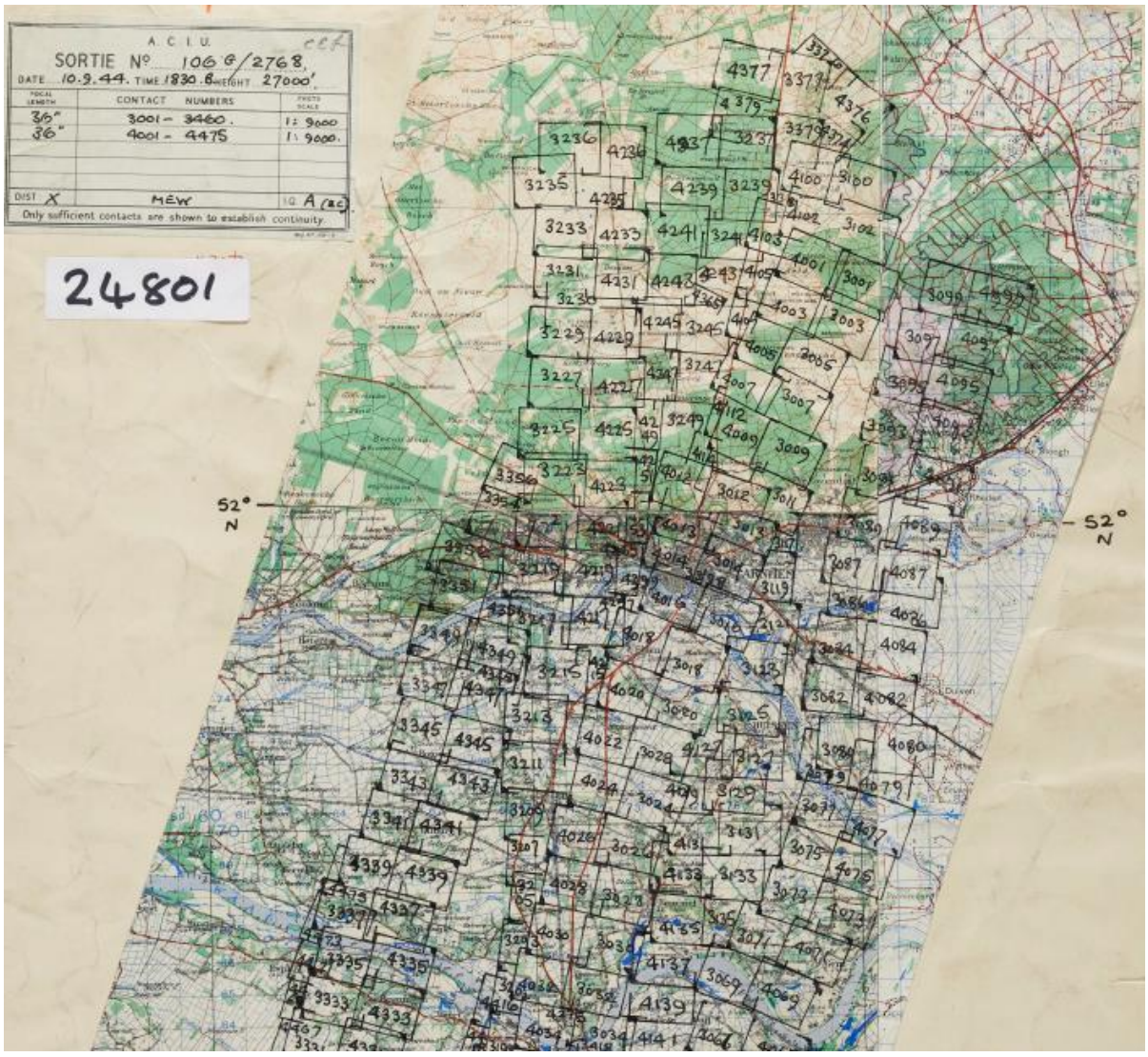


A comparison of the Deelerwoud imagery from 6 and 12 September 1944.

Among other things, he took photographs over the Deelerwoud, covering the same woodland track intersection where tanks were photographed six days later. The imagery showed objects of a similar outline to some of the vehicles parked by the track on 12 September but did not capture the same detail. This difference may have resulted from poor light conditions, but more probably the vehicles were under covers such as tarpaulins. It is unlikely that they would have been left uncovered and in the open for at least six days. It has not been possible to locate an interpretation report confirming whether the vehicles were spotted by Allied photographic interpreters (PIs) at this time.

After the weather prevented reconnaissance flying the following day, 8 September witnessed the launch of the first V-2 missiles against London. The hunt for V-2 launchers, already underway, was intensified to cover the entirety of the western Netherlands, leaving even less capacity available for the airborne.[46] Coverage of Arnhem was updated at least three times by 541 Squadron in the period 9-13 September, and some further missions were flown by the tactical squadrons on the continent, but the second period of adverse weather then intervened.[47]

After 6 September, the UK archives contain no further relevant imagery until the 10th, when mission 106G/2768 (another high-level 541 Squadron Spitfire sortie) provided more north-to-south coverage but not the breadth of the earlier flight. (see Plot 2) To the south, the pilot photographed Nijmegen in considerably more detail, but his more northerly photographs again covered the Deelerwoud. However, as the mission was flown at the end of the afternoon, tree shadow substantially obscured the track through the forest, making the parking area extremely difficult to see. More visible were three of the four supply dumps, which were in relatively open ground. They might have caught the interpreter's eye, but again, no tactical interpretation report for this mission has so far been found.



Plot 2: northern coverage of 106G/2768 of 10 September 1944.

The Deelerwoud track intersection, late afternoon on 10 September 1944.

Thereafter, our story is dominated by the well-known account of how a low-level Spitfire sortie allegedly photographed Panzers near Arnhem shortly before the Allied airborne landings – tanks assumed to belong to II SS Panzer Corps. This one 'dicing' sortie, although first described in print in 1962, did not receive close attention until the publication of Cornelius Ryan's book, *A Bridge Too Far*, in 1974.[48] Both the mission and its aftermath were then subject to highly emotive dramatization in the film of the same name. Ryan's account was based entirely on an interview with the British Airborne Corps intelligence head, Major (later Sir) Brian Urquhart.

In the original interview transcript, Urquhart recalled his mounting concern about the reports of German armour in the Arnhem area. Finally, he described how 'he had received several low-level oblique aerial photos taken by a squadron, stationed at Benson, in Oxfordshire, which specialised in that sort of thing.'[49] The aircraft involved

was said to have been searching for V2 launchers over the Hague before covering Arnhem as a secondary task. But when he showed the imagery to the British Airborne Corps Commander, Lieutenant General FAM 'Boy' Browning and his Chief of Staff, they appeared uninterested, Browning even questioning whether the tanks were serviceable. Shortly afterwards, the unfortunate Urquhart was relieved of his duties – ostensibly on medical grounds.

Yet by the time Urquhart came to write his memoirs, he had assigned himself a more central and deliberate role in these events. Reiterating his deep misgivings about the Arnhem plan, he recalled that his anxiety was increased shortly after Market Garden was authorised, when he noticed in a 21st Army Group report a reference to the possibility that II SS Panzer Corps was refitting in the Arnhem area. Deeply perturbed, he showed the report to Browning but to no clear effect. Urquhart continued:

> To convince Browning of the danger, I decided to try to get actual pictures of the German armour near the 1st Airborne Division's dropping zone, and asked for oblique photographs to be taken of the area at low altitude by the acknowledged experts in this art, an RAF Spitfire squadron stationed at Benson in Oxfordshire. Oblique photographs taken at low altitude were as good as, or better than, pictures taken on the ground, and any danger of security leaks could be handled by including the photographic aircraft in one of the myriad Allied fighter-bomber strikes which swarmed across Holland to the Ruhr each day.[50]

Urquhart now avoided any suggestion that the aircraft was primarily tasked to photograph V2 launch sites in the west. In later correspondence with the historian Martin Middlebrook, he identified the tanks as Panzer IIIs and Panzer IVs.[51] With hindsight, it might be suggested that the historical community should have taken this clue far more seriously by considering where tanks of this type were actually encountered by Allied forces on the day Market Garden was launched.

Browning, photographed at RAF Lyneham in June 1944.

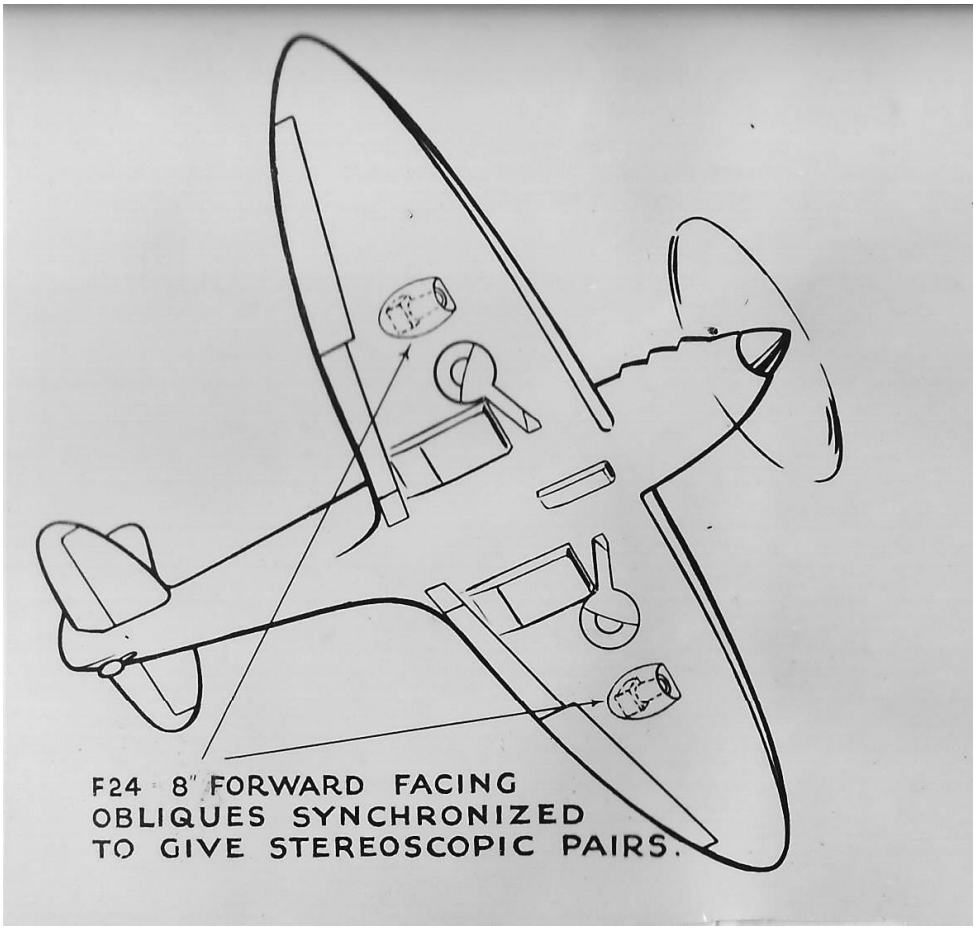
Many historians have accepted Urquhart's account at face value, yet it raises a multiplicity of issues. The order of events is questionable, in certain respects, particularly the claim that the first reports mentioning the presence of II SS Panzer Corps at Arnhem appeared after Market Garden was approved. In fact, as we have seen, the official records show that they were circulated during the planning for Operation Comet, several days earlier. Indeed, Comet was enlarged into Market to deal with the enemy threat – an important point that is completely overlooked in Urquhart's account.

This is linked to the implication that Browning somehow ignored or suppressed the intelligence. For it was on 7 September that he himself informed the more senior 1st Airborne Division officers of the reported movement of German armour to Arnhem. Within 1st Airborne, the task of capturing the Arnhem road bridge (and the rail bridge) on 17 September was assigned to 1 Parachute Brigade, commanded by Brigadier Gerald Lathbury. After the war, Lathbury was contacted by the official Cabinet Office

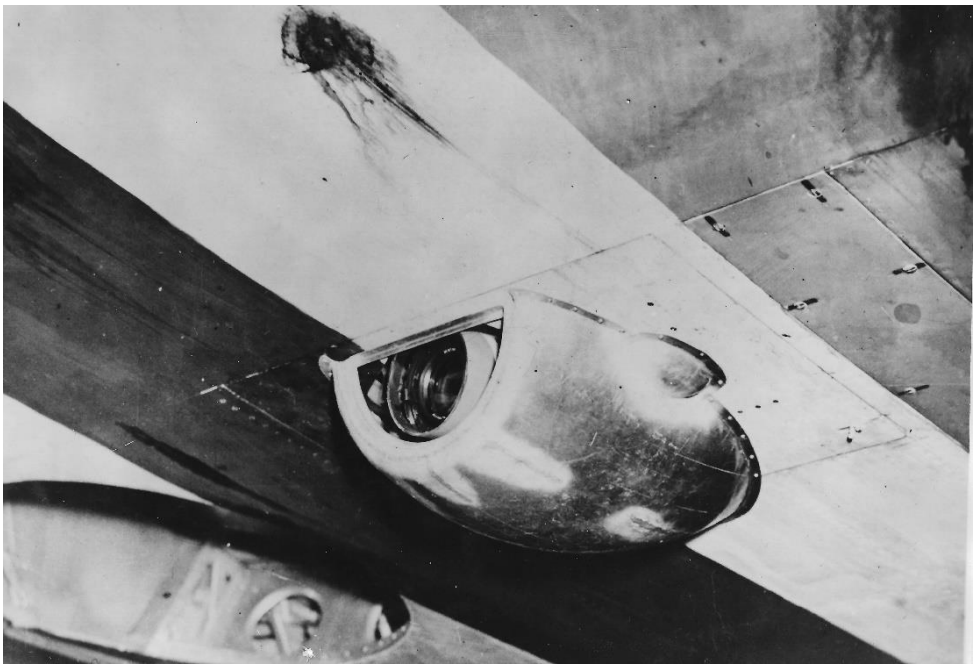
historian and asked when and how he had first learnt that II SS Panzer Corps was in the Arnhem area. In his reply, he referred to the planning for Comet. 'During the initial briefing by the Corps Commander [Browning] the suspected presence of II [SS] Panzer Corps refitting in the area was mentioned.' The basis for Browning's statement would almost certainly have been the 5-6 September Enigma decrypts, suitably sanitised. Lathbury went on to say that no further reference to this formation had been contained in later briefings. 'I certainly never considered it in my plan.'[52] Nevertheless, the warning was repeated in 1st Airborne Division's Planning Intelligence Summary of 7 September.[53]

Third, both of Urquhart's accounts point to a significant degree of unfamiliarity with the tactics, techniques and procedures that governed Allied air reconnaissance in the Second World War. Indeed, there is a fundamental mismatch between the capabilities of the RAF Benson squadrons – the only reconnaissance squadrons that operated in support of the airborne forces – and the task that Urquhart described. To capture oblique imagery at low level, 541 Squadron Spitfires were equipped with wing-mounted forward-facing synchronised 8-inch lens cameras. As they only produced photographs of a limited area, the target location had to be established and briefed to the pilot in advance and the aircraft had to be flown directly towards the target when the photographs were taken.[54]

Consequently, this technique was reserved for fixed points of interest. Indeed, of the few low-level missions flown by 541 Squadron in the summer of 1944, not one was launched to photograph mobile tactical targets, such as mechanised ground formations. In truth, the squadron did *not* possess an expertise in this field: it was after all, a strategic reconnaissance squadron. In August, for example, 541's objectives at low level included the Wizernes V-2 site, an airfield, cave entrances, a radar mast and docks.[55] Obliques of mobile ground targets were captured by tactical reconnaissance squadrons based on the continent, but with rear-mounted sideways-facing cameras fitted in aircraft that flew parallel to target areas – not towards a specific pinpoint.[56] The 541 Squadron Spitfires did not use this camera configuration.

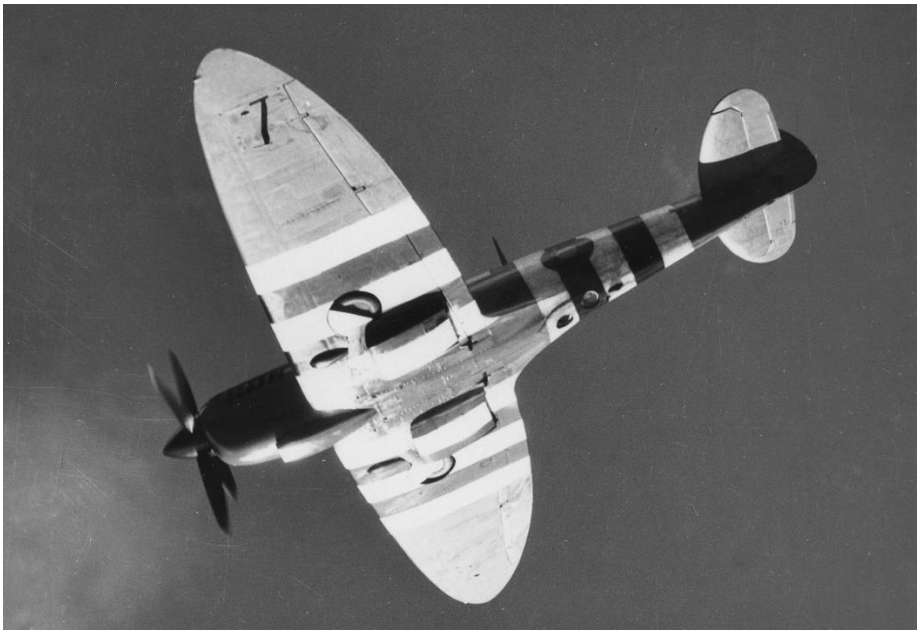


541 Squadron camera configuration for oblique photography.



Wing-mounted forward-facing camera; note the flak damage.

The first air image of a V2 launch – a high-altitude vertical shot.



A 541 Squadron Spitfire equipped to capture high-altitude vertical imagery with cameras in the lower rear fuselage.

In short, to stand any realistic chance of obtaining low-level obliques showing elements of II SS Panzer Corps, 541 Squadron would have had to possess other information identifying the exact location of the enemy formation at some kind of fixed site, such as a barracks. This hardly accords with the notion of a 'low-level sweep across the Arnhem area' described by Ryan on the basis of his interview with Urquhart. The Dutch had reported the arrival of panzer troops at specific Arnhem barracks, but Urquhart's account clearly placed the tanks in a more tactical setting, 'parked under trees'. Moreover, even if he had obtained detailed intelligence of where the armour was positioned at a particular time, subsequent relocation was not merely possible but highly probable while the reconnaissance sortie was being requested, approved and mounted.

This raises the question of whether the mission as described would even have been officially authorised, for it would have involved considerable risks without much likelihood of operational gain. Low-level missions were nicknamed 'dicing' quite literally because they involved dicing with death. In this regard, it is important to remember that all requests for air reconnaissance tasks involving the 106 Group squadrons had to be approved by a body named the Joint Photographic Reconnaissance Committee (JPRC). Located at Benson, the JPRC was a subcommittee of the Joint Intelligence Committee, through which it was responsible to the Chiefs of Staff. With tri-service and American membership, it was continuously briefed on the development of operational planning and met twice per day to assess requests for cover and prioritise between reconnaissance tasks. The JPRC had also to clarify poorly-worded or ill-judged applications.

> For instance, they were able to reduce some vague enquiry to terms of accurate co-ordinates ... By the time, therefore, that a job left the Joint Photographic Reconnaissance Committee, it was certain that it was really necessary, it's degree of importance was known, and it was reduced to accurate map co-ordinates and scale.[57]

It is unthinkable that the JPRC would have acceded to a request for a low-level air reconnaissance mission to search some general area around Arnhem for German

armour, when the proposed task would have been carried out by a squadron that had no established low-level capability against mobile tactical targets and was only equipped to take low obliques of fixed points of interest. The probability of mission success would have been minimal under any circumstances; it would have been reduced still further by the densely forested terrain north of Arnhem, which offered the Germans abundant scope for concealment. In actual fact, when tasked to photograph smaller, tactical targets, without specific knowledge of their whereabouts, 541 Squadron's approach was overwhelmingly to operate at high altitude using cameras with 36-inch lenses to take vertical imagery of areas rather than pinpoints.[58] Consequently, it is extremely unlikely that an aircraft primarily sent out to photograph V2s would have been suitably equipped to undertake secondary low-level collection over Arnhem in the manner Urquhart described to Cornelius Ryan.

Equally unconvincing is the suggestion that a single low-level reconnaissance aircraft might somehow have been concealed within a formation of fighter-bombers. Low-level reconnaissance certainly raised challenging operational security issues. At high altitude, an aircraft might collect imagery against a multiplicity of possible objectives or points of interest, whereas 541 Squadron low-altitude missions typically imaged a single target, confirming an interest in that target and a possible link to future plans. Before the Normandy landings, operational security had been maintained by mounting more air reconnaissance sorties outside the invasion area than inside it, but no such cover plan was either proposed or implemented for Market Garden. It is therefore not surprising to discover that Urquhart's wisdom in organising the 6 September missions to photograph the bridges was called into question. To quote one intelligence report by 1st Airborne Division, 'Perhaps as usual the Germans have misappreciated (*sic*) our intention and they really do think we wish to destroy the bridges which we photograph but do not bomb, or perhaps they perceive as we have that the bridges are a suitable airborne target.'[59] Needless to say, the three aircraft tasked on the 6th were not hidden among fighter-bomber formations heading for Germany.

The perplexing nature of Urquhart's account must be considered alongside the multiple unsuccessful efforts to document the events he described. The failure of several extensive searches for the photographs might not seem especially surprising,

as most tactical reconnaissance material was destroyed after the war, but Urquhart insisted that the Arnhem sortie was flown by a Spitfire squadron based at Benson and thus one of the component squadrons of 106 Group. Far more of their imagery survived in the UK archives, but no oblique photographs showing tanks at Arnhem. Additionally, although the Benson missions were systematically recorded at squadron and group level, not one record matches the sortie Urquhart described. The low-level missions targeting the bridges on 6 September were scrupulously noted down, but all other recorded reconnaissance sorties over Arnhem were flown at higher altitudes and collected vertical imagery.

