

Learning to Fly: The Royal Flying Corps and the Development of Air Power

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ABSTRACT

The history of Britain's air services in the First World War has long been coloured by a fascination with fighter 'aces'. Although scholarship over the last 20 years has challenged this perception, the work of the Royal Flying Corps and the Royal Air Force is still often seen through the lens of air fighting. While the struggle for control of the air was of great importance, it arose from the need to ensure freedom of action for those supporting troops on the ground. This article examines how the support roles – reconnaissance, artillery observation and attack – developed within the RFC, and their interaction with the contest for air superiority. It highlights the growing importance of aircraft to British operations between 1914-1918, how air power was integrated into the land battle and the uneven way lessons were learned and implemented as the RFC and RAF developed into a highly effective force.

Even though the United Kingdom has made use of aircraft for military purposes for over a century, much of the early history of the nation's air services has been coloured by an unhelpful combination of myth, hyperbole and inaccurate iconography. Although the key purpose of British military aviation during the Great War was as a supporting and enabling arm, the precise role and function of aircraft during the conflict has been obscured. This, in turn, has created a situation where despite an increase in the breadth and depth of understanding of the air services in the latter years of the 20th Century, comprehension of what the air services did, and how and why, is lacking. Their development is often treated in a somewhat cursory manner in many histories of the war, and the integral part of aviation to operations on the Western Front is often understated. The aircraft of the time could not hope to be a decisive element on the battlefield, but the roles they performed were critical to the ultimate success of the British Expeditionary Force (BEF). This article seeks to analyse the development of military aviation in Britain during the First World War, and to illustrate the way in which the Royal Flying Corps (RFC) transformed aircraft from interesting machines

which were thought to perhaps have some potential use on operations into a critical element in the prosecution of modern war.¹

The reason for this lacuna in popular understanding of the development of air power results from the longstanding interest in combat between aircraft, and particularly those who flew fighter aircraft. Those who achieved success were swiftly labelled as 'aces', and much of the historiography of aerial warfare between 1914 and 1918 is dominated by consideration of air fighting as a result.²

The stories of the 'aces' provided a ready source of literature which has been consumed eagerly by readers ever since the First World War itself, although in the British context, there was an initial reluctance to talk about the individuals involved. This could not survive pressure from the media, and by the middle of 1916, the press was talking enthusiastically about the leading British fighter pilot, Lieutenant Albert Ball. He loathed the attention, disguising himself to walk through his home town when on leave.³ Ball's death on 7 May 1917 caused public dismay, but the media soon found another hero, in the leading British 'ace' of the day, James McCudden. He was persuaded - against his better judgement - that he should record his experiences of

¹ This article employs the term 'military aviation' in the traditional use of the word 'military' to cover the work with the British Army of the Royal Flying Corps (RFC) and, from 1 April 1918, the successor organisation the Royal Air Force (RAF), which emerged from the combination of the RFC and the Royal Naval Air Service (RNAS). For a consideration of the RNAS, see David Jordan, 'Royal Navy concepts of air power in the maritime environment 1900–1918', in Greg Kennedy (ed.), *Britain's War at Sea: 1914-1918: The war they thought and the war they fought* (Abingdon: Routledge, 2016), pp. 183-203; Eric Grove, 'Sailors or Airmen: The Early Days of British Naval Flying' and the same author's 'Air Force, Fleet Air Arm or Armoured Corps?' in Tim Benbow, *British Naval Aviation: The First 100 Years* (Abingdon: Ashgate, 2011), pp. 7-56; S. W. Roskill, *Documents Relating to the Naval Air Service, Volume 1 1908-1918* (London: Naval Records Society, 1969). The term 'British' is used as convenient shorthand for all those Empire and Dominion forces which participated during the war.

² The term 'ace' is now generally applied to those pilots credited with the destruction of five or more enemy aircraft. This conceptual precision was lacking during the First World War, and the RFC never really accepted the notion at all. The difficulty in confirming successes, unwitting over-claiming by pilots and a lack of clarity as to what constituted a victory (the destruction or downing of the enemy aircraft? Or simply forcing the pilot to break off the fight, 'driven down out of control?') means that accuracy over the 'kill' tallies of most 'aces' remains difficult to achieve.

³ See Ball's biography in *The Oxford Dictionary of National Biography*. Article available at: <https://doi.org/10.1093/ref:odnb/30562>. Accessed 21 September 2017.

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combat. The resultant memoir, *Five Years in the Royal Flying Corps*, is perhaps instructive of the dichotomy at the heart of the attitude of most 'aces'.⁴ McCudden felt that his peers would regard the book as nothing more than his showing off and set about his task with little enthusiasm, realising that it would bring him more publicity – publicity which he hated as much as Ball had done.⁵ McCudden's untimely death in a flying accident in July 1918, shortly after he, too, had been awarded the Victoria Cross did not have the deleterious effect on public morale that the death of the leading enemy 'ace', Manfred von Richthofen, had upon the German public three months previously.⁶

Any hopes that the achievements of the aviators might soon be seen in their correct context were scuppered even before McCudden's death, with no less a figure than the Prime Minister, David Lloyd George referring to pilots (taken, naturally to be *fighter* pilots) as the 'cavalry of the clouds', men who were 'the knighthood of this War, without fear and without reproach'.⁷ The use of 'without fear and without reproach' was a direct translation (literally and figuratively) of the concept 'sans peur et sans reproche', a description of knightly honour applied to Pierre Terrail, Seigneur de Bayard, who died in battle in 1524 with a reputation as a gallant man of courage and virtue. While the reality of air combat in the First World War had little that was chivalric about it, this iconography of some form of honourable combat far above the muddy, sanguinary battlefields below did little to enhance understanding of what air power was about; if anything, it helped to create a myth which endures to this day.⁸

In the aftermath of the war, a variety of memoirs and popular accounts of military aviation appeared, but these offered a relatively narrow view of events which did little to shake the image, even though many authors attempted to offer a corrective. Captain Alan Bott, for example, took Lloyd George's hyperbole and used it as the ironic title for his book, in which he lamented: He even went so far as to make clear why, in part, he was writing the work, lamenting:

⁴ James McCudden, *Five Years in the Royal Flying Corps* (London: 1919).