Equally, it proved impossible to locate an interpretation report derived from a low-level mission that photographed German armour near Arnhem before Market Garden. Unfortunately, relatively few tactical interpretation reports prepared during the war have survived. The only known interpretation report mentioning armour near Arnhem before Market-Garden referred to imagery collected by another 541 Squadron Spitfire at high altitude on 13 September (106G/2872), which showed a single armoured vehicle on the Arnhem-Apeldoorn road, which was thought to be part of a convoy. This may well have belonged to II SS Panzer Corps, but it was clearly not one of the Panzers described by Urquhart. On the 16th, a 2 Squadron tactical (i.e. visual) reconnaissance mission spotted 12 possible tanks or self-propelled guns parked in an orchard near Meteren, about 40 KM west of Nijmegen, but the two Spitfires involved then came under a barrage of ‘intense accurate heavy’ anti-aircraft fire from around 12 guns. They did not hang around to take photographs.[60]

In time, this total lack of evidence inevitably generated scepticism, and some even questioned whether the Spitfire sortie had been flown at all. It was only quite recently that supporting evidence was supplied by Major Anthony Hibbert, a brigade major with 1st Airborne Division at Arnhem. Hibbert recalled that Urquhart had shown him photographs of tanks ‘tucked in underneath woods’ on or around 12 September, and specifically remembered seeing Panzer IVs.[61]

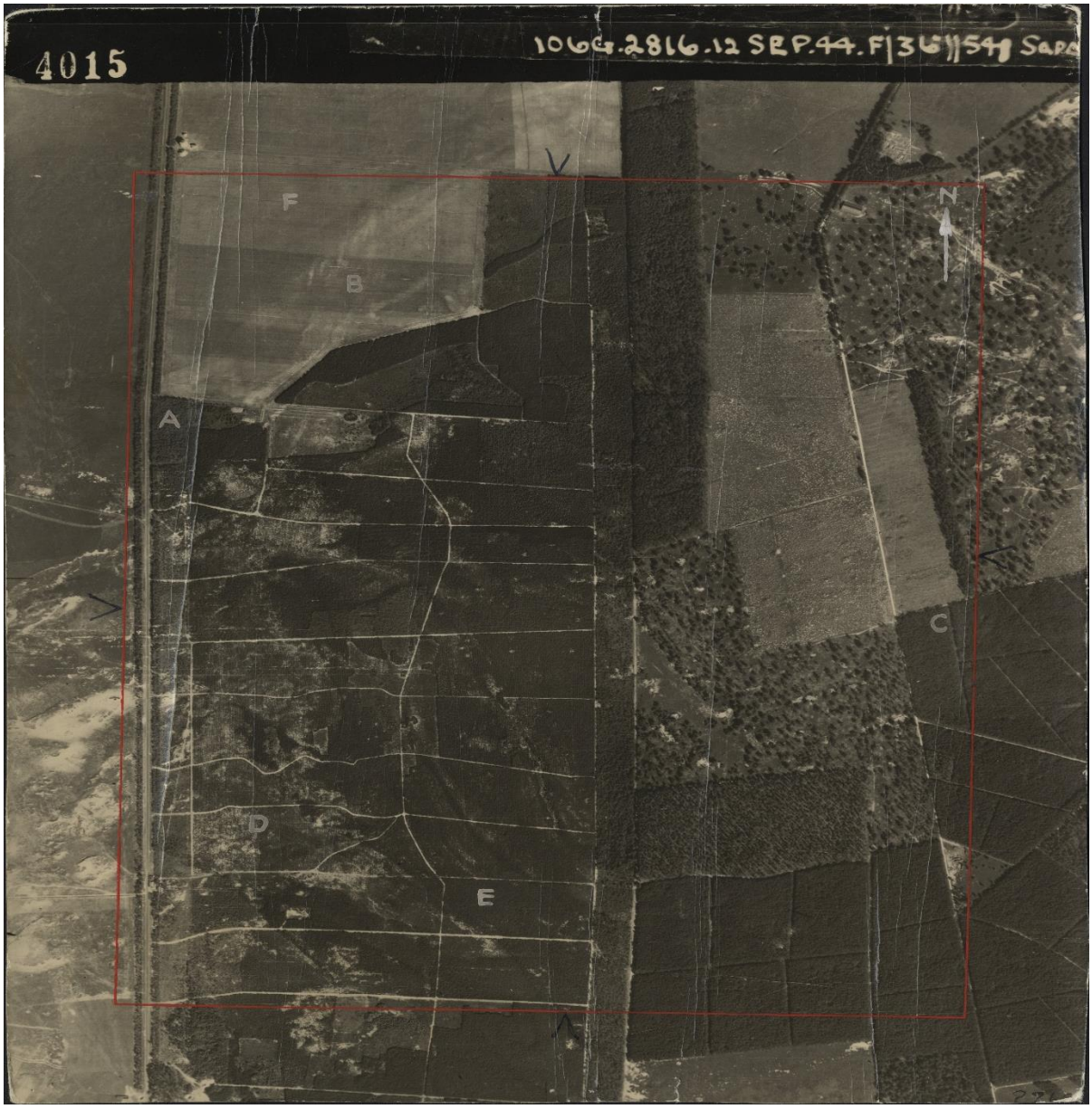
It was the next routine high-level mission covering Arnhem and Nijmegen for the airborne forces that actually photographed the tanks. As we have seen, the imagery

from this mission formed part of a substantial bequest from the UK to the Dutch government after the war to assist with reconstruction and a range of postwar economic and legal tasks. For many missions, duplicate imagery was not retained in the UK; a substantial proportion of the Dutch collection is thus unique.[62] However, the photographs were held in the form of hard-copy prints, which could not easily be enlarged. Only their digitisation provided the means to achieve rapid enlargement.

It should be stressed here that the photographs were scanned from prints and thus lack the clarity of the images that would have been available to interpreters in 1944. Then, it would have been possible to produce enlargements directly from the negatives, a facility that generated clearer and larger blow-ups than we can obtain from digital imagery today before losing resolution. Nevertheless, digitisation still allowed the Dutch imagery to be examined in far greater detail than had previously been readily available to researchers, including the only surviving photographs from a 541 Squadron mission, 106G/2816, flown from Benson on 12 September by Flight Lieutenant Brian Fuge in Spitfire XI PL907. Fuge was airborne for two hours and fifty minutes, taking off at 10.05 and landing at 12.55. The mission was flown at high altitude and captured vertical imagery with a 36-inch lens camera. Its geographical parameters were confined to the Arnhem and Nimegen areas.[63]

After routing east, north of Arnhem and across the Arnhem-Apeldoorn road, the Spitfire commenced collection on a westward run just south of the village of Loenen, orientated slightly north of the Luftwaffe airfield at Deelen. Seconds later, Fuge was flying over the Deelerwoud, northeast of the airfield. His first frame was numbered 4001; frame 4014, his fourteenth (out of a mission total of 942 frames) covered the track intersection where objects had first been photographed on the 6th. High-resolution imagery of this frame and of frame 4015 revealed the presence of multiple German armoured fighting vehicles (AFVs). Some were partly obscured by tree cover, while others were in the open.

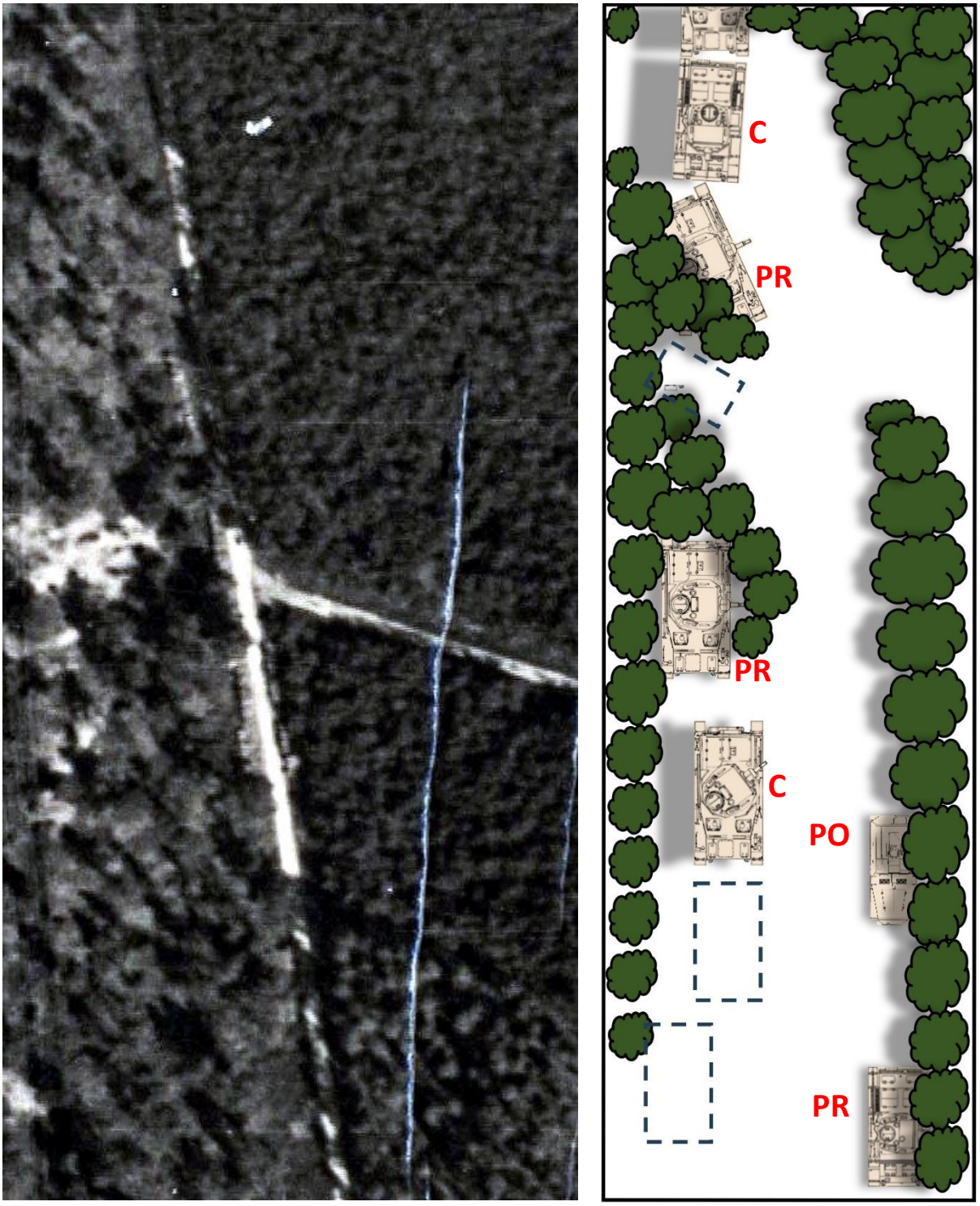
Flight Lieutenant Brian Fuge, 1944.



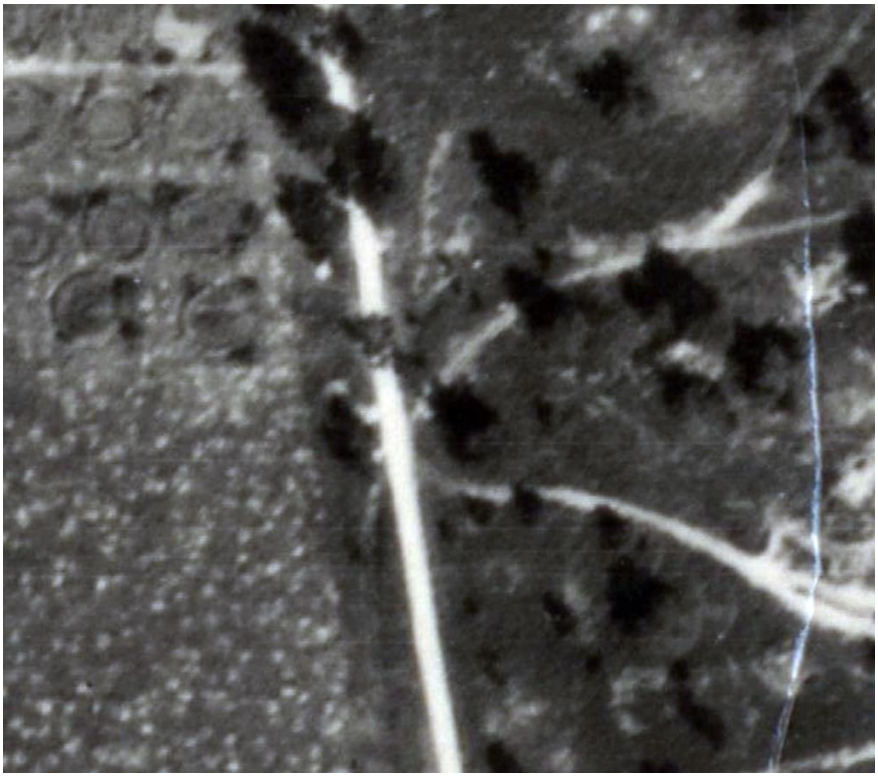
Frame 4015 from mission 106G/2816 of 12 September 1944.

There was insufficient resolution and too much tree cover or shadow to provide more than a few reliable identifications, but the tanks included Panzer IVs of early design, with short-barrelled 75mm guns, and there were also smaller tanks, including Panzer IIIs, which were again equipped with short-barrelled guns rather than the longer cannon of later variants. Some of the tanks had rotated turrets – a routine procedure to create access and space for maintenance work and refuelling. There were signs of activity behind two tanks.

Frame 4015: German armoured column and supply dumps in the Deelerwoud.



Due to lack of resolution, it was impossible to make clear enlargements of the track intersection; this diagram was prepared using digital enlargement and enhancement to provide identifications for vehicles as Certain (C), Probable (PR) and Possible (P). Dotted lines show vehicles as present but unidentifiable.



Detail from frame 4015: a single AFV on the track north of the Deelerwoud.

Apart from the tanks, one of the AFVs near the intersection might have been a half-track with a short-barrelled rear-mounted gun, possibly an SDKFZ 250/8 or 251/9. Further up the track, moving through the woods, was another turreted AFV, which was impossible to identify. Of the other vehicles visible in the photographs, none was readily identifiable, but the objects suspected of being fuel dumps showed up particularly clearly, and two further dumps were visible south of the main parking area. North of the forest, a second AFV with a rear-mounted turret or gun was visible in the open, possibly stationary, and more vehicles could be seen heading south.

There are only tenuous links between the vehicles in the photograph and German formations known to have deployed armour at Arnhem during Market Garden. The reconnaissance battalion of 9th SS Panzer Division, under Hauptsturmfuhrer Victor Graebner, was positioned at the village of Hoenderloo just north of Deelen before the operation. Indeed, the German vehicles visible in the photograph were parked or moving along a track that could easily have been reached from the village. The battalion did possess SDKFZ 250s and 251s, but there is no record suggesting the

involvement of early type Panzer IIIs or IVs in the Arnhem battle. More modern Mk IIIs and IVs only arrived from Germany on 19 September, two days after the airborne landings began.[64] The armour in the Deelerwoud did not belong to II SS Panzer Corps.

There was, however, another formation in this area of the Netherlands that possessed quite a number of older tanks. This was the Hermann Goering Parachute Panzer Training and Replacement Regiment, which was responsible for supplying replacements to its parent division, the Hermann Goering Parachute Panzer Division, which was a Luftwaffe formation. The regiment's second battalion was tasked with training panzer, panzer-grenadier, self-propelled artillery and self-propelled anti-tank gun personnel. Based at Utrecht, it is recorded that they had previously used Apeldoorn and other locations north of Arnhem for training purposes, and one local diarist noted the presence of Hermann Goering personnel at Apeldoorn on 8 September 1944, just four days before the Spitfire sortie.[65] The diary of their commanding officer, Oberst Fritz Fullriede, records that in the first week of September the regiment became part of the 1st Parachute Army, formed under Generaloberst Kurt Student with the aim of constructing a defensive line on the Albert Canal to block the British advance from Antwerp. Soon afterwards, the second battalion was sent south. They suffered heavy losses fighting at Hechtel between the 7th and the 10th, but Fullriede's diary confirms that he retained some tanks.[66] In the same period, the imagery suggests that tanks were parked in the Deelerwoud near to the fuel dumps.

It was on the 10th that the Irish Guards captured 'Joe's Bridge' over the Meuse-Escaut Canal, an achievement that immediately confronted the Germans with the prospect of an Allied ground advance towards Eindhoven and, beyond it, Nijmegen and Arnhem. Therefore, on the 11th, all remaining Hermann Goering units were ordered to move from their base areas to Eindhoven. As Fullriede noted, 'Even the recruits are to be sent in. Otherwise, there is nothing more available.'[67] What remained of his armour was positioned north of Eindhoven and just north of Son, where the bridge over the Wilhelmina Canal was a key objective for the 101st Airborne Division on Market Garden's first day. Specifically, they deployed around a small hamlet named Wolfswinkel.[68]

Panzer IV of the Hermann Goering Parachute Panzer Training and Replacement Regiment, Netherlands, July 1944.

One of the Hermann Goering Regiment's Panzer IIIs, knocked out near Wolfswinkel on 17 September 1944.

The full equipment inventory of the Hermann Goering Regiment in September 1944 is not recorded either before or after the fighting at Hechtel. Their strength on 1 August included five Panzer IIIs and two Panzer IVs, but their parent division was being reorganised and re-equipped in this period, and this may well have resulted in the transfer of additional obsolescent tanks to the Netherlands to augment training resources.[69] The most likely scenario is that at least some armour was held in the rear during the Hechtel battle along with the tanks parked under cover in the Deelerwoud – possibly the least battle-worthy or serviceable vehicles. When the regiment was ordered to move south on the 11th, these last few AFVs were assembled, serviced and refuelled from the dumps in the forest, where they were photographed by the 541 Squadron Spitfire, before making their way to Son.[70]

Further evidence from the records and the imagery supports the contention that the armoured vehicles probably belonged to a training unit. Allied intelligence reports prepared before Market Garden acknowledged the long-term importance of the area north of Arnhem for panzer training – especially training for Hermann Goering Division replacements. A summary prepared by 1 Parachute Brigade noted that the training area northwest of Arnhem had primarily been used for armoured and motorised troops, including SS units and 'Hermann Goering reinforcements units'. The headquarters for armoured warfare training was at Zwolle, 42 miles north of Arnhem.[71] Squadron Leader Lawrence Wright, the RAF intelligence officer most intimately involved in planning Market Garden, referred to the Deelen area as 'an active military training zone with an active airfield in its centre'.[72]

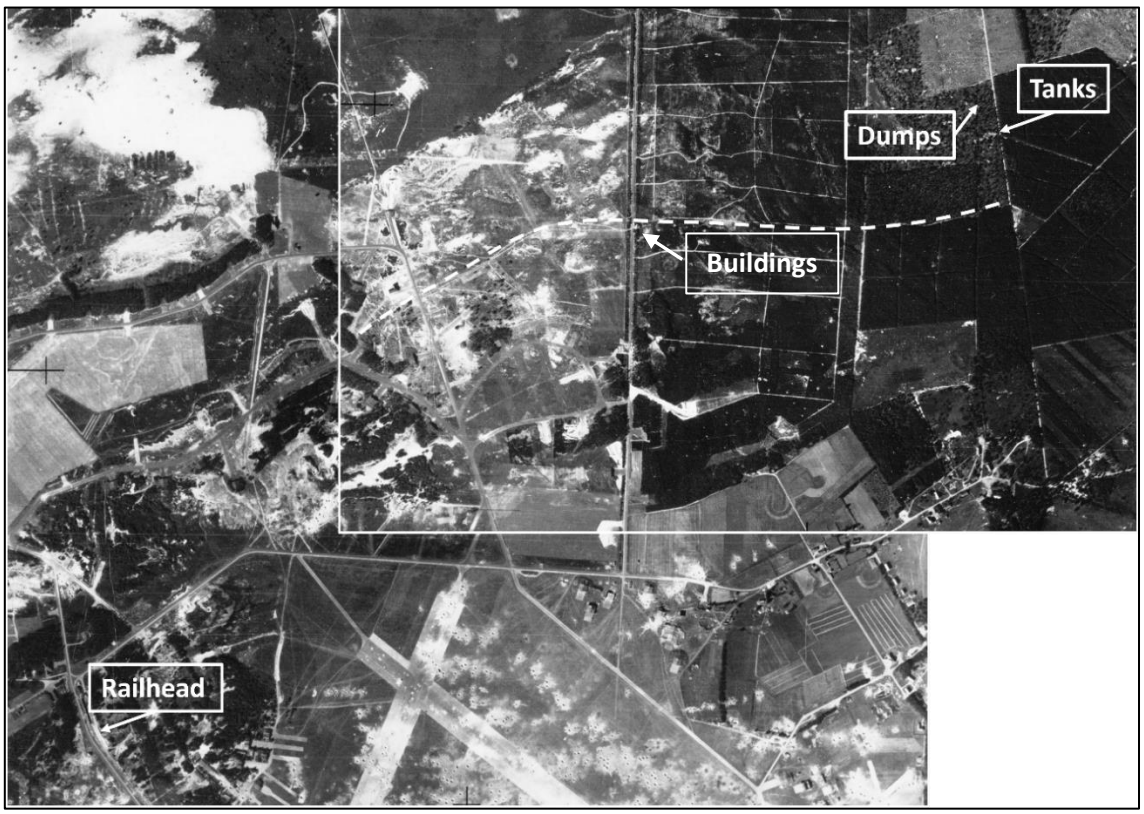
And then there were the supply dumps. Their position was clear in air imagery dating from earlier in 1944, demonstrating that they were in regular use well before the events described in this study.[73] Moreover, the most visible dumps in the Deelerwoud numbered just four, which would have been wholly inadequate to supply a large armoured formation. Their appearance corresponded exactly with Allied interpretation guidance on the type of fuel dumps typically created for German armoured units in forward locations: *'The less prominent dumps established during mobile operations normally consist of stacks, often about 20 ft square, sited in woods or along tree-lined*

roads.'[74] Yet they were 70 miles behind the front line early in September 1944, and hundreds of miles behind it before the Allied breakout from Normandy.

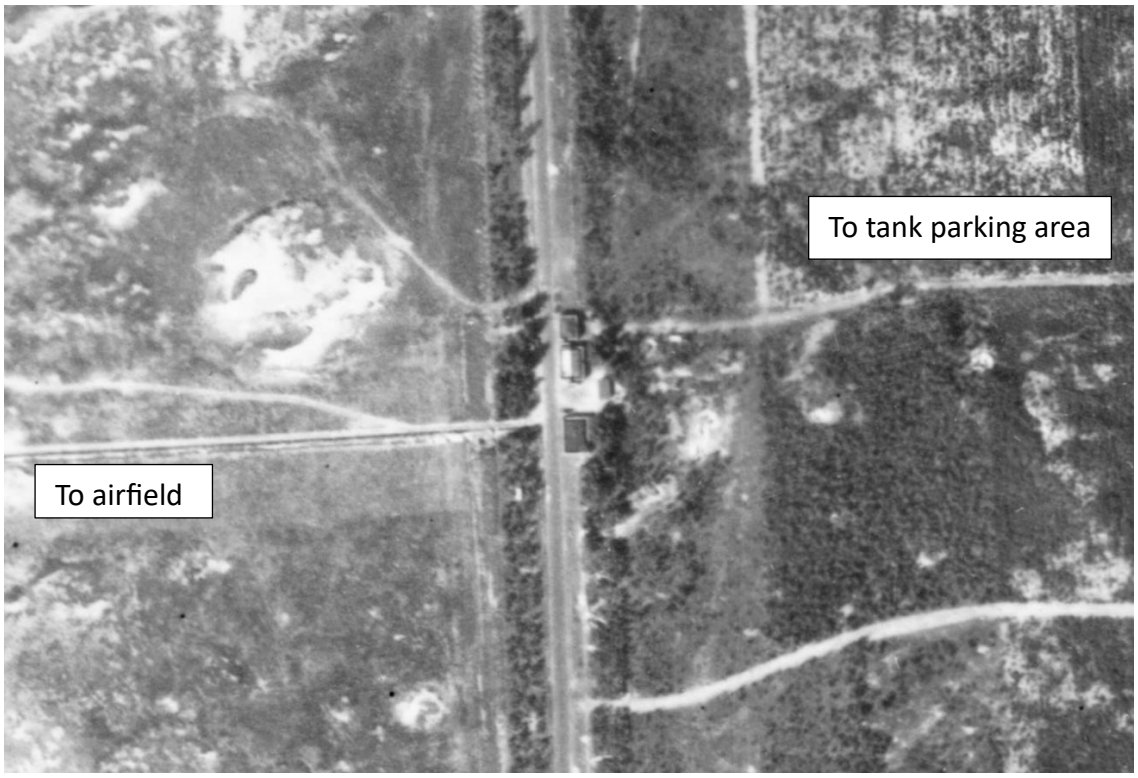
It is probable that the dumps were restocked from the airfield, which imported all its supplies via a specially constructed railway line, including fuel for Deelen's substantial fleet of motor vehicles.[75] A single cross-country track (part of which still exists) linked the dumps and the parking area in the forest with the central airfield buildings and, potentially, the fuel storage areas near the rail head. This would have been a long distance to cover to restock the dumps in the forest, so it is likely that some fixed facility nearer to the Deelerwoud would have served as a halfway house. In this regard, the imagery shows three buildings with extensive vehicle parking at the boundary of the forest and the airfield, and positioned on the track that connected them. It is possible that the two larger buildings were used for fuel storage, while the building sited on the track itself may have been a transit or transfer point for supply vehicles, but this requires further research (see imagery on p. 43).