⁵ Christopher Cole, *McCudden VC* (London: William Kimber, 1967), pp. 173-174.

⁶ See, for example, Herbert Sulzbach, *With the German Guns: Four Years on the Western Front* (1935: Barnsley: Pen and Sword, 2012), pp. 118, p. 142 and pp. 164-166 for examples of Richthofen's fame and reputation and the effect on morale resulting from his death.

⁷ David Lloyd George, *The Parliamentary Record (Hansard), Volume 98, Column 1247.*

⁸ Also see Michael Paris. 'The Rise of the Airman: the Origins of Air Force Elitism c.1880-1918', *Journal of Contemporary History*, Vol. 28, No.1 (Jan 1993), pp. 123-141.

Of the part played by machines in this war of machinery, the wider public has but a vague knowledge... Of aerial observation, the main *raison d'être* of flying at the front they own to nebulous ideas.⁹

To complete the failure of wider understanding of the development of British air power and the way in which those engaged in fighting the first war in the air developed doctrine (although they did not term it as such at the time), tactics and procedures, the fascination with air combat was often superficial, or became bogged down in knowledge of the aircraft that had been flown during the war, rather than the way in which they were used or, more importantly, *why* they had been used in a particular manner.¹⁰

The first attempt to capture an overall view of Britain's first air war was found in the official history, commissioned by Sir Hugh Trenchard, the Chief of the Air Staff, and fighting to retain the RAF as a separate service in the austere fiscal conditions after the end of the war. He felt that it was vital that the story of the air service was captured in a literary and stylish manner, and engaged Sir Walter Raleigh, sometime Regius Professor of English at the University of Edinburgh, and then the Merton Professor of English Literature at Oxford, for the task. Unfortunately, his research culminated a visit to RAF units in the Middle East, where he contracted typhoid and died with but one volume of his work completed. Trenchard sought to persuade T. E. Lawrence ('of Arabia') to take over, but he declined, and after several other abortive attempts to find a 'big name' the task was passed to Raleigh's research assistant, H.A. Jones. Jones was a former RFC and RAF officer, but while his technical knowledge surpassed that of Raleigh, his literary tone was less potent. Trenchard's biographer lamented that Jones turned the history of the air services during the war into a work with the 'consistency of a suet pudding'.¹¹ In truth, his account was more to the point and less prone to the flights of rhetoric in Raleigh's only contribution to a six-volume account of the air services.¹² The issue was not so much the flair with which the story was told, but the manner in which Jones laid out the volumes; rather than addressing key themes such as home defence, army cooperation and maritime aviation in a clear order, the Official History careers around in the manner of an ill-flown aeroplane, making the journey rather more arduous than it should be. The lack of theme certainly helped to

⁹ 'Contact' (Alan Bott), *Cavalry of the Clouds* (London: Doubleday, 1918), p. vii.

¹⁰ James Pugh, *The Royal Flying Corps, The Western Front and Control of the Air, 1914-1918* (Abingdon: Routledge, 2017).

¹¹ Andrew Boyle, *Trenchard: Man of Vision* (London: Collins, 1962), p. 514.

¹² Sir Walter Raleigh and H.A. Jones, *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force*, 6 volumes, plus one volume of appendices, (Oxford: Clarendon Press, 1922-37).

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obscure the fact that the RAF and its predecessors had been most successful in supporting surface forces, a fact which played into the hands of those who wished to argue that the third service was a wartime aberration, created for political purposes and diverted from its true role, subordinate to the army and navy, but it does not help provide a clear narrative.

Before historians had the opportunity to take the key facts to be found in Jones' efforts and turn them into crisper prose, the Second World War had begun, and interest in the first air war ebbed away. While popular accounts, memoirs and works of fiction (most obviously Captain W. E. Johns' hero Biggles) remained popular, little effort was expended in casting a critical eye upon the RFC, RNAS and finally the RAF during the war.

Much of what had been achieved was therefore overlooked. History moved on to the clearer-cut results of the Second World War, and the Battle of Britain and the bomber offensive against Germany provided a ready source of material for historians and biographers in the years after 1945. The fascination with the aircraft involved in combat moved away from the First World War to the Second global conflict, and in due course, the historiography of air power became dominated by what had transpired between 1939 and 1945.¹³ Efforts to correct this imbalance began in the 1980s and have continued to this day with an ever-growing corpus of literature.¹⁴ Yet, despite this increase in work which places the work of the air services in a more accurate context,

¹³ Tami Davis Biddle, 'Learning in Real Time: The Development and Implementation of Air Power in the First World War', in Sebastian Cox and Peter Gray, *Air Power History: Turning Points from Kitty Hawk to Kosovo* (Abingdon: Frank Cass, 2002), p. 3.

¹⁴ See, *inter alia*, SF Wise, *Canadian Airmen and the First World War: The Official History of the Royal Canadian Air Force, Volume 1* (Toronto: University of Toronto Press, 1980); Denis Winter, *The First of the Few* (London: Allen Lane, 1982); Malcolm Cooper, *The Birth of Independent Air Power: British Air Policy in the First World War* (London: Allen & Unwin, 1986); Lee Kennet, *The First Air War, 1914-1918* (New York: The Free Press, 1991); John H Morrow Jr, *The Great War in the Air: Military Aviation from 1909-1921* (Washington: Smithsonian Institution Press, 1993); ER Hooton, *War Over the Trenches: Air Power and the Western Front Campaigns 1916-1918* (Hinkley: Midland Publishing, 2009); Michael Molkenntin, *Fire in the Sky: The Australian Flying Corps in the First World War* (Crow's Nest, NSW: Allen & Unwin, 2010) and *Australia and the War in the Air: Volume 1 - The Centenary History of Australia and the Great War* (Oxford: OUP, 2014); Peter Dye, *The Bridge to Airpower: Logistics Support for Royal Flying Corps Operations on the Western Front, 1914-18* (Annapolis: Naval Institute Press, 2015) and Pugh, *The Royal Flying Corps, the Western Front and the Control of the Air, 1914-1918*.

the dominance of the 'traditional' image of the first air war still persists in popular perception.¹⁵ Thus, although the situation is improving, it means that it is still legitimate to examine the question of what the British air services achieved as they sought to develop air power from little more than an array of speculative theories and postulations into a credible war-fighting weapon.

The first, and most obvious challenge facing both the Britain's air services in 1914 was the fact that they had no experience of using heavier-than-air craft in support of operations, and a relatively small amount of knowledge gleaned from exercises prior to the outbreak of war. These exercises demonstrated that the British Army, contrary to a popular perception which arose as part of the general 'debunking' of the competence of British generals, understood that aircraft could be of utility in a future war. This awareness had predated the formation of the RFC and even its precursor organisation the Air Battalion of the Royal Engineers. In 1907, Brigadier-General David Henderson used the second edition of his book *The Art of Reconnaissance* to observe that the recent invention of the aeroplane might offer opportunities to enhance the extent of reconnaissance that might be conducted by armies,

... should an effective method be devised of controlling the movements of dirigible balloons or aeroplanes, the possibilities of aerial reconnaissance will... be infinitely extended.¹⁶

Henderson was regarded as perhaps the leading expert on reconnaissance in the British Army, and his comments were particularly prescient. His book was of sufficient interest to see it updated twice before the outbreak of the First World War. By the time the third edition of the work appeared in 1914, Henderson had become the Director of Military Aeronautics – and *de facto* commander of the RFC. The third

¹⁵ The fourth episode of the comedy series *Blackadder Goes Forth*, 'Private Plane' (BBC, 1989), seems to have been taken by the British public as an obviously-exaggerated (and, in the character of Squadron Commander Flasheart, hilarious) but not-too-extreme portrayal of the first air war, while the only film seen on a fairly regular basis on television has been *Aces High*, with a focus on air fighting. Commemoration of the centenary of the First World War has seen wider media efforts to address this, with the BBC's webpage 'How did World War I's Battle in the Skies Change Warfare?' Article available at: <http://www.bbc.co.uk/guides/zgxp4> (accessed 19 October 2017) and the Corporation's documentary *The First World War From Above* (2010) serving as two illustrations of attempts to broaden popular understanding of the air war.

¹⁶ Brigadier-General David Henderson, *The Art of Reconnaissance* (London: John Murray, 1907), pp. 11-12.

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edition added a ninth chapter to the work, addressing aerial reconnaissance in more detail. Henderson noted:

The advent of the dirigible and the aeroplane has undoubtedly introduced a new factor into reconnaissance... what the final effect may be is not yet known, for the art of flying is only beginning to develop; aerial reconnaissance has not yet been seriously tried in war, and theories based on peace experience are not quite trustworthy.¹⁷

Practical experience of the possible value of aerial reconnaissance had come even before the creation of the RFC in 1912. Aeroplanes had seen some use in exercises, beginning with the Army Manoeuvres of 1910. Captain Bertram Dickson and Lieutenant Lancelot Gibbs had attempted to conduct observation using an aircraft, but the weather conditions were poor, and their efforts were largely abortive. Attempts at using aeroplanes in the Indian Army's manoeuvres later in the year went more smoothly, and although the relative contribution of aircraft to the exercise was small, enough was done to impress a number of observers that aerial observation had potential in the future.¹⁸ Those looking on included the Chief of the General Staff in India, Lieutenant-General Sir Douglas Haig. Haig returned to Britain to become GOC Aldershot Command in 1912, and later that year, took his command on the annual manoeuvres against Lieutenant-General Sir James Grierson's Eastern Command. Grierson had number 3 Squadron, RFC at his disposal, and was keen to make use of their aircraft. The tenor of much of the reporting of the 1912 manoeuvres lends itself to a degree of levity, with Grierson supposedly asking in ignorance whether the 'aeroplanes could do anything' when informed that his cavalry units could not be expected to obtain any useful information about Haig's dispositions for some time.¹⁹

This is something of a misrepresentation, since Grierson's query, while perhaps casual in nature, was not that of an ignorant general, but one of a man hoping for the positive answer he received. Number 3 Squadron's commanding officer, Major Robert Brooke-Popham, assured Grierson that his aircraft would be able to assist, and by 9.00am the following morning, Grierson's aviators had provided him with a detailed description of the location of all of Haig's troops. Grierson ensured that he had a regular supply of information from the air and was able to defeat Haig in short order. Grierson wryly

¹⁷ Brigadier-General David Henderson, *The Art of Reconnaissance* 3rd Edition (London: John Murray, 1914), p. 168.