In any case, it is hard to avoid the conclusion that we are looking at an armoured training refuelling loop in the air imagery – a facility often used by the Hermann Goering Regiment after it was positioned in the Netherlands in 1942 and which was reactivated to support their operational deployment to Son on 12 September 1944. For training purposes, armoured units would have been dispatched on a particular axis of advance; they would then have had to divert from that axis to a remote tactical location for refuelling before returning to their original route. Suppliers may well have had the corresponding training task of finding the refuelling area in the forest and replenishing the fuel dumps. Similar exercises are still conducted by armoured units to this day.[76]

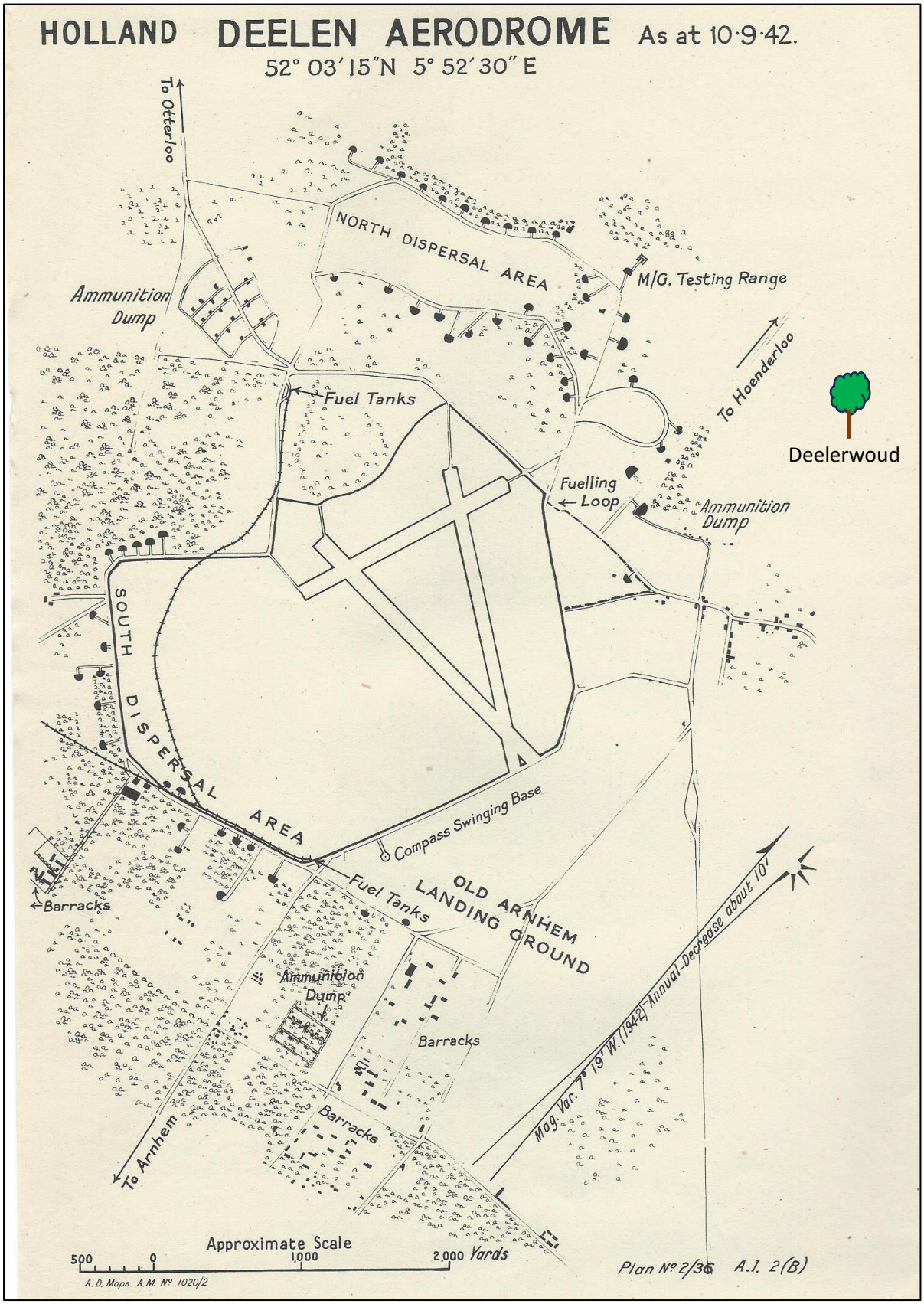
After the reconnaissance mission was completed and Flight Lieutenant Fuge landed at Benson, he would have been debriefed while the film was developed at the airfield Photographic Section on a Kodak continuous processing machine, capable of producing as many as 400 negatives per hour. The negatives would then have been viewed by interpretation officers at the First Phase Section, who had the job of selecting shots of particular importance for rush printing before the routine printing of the entire film.



The track leading from Deelen airfield to the area where the tanks were parked.



The buildings on the boundary of the Deelerwoud and the airfield.



Deelen airfield in September 1942, showing the railway; the track to the Deelerwoud began in the North Dispersal Area.

First-phase section, RAF Benson.

From these selected images, a first-phase interpretation report would have been written and dispatched by teleprinter on a so-called Form White to interested parties. In the case of a mission flown for British Airborne Corps headquarters, the interested party would have been Major Brian Urquhart. At Benson, the average time between the receipt of photographs by interpreters and the issue of the Form White was between half and one hour. Information of a particularly urgent nature could be telephoned to recipients in considerably less time.[77] In the case of Fuge's mission, a potential link between frames 4014 and 4015 and the first-phase report is indicated by the surviving 106 Group records, which show that Deelen was the subject of the Form White.[78]

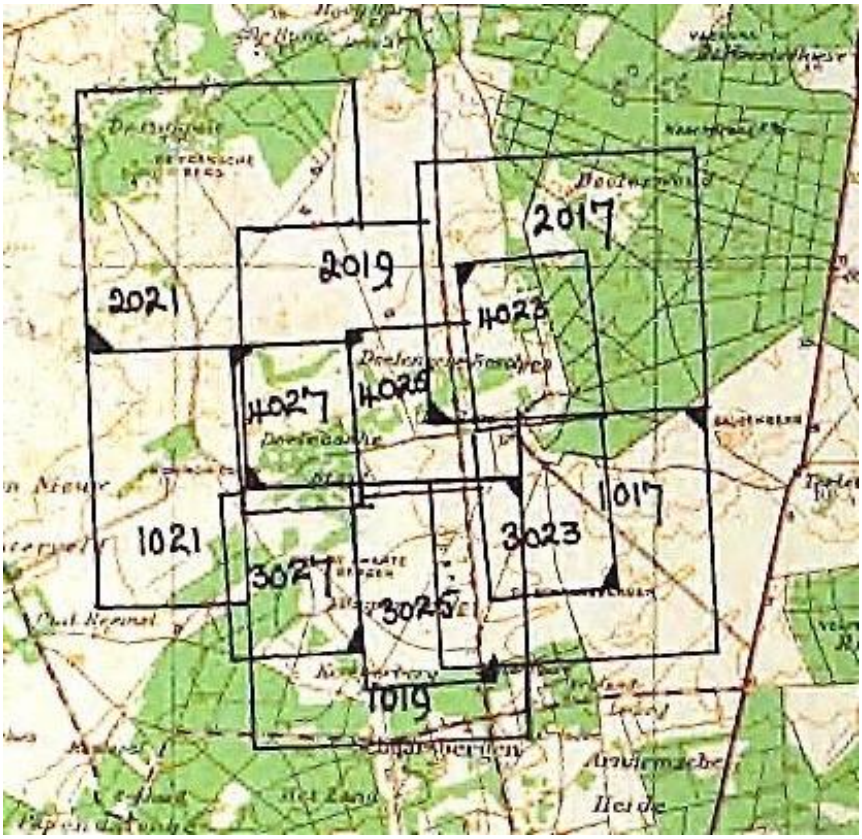
If this episode is unrelated to the sortie that Urquhart recalled, it would mean that two very similar events occurred at around the same time, one of which has featured in almost every published work on Market Garden while the other has been entirely hidden from history until recent years. This is wholly implausible. While British Airborne Corps intelligence undoubtedly requested 106G/2816 and probably received the Form

White, Urquhart only ever recalled one occasion when German armour was photographed near Arnhem. More probably, the photographs supplied to Urquhart were not separate frames but blow-ups taken from the high-level vertical images, frames 4014 and 4015, that clearly depicted the tanks and armoured vehicles 'parked under trees' that he and Hibbert recalled and the Panzer IIIs and IVs that they specifically identified. The supposition that the imagery was captured at low level may perhaps have stemmed from the scale of the enlargements, for the German vehicles are difficult to see unless the photos are blown up to the maximum possible extent. Alternatively, Urquhart may have requested a low-level sortie that was not ultimately flown; or he may, looking back, have confused this episode with the 6 September 541 Squadron tasking to photograph the Arnhem, Nijmegen and Grave bridges. As the story of the mission gained in prominence, correction might in due course have been supplied by the pilot himself, had he survived the war, but Flight Lieutenant Fuge sadly lost his life during another reconnaissance mission barely six weeks before hostilities ended. No trace of a crash site was ever found; he is therefore commemorated on the Runnymede Memorial.

A second high-altitude air reconnaissance mission (106G/2830) photographed the very same part of the Deelerwoud later that day. In this instance, the task was assigned to a 544 Squadron Mosquito, MM 285, crewed by Flight Lieutenant PT Pratt and Pilot Officer EH Grennan. The aircraft took off at 13.35 and initially flew to Germany to gather imagery of two predominantly urban targets – Osnabruck and Munster; it then transited back across the Netherlands to execute tasking over The Hague and Rotterdam, presumably in search of V-2 launchers. However, *en route* from Germany towards the end of the afternoon, the Mosquito also photographed Deelen airfield.[79] A plot of this imagery supplied by the National Collection of Aerial Photography (NCAP) in Edinburgh shows that the Mosquito's cameras were activated directly over the wood where the German armour had previously been spotted, and the frame covering the track intersection (4023) had been marked with an 'A'. This may have been connected to the interpretation of the imagery, or it may simply have marked the point at which the camera was turned on.[80]

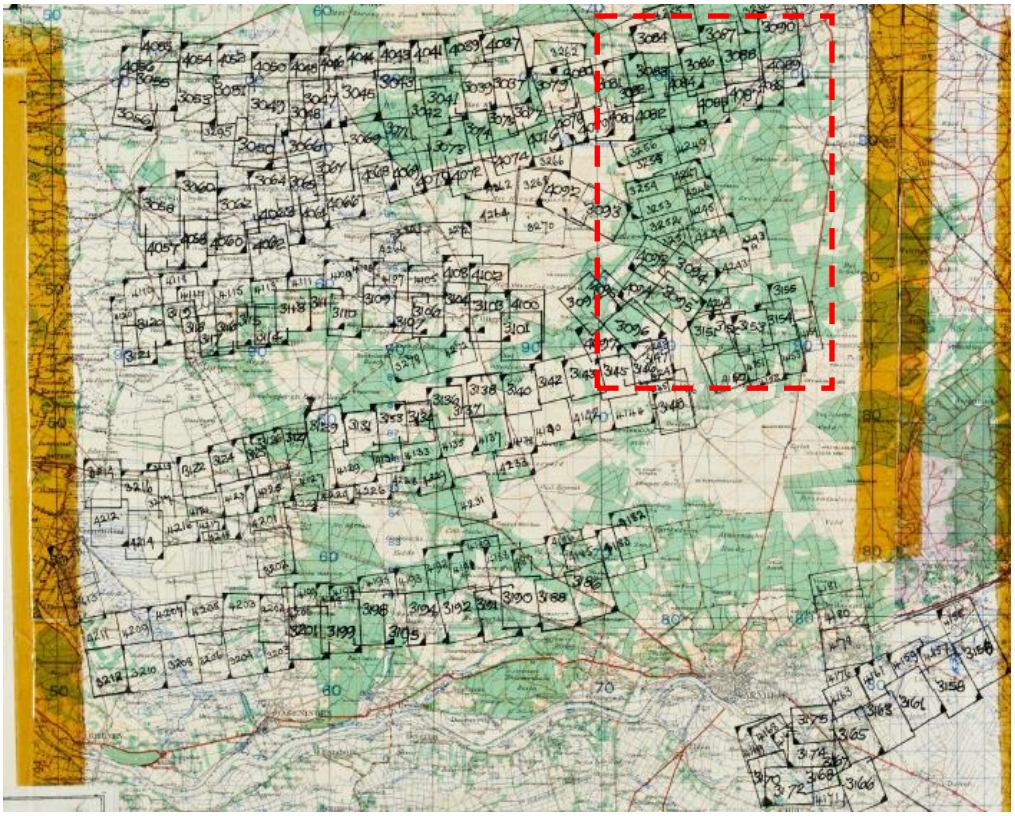
Regrettably, the marked frame is missing from the NCAP collection – the only photograph that is not present among the group of images captured by the Mosquito over Deelen on 12 September. Astonishing as this might seem, many equally historic frames have unfortunately not found their way into the UK's national air imagery archive. As the photographs passed through several different hands before reaching their current home, there was ample opportunity for interested individuals to remove them. The remaining three frames covering the same area are of inferior quality to the images captured by the Spitfire but are clear enough to show that the parking area had been vacated. Furthermore, while the trees that lined the forest track cast long shadows across it, the supply dumps had been so depleted that they cast no shadow at all.

On the following day, 541 Squadron returned to Arnhem. This time, their routing differed significantly from the 6 and 10 September missions, and the 12 September mission flown by Flight Lieutenant Fuge, in that there were clear areas of focus for collection. One of these, for reasons unknown, was southeast of the city; the other was the Deelerwoud, where a considerable number of frames straddled the area where the tanks had been parked without actually covering it.[81] A follow-up mission over the forest would have been entirely logical in the context of the imagery captured the previous day. This was the mission that succeeded in photographing one armoured vehicle (recorded in one of the few surviving interpretation reports) on the eastern edge of the Deelerwoud, which had apparently halted while heading north towards Apeldoorn. Activity around the vehicle suggests that it may possibly have broken down. After poor weather prevented collection on the 14th and 15th, the forest was covered again on the 16th. Light conditions were poor, but the imagery was clear enough to show that the parking area was empty.[82]



Plot 3: 106G/2830 of 12 September 1944.

Mission 106G/2830, frame 4024.



Plot 4: 106G/2872, 13 September, took numerous photos of the Deelerwoud.

The vehicle photographed on the eastern edge of the forest on 13 September, interpreted as a 'possible AFV'.

How significant was the imagery captured by the Allies on 12 September 1944? One possible reading might well have been that the German forces shown in the photograph posed a major threat to Allied plans. The movement of German armour to Arnhem had first been suggested by signals intelligence, then by the Dutch resistance; now the Allies also possessed visual confirmation of an enemy armoured presence. The vehicles in the Deelerwoud included tanks and perhaps one armoured half-track – possibly more. Moreover, if the armour belonged to 9th or 10th SS Panzer Division, some motorised infantry, artillery and support elements might well have been located nearby.

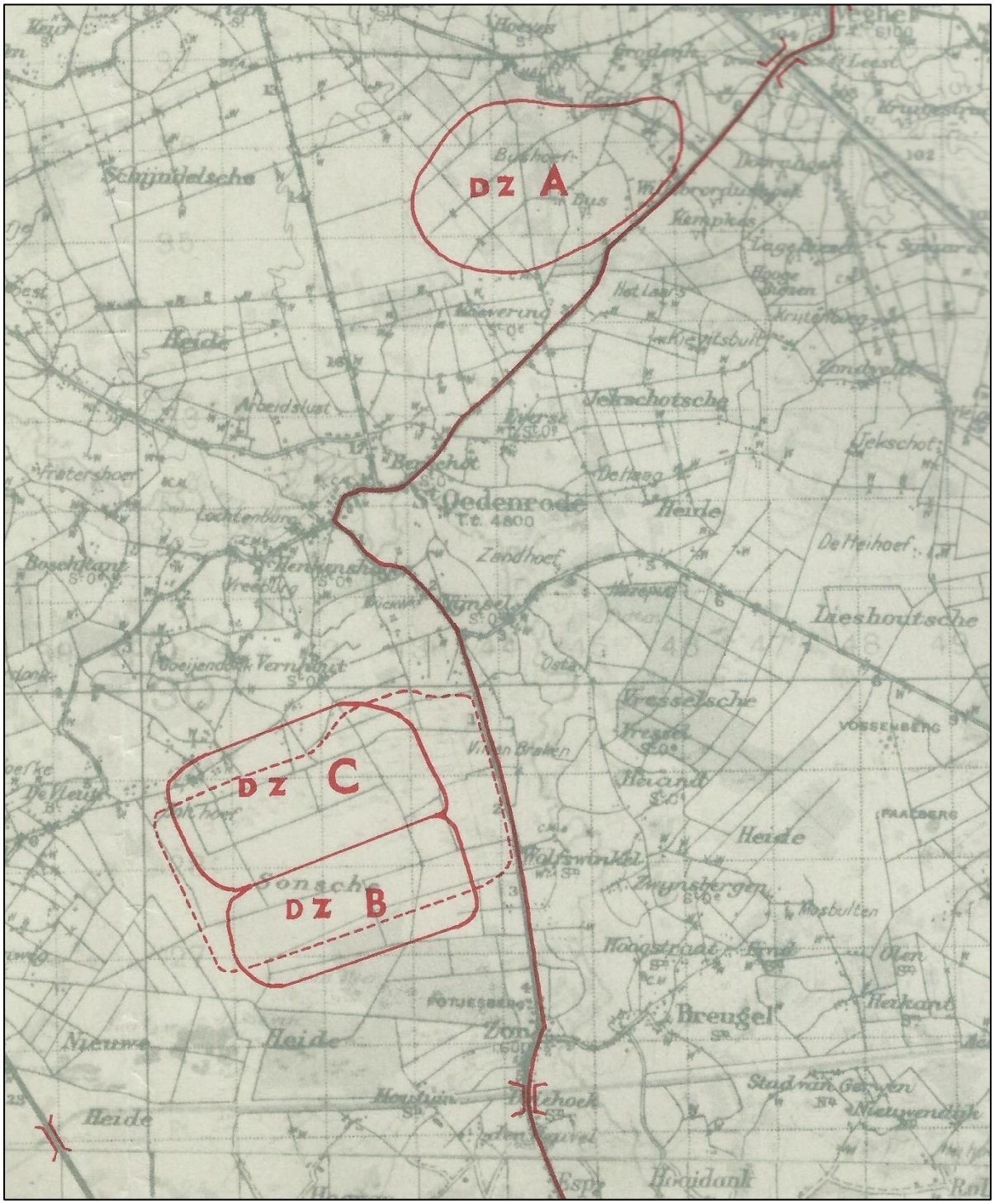
Yet the issues were by no means clear-cut. After the ULTRA messages of 5 and 6 September, no further signals intelligence was received to the effect that II SS Panzer Corps was in the Arnhem area; 21st Army Group apparently had reason to view the Dutch resistance reports with some scepticism, and Montgomery's staff retained their conviction that II SS Panzer Corps could no longer fight effectively, in any case. The proposition that the German unit in the photograph lacked much combat capability or was nothing more than a training outfit might well have received some support from the absence of camouflage and the presence of older equipment. Most front-line German armoured vehicles were permanently covered with bushes and branches by this stage of the war due to the threat of air attack. Some early model Panzer IVs had been employed by 21st Panzer Division in Normandy, but the vast majority of front-line Panzer IVs were equipped with long-barrelled guns by September 1944; Panzer IIIs were no longer in front-line service, and the detachment that reached Arnhem from Germany on 19 September was drawn from a training unit.[83]

It is also important to remember that Market Garden had been enlarged from one to three airborne divisions to counter the increased enemy threat, and that some armoured opposition was always expected. For this reason, 1st Airborne Division landed at Arnhem on 17 September equipped with anti-tank guns and other anti-armour weapons in considerable quantity.[84] When Graebner's reconnaissance battalion was captured in air imagery during the Arnhem battle, the low-level oblique photographs (taken by 16 Squadron with a rear-mounted sideways-facing camera) showed a tangled mass of destroyed vehicles and dead SS troops on the road bridge,

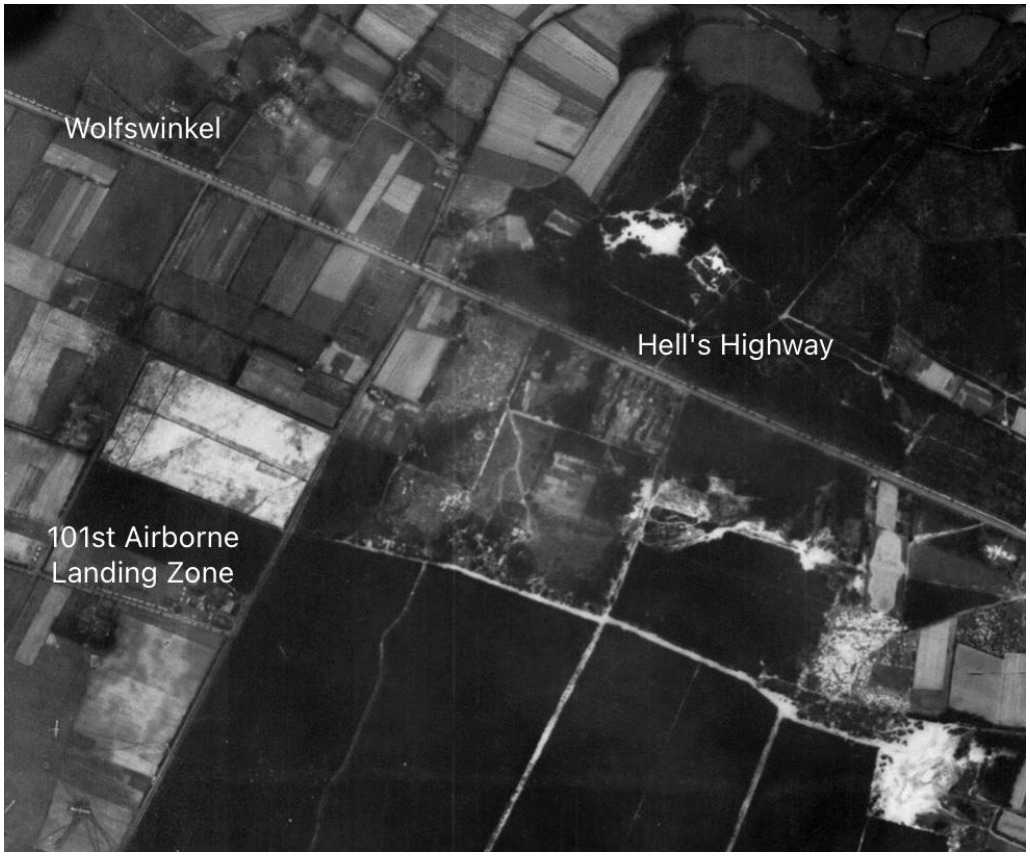
the victims of a misguided attempt to recapture the bridge that was comprehensively defeated by 2 PARA. Armoured opposition came as no surprise to 1st Airborne. Rather, they were undone by the speed and scale of the German response and by Second Army's failure to relieve them.[85]

As for the ageing tanks of the Hermann Goering Parachute Panzer Training and Replacement Regiment, their movement south provides further irony in that it conformed with the British perception that German forces were mainly being deployed in front-line areas as opposed to rear locations like Arnhem, and eye-witness reports from Dutch civilians and American paratroopers confirm that the panzers did not exert any influence on events on Market Garden's first day. Their arrival at Wolfswinkel 'a week before' corresponds broadly with Fullriede's diary record and the Deelerwoud imagery. Confronted by 101st Airborne's landings, they opened fire from an orchard next to the all-important road north, which the Americans named 'Hell's Highway', but then came under attack from Allied fighter-bombers, which had been circling overhead.

Coupled with the daunting spectacle of the massed airborne landings, the air attacks proved too much for the Hermann Goering units, and they fled. However, their escape was complicated by the presence of the River Dommel east of Wolfswinkel. Two tanks drove north up Hell's Highway but were again targeted from the air in the village of Nijnsel, south of Sint-Oedenrode. Approaching from the south, 'C' Company of the 1st Battalion, 502nd Parachute Infantry Regiment, found their view obscured by trees but watched the aircraft diving down to attack. Subsequently, where the road curved to the northwest, they discovered two knocked out panzers identified by the battalion commander as Panzer IVs.[86] Another eyewitness recalled that 'The lead tank's engine was still running … There was a dead German up in the hatch.'[87] The second escape route led directly across the fields northeast of Wolfswinkel, crossing one lane named Waterhoef and another field bordered by a second lane, Watermolenstraat, which led to a wooden bridge across the Dommel. One Dutch eyewitness recalled seeing a Panzer III turn off Hell's Highway to reach the bridge, although it's weight-bearing capacity of about eight tons was wholly inadequate for the 25-ton tank. 'In their hurry to get away, the tank crew drove on without stopping and broke off the right railing in the process. Incredibly, the bridge held, and they made it across.'[88]

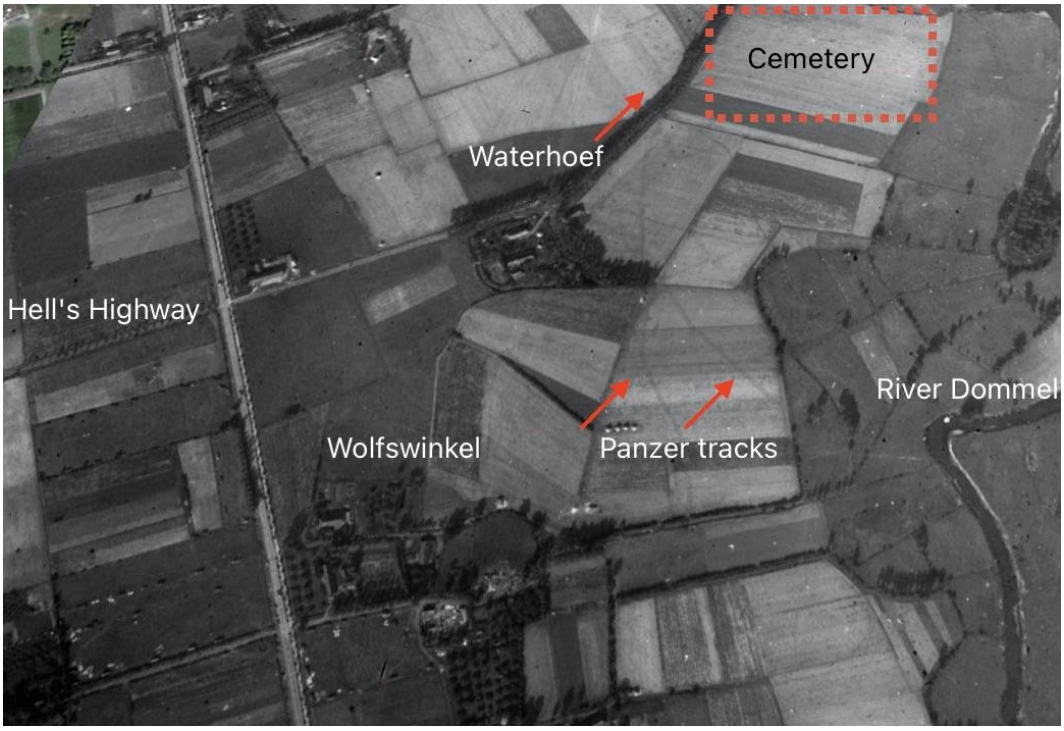


Period map showing 101st Airborne Division's DZ/LZ areas and Son (spelled Zon), Wolfswinkel, and the road north to Nijnsel, Sint-Oedenrode and Veghel.

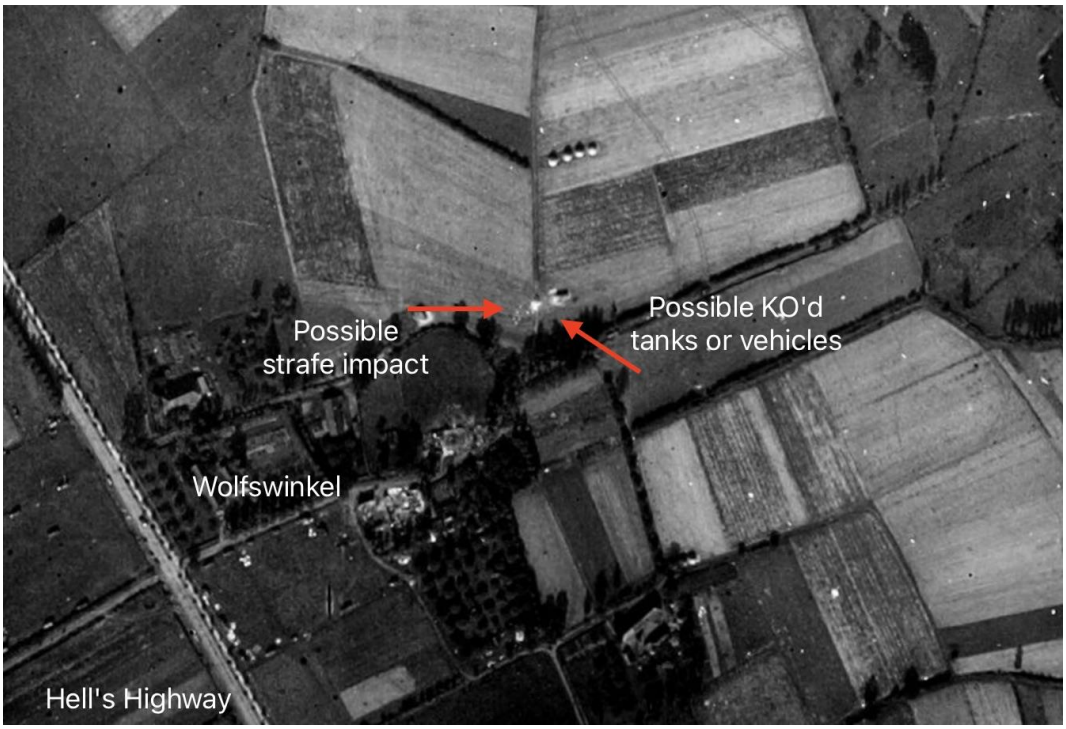


Smoke drifting from Wolfswinkel late on 17 September 1944.

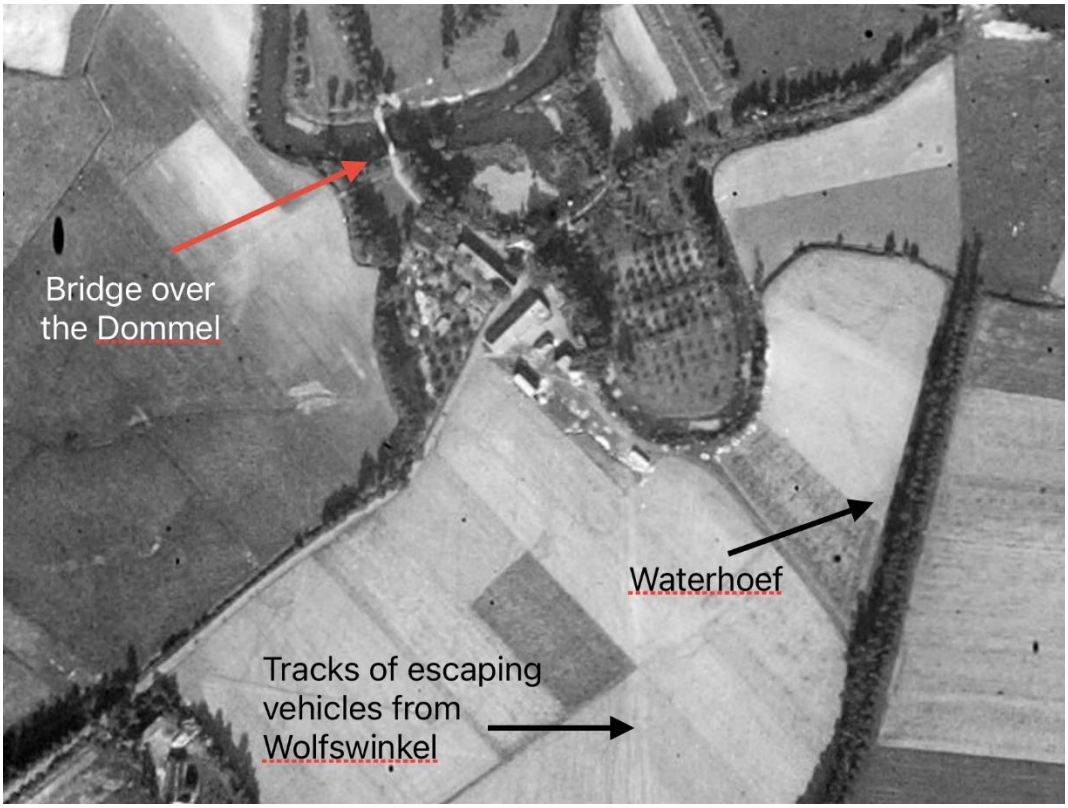
Nijnsel, 19 September: the destroyed panzers had been pushed off the road.



19 September, showing tracks left by escaping German armour on the 17th and the site of the US military cemetery built soon afterwards by Waterhoef.

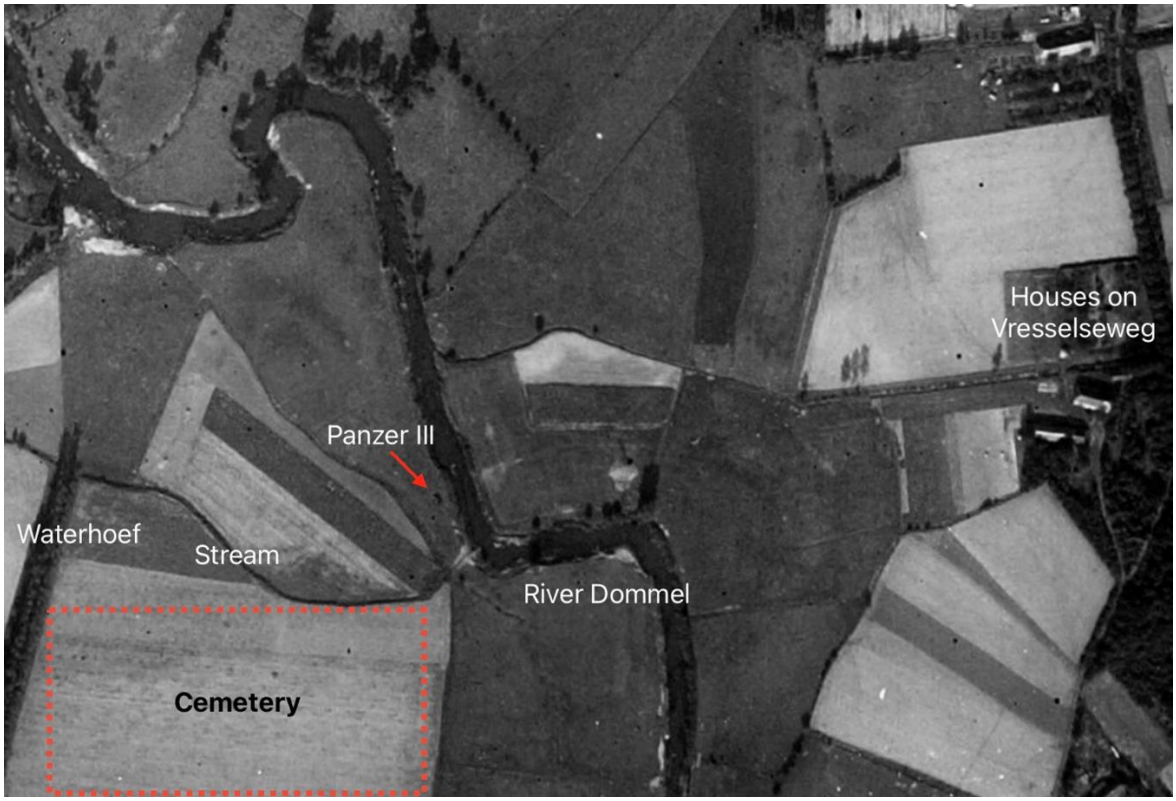


This enlargement shows another possible casualty from the air strikes on 17 September.



The Dommel bridge, over which one tank escaped; the dark area may be shade from nearby trees, or the bridge may have been demolished.

Ground view from the US cemetery at Waterhoef, winter 1944; the most famous of the Hermann Goering Panzer IIIs is just visible at the extreme right.



The view from the air, showing the Panzer III next to the Dommel; there is also a large object in the river; this may be where German troops swam or roped across.

The low camera angle and the colour of the vegetation make the Dommel almost invisible in the close-up ground photograph of the Panzer III.

The third route proved to be a lethal cul-de-sac. In their haste, many of the Hermann Goering troops and one of the Panzer IIIs apparently mistook Waterhoef for Watermolenstraat and found themselves trapped between the advancing American paratroopers and the Dommel. 'The soldiers swam the river and those who couldn't swim were pulled across with ropes. Much of their equipment was left on the opposite bank.'[89] This included the Panzer III, which was also functionally destroyed by another air strike.

The one tank known to have escaped from Wolfswinkel ran into more American paratroopers slightly further north, at Veghel, but escaped under a hail of bazooka and small-arms fire. However, Hermann Goering elements are said to have been responsible for demolishing the bridge over the Wilhelmina Canal at Son, so delaying the British ground advance to some extent, and the regiment subsequently fought with distinction in defence of the Nijmegen road bridge, albeit under the command of the SS.[90]

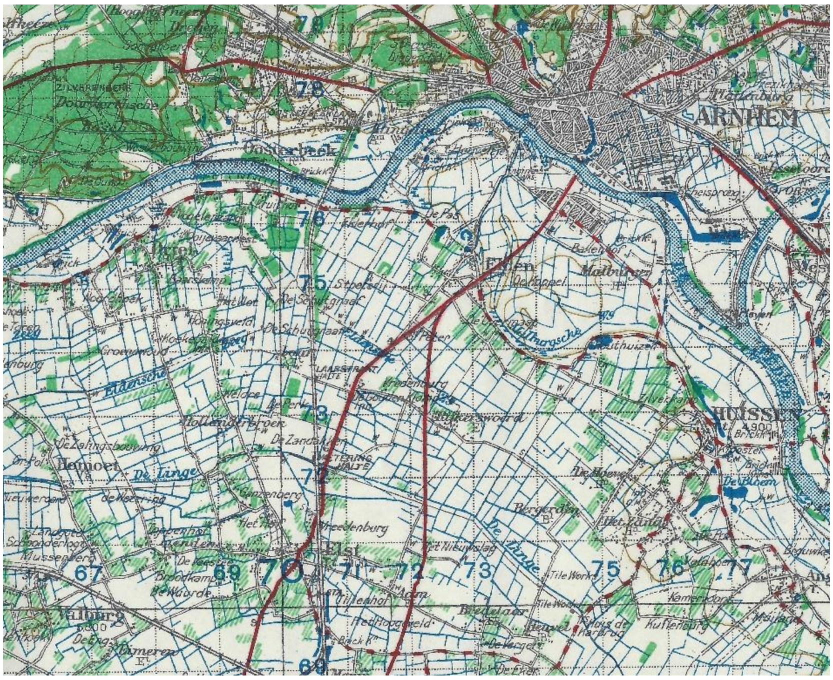
The many other photographs taken over the Netherlands in the days leading up to Market Garden contained a great deal of useful intelligence, but its impact on Allied planning varied considerably. Air imagery captured the terrain characteristics of the prospective battle area with particular clarity, showing the very sharp contrast at Arnhem between the low, flat polderland south of the Neder Rhine, with its multiplicity of dykes and drainage ditches, and the rising and densely wooded countryside on the north bank. To link up with the airborne, Second Army's XXX Corps, headed by the Guards Armoured Division, had to advance along a single, narrow road, raised above the level of the surrounding polder, straight towards a near-perfect defensive position – hills fronted by a major water obstacle, rather like an enormous medieval moat. The commander of 4 Parachute Brigade at Arnhem, Brigadier (later General Sir) John Hackett, described the terrain thus:

> Standing on the high ground at Westerbouwing for the first time a few years ago, moreover, and looking south, I could not help thinking that, with observation from there, well-placed artillery on the north bank of the Rhine could totally control movement along that road for many

> miles. The Guards Armoured Division was here set an impossible task. Why was this road used as the main axis anyway?[91]

This was always going to be difficult fighting terrain, certain to impede movement and manoeuvre; but it also made Arnhem a very problematic airborne objective. The photographs, supported by the available mapping and intelligence from the Dutch, disclosed terrain in the immediate vicinity of the road bridge completely unsuitable for the large-scale glider landings that were a central feature of the British plan. Annex A to 1st Airborne Division's Planning Intelligence Summary of 5 September 1944 stated that 'the areas between the Waal and the [Lower] Rhine and south of the Waal are mainly flat, dyked clay polderland, intersected by innumerable drainage ditches.' According to the 7 September Intelligence Summary, the smallest of these ditches were 5-6 feet wide, while the largest were 12 feet wide. 'The wider ditches may be vaulted with a 12-foot pole, which is the practice in the Royal Dutch Army.'[92]

Lawrence Wright similarly described 'reclaimed, low-lying, soft polderland, cut up by countless ditches and banks into small fields, with very sparse road or track access', and a post-war official account refers in even more detail to the terrain features south of Arnhem: 'The land here is divided by ditches into areas of around 50 to 100 metres in width and 100-200 metres long. The ditches are 2-3 metres wide and 1½ deep with usually ½ metre of water in them.'[93] No responsible Allied commander could conceivably have authorised a substantial assault glider landing into such extensively subdivided country. To have done so would have involved a high risk of serious damage to the gliders and their cargoes, injury or worse to their passengers, and acute difficulties unloading and transporting vital equipment.[94] Equally, landings would hardly have been practicable in the urbanised area on the north bank of the river, nor could they have been safely executed in the thick woodland that surrounded Arnhem. Hence, there was no alternative to the selection of more distant landing areas with the obvious disadvantages involved.[95]

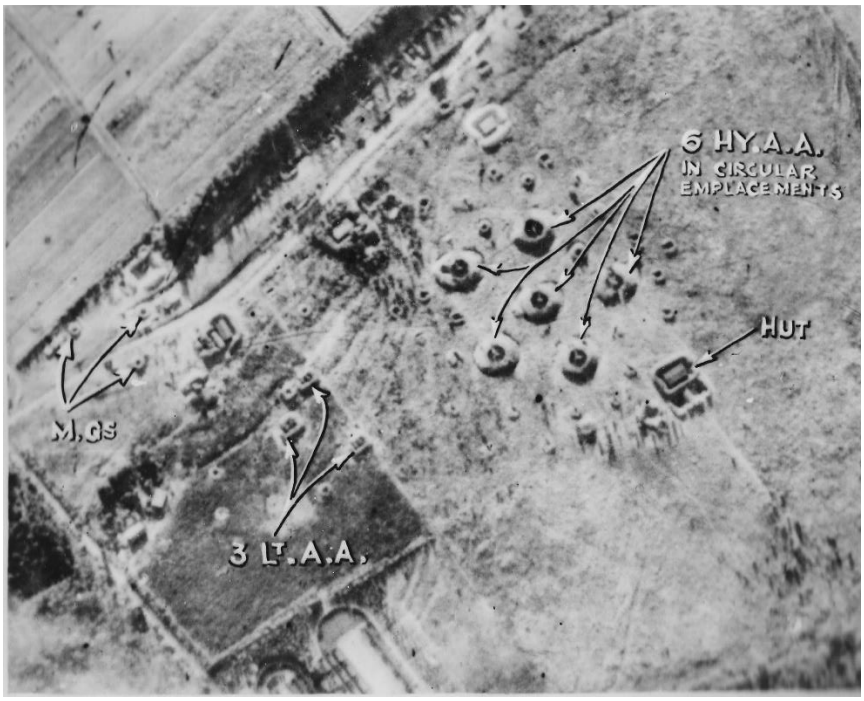


Air photos reinforced other topographical intelligence; the Arnhem bridge was shielded by the city, dense woodland and polder intersected by countless drainage ditches.