¹⁸ Ralph Barker, *The Royal Flying Corps in France: From Mons to the Somme* (London: Constable, 1994), p. 10.

¹⁹ Raleigh, *The War in the Air, Volume I* (Oxford: Clarendon Press, 1922), p. 243.

observed 'the aeroplanes completely spoilt the war'.²⁰ Again, the stereotype of the 'blimpish' British general might suggest that Grierson had missed the point, but he had not; his lightly-expressed contention was that aerial reconnaissance had changed the way in which commanders needed to think about conducting operations.²¹ He would soon be proven correct.

The RFC went to France at the outbreak of war with just four squadrons and 63 aircraft, amidst a general belief that the war was likely to be a short one. The eagerness to serve was exemplified by David Henderson, recently designated as the GOC of the RFC, who took it upon himself to take command in the field, even though Lieutenant-Colonel Frederick Sykes was meant to be the man in command. Sykes, whose relationship with Trenchard was sufficiently poor enough to see him all but written out of *The War in the Air*, was a man of considerable vision when it came to thinking about the use of air power.²² He was also rather put out to discover that Henderson had, in effect, taken his command away from him – but nowhere near as irritated as Trenchard was to be left at home, charged with looking after training at the Central Flying School.²³ What Trenchard did not – indeed, could not – appreciate at that time was that the small pool of unreliable aircraft he now presided over, a third of the RFC's strength in 1914 – would be replaced by many more, leading to an air force over which he would preside just four years later. As a sign of the expansion of the air service, Trenchard found himself commanding a three-squadron strong Wing in France in March 1915, and by September, he was the GOC of the RFC in France.²⁴ Although the RFC had more than doubled in size by this point, the RFC's main duty, based upon pre-war experience, remained reconnaissance, although other roles had started to emerge.

²⁰ Sir Robert Thompson, *The Royal Flying Corps* (London: Leo Cooper, 1968), p. 31.

²¹ David Jordan & Gary Sheffield, 'The British Army and Air Power,' in Peter W Gray and Sebastian Cox (eds), *British Air Power* (TSO, 2003), pp. 67-89; Andrew Whitmarsh, 'British Army Manoeuvres and the Development of Military Aviation, 1910–1913', *War in History* Vol. 14, No. 3 (2007). Grierson did not live to see his analysis be proven true; the designated commander of the BEF's II Corps, he died of a heart attack on 17 August 1914.

²² See below; also Eric Ash, *Sir Frederick Sykes and the Air Revolution* (Abingdon: Frank Cass, 1999).

²³ David Jordan, 'The Battle for the Skies: Sir Hugh Trenchard', in Matthew Hughes and Matthew Seligmann (eds.) *Leadership in Conflict* (Barnsley: Pen & Sword, 2000), pp. 70-71.

²⁴ Henderson had returned to control air matters at the War Office, while Sykes had been sent to assist the Admiralty's operations at Gallipoli. As the senior airman in France, Trenchard took over the RFC almost by default.

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The speed of the German advance in the early days of the war meant that headquarters formations were invariably aware of the location of the enemy from other sources by the time reports from aircraft reached them, but the utility of aircraft would soon become apparent, even from unpromising beginnings. The first reconnaissance sortie on 19 August 1914 saw two aircraft despatched with the task of locating the forward elements of the Belgian army and advancing German cavalry units become separated and then lost. The pilots, Gilbert Mapplebeck and Philip Joubert de la Ferte, discovered that the large scale maps with which they had been issued were inadequately detailed for use over unfamiliar territory.²⁵ While familiar landmarks below such as railways, roads and rivers could always be used to aid pilots flying training sorties at home, this did not apply at the front where there had been little chance to become familiar with landmarks which might help a pilot 'temporarily uncertain of his position'. Mapplebeck had a smaller scale map with him and worked out where he was, only to go on to see very little of interest. As well as the inadequacy of his maps, the weather had militated against his efforts, with cloud obscuring the ground for much of the flight.²⁶

Joubert ran into similar problems. He lost his way in cloud and spent two hours navigating using his compass and watch in the hope that he might see something through a break in the undercast. He found Tournai and landed in a field, asking passing locals if they had seen the Belgian forces he had been sent to find. No-one had, so armed with this information, Joubert returned home, hampered again by cloud, although he was able to identify that roadblocks had been set up in several locations, suggesting the recent presence of the troops he had been sent out to locate.²⁷

This unpromising start was soon forgotten, as information brought back on successive days increased the confidence of both aircrew and those receiving the information they brought back. An increasing amount of detail was returned, and on 22 August, a reconnaissance conducted by Captain Lionel Charlton and Lieutenant Vivian Wadham not only discovered German troops, but could find no trace of the French forces who were meant to be protecting the flank of the BEF. While Wadham manoeuvred the aircraft to avoid the heavy ground fire directed at them, Charlton took to lobbing a few hand grenades at their assailants before shooting at them with a rifle.²⁸

²⁵ The National Archives (hereafter TNA) Air 1/749/204/3/76, 'Reconnaissance report by Lieutenant Mapplebeck'.

²⁶ Ibid.

²⁷ TNA Air 1/749/204/3/76, 'Reconnaissance Report by Lieutenant Joubert.

²⁸ TNA Air 1/749/204/3/76, 'Reconnaissance Report by Lieutenant Wadham and Captain Charlton'.