Air imagery of German flak defences in the Arnhem and Nijmegen areas delivered the same basic message. A substantial build-up was revealed by the photographs and was noted in successive interpretation reports. On 6 September, one report based on air imagery described 'heavy concentrations at Deelen airfield, Arnhem and Nijmegen – respectively 30 light and 24 heavy guns, 36 light and 36 heavy guns, 24 light and 12 heavy guns.' These numbers were expected to increase.[96] On the 7th, XXX Corps recorded that heavy and light flak at both Arnhem and Nijmegen was increasing very considerably. 'Guns getting into position (with vehicles and pits under construction) can be seen on several photos and there is railway flak at Arnhem.'[97] Some reorganisation of Deelen's flak batteries evidently occurred in the aftermath of a Bomber Command raid on the airfield on 3 September, and it was at first thought that the airfield's anti-aircraft defences had been removed. However, this assessment was revised on the basis of later air reconnaissance. An estimate produced by First Allied Airborne Army on 12 September recorded: 'Flak is apparently still present in rather large quantity, there being seventeen heavy guns and fifty-five light guns shown as occupied positions on the latest photo cover.'[98]

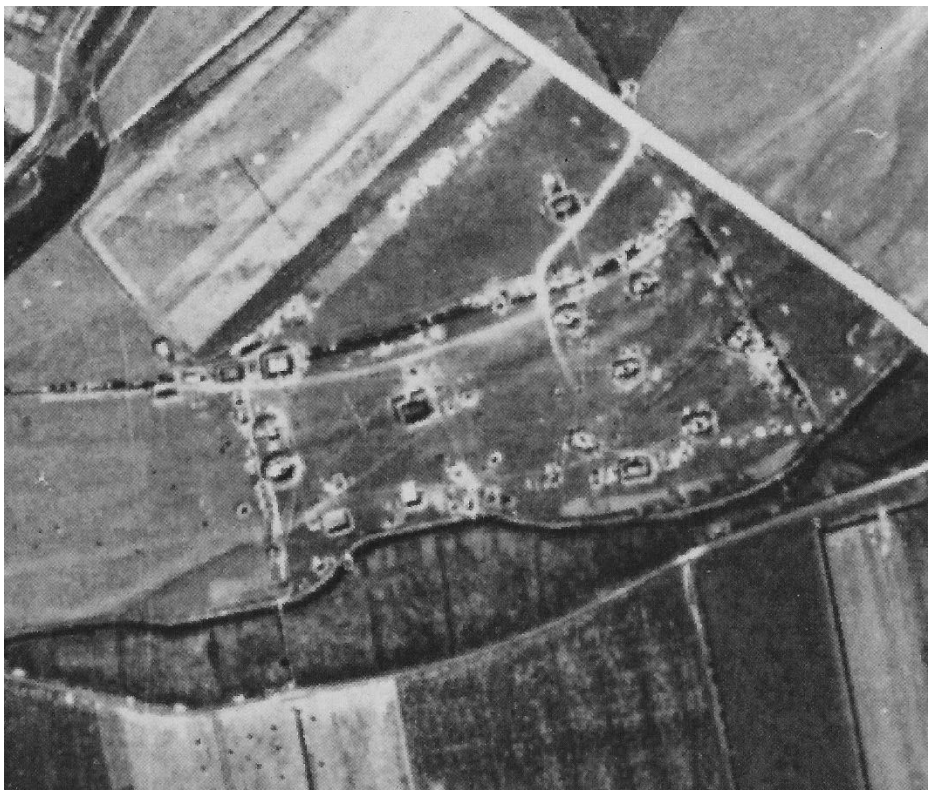
These developments would have been worrying enough under any circumstances, given the inherent vulnerability of airborne air transport – the massed formations of large, slow-moving aircraft and gliders flying straight and level at low altitude; but the build-up of German flak around Arnhem and Nijmegen gave cause for particular concern because it was suspected of being far from coincidental. Both the RAF air transport commander, Air Vice-Marshal Hollinghurst, and Browning feared that operational security had been breached,[99] and these concerns were shared by 1st Airborne Division's head of intelligence, as we have seen.[100] In fact, while the Germans were expecting an Allied ground offensive in the Netherlands as well as the possible use of airborne troops, this was not linked to the build-up of flak. Instead, the surviving Luftwaffe records show that flak was being strengthened in the Market Garden area as a direct result of the decision to establish a defensive line between Antwerp and Maastricht. Both the formation and sustainability of this line depended on the integrity of the communication routes behind it. Presumably, because these were vulnerable to air interdiction, orders were issued to strengthen anti-aircraft defences at key points.

Heavy anti-aircraft artillery battery north of Arnhem, unoccupied on 6 September.

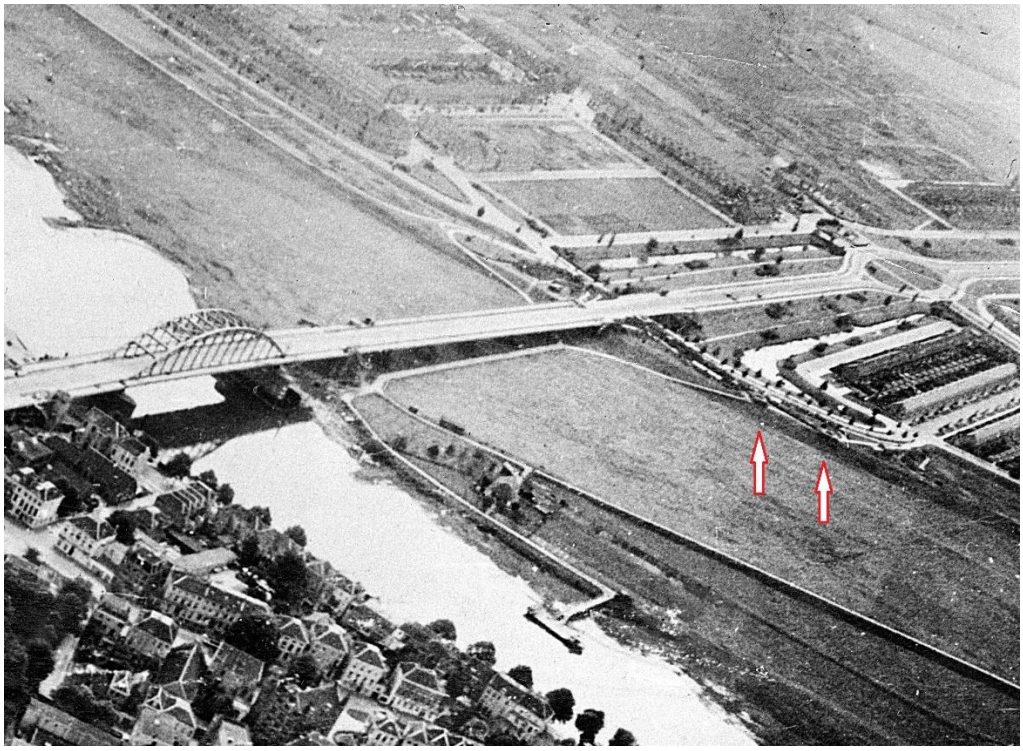


The same battery, occupied by 12 September.

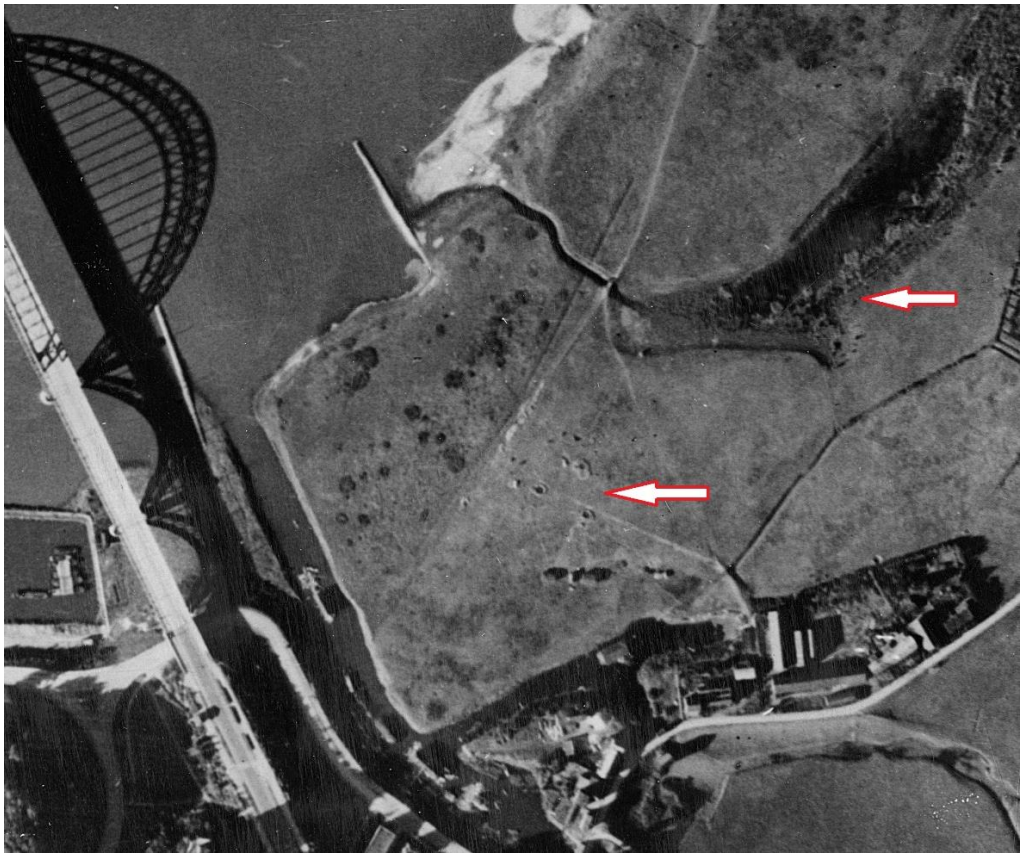
A heavy anti-aircraft battery southeast of Arnhem, unoccupied on 6 September.



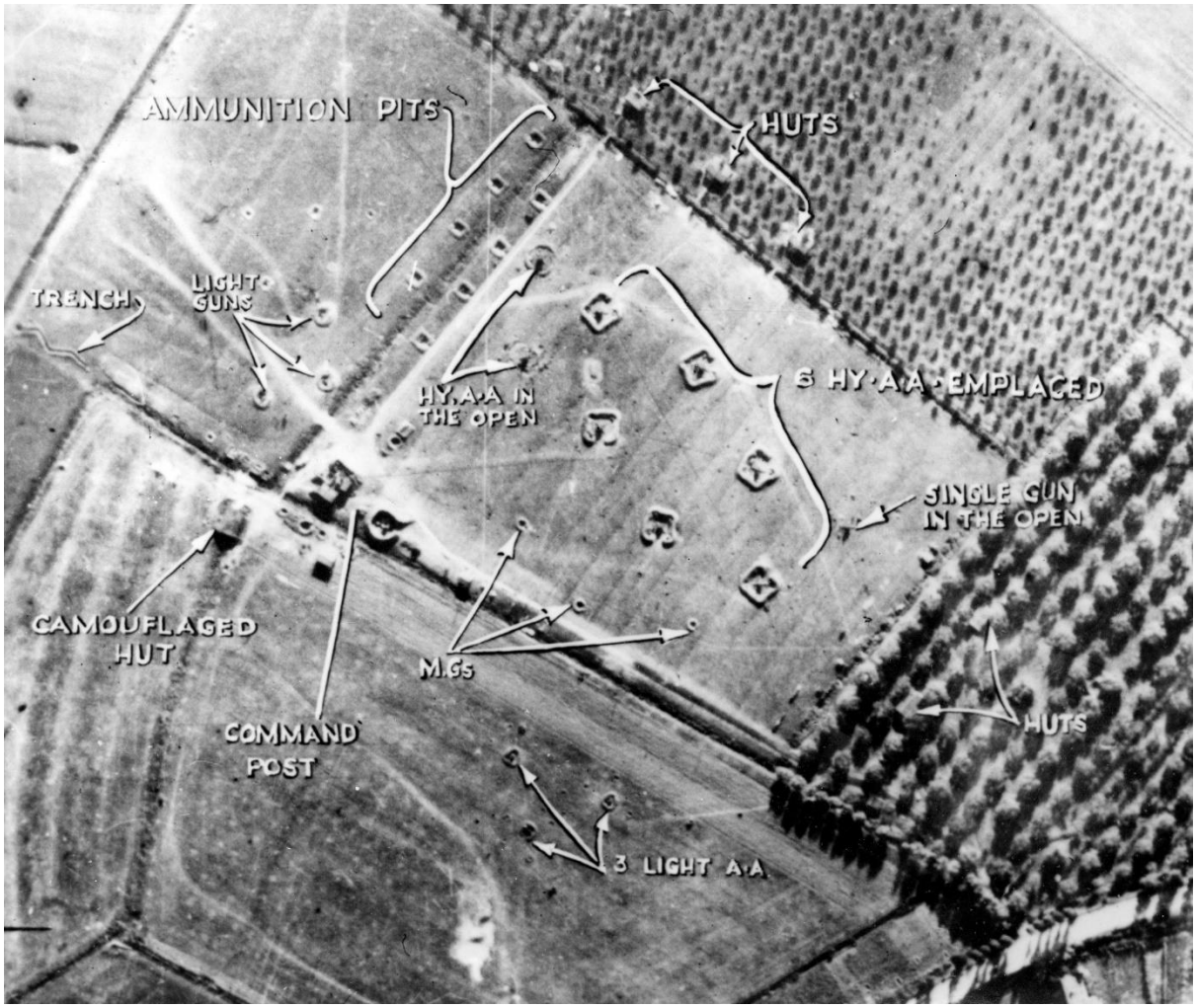
The same battery occupied by 12 September.



Flak positions by the Arnhem road bridge.



Flak positions in the fields by the Waal at Nijmegen.



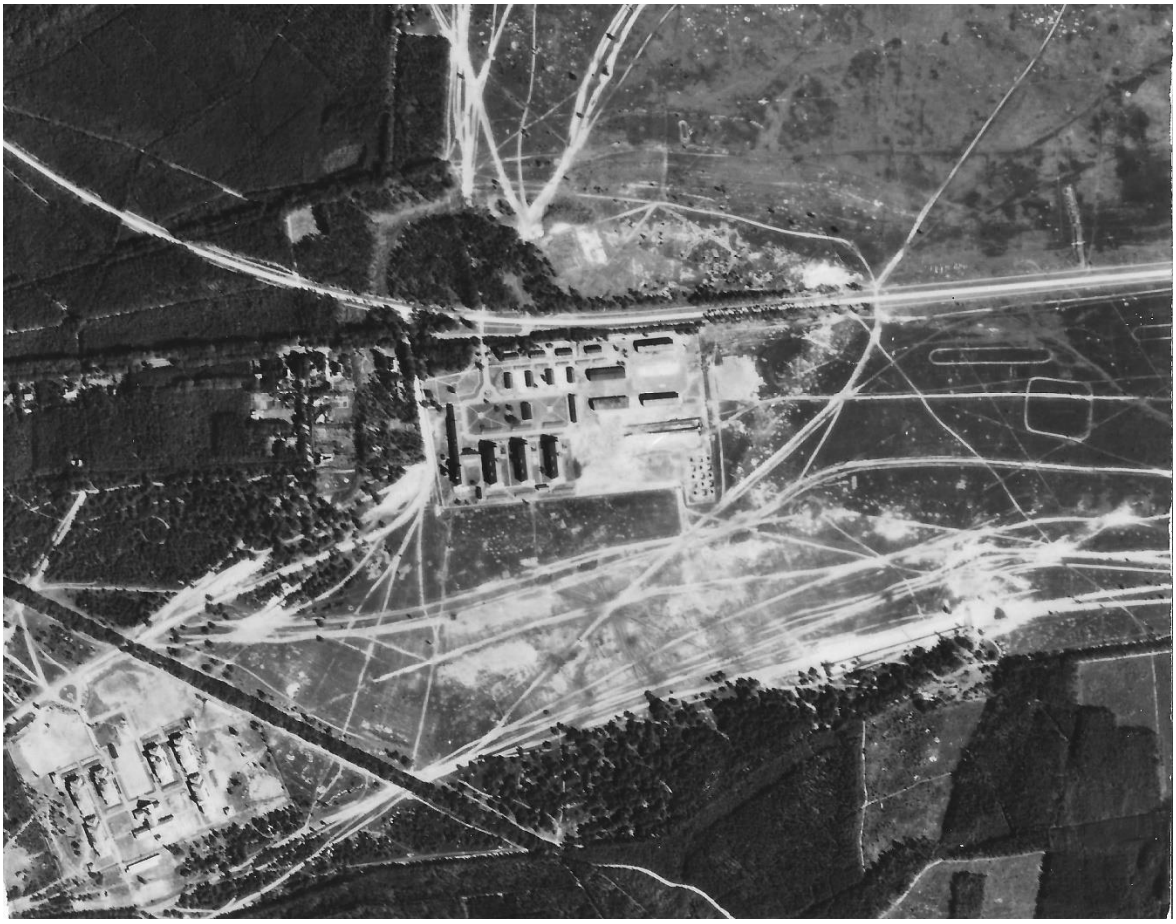
Another heavy anti-aircraft battery located between Nijmegen and Arnhem.

On 5 September, Luftgau Belgium-Northern France Field Headquarters received orders 'to put A.A. [anti-aircraft] artillery into the German western position to provide defence against air attack for troops fighting there, and also to cover defiles, bridges, etc. on supply routes.' The headquarters was specifically instructed to protect the area 'between Antwerp and Maastricht'.[101] The lines of communication serving the more westerly sector of this region ran directly through Arnhem and Nijmegen, and could have been severed by the destruction of their vital bridges over the Neder Rhine and the Waal. This doubtless explains why they were singled out for the additional flak cover noted by Allied air reconnaissance. Many historians have since argued that the flak threat was much exaggerated by the RAF. However, 1st Airborne Division's post-operation report records that the flak estimates came not only from RAF but also Army photo-interpreters; they were in full agreement.[102] Close inspection of the surviving

imagery suggests that high-level vertical shots rarely failed to provide enough resolution to establish reliably whether flak emplacements were occupied or not, but distinguishing between real and dummy positions would have been difficult. In such circumstances, there may have been some tendency for the interpreters to err on the side of caution, but the consequences of a significant underestimate could equally have been disastrous.

A large quantity of imagery gathered around Arnhem demonstrated that the Allies were targeting an area of considerable importance to the German military. There were photographs of barracks, ranges, communications facilities, rail and storage depots and of course Deelen airfield. Before the war, this region had been extensively used by the Dutch armed forces, particularly for training and exercises. After the Netherlands surrendered in 1940, the Germans took over the military facilities in and around Arnhem, including the various barracks and training areas. We have already noted the importance of the area for armoured warfare training.

As for the barracks, Arnhem boasted five in total, with an estimated capacity of around 5,000 troops. There were also infantry and artillery barracks at Ede, close to the airborne landing areas, that could accommodate around 3,000 troops. At Deelen airfield, there were thought to be 2,000 Luftwaffe personnel in July 1944. After the Allied landings in Normandy, it seemed likely that the training activities associated with the Arnhem area would have been scaled down, but there was evidence to suggest that, while some troops had moved on, others had arrived in their place.[103] There was an obvious logic behind such assessments. Boasting extensive military facilities, including barracks, Arnhem was effectively a military base and one of the few major crossing points over the river that formed the last natural barrier against an Allied advance into Germany. On these grounds alone, a significant German presence was highly probable.



Two of the five German barracks in the Arnhem area.

Moreover, quite apart from the Dutch resistance reports on the arrival of German troops at the barracks, the Allies also captured orders to strengthen defences around the Rhine crossings, which were issued to German home defence and occupation troops.[104] Nevertheless, 21st Army Group and its subordinate formations remained adamant that the Germans had left Arnhem largely undefended. The barracks were unoccupied and the ranges deserted; the main German military presence in the Netherlands was concentrated near the front line, nearly 70 miles to the south.[105] The Allies were thus surprised to discover that the Germans could mobilise numerically strong forces in the Arnhem and Nijmegen areas at very short notice in response to the airborne landings.

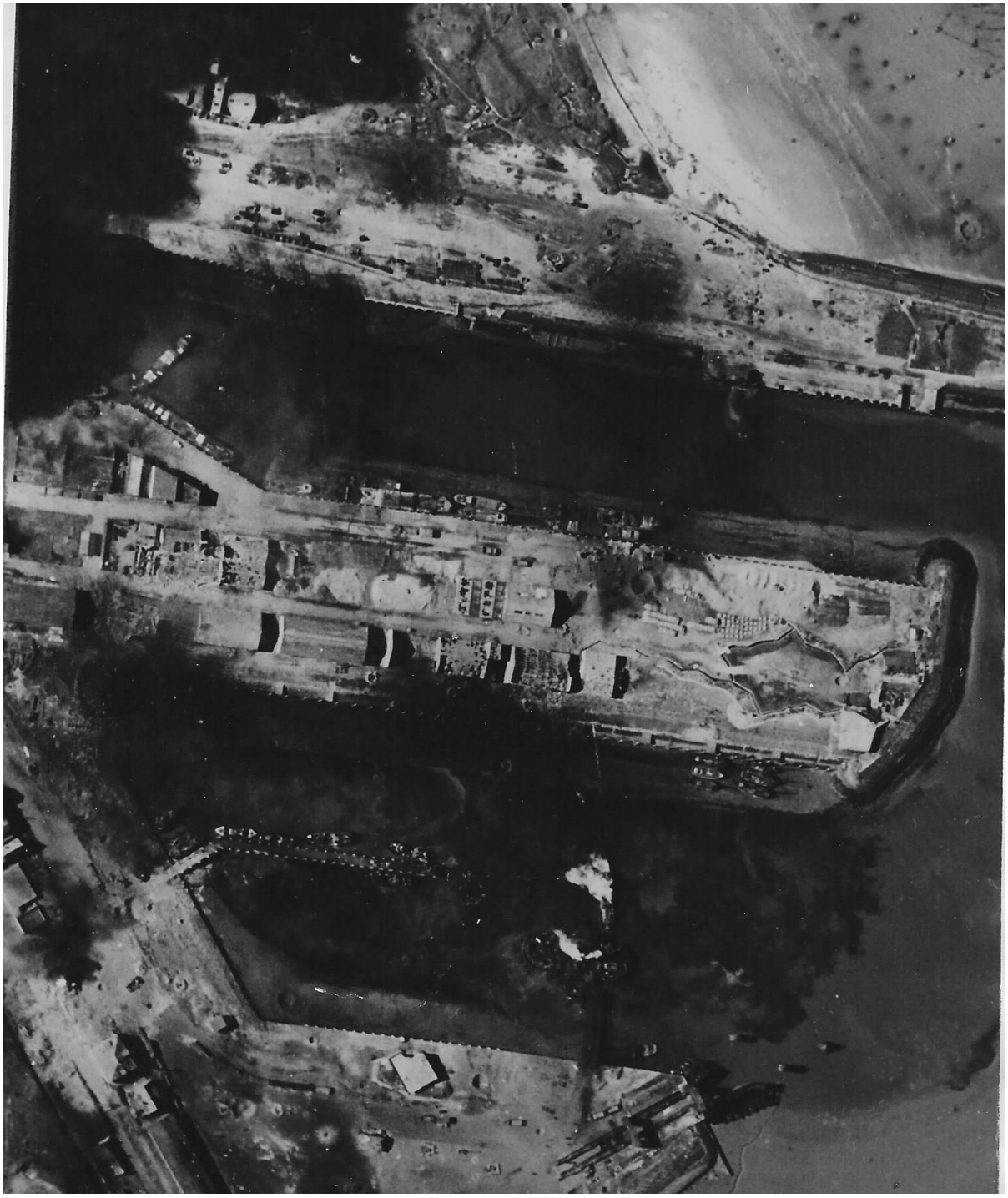
Elsewhere in the Netherlands, air imagery also captured the withdrawal of the German 15th Army across the Scheldt Estuary during the first two weeks of September – a manoeuvre that saved them from a disaster on the scale of the Falaise Pocket and brought thousands of additional troops into the Market Garden area. As early as 5 September, barely one day after British forces entered Antwerp and blocked 15th Army's escape over land, air reconnaissance imagery revealed increased shipping activity on the north bank of the Scheldt at Vlissingen, involving landing craft and auxiliary vessels. On the south bank, at Terneuzen, air photographs revealed barges and 'a concentration of 150/200 vehicles', which was substantially located 'on the roads adjoining the quays.' Soon, the 'German Dunkirk' was in full swing.[106] On the 10th, air imagery provided 'considerable evidence of the withdrawal of the German Forces from the area between Bruges and Antwerp'. The harbours at Terneuzen and Breskens were 'plainly being used as the evacuation points to the islands of Walcheren and South Beverland' and unloading was observed at Vlissingen and Hoodekenskerke.