A follow-up sortie was conducted, also failing to find any trace of the French. It became clear to the BEF's commander, General Sir John French, that his allies had departed from their position without telling him; although he was beginning to have his suspicions that this might have been the case from reports from elsewhere, the inability of the RFC to find Allied troops where they ought to be convinced French that it was time to fall back so that his flank might be made secure. This helped increase French's confidence in the work of his airmen. While mistakes were still made – instances where inexperienced crews, unfamiliar with the appearance of objects when viewed from the air, returned with alarming reports of enemy troops in locations where they ought not to be, with the 'troops' turning out to be mundane items such as gravestones and patches of fresh asphalt on roads, this did not dent the pre-war view that aircraft would be of considerable value.²⁹ Sorties in support of Sir Horace Smith-Dorrien's II Corps, while limited in the information gathered because of the confused fighting on the ground, were thought to have been of some utility to decision-making which enabled Smith-Dorrien to check the Germans at Le Cateau, before conducting a fighting withdrawal. By the start of September, the reconnaissance efforts of the RFC were drawing considerable praise from their French allies, who signalled the BEF to offer thanks for 'very reliable reports from British airmen', while the French commander Marshal Joffre felt moved to commend:

The precision, exactitude and regularity of the news brought in by them... evidence of their perfect organisation and also of the perfect training of pilots and observers.³⁰

While Joffre's praise for the organisation, and particularly the training, was dramatically overstated, it confirmed that aerial reconnaissance had an important part to play. With the Battle of the Marne won by the hard-pressed allies, the war entered the last phases of manoeuvre with the 'race to the sea', and as winter began, the war had settled down into a stalemate of static lines.

This had two effects upon the RFC. The first was that it made its aircraft the key means of obtaining information about enemy dispositions beyond the front line; the second that the control and guidance of artillery would be of great importance.

There had already been some success in the latter field, with messages of praise from a variety of army commanders reaching the ears of Sir John French before 1914 had ended. This had been based on some experimentation carried out by Number 3

²⁹ Raleigh, *The War in the Air, I*, p. 303.

³⁰ Mead, *Eye in the Air*, 55; Raleigh, *The War in the Air, I*, p. 335.

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Squadron, RFC, prior to the war, in which a number of difficulties had been identified, most notably in communicating with the artillery batteries, as well as demonstrating the potential for cooperation, even allowing for the relatively small number of trial sorties which could be conducted.³¹ It appeared that communication with the batteries might be eventuated through the means of wireless telegraphy, but this was still in its early stages when war broke out. The Royal Navy had taken the lead in developing wireless telegraphy (WT) in part because of the weight of the WT sets, which made the first ones too heavy for carriage in the aeroplanes of the day.³² Lighter sets appeared just in time for limited use as 1914 concluded, but their weight was still great enough to require the pilot to fly the aircraft, conduct the observation and operate the wireless. The greatest difficulty lay in the absence of wireless-equipped machines and a lack of standardisation in the direction of fire.³³

Using maps proved to be of little use, but experimentation led to the adoption of the 'Clock Code'. Lieutenants Bron James and Donald Lewis divided the issue maps (already, in many cases, an improvement on those which had caused difficulties on the first reconnaissance) into squares, so that both the pilot and the artillery battery he was supporting could be sure that they were talking about a target in the same grid square. A clear overlay upon which concentric circles were printed could then be placed over the map. The circles represented ten, 25, 50 and 100 to 500-yard radii from the target, the target's position on the map being placed in the centre of the circle, and then transmitted to the battery via WT. The battery would fire upon the target, with the pilot sending back corrections where needed, advising where the shells were landing using a combination of the position of the shell-burst as though the target were the centre of a clock, and the distance away – thus a shell landing at 12 o'clock was falling directly north of the target, while once it was within the 10-yard ring on the overlay, the target was – at the very least – being badly shaken by the shell burst.³⁴

³¹ TNA, Air 1/742/204/2/43. No. 3 Sqn RFC Report on experiments in observation of artillery fire from aeroplanes, 1913.

³² TNA, Air 1/733/178/1, Lecture on Wireless Telegraphy by Captain Raymond Fitzmaurice RN, 1913[?]. The file is dated 1913, but the contents suggest that the document therein is almost certainly an updated version of a lecture first given in that year and possibly sent in amended form to assist the Air Historical Branch in the writing of the Official History.

³³ See, for example, TNA, Air 1/751/204/4/8, Reconnaissance Orders, 1 October 1914–30 November 1914 for an illustration of the scarcity of wireless-equipped aircraft.

³⁴ TNA, Air 1/524/16/12/21. Pamphlet 'Co-operation of Aeroplanes with artillery' (undated, but Dec 1914).

The system took time to perfect, particularly since it was necessary to train newly-arrived artillery officers in the technique, and because there was a lack of standardisation in the exact implementation of the basic principles, which was to cause some confusion in time as RFC squadrons began working with new artillery batteries when one or both units had moved from elsewhere on the front, only to discover that there were differences in the signals used, or the technique. For example, the imaginary '12 hand' was not fixed as always being due north to begin with. This meant that it was possible for the aircraft crew to take '12 o'clock' as always being directly ahead of them, while the battery assumed that it was north of the target. Thus, the battery would assume that a shell had landed north of the target, while the aircraft, flying in a westerly direction, wondered why the shell had landed at three o'clock. The introduction of pamphlets to standardise the techniques and signals helped to alleviate this difficulty.³⁵ By the time of the Neuve Chappelle offensive in 1915, the impressive performance of artillery observation aircraft was widely recognised, although Lieutenant General Sir Douglas Haig, commanding First Army in that battle, was famously called upon to tell a few of his recalcitrant artillerymen whose scepticism had led them to ignore direction from supporting aircraft that he would not tolerate 'early Victorian methods'.³⁶