> The ferries that normally ply between these ports are loaded full with MT and are obviously being worked hard. In addition a number of TLC [Tank Landing Craft] type III are being used as ferries together with pontoons and small barges ... Several covers of Breskens during the day show a considerable amount of MT waiting to be ferried across. More vehicles are present during the morning than in the afternoon.[107]

The area of 15th Army's escape.

Even after Breskens was bombed on the 11th, Allied intelligence noted that the shuttle service across the estuary to Vlissingen was being maintained by at least four landing craft and a ferry, and four further landing craft and a barge were seen approaching Vlissingen from further east, 'probably from Terneuzen'.[108]

Ultimately, over 16 days, the Germans succeeded in evacuating six divisions across the estuary – 100,000 troops, 6,000 vehicles, 6,000 horse-drawn wagons and 750 artillery pieces. At least three of these divisions would contribute to the German victory in Market Garden.[109] British intelligence officers certainly acknowledged that elements of 15th Army might be encountered during the offensive, but this realisation exerted no tangible influence at all on Allied plans.



Shipping used for 15th Army's escape, Breskens, September 1944.

Montage of air imagery of 15th Army troops and vehicles being loaded at Terneuzen for the Scheldt crossing.

Conclusion

The Allies did not, of course, generate their intelligence picture exclusively from air reconnaissance. Multiple sources were employed, just as they are today, including ULTRA, Dutch resistance reports, POW interrogations and captured documents. However, we can legitimately ask what assessment air imagery might have supported before Market Garden, objectively considered. Despite the resource constraints and unfavourable weather conditions, and the limited time available, air imagery backed the following conclusions:

[1] Heavily wooded and urban terrain and extensive polder-land had the potential to make Arnhem and Nijmegen very difficult areas in which to conduct offensive ground operations.

[2] The terrain features of the Arnhem area were also unfavourable for airborne and particularly glider-borne operations.

[3] Rapidly increasing anti-aircraft defences in the Market Garden area posed a significant threat to Allied troop carriers and glider combinations.

[4] Parts of the battle area were extensively militarised, suggesting the presence of enemy personnel in considerable numbers.

[5] Tens of thousands of German troops were withdrawing into northern areas of the Netherlands across the Scheldt Estuary, potentially threatening an Allied advance north from the Dutch-Belgian frontier.

[6] A mechanised unit possessing at least some tanks and AFVs was positioned a few miles north of Arnhem on 12 September and would probably be encountered in the Market Garden area after the operation began.

On this basis, the imagery, combined with intelligence from other sources, provided grounds for two particular conclusions. First, Arnhem was not an especially favourable

objective for the type of operation that the Allies had in mind; second, if the operation targeted Arnhem, the airborne might well be confronted by at least some German armour, bolstered by a substantial range of other troops drawn from across the military spectrum. Some of the earlier reports offered precisely this analysis, but their discouraging tone ultimately made way for a more optimistic one. The pessimistic appraisal proved the more accurate but not because 1st Airborne Division was confronted by armour, which was always expected and which did not, in any case, appear in force until it arrived from outside the battle area on 19 September. Rather, it was accurate because it drew attention to the likelihood that the Germans would be able to mobilise considerable numbers of military personnel in the Arnhem-Nijmegen area, including elements of II SS Panzer Corps. What the intelligence could not predict was the speed of this mobilisation, which substantially exceeded Allied expectations and probably contributed more than any other factor to the German victory.

As for Brian Urquhart's famous account of how a low-level Spitfire sortie took photographs of tanks assumed to belong to II SS Panzer Corps, the version of events originally supplied to Cornelius Ryan appears more plausible than the version contained in Urquhart's memoirs. To Ryan, Urquhart merely described himself as the recipient of air photographs that were probably high-magnification blow-ups of vertical images rather than oblique shots; in his memoirs, he claimed to have orchestrated a low-level search for tanks around Arnhem that would never have been sanctioned by the JPRC. Still, we now know for certain that an air reconnaissance mission flown by a Spitfire from RAF Benson located armour north of Arnhem on 12 September 1944, including Panzer IIIs and IVs 'tucked in underneath woods'. They probably belonged not to II SS Panzer Corps, but to the Hermann Goering Parachute Panzer Training and Replacement Regiment, a formation that had long been using the same area for training, as the Allies well knew. It was probably reasonable to identify the tanks as a potential threat to 1st Airborne Division, but the issue was not straightforward. The appearance of modern tanks such as Panthers or Tigers in the imagery would certainly have provided grounds for serious concern, but the prevalence of older model Panzer IIIs and IVs could well have suggested to an experienced intelligence officer that they belonged to a second-line unit of questionable combat capability. A reasonable conclusion might have been that the photographs reinforced the broader intelligence

picture of German militarisation in the Market Garden area but did not necessarily point to a specific threat from a first-line panzer formation at Arnhem.

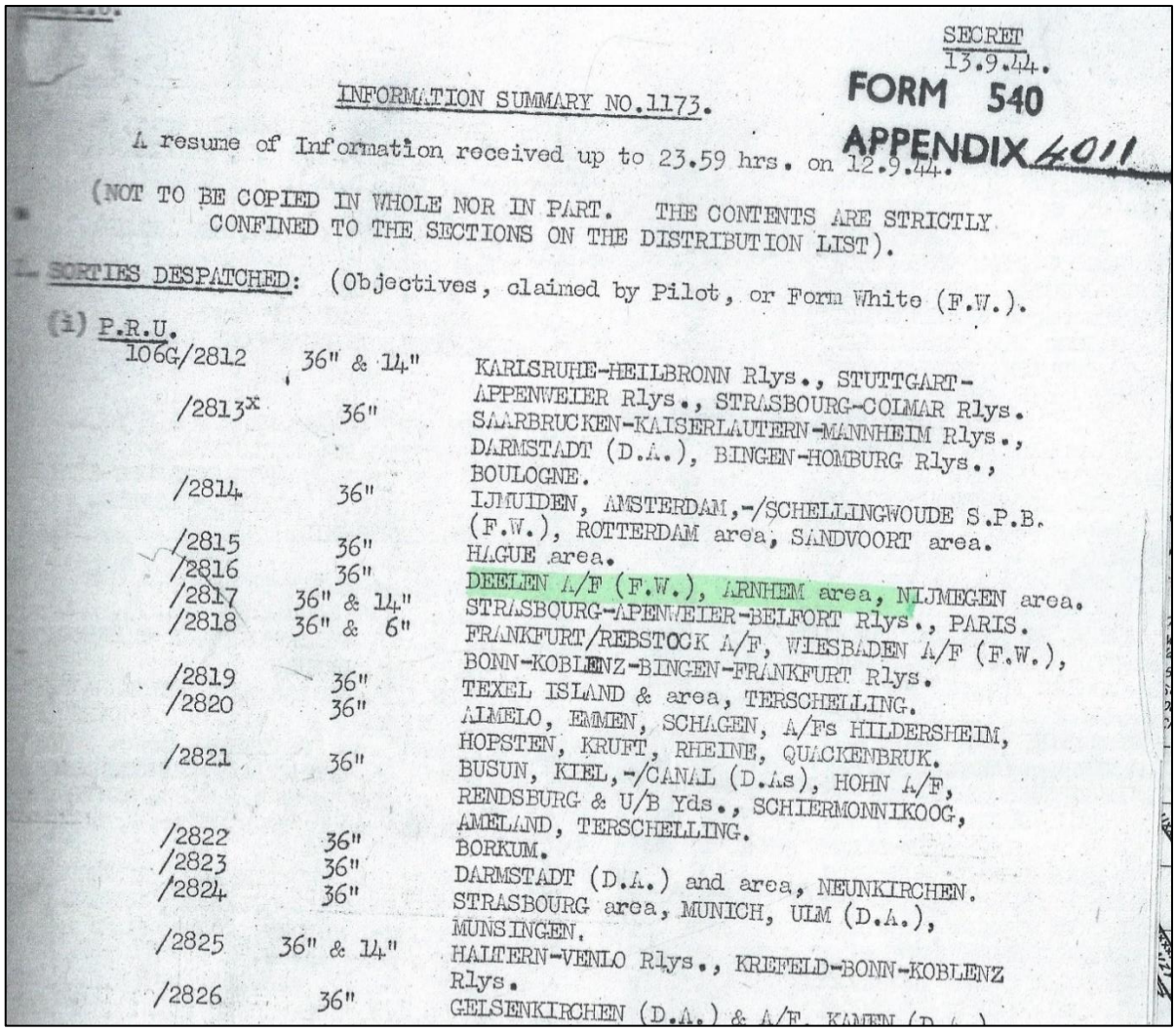
Research Methodology

Since *Arnhem: The Air Reconnaissance Story* was first published, there has been considerable interest in the research methodology employed. The basic research path followed during the preparation of this study is detailed here. The primary objective was to examine the contention that the Allies obtained air photographs of German tanks in the Arnhem area shortly before Market Garden was launched. As we have noted, both Brian Urquhart and Tony Hibbert claimed to have seen imagery of Panzer IIIs and IVs parked in woods. Their story had already been partially considered during earlier research, which concluded that details of Brian Urquhart's account, as reproduced in multiple published histories, were probably inaccurate.[110] One possibility, at least, was that the sortie he remembered was flown at high rather than low altitude, and that the photographs were enlargements of high-level vertical shots rather than low-level obliques.

The initial research task involved an extensive trawl through the relevant documents in the UK National Archives, searching particularly for interpretation reports confirming that tanks were spotted. This produced just one document of interest, already well-known to historians, which recorded the presence of a single AFV on the edge of the Deelerwoud on 13 September – thought to be part of a convoy.[111] However, it was clear that many tactical interpretation reports had been destroyed after the war. The only other primary source of some relevance was the Operation Record Book of 2 Squadron, RAF, which noted the possible presence of tanks and self-propelled guns about 40 KM west of Nijmegen, near Meteren, on 16 September.[112]

The most positive outcome from this early investigation concerned the wartime imagery interpretation process. This drew attention to the generation of the so-called 'Form White' for transmitting high-priority intelligence.[113] If tanks had been observed in or around Arnhem during a mission flown for the airborne forces, it seemed likely that this information would have been included on the Form White. Although the forms

themselves have not survived, their creation is shown in the records of the ACIU when they mentioned locations that were not listed as the primary mission objectives. In the period before Market Garden, Spitfire sorties in the prospective battle zone resulted in the production of only a handful of Form Whites. It was for this reason, first and foremost, that mission 106G/2816 became a focus of attention. Apart from the fact that it was flown by the right squadron (541 Squadron – the RAF Benson Spitfire squadron responsible for the Netherlands) on approximately the right date (12 September), and was confined to the airborne objectives (Arnhem and Nijmegen), the mission Form White also referred to Deelen.[114]



SECRET
13.9.44.

INFORMATION SUMMARY NO.1173. FORM 540

APPENDIX 4011

A resume of Information received up to 23.59 hrs. on 12.9.44.

(NOT TO BE COPIED IN WHOLE NOR IN PART. THE CONTENTS ARE STRICTLY CONFINED TO THE SECTIONS ON THE DISTRIBUTION LIST).

SORTIES DESPATCHED: (Objectives, claimed by Pilot, or Form White (F.W.).

(i) P.R.U.

106G/2812	36" & 14"	KARLSRUHE-HEILBRONN Rlys., STUTTGART-APPENWEIER Rlys., STRASBOURG-COLMAR Rlys.
/2813[x]	36"	SAARBRUCKEN-KAISERLAUTERN-MANNHEIM Rlys., DARMSTADT (D.A.), BINGEN-HOMBURG Rlys., BOULOGNE.
/2814	36"	IJMUIDEN, AMSTERDAM,-/SCHELLINGWOUDE S.P.B. (F.W.), ROTTERDAM area, SANDVOORT area.
/2815	36"	HAGUE area.
/2816	36"	DEELEN A/F (F.W.), ARNHEM area, NIJMEGEN area.
/2817	36" & 14"	STRASBOURG-APENWEIER-BELFORT Rlys., PARIS.
/2818	36" & 6"	FRANKFURT/REBSTOCK A/F, WIESBADEN A/F (F.W.), BONN-KOBLENZ-BINGEN-FRANKFURT Rlys.
/2819	36"	TEXEL ISLAND & area, TERSCHELLING.
/2820	36"	ALMELO, EMMEN, SCHAGEN, A/Fs HILDERSHEIM, HOPSTEN, KRUFT, RHEINE, QUACKENBRUK.
/2821	36"	BUSUN, KIEL,-/CANAL (D.As), HOHN A/F, RENDSBURG & U/B Yds., SCHIERMONNIKOOG, AMELAND, TERSCHELLING.
/2822	36"	BORKUM.
/2823	36"	DARMSTADT (D.A.) and area, NEUNKIRCHEN.
/2824	36"	STRASBOURG area, MUNICH, ULM (D.A.), MUNSINGEN.
/2825	36" & 14"	HALTERN-VENLO Rlys., KREFELD-BONN-KOBLENZ Rlys.
/2826	36"	GELSENKIRCHEN (D.A.) & A/F. KAMEN (D.A.)

ACIU summary showing 106G/2816 and recording the Form White reference to Deelen.

On this basis, imagery from 106G/2816 was requested from NCAP. However, it transpired that no photographs from this mission were held in the UK archives. A further request was therefore submitted for imagery from any other sorties that covered Deelen on 12 September. In response, NCAP provided the wartime plot of imagery captured by the 544 Squadron Mosquito. A single frame drawn on to the plot (4023) was of immediate interest, as it had been marked with the letter 'A'.[115] While the significance of this marking was unclear, it was obviously added on to the map for a reason that merited investigation. Unfortunately, it transpired that frame 4023 was missing from the NCAP collection, and there was no sign of the interpretation report among the files at the National Archives.

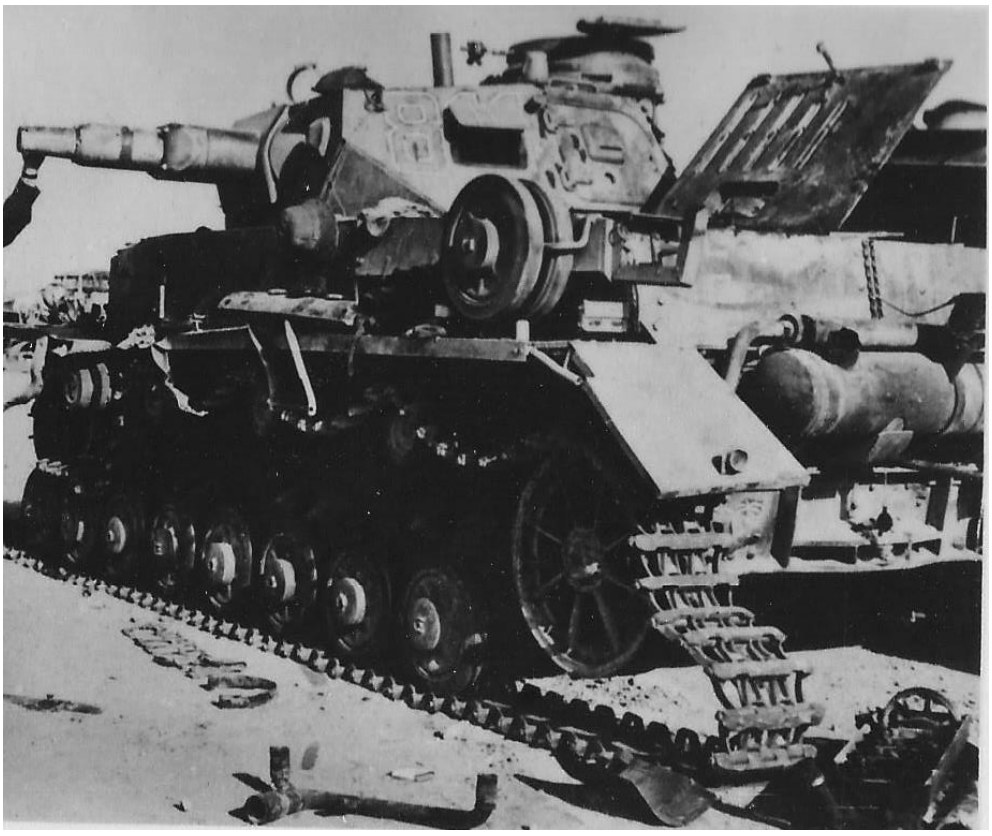
Enlarged plot of 544 Squadron imagery of Deelen and the Deelerwoud, 12 September 1944; note the 'A' in pale ink in frame 4023.

At this stage, there seemed to be no clear way forward. It was only possible to resume the study after the Dutch air reconnaissance archive was placed online. It then transpired that the imagery from 106G/2816 had survived and had been digitised in its entirety. An online search for a photograph began, focusing on the same location as the Mosquito frame 4023. Two photographs from 106G/2816 – frames 4014 and 4015 – were found to have covered this area, and frame 4015 had been marked with several letters. It was therefore assumed that they referred to objects of significance described in an interpretation report, and this supposition was reinforced by the views of several members of the RAF intelligence community, serving and retired. In fact, the lettering had been added after the war. Nevertheless, by an extraordinary coincidence, a high-resolution copy of frame 4015 revealed a column of military vehicles, including armoured vehicles, parked by or moving along the track through the Deelerwoud, and the probable supply dumps.

In seeking to identify the vehicles, the key challenge could be summed up in one word – resolution. To produce maximum clarity and detail, Second World War photo enlargements were created directly from the negative of the frame rather than the print. To give some idea of the clarity that resulted from this approach, a wartime enlargement of three Panzer IIIs is reproduced here. Further illustration is provided by the two more detailed photographs of German heavy anti-aircraft artillery batteries reproduced earlier in this study, both of which were taken on 12 September 1944.

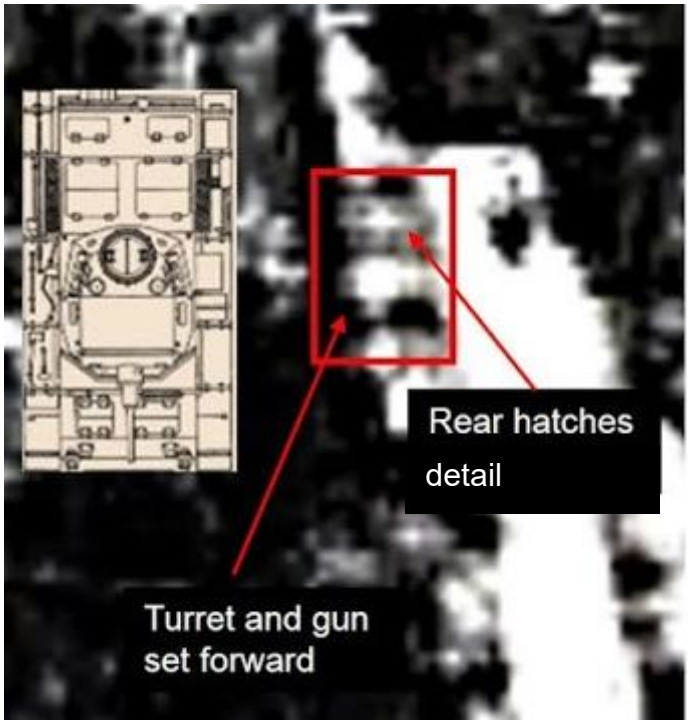
Early Panzer IIIs; distinguishing features include front hull and vertical armour in parallel alignment and the forward position of the turret.

In the absence of negatives for the wartime photographs, it is impossible to recover the resolution that would have been available to Allied interpreters in 1944. In short, we will never be able to view the two frames in the same detail that would have been available to them because of the loss of resolution that occurs during the transition from negative to print, and then from print to electronic scan. The photographs were taken in extremely sunny conditions, and there was a great deal of light reflection from the top of the vehicles (although there was also a lot of shadow and tree cover). Nevertheless, the resolution was so poor that it was initially hard to determine the orientation of the column. At first, due partly to the position of the most visible Panzer IV turret, it seemed as if the column might be moving north. The common German practice of rotating turrets during servicing and maintenance was not taken into consideration until accumulating evidence demonstrated unequivocally that the vehicles were heading in the opposite direction.

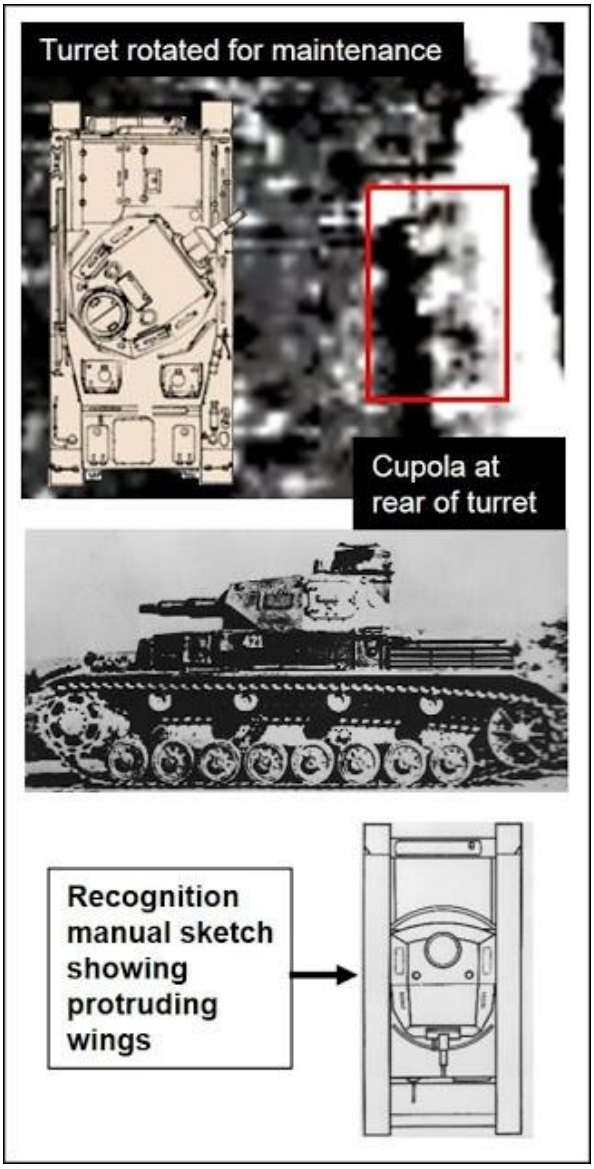


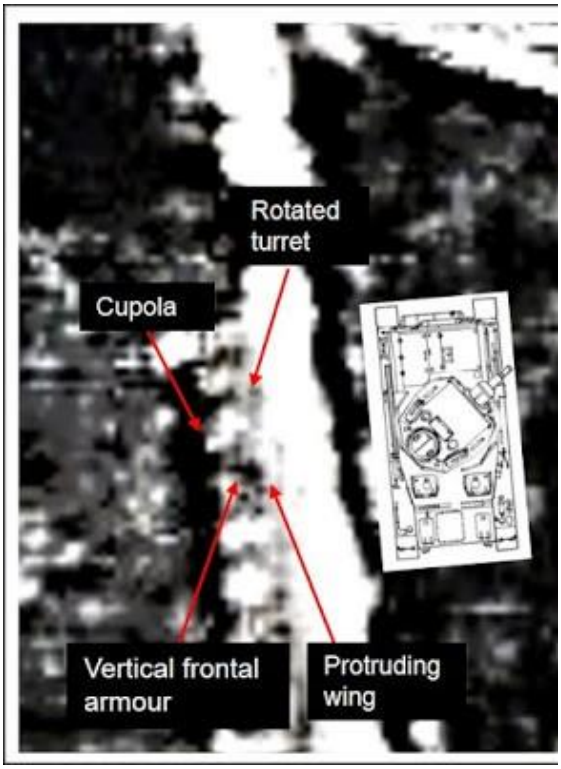
Panzer IV maintenance with turret rotated.