These methods looked even more out of date when the developments in reconnaissance were considered alongside artillery observation. The limitations of the human eye in seeing vital information and then recording it while in flight when compared to the benefits of being able to study a photograph in detail had been understood prior to the war. Unfortunately, the cameras available were not suited for operation at altitude, and funding to develop a practical aerial camera had not been available.³⁷ From 1915, the RFC sought to develop a photographic reconnaissance capability. This began by the informal tasking of those aircrew who owned a camera as squadron air photographers. A more formalised approach followed, notably in First Wing under Trenchard's command. He gathered together a small group of photographic enthusiasts and set them to work developing photographic reconnaissance techniques.³⁸ Two of the group, Lieutenants JTB Moore-Brabazon and Charles Campbell, were sent back to England to create a purpose-built aircraft camera. The resultant – if unimaginatively-named – 'Type A' Camera was relatively primitive

³⁵ Ibid.

³⁶ RAF Museum Hendon, Trenchard Papers, MFC 76/1/61 Draft autobiographical notes.

³⁷ Air 1/2395/255/1 3 Squadron notes on aerial photography by C. C. Darley; Air 1/724/91/6/1, History of Air Photography, Lt Col J.T.B. Moore-Brabazon.

³⁸ Air 1/2393/240/2. Notes on first steps in air photography on the Western Front by Wg Cdr W. S. Douglas 23 Sept 1925; Air 1/724/91/6/1, History of Air Photography.

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but was a considerable improvement on what had gone before. While they were at work, delivering the new camera in February 1915, another of the group, Captain Charles Darley, was instrumental in photographing the German positions around Neuve Chappelle. This enabled the offensive there in March to be planned with the aid of knowledge of the enemy's second line positions.³⁹ Again, the hand of Haig can be seen in this development, as Moore-Brabazon later complained that until then the staff were reluctant to accept photographs handed to them by airmen, and that when the RFC published a guide as to how to interpret photographs, this caused dispute, as such activity was the responsibility of the intelligence section, not the air service.⁴⁰ It appears that commanders stamped on this squabbling with alacrity and decreed that this was a matter for the RFC. The notion that the army could do without aerial photographs being regarded as ridiculous within a very short space of time

The importance of the camera was driven home during 1916. The performance of observers during the course of the year was variable, not least since so many were inexperienced and their training was still rudimentary, a situation which would not be rectified until early 1917. Thus, on the first day of the battle of the Somme, the RFC's performance was the source of some disappointment, with inaccurate reports being submitted, or information not being gathered at all.⁴¹ This meant that deriving information from photographs, which was almost as swift a process as reading a report from an observer, became ever-more important. To meet increased demand for photographs, improvements in photographic interpretation training were introduced, along with better cameras.⁴² The greatest challenge came from a shortage of optical glass, which was initially solved by the expedient of asking the public to donate any items they might have which contained such glass, and then recycling captured German optical glass during the summer and autumn of 1916.⁴³ This was vital, since the demand for photographs increased dramatically. By the end of that year, 542,453 photographs had been printed; by the end of 1917, that had risen to 3,925,169 and at least 5,884,826

³⁹ Air 1/724/91/2, Photography in the RAF, Lt Col J.T.B. Moore-Brabazon.

⁴⁰ *The Journal of the Royal Aeronautical Society*, Vol. 69, No. 1, (1965).

⁴¹ SF Wise, *Canadian Airmen and the First World War: The Official History of the Royal Canadian Air Force, Part I* (Toronto: University of Toronto Press, 1980, p. 372.

⁴² Air 1/724/91/2, Photography in the RAF, Lt Col J.T.B. Moore-Brabazon; Air 1/539/16/14/2, Notes on Practice Photography, December 1915.

⁴³ *Board of Trade Journal and Commercial Gazette*, Volume CIV (January-June 1920), p. 252; Roy and Kay MacLeod 'War and Economic Development: government and the optical industry in Britain, 1914-1918', in J.M. Winter (ed.) *War and Economic Development: Essays in Memory of David Joslin* (Cambridge: Cambridge University Press, 1975), p. 175.

in 1918, with 600,000 of the latter appearing in the last six weeks of the war.⁴⁴ Conversely, the use of aircraft to track the progress of advancing troops by use of Contact Patrols did not develop as clearly. While the situation in 1918 was better than before, the problem that it was difficult to locate troops who were often unable or unwilling to signify their position to the aircraft trying to find them remained. While the Contact Patrol provided useful detail for commanders lacking any means of voice communication with their forward units, information gathered from these sorties could be frustrating in its imprecision.

The same could not be said of the development of artillery cooperation by 1918, as it had evolved from the early experimentation by the likes of James and Lewis into a well-organised and highly effective system which was critical to the success of the Royal Artillery's domination of the battlefield. The process had not been easy. While it is not unfair to suggest that by 1916 the RFC's artillery observation was effective in limited actions, the Battle of the Somme was an unhappy experience, just as had been the case with battlefield observation.⁴⁵ The RFC and artillery proved to be less well-prepared than they had hoped. On 1 July 1916, Cecil Lewis, a pilot with 3 Squadron, carried out several frustrating sorties, later noting in his log:

Many active enemy batteries seen, and though all information was wirelessly to [our reporting station], our batteries did not reply on the co-ordinates given... there must be a colossal lack of organisation somewhere.⁴⁶

Elsewhere, aircrew were frustrated by the failure of the guns to respond to them, and it became clear that both gunners and aircrew were not always cooperating well on enough occasions for this to be a concern rather than simply the inevitable isolated problems which could be expected to occur.⁴⁷ This was driven home in the aftermath of the battle, where Generals Sir Henry Rawlinson (GOC, Fourth Army) and General Sir Henry Horne (GOC, First Army) offered their observations about the Battle. While both men were appreciative of the work of the RFC, Rawlinson going so far as to write a note of appreciation to Trenchard, during the Battle, they were both concerned

⁴⁴ TNA Air 1/724/91/6/1, History of Air Photography.