The Air Ministry's wartime guidance 'for Officers concerned with the Examination and Interpretation of Air Photographs' provided some useful assistance, noting that tanks could be differentiated from motor transport first 'By their appearance (presence of turret shadow, tank suspension or other feature) on large-scale photographs or by their dimensions. In comparison with its length, the width of a tank is considerable, the length-width ratio being less than 2.5 and usually about 2.0. Motor transport vehicles, with few exceptions, have ratios in excess of 2.5.' The second difference was that 'The tracks made by tanks are very prominent and have characteristic turning marks which are not smooth like motor transport turning circles.'[116] In addition, the War Office's Air Recognition Manual drew attention to certain specific features of the Panzer III and IV that appeared in vertical imagery. For the Panzer III, these included the 'turret set slightly forward'. For the Panzer IV, the attention of interpreters was drawn to the 'cupola at extreme rear and centre of the turret, which is set midway' and 'wings protruding beyond main body'. [117] Further relevant information from the Air Ministry guidance concerned the appearance of German forward supply dumps, which has already been described.[118]



Panzer III identification based on turret, gun and rear hatch detail.



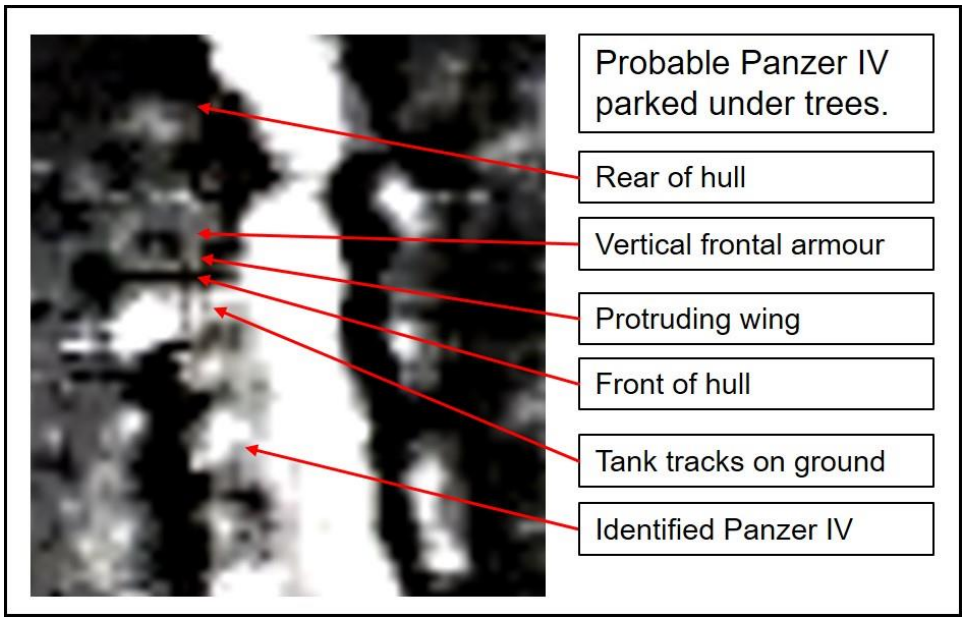


Panzer IV identifying features.

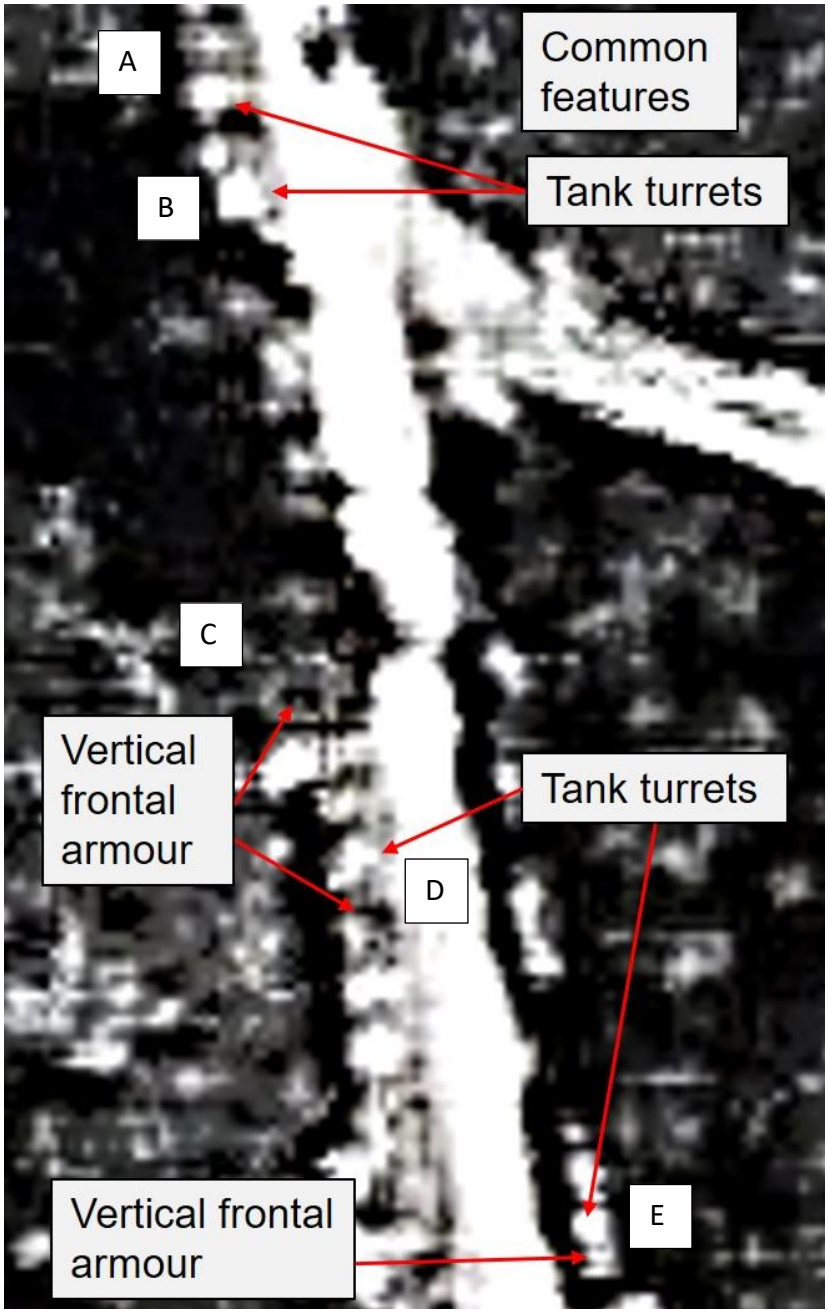
The most obvious approach available to study the appearance of the tanks involved digital enlargement and enhancement of the imagery to the maximum extent, accepting some pixelation. The objects in the photograph could then be compared with further relevant imagery from the wartime period, drawing on the Air Ministry and War Office guidance.

Via this means, it was possible to define the basic rectangular outline of tank hulls, such items as tank turrets and upright frontal armour – a particularly distinctive feature of the Panzer III and IV – and the Panzer IV 'wings protruding beyond main body'. In addition, while light reflection obscured some smaller objects, it revealed others in extraordinary detail. The 'certain' identification of the Panzer III stemmed not only from

the visibility of its turret and gun and the forward position of the turret (relative to the Panzer IV), but also from the symmetrical pattern of rear hatch fittings on top of the hull. The 'probable' Panzer IV parked under the trees left the markings of a tank track on the ground, perfectly aligned with the wing of the stationary vehicle. Beyond this, the length-width ratios of the three most visible tanks measured between 1.8 and 2.0 (exact measurement was impossible because of the amount of tree cover and shadow).

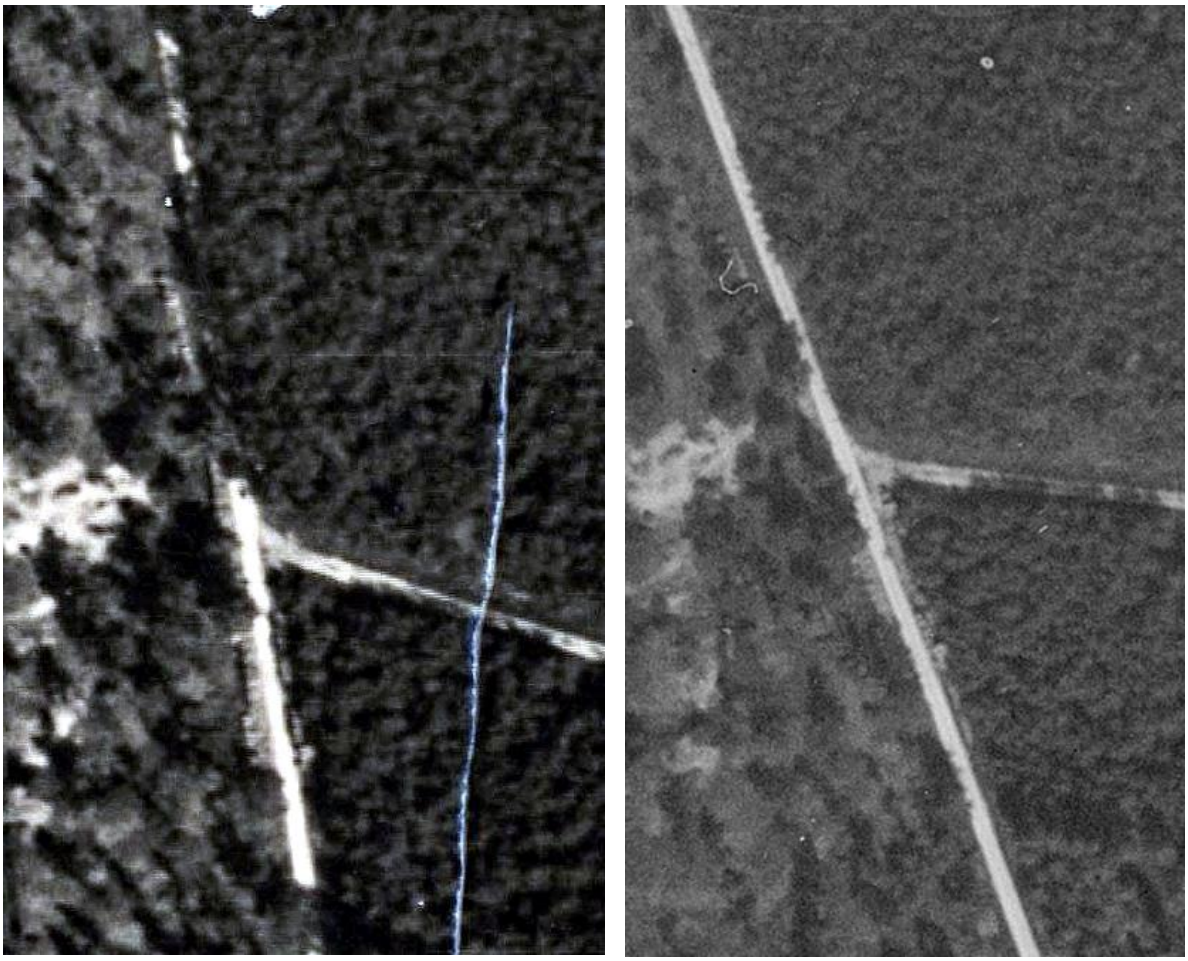


No less revealing were the common features of the various objects in the photograph. Given the limited resolution available, a single speculative tank turret identification might reasonably have been called into question. However, at least four turrets are visible, and vertical frontal armour can be seen in at least three cases. Relative to one another, these features were also positioned in accordance with the general layout of Panzer IIIs and IVs. The rear hatches of the 'certain' Panzer III (labelled 'A' below) are located behind the turret. The front of the hull of the 'probable' Panzer IV under the trees (labelled 'C') is positioned in front of the vertical frontal armour. This tank, and the 'certain' Panzer IV (labelled 'D'), clearly display the correct relative positioning of the frontal armour and the protruding wing.



The turret of the ‘certain’ Panzer IV (‘D’) is correctly positioned in the middle of the hull, well behind the frontal armour, just as the cupola is correctly positioned at the back of the turret. The ‘probable’ Panzer III on the other side of the track (‘E’) displays first the hull front, then the upright armour, then the turret, replicating the layout of the three Panzer IIIs shown earlier in this section (p. 76). Additionally, the measurable distance from the vertical frontal armour to the rear of the hull was identical for tanks C and D, supporting the identification of tank ‘C’ as a Panzer IV or a derivative incorporating the Panzer IV’s hull.

Another technique repeatedly recommended in the wartime literature is now known as change detection. A comparison of photographs taken at the same location on different dates will often reveal information that might not otherwise be apparent in a single image. It was not essential to employ change detection to analyse the 12 September imagery as the German armoured column was relatively easy to spot. However, it seemed possible that this approach might assist in the identification of the German formation and provide clues about their subsequent activities.



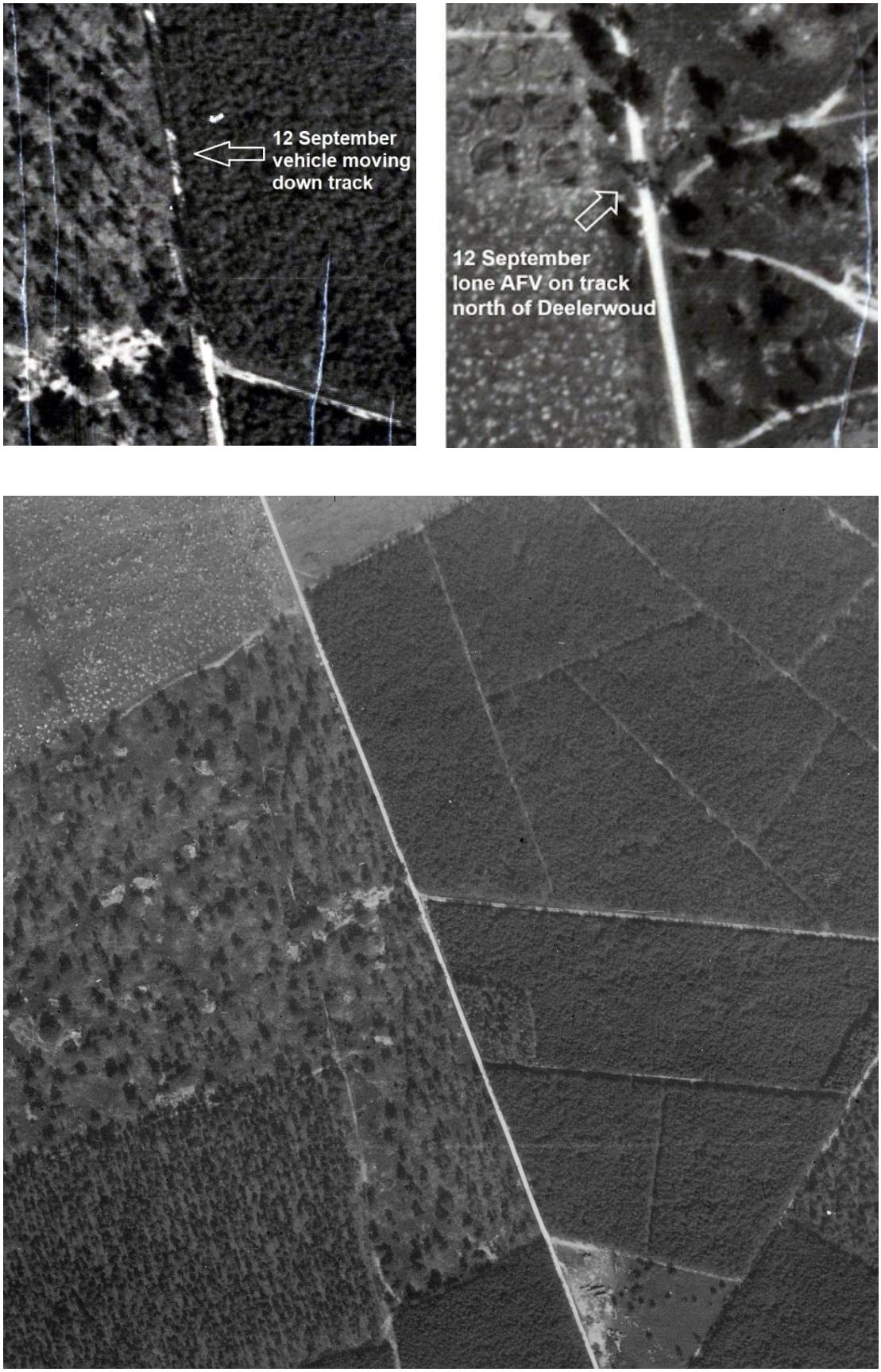
Left, the 12 September image clearly shows the armoured column; on the right, the 19 September image shows scarring from parked vehicles.

A further reason for using change detection was that there were obvious similarities between low-resolution images of our area of interest captured on 12 and 19 September – two days after Market Garden was launched. Indeed, apart from the presence of the supply dumps in the later photograph, it appeared that there might still

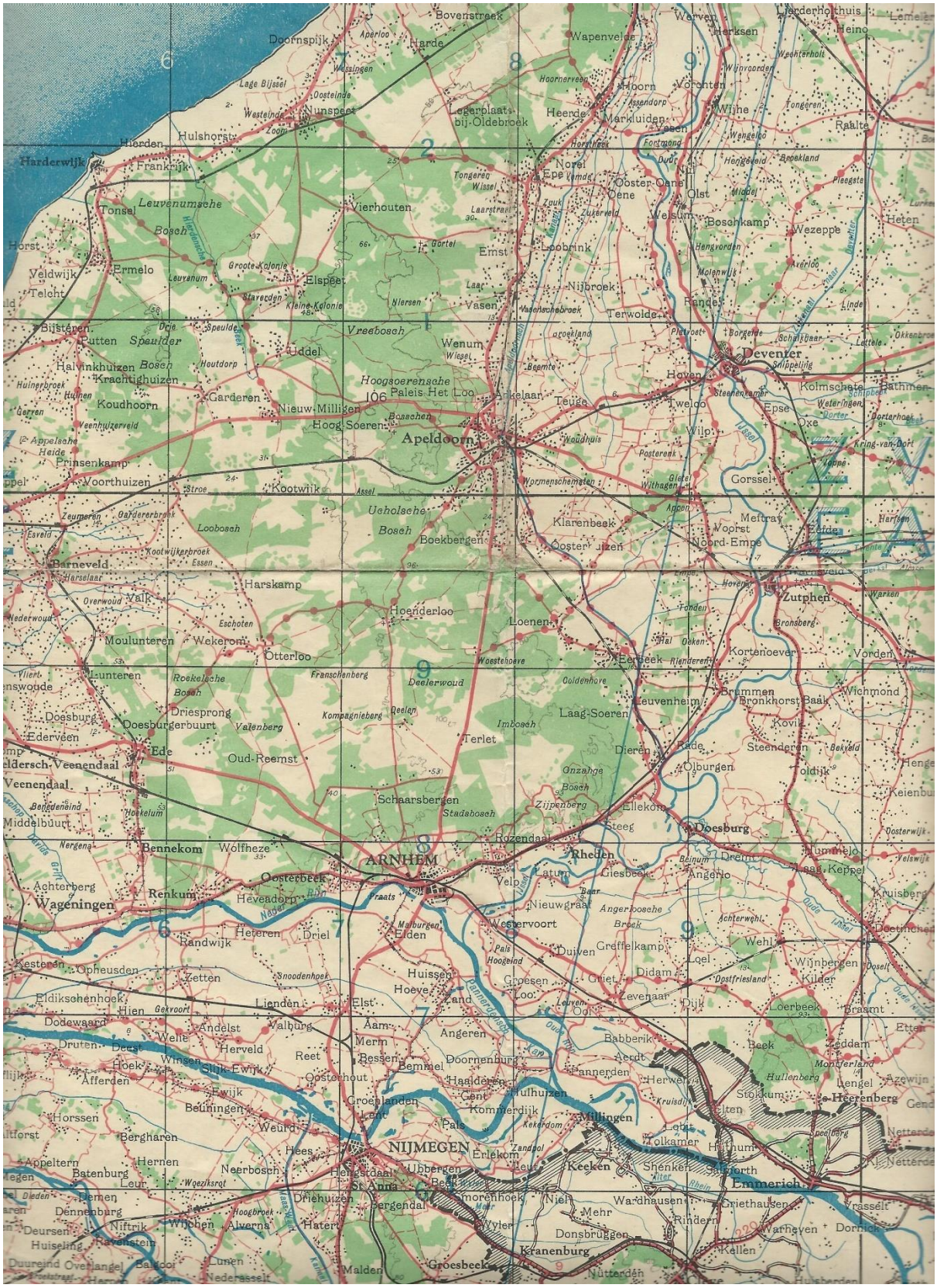
be objects of some kind in the exact areas where the tanks were parked. Yet it is most unlikely that a German armoured column would have remained stationary in the Deelerwoud for such a significant length of time – especially after the Allied airborne assault began.

Analysis of high-resolution photographs taken on both dates fortunately settled the issue. The objects visible along the woodland track on 12 September were three-dimensional in character. They clearly projected upwards towards the airborne camera, and the effect was magnified by the extensive shadows that each vehicle generated. Numerous objects in the photograph were also obviously symmetrical. There were multiple straight lines, parallel lines and right-angles. By contrast, except where the supply dumps are concerned, these features were completely absent from the 19 September photos. The only feature visible in the parking area on the 19th is scarring left on the ground by parked (and often tracked) vehicles, which probably stopped there regularly to refuel. No vehicle shadows are visible on the 19th, only tree shadows.

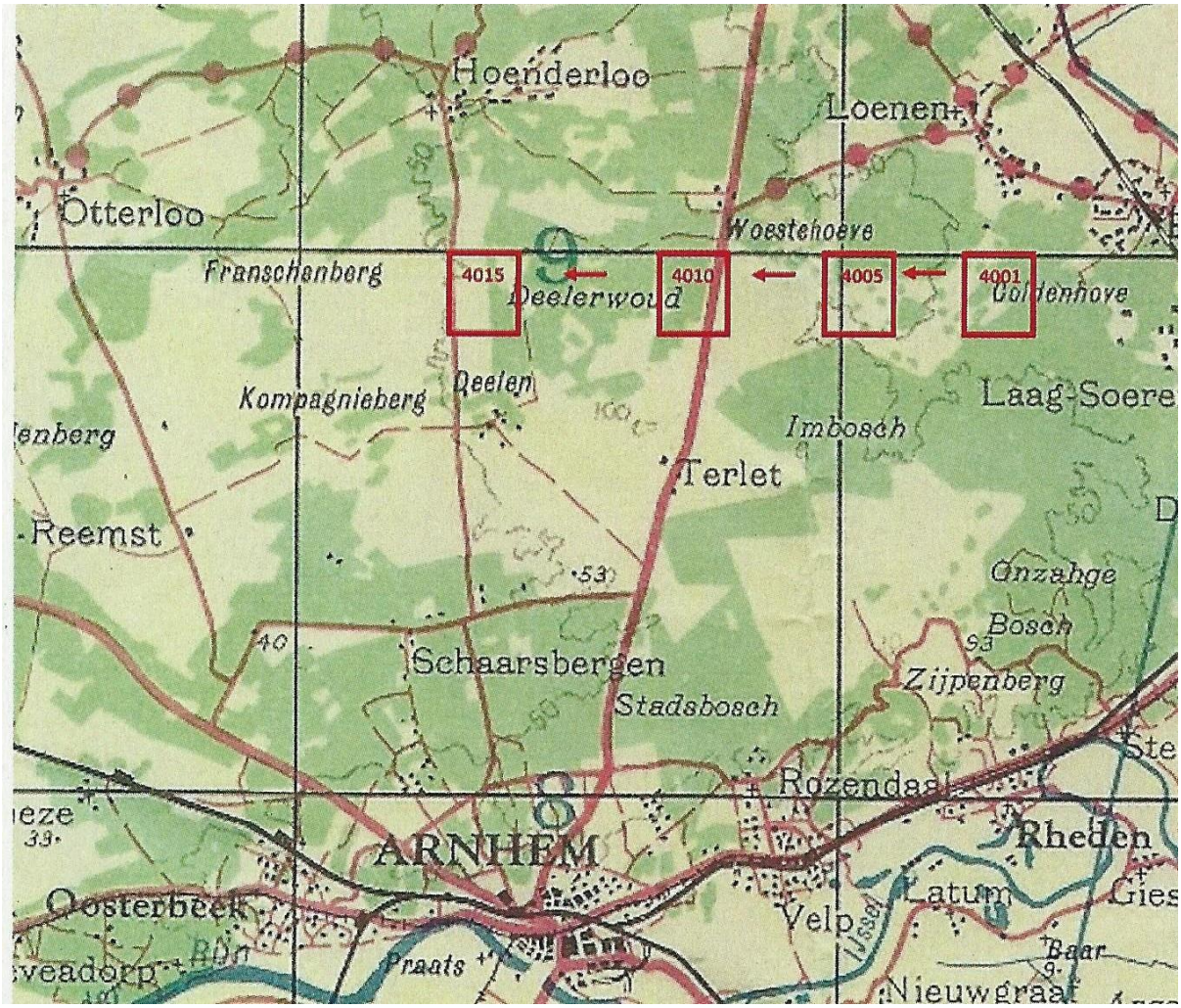
The other important change was that the 12 September imagery showed several vehicles moving down the track through the Deelerwoud, whereas no vehicles were in evidence on the track on the 19th. Thus, the use of change detection reinforced the impression that the armoured unit photographed on 12 September only paused temporarily in the Deelerwoud to refuel and to service and crew up the vehicles that had been parked at the track intersection for several days. Then they deployed south. Their deployment and subsequent appearance at Son align chronologically with the order issued to the Hermann Goering Training and Replacement Regiment on the 11th. Moreover, it was only at Son that Allied forces encountered the same mix of older Panzer IIIs and IVs previously observed in the Deelerwoud.



On 19 September, the track through the Deelerwoud was empty.



Period map of the area covered by 106G/2816 on 12 September 1944.



Approximate plot of the first 15 frames of 106G/2816, 12 September 1944.

Notes

1. Stephen Ambrose, *D-Day: June 6 1944, The Battle for the Normandy Beaches* (Pocket Books, London, 2002), p. 517.

2. FH Hinsley, EE Thomas, CAG Simkins and CFG Ransom, *British Intelligence in the Second World War: Its Influence on Strategy and Operations*, Vol. 3, Pt. 2, (Her Majesty's Stationary Office, London, 1988), pp. 382-386; William Buckingham, *Arnhem 1944* (Tempus, Stroud, 2004), pp. 76-77, 95; Cornelius Ryan, *A Bridge Too Far* (Wordsworth Editions, Ware, 1999), pp. 85-87, 109-110; Richard Lamb, *Montgomery in Europe 1943-1945: Success or Failure?* (Buchan & Enright, London, 1983), pp. 215, 222, 225-6; Geoffrey Powell, *The Devil's Birthday* (Leo Cooper, London, 1984), pp. 40-48; Peter Harclerode, *Arnhem: A Tragedy of Errors* (Caxton Editions, London, 2000), pp. 30-45; Martin Middlebrook, *Arnhem 1944: The Airborne Battle, 17-26 September* (Penguin, London, 1995), pp. 64-67; Harold Deutch, 'Commanding Generals and the Uses of Intelligence,' in Michael Handel (ed.), *Leaders and Intelligence* (Frank Cass, London, 1989), pp. 245-246.

3. Sebastian Ritchie, *Arnhem – Myth and Reality: Airborne Warfare, Air Power and the Failure of Operation Market Garden* (Robert Hale, London, 2011), pp. 89-104, 112-115.

4. Robert Kershaw, *It Never Snow in September: The German View of Operation Market Garden and the Battle of Arnhem, September 1944* (Ian Allen, Hersham, 2004), pp. 16, 28, 38, 78.

5. *Airborne Operations: A German Appraisal*, Office of the Chief of Military History, Department of the Army (US Army Foreign Military Studies Series, 1950), pp. 54-55.

6. Kershaw, *It Never Snows in September*, pp. 108-112, 119-120.

7. Powell, *The Devil's Birthday*, pp. 43-44.

8. *Daily Telegraph* obituary, June 1995.

9. Nigel Hamilton, *Monty: The Battles of Field Marshal Bernard Montgomery* (Hodder & Stoughton, London, 1944), pp. 428-429; Chester Wilmot, *The Struggle for Europe* (Reprint Society, London, 1954), pp. 528-529.

10. UK National Archives (TNA) WO 219/605, Annex 1a to Field Order 3 for Operation Linnet, G2 estimate of enemy situation, 30 August 1944. Operation Linnet was one of the many airborne operations proposed and then cancelled in the summer of 1944.

11. TNA WO 285/3, Second Army Intelligence Summary, 1 September 1944.

12. TNA WO 285/3, Second Army Intelligence Summary, 2 September 1944.

13. Kershaw, *It Never Snows in September*, pp. 11-13.

14. TNA WO 285/3, Second Army Intelligence Summary, 3 September 1944.

15. Kershaw, *It Never Snows in September*, p. 38.

16. TNA DEFE 3/221, XL 9188, 5 September 1944.

17. TNA DEFE 3/221, XL 9245, 6 September 1944.

18. TNA WO 285/3, Second Army Intelligence Summary, 6 September 1944; WO 171/341, XXX Corps intelligence summary, 7 September 1944; WO 171/393, 1st Airborne Division Planning Intelligence Summary, 7 September 1944.

19. TNA WO 285/3, Second Army Intelligence Summary, 9 September 1944.

20. TNA WO 171/393, 1st Airborne Division Planning Intelligence Summary, 6 September 1944.

21. TNA WO 171/393, 1st Airborne Division Planning Intelligence Summary, 7 September 1944.

22. TNA WO 171/393, 1st Airborne Division Intelligence Summary, 8 September 1944.

23. Karel Margry (ed.), *Operation Market Garden Then and Now*, Vol. 1 (Battle of Britain International, London, 2002), p. 82.

24. TNA WO 285/9, Dempsey diary, 9 and 10 September 1944.

25. Margry, *Operation Market Garden Then and Now*, Vol. 1, p. 82.

26. TNA WO 219/1924, SHAEF intelligence summary, 16 September 1944. Several histories have assumed that this intelligence arrived at about the time this summary was issued. However, the SHAEF document was prepared weekly and covered intelligence received over a seven-day period.

27. Major General RE Urquhart, *Arnhem* (Pan, London, 1958), pp. 19-21.

28. TNA WO 171/132, 21st Army Group Intelligence Summary, 12 September 1944.

29. TNA AIR 37/1217, Headquarters Troop Carrier Forces, US Army Air Forces, Field Order No. 4 for Operation Market, 13 September 1944.

30. TNA AIR 37/1217, Information from Northern Group of Armies, Second Army and XXX Corps, as at 1100 hrs, by Lieutenant Colonel A Tasker, G-2, First Allied Airborne Army, 12 September 1944.

31. TNA WO 219/5137, 1 Parachute Brigade Intelligence Summary, 13 September 1944.

32. TNA AIR 37/1217, Operation Market, 1st Airborne Division Planning Intelligence Summary, 14 September 1944.

33. TNA CAB 106/1133, Netherlands Military Attaché to Lieutenant Colonel GW Harris, Cabinet Office Historical Section, 30 March 1953.

34. CB Macdonald, *The Siegfried Line Campaign* (Office of the Chief of Military History, Washington, 1965), p. 122.

35. TNA WO 171/132, 21st Army Group Intelligence Review, 18 September 1944.

36. Lamb, *Montgomery in Europe*, p. 225. Williams told Lamb that 2 SS Panzer Corps 'had refitted, so they were stronger than I expected'.

37. Field Marshal the Viscount Montgomery of Alamein, *Memoirs* (Collins, London, 1958), p. 297.

38. Kershaw, *It Never Snows in September*, pp. 38-43; Buckingham, *Arnhem*, pp. 52, 101-102.

39. Kershaw, *It Never Snows in September*, p. 41.

40. Ritchie, *Arnhem – Myth and Reality*, pp. 217-219.

41. Air Historical Branch (AHB), *The Liberation of Northwest Europe, Vol IV, The Breakout and the Advance to the Lower Rhine*, 12 June to 30 September 1944, p. 147, https://www.raf.mod.uk/what-we-do/our-history/air-historical-branch/second-world-war-campaign-narratives/liberation-of-north-west-europe-vol-iv-the-breakout-and-advance-to-the-lower-rhine-12-jun-30-sep-1944/ (accessed 28 November 2024).

42. AHB, *Photographic Reconnaissance*, Vol. 2, p. 51, https://www.raf.mod.uk/what-we-do/our-history/air-historical-branch/second-world-war-thematic-studies/photographic-reconnaissance-vol-ii-may-1941-august-1945/ (accessed 28 November 2024).

43. 'Thirty-Four Wing: An Unofficial Account' (unpublished wing history, AHB copy), pp. 44; Jimmy Taylor, '16 Squadron's Participation in Operation Market Garden, September 1944, Pt. 2', *16 Squadron 1939-1945 Newsbrief Extra*, May 2001, pp. 42-44 (AHB copy). The detachment was commanded by Wing Commander CFH 'Sandy' Webb, DFC, who captured the landing zone and Arnhem bridge imagery.

44. TNA AIR 27/2013, 541 Squadron F.540, September 1944.

45. TNA AIR 27/2013, 541 Squadron F.540, 6 September 1944. The three mission numbers were 106G/2676 (Arnhem), 2677 (Nijmegen) and 2678 (Grave).

46. TNA AIR 34/136, Interpretation Report BS 945, 19 September 1944.

47. 106 Group objectives in this period are in TNA AIR 29/355, AIR 29/356, AIR 29/357, AIR 29/358, 106 Group daily information summaries, 6-16 September 1944.

48. Christopher Hibbert, *The Battle of Arnhem* (Batsford, London, 1962), p. 38; Ryan, *A Bridge Too Far*, pp. 85-87, 109-110.

49. Cornelius Ryan collection, Ohio University, box 108, folder 06, interview with Brian Urquart, 24 January 1967.

50. Brian Urquhart, *A Life in Peace and War* (Harper & Row, New York, 1987), pp. 71- 72.

51. Middlebrook, *Arnhem 1944*, p. 65.

52. TNA CAB 106/1133, Lathbury to Harris, 5 April 1954.

53. TNA WO 171/393, 1st Airborne Division Planning Intelligence Summary, 7 September 1944.

54. 'Photographic Reconnaissance and Photographic Intelligence, 1939-1944', *Evidence in Camera*, Annex to Vol. VIII, 7 August 1944 to 5 March 1945, pp. 12-15 (AHB copy).

55. TNA AIR 27/2013, 541 Squadron F.540, August 1944.

56. 35 Reconnaissance Wing, Second TAF, *Air Recce* (unpublished and undated official report, AHB copy), pp. 17-18.

57. AHB, *Air Ministry Intelligence*, Pt. 2, Chapter 5, para 11-14, https://www.raf.mod.uk/what-we-do/our-history/air-historical-branch/second-world-war-thematic-studies/air-ministry-intelligence-narrative/ (accessed 28 November 2024).

58. Statement based on TNA AIR 29/355, AIR 29/356, AIR 29/357, AIR 29/358, 106 Group daily information summaries, 6-16 September 1944. Sometimes, 20-inch lens cameras were also used to capture high-altitude vertical imagery during the V-2 hunt.

59. TNA AIR 37/1217, Operation Market, 1st Airborne Division Planning Intelligence Summary, 14 September 1944.

60. TNA AIR 27/20, 2 Squadron F.540, September 1944, reference 35/16/31. It has not been possible to establish the identity of this armoured unit.

61. http://www.pegasusarchive.org/arnhem/tony_hibbert.htm (accessed 2 July 2015).

62. http://www.wageningenur.nl/en/article/About-the-RAF-aerial-photographs-1943-1947.htm (accessed 2 July 2015).

63. TNA AIR 27/2013, 541 Squadron F.540, September 1944.

64. Kershaw, *It Never Snows in September*, pp. 134, 178-183.

65. https://www.apeldoornendeoorlog.nl/oorlogskroniek#toc-1944-tweede-helft--2 (accessed 30 October 2024), Hardonk entry, 8 September 1944.

66. Oberst Fritz Fullriede diary, Cornelius Ryan collection, Ohio University, box 128, folder 2, 8 and 10 September 1944; see also http://www.defendingarnhem.com/Worrowskibtl.htm (accessed 2 July 2015); http://www.maparchive.ru/division/part15/Fallschirm-PanzerDivision%20Hermann%20Goering.pdf (accessed 2 July, 2015); TNA WO 219/5137, 1 Parachute Brigade Intelligence Summary, 13 September 1944.

67. Fullriede diary, 11 September 1944.

68. Margry, *Operation Market Garden Then and Now*, Vol. 1, p. 117.

69. Lawrence Paterson, *Fallschirm Panzer Division 'Hermann Göring': A History of the Luftwaffe's Only Armoured Division, 1933-1945* (Greenhill, London, 2021), p. 209; https://panzerworld.com/german-armor-allocation-1944 (accessed 31 October 2024). Formation of the division's 1st Battalion with Panthers and concentration of modern Panzer IVs (with long-barrelled guns) in the 2nd Battalion could well have made more obsolescent models available for the training regiment. I am grateful to David Castrey for sharing with me his work on the Hermann Göring Parachute

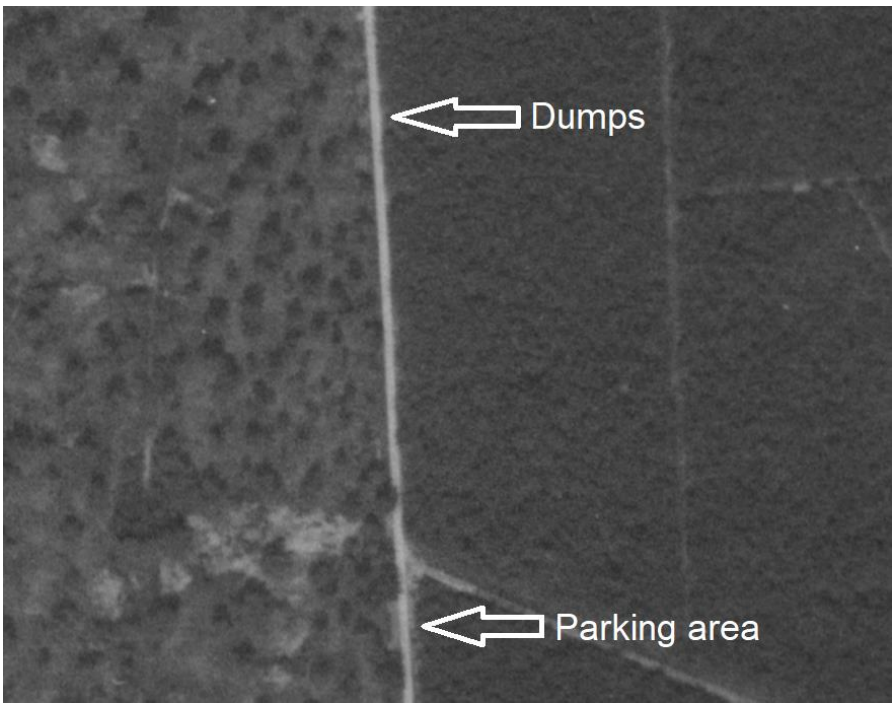
Panzer Training and Replacement Regiment in the Netherlands. Rail movement of armoured vehicles between Utrecht and Arnhem on 12 September 1944 is recorded in 83 Group Intelligence Summary 89, 13 September 1944 (AHB copy); see also TNA AIR 27/1134, 181 Squadron F.540, September 1944: '1 loco and 40 plus trucks were found, having the appearance of being loaded with tanks, AFVs or MET.'

70. It is doubtful that such tanks as escaped from Hechtel would have been withdrawn to Arnhem, only to be deployed south again to Son on 12 September. The tanks sent to Son may just have been those photographed in the Deelerwoud, or the regiment may have gathered all its surviving AFVs from the north and south at Son.

71. TNA WO 219/5137, 1 Parachute Brigade Intelligence Summary, 13 September 1944.

72. Lawrence Wright, *The Wooden Sword: The Untold Story of the Gliders of World War II* (Elek, London, 1967), pp. 225-226.

73. The site of the dumps is visible in frames from mission US7/3038, 17 August 1944. The site was not in use, but the stacks had left clear imprints on the ground:



74. *Illustrated Handbook for RAF Intelligence Officers concerned with Examination of Air Photographs*, Air Ministry Manual SD 439, July 1943, Part 4, p. 6, Section C (AHB copy).

75. Luftwaffe Airfields folder, Sheet 7, Deelen Airfield, 10 September 1942 (AHB copy). Such an arrangement would probably have been easier to establish between two Luftwaffe entities than between the Luftwaffe and the Wehrmacht.

76. Major Leslie A Grayham, 'Maintaining momentum through refuel on the move', *Army Sustainment Magazine,* January-February 2016, https://www.army.mil/article/159656/maintaining_momentum_through_refuel_on_the_move (accessed 3 November 2024).

77. AHB, *Air Ministry Intelligence*, Pt. 2, Chapter 5, paras 19-22.

78. TNA AIR 29/356, Information Summary 1173, 13 September 1944, a resumé of information received up to 2359 hrs on 12 September 1944.

79. TNA AIR 27/2028, 544 Squadron F.540, September 1944.

80. National Collection of Aerial Photography (NCAP), Overlay 24891, covering mission 106G/2830, 12 September 1944. The letter is marked in pale ink above the number 2 in 4023. Further research is needed to establish how much intelligence the Allies had previously collected on German armoured training in the Deelerwoud.

81. NCAP, 106G/2872, 13 September 1944, frame 4153.

82. NCAP, 106G/2929, 16 September 1944, frame 3313.

83. Kershaw, *It Never Snows in September*, pp. 134, 178-183.

84. AD Harvey, *Arnhem* (Cassell, London, 2001), p. 35.

85. Kershaw, *It Never Snows in September*, pp. 128-131, 304-306.

86. Arthur Northwood Jr. and Leonard Rapport, *Rendezvous with Destiny: A History of the 101st Airborne Division* (Konecky & Konecky, Old Saybrook, CT, 1948), p. 283.

87. George Koskimaki, *Hell's Highway: Chronicle of the 101st Airborne Division in the Holland Campaign, September-November 1944* (Casemate, Havertown Pennsylvania, 2003), pp. 167-168.

88. Ibid., p. 31.

89. Koskimaki, *Hell's Highway*, p. 34.

90. Stephen Badsey, *Operation 'Market Garden'* (Osprey, London, 1993), p. 41; Margry, *Operation Market Garden Then and Now*, Vol. 1, pp. 110, 117, Vol. 2, p. 499; Fullriede Diary, 17, 19 and 20 September 1944.

91. General Sir John Hackett, 'Operation Market Garden,' in MRD Foot (ed), *Holland at War Against Hitler: Anglo-Dutch Relations, 1940-1945* (Frank Cass, London, 1990), p. 164.

92. TNA WO 171/393, 1st Airborne Division Planning Intelligence Summary, 7 September 1944.

93. Wright, *The Wooden Sword* p. 226; AHB, *The Liberation of North West Europe Vol. 4, The Breakout and the Advance to the Lower Rhine*, 12 June to 30 September 1944, p. 169, note 1.

94. Hollinghurst papers, Royal Air Force Museum, AC 73/23/49, comments on AHB monograph on the history of the airborne forces, p. 2.

95. Ibid., p. 3.

96. TNA WO 171/393, 1st Airborne Division Planning Intelligence Summary, 6 September 1944.

97. WO 171/341, XXX Corps intelligence summary, 7 September 1944.

98. The assertion that the flak guns were removed appears in Harclerode, *Arnhem*, pp. 64-65, and is based on imagery gathered by a 541 Squadron Spitfire on 6 September – presumably the same aircraft that photographed the Deelerwoud; for

the correction see TNA WO 219/4997, HQ First Allied Airborne Army, Flak Estimate, Operation Market, prepared by Major TJ Lowe, 12 September 1944.

99. Hollinghurst papers, AC 73/23/49, comments on AHB monograph on the history of the airborne forces, p. 2.

100. TNA AIR 37/1217, Operation Market, 1st Airborne Division Planning Intelligence Summary, 14 September 1944.

101. War Diary of Luftflotte 3, September 1944, entry of 5 September 1944, https://www.raf.mod.uk/what-we-do/our-history/air-historical-branch/ahb-translations-from-captured-german-documents/war-diary-of-luftflotte-3-western-front-september-1944/ (accessed 28 November 2024).

102. 1st Airborne Division Report on Operation Market, 10 January 1945 (AHB copy).

103. TNA WO 219/5137, 1 Parachute Brigade Intelligence Summary, 13 September 1944.

104. TNA WO 171/376, Appendix A, Captured Order for Defence of the Rhine Crossings, 15 September 1944.

105. TNA AIR 37/1217, Operation Market, 1st Airborne Division Planning Intelligence Summary, 14 September 1944.

106. TNA AIR 29/355, Interpretation Report 6841, 6 September 1944, photographs taken on 5 September 1944.

107. TNA AIR 29/356, Interpretation Report 6865, 12 September 1944, photographs taken on 10 September 1944.

108. TNA AIR 29/356, Interpretation Report 6869, 12 September 1944, photographs taken on 11 September 1944.

109. Margry, *Operation Market Garden Then and Now*, Vol. 1, pp. 72-73.

110. Ritchie, *Arnhem - Myth and Reality*, pp. 132-134.

111. Margry, *Operation Market-Garden Then and Now*, p. 81.

112. TNA AIR 27/20, 2 Squadron F.540, September 1944, reference 35/16/31.

113. AHB, Air Ministry Intelligence, Pt 2, Chapter 5, paras 19-22.

114. TNA AIR 29/356, Information Summary 1173, 13 September 1944, a resumé of information received up to 2359 hrs on 12 September 1944.

115. NCAP, Overlay 24891, covering mission 106G/2830, 12 September 1944.

116. *Illustrated Handbook for RAF Intelligence Officers concerned with Examination of Air Photographs*, Part 4, p. 7, Section E.

117. *Recognition of Military Equipment from Air Photographs* (Short Title - Air Recognition Manual), War Office, undated (AHB copy), PZ KW III, PZ KW IV.

118. *Illustrated Handbook for RAF Intelligence Officers concerned with Examination of Air Photographs*, Part 4, p. 6, Section C.