⁴⁵ David Jordan, 'The Army Cooperation Missions of the Royal Flying Corps/Royal Air Force, 1914-18', PhD Thesis, University of Birmingham, 1997, p. 173.

⁴⁶ Cecil Lewis, *Sagittarius Rising* (1936; London: Heinemann/Peter Davies, 1985), p. 104.

⁴⁷ See, for example, Wise, *Canadian Airmen*, 369: TNA AIR 1/734/204/1/10, Daily Record Book Number 2 Squadron RFC, July 1916.

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about artillery observation.⁴⁸ In separate reports to GHQ in late 1916, they both made clear their firm belief that artillery was vital to success on the battlefield, and that aerial observation was a key part of this – but that the level of cooperation and observation was not adequate. Rawlinson noted that aerial observation was ‘skilled work of a very high order’ and that suitably-qualified men were in short supply. He was also troubled by the fact that there did not appear to be enough aircraft and crew for the work required and hinted at a lack of success as the result of a failure to standardise procedures.⁴⁹

Horne was even more direct:

...We have not had the best value from observers from either aeroplane or kite balloon, and I attribute this in great measure to want of knowledge and skill of the observer. Many of the officers who conduct artillery fire from the air have had no training as artillery officers. We have begun at the wrong end... we have taken an airman and expected him, with little or no artillery training to conduct artillery fire to our satisfaction. He has done wonders under the circumstances but not enough.⁵⁰

Both generals proposed that the answer to the problems might be found in transferring the responsibility for the RFC’s artillery work to the Royal Artillery. Trenchard found himself arguing that this was not the simple answer it appeared to be, not least since artillery observation was just part of the work of the army cooperation squadrons. Any transfer of squadrons would require the artillery to take on this work – thus diluting the effect Rawlinson and Horne were seeking – or an expansion of the RFC which was simply not possible given the levels of aircraft production at the time.⁵¹ Trenchard supported the point that even greater cooperation was required but was very clear as to where the blame lay. While RFC squadrons remained assigned to the same Army Corps for a significant period, the artillery batteries in those Corps would transfer to different Corps, or new batteries would arrive on strength without making the necessary links to their supporting RFC squadrons.

⁴⁸ TNA Air 1/153/15/120/1, Messages of Appreciation of work of the R.F.C. in the field from Allied officers, etc. Part I; Rawlinson to Trenchard, 18 September 1916.

⁴⁹ PRO Air 1/524/16/12/26, Co-operation between Aircraft and Artillery, Rawlinson to GHQ 30 October 1916.

⁵⁰ Ibid, Horne to GHA, 13 November 1916.

⁵¹ Ibid, Trenchard response to Rawlinson and Horne, undated.

The result was that the standardisation which the RFC and artillery had been working towards in 1915 was still not entirely complete, and this had caused some of the confusion which had arisen during the battle.⁵² Also, Trenchard complained, some of the batteries had asked the RFC squadrons to set a programme of work for their shoots. This was inappropriate, as the RFC squadrons took direction from higher formations. The RFC supported the plans of the higher formation – be that Brigade, Division, Corps or Army - which were based upon intelligence and their wider knowledge of what was happening at the front which a squadron simply could not possess. Although Trenchard was able to note that there were clear problems within the artillery organisation, he could not avoid the subtext to the criticism, namely a lack of training. Fortunately, he could report that the training organisation in the United Kingdom had been significantly overhauled in recent months, and while the majority of aircrew who had participated in the Battle of the Somme had not benefitted from this development, the difference would soon be seen.⁵³ Trenchard was, in fact, not happy with the training programme which had been introduced, believing that it was not extensive enough, so it was further expanded in early 1917. By the Spring, aircrew took various courses to ensure that the quality of observation was improved, and the overall level of cooperation between the guns and their supporting aircraft was enhanced.⁵⁴ Training pamphlets were produced for dissemination both at home and in France, laying down standardised procedures. Although increased losses during 'Bloody April' meant that the effects were not felt as quickly as Trenchard might have hoped, the improvement in quality was noticed by the middle of the year, in time for the Third Battle of Ypres. The effect was further enhanced by the introduction of new technology in the form of sound ranging and flash spotting. This allowed for the location of enemy guns even when bad weather precluded aerial reconnaissance, with 75 percent of German positions being located through these methods by June 1917.⁵⁵ Coupled with better-trained aircrew and the regaining of control of the air during the summer, this meant that the level of artillery cooperation achieved finally reached that which had been aspired to as early as winter 1914. By the summer of 1918, the combination of air reconnaissance, flash spotting and sound ranging were at a level which enabled almost all German artillery positions to be located prior to the start of

⁵² Ibid.

⁵³ Ibid, also Jordan, 'Army Cooperation Missions', pp. 55-60.

⁵⁴ Philip Brereton Townsend, *Eye in the Sky 1918: Recollections of Air-to-Ground Cooperation by a W.W.I Pilot* (Croydon: E Hallett & Co., 1986), pp. 5-11; TNA Air 1/733/183/1, Brief history of RFC Wireless.

⁵⁵ Paddy Griffith, *Battle Tactics of the Western Front: The British Army's Art of Attack 1916-1918* (London: Yale University Press, 1994), pp. 153-54; Shelford Bidwell and Dominick Graham, *Firepower: The British Army and Theories of War, 1904-45* (London: Allen & Unwin, 1985), pp. 108-111.

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operations, so that they could be swiftly and accurately suppressed as the British troops went 'over the top'. RAF aircraft flew with relative impunity from German fighters to locate those few positions which had not been found prior to the opening of the attack and using the Counter Battery Staff Office (CBSO) as their reporting station, the information gathered was swiftly passed to an appropriate battery which would then engage the target. The domination of the battlefield was at last complete.

By the end of the war, then, the RAF had developed an extensive and highly effective photographic reconnaissance system, a far cry from the uncertain efforts of August 1914. Artillery cooperation, which had demonstrated its worth from the outset of the war, was conducted at a high pitch. There were, of course, constraints. The weather was a constant obstacle about which, of course, the air service could do nothing. While aircraft technology developed in due course so that flying in poor weather became almost a matter of routine, the airframes of the First World War were not suited to such operations. This meant that flying during the winter months was heavily curtailed, and even when flying was possible, reconnaissance was made difficult. Only when sound ranging and flash spotting appeared in 1917 was the lack of air observation mitigated, and even then, the direction and correction of fire during a battle remained in the hands of the airmen.

Another obvious challenge came in the form of enemy fighter aircraft, which could be mitigated. This mitigation evolved throughout the war and the cost of significant casualties. The threat had been recognised pre-war. In his report on the 1912 Manoeuvres, Grierson had summarised the challenges aircraft presented, and the need to counter them, arguing 'the first step in war will be to get rid of the hostile aircraft. He who does this first or who keeps the last aeroplane afloat will win, other things being approximately equal'.⁵⁶ This would become a critical, if indirect part of the RFC and RAF's role in supporting the BEF.

Although the initial skirmishes of the war between aircraft were inconclusive, it was not long before the first aerial combat resulting in the loss of an aircraft occurred, and it was a matter of weeks before the RFC began to consider how it might ensure that it could go about its business unmolested by enemy aircraft attempting to bring them down, while ensuring that the Germans' freedom of action was limited.

Both the British and French tended towards the offensive; this was entirely in keeping with broader military thought at the time, where offensive action was considered far superior to the defence. By 1915, with the war in France fought on static lines, the

⁵⁶ TNA, WO 279/47, 'Report on Army Manoeuvres', 1912.

advantage of attack over defence was less clear-cut in the eyes of many soldiers. A further complication had arisen for with the so-called 'Fokker scourge', in which a relatively mediocre aircraft, the Fokker Eindekker, had caused consternation because of being fitted with a fixed machine gun with interrupter gear, making it possible to fire the propeller. Pilots simply had to point the nose of their aircraft at the enemy, and allowing for deflection and range - not as easy as it may sound – then open fire on their opponent. Britain lagged behind in the development of interrupter gear and sought to provide similar firepower through 'pusher' fighters such as the DH2, where the engine's position to the rear meant that there was no propeller to fire through. Other expedients such as mounting a Lewis machine gun on the upper wing were adopted, but this was suboptimal thanks to the need for the pilot to reach above their head or even stand up to change the magazine on the weapon, or to clear stoppages. By the middle of 1916, the British would have their own fighters with interrupter gear, but the preceding 12 months demonstrated the technological battle between the two sides in attempting to gain air superiority, thus enabling army support operations to be conducted.

When the German assault at Verdun began in February 1916, the success of some German aircraft in getting past the French fighter force led to demands from the soldiers on the ground for more defensive patrols to protect them. The French air service thus changed emphasis towards the defence, but discovered that this made matters worse, since German aircraft which had previously been driven away were able to approach far more easily, and the skies above the French lines had more German aircraft in them than ever.

This lesson was not lost on Trenchard, now approaching a year in post as the commander of the RFC in France. Although the RFC had maintained an offensive approach throughout, Trenchard was determined to lay down a clear explanation for the policy of a continuous and vigorous air offensive. He did so in a memorandum on 22 September 1916, *Future Policy in the Air* in which he made clear that the only effective way of ensuring dominance over the enemy in the air was by 'attacking and continuing to attack'.⁵⁷

Trenchard's view of the matter was clear and consistent – aircraft could be used in defence, but this failed to recognise their limitations. Without early warning, it was impossible to guarantee defence against enemy aircraft. Standing patrols across the whole of the front were impracticable for the simple reason that they would require far more aircraft than would ever be likely to be available. Thus, Trenchard argued, the only sensible way of using aircraft was offensively. By dominating the enemy over

⁵⁷ RAF Museum, Trenchard Papers, MFC 76.

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their territory, they would be unable to send their reconnaissance and artillery cooperation machines over the lines to gather information or correct the fire of their guns. Trenchard took a maximalist view of the offensive – the further his fighters were behind the German lines, the better.

There were, though, several problems associated with this approach. The first was that it increased the risk to RFC pilots considerably. Any British aircraft which came down while over German-held territory, whether the result of enemy action or technical failure, took the crew with it. This ensured that the attrition rate amongst RFC fighter crews was consistently high, even when the RFC held the upper hand. At times when the Germans had qualitatively superior aircraft, the losses were even more significant – but, crucially, they were never sufficiently prohibitive to prevent British air operations. The number of men and aircraft being produced in the United Kingdom meant that the RFC was never at risk of running out of manpower. This, in turn, meant that there was rarely any nuance to Trenchard's approach. While he regretted the losses amongst his pilots, he did not see any possible alternative to maintaining constant and unwavering pressure on the enemy.

Even allowing for the fact that Trenchard and the RFC were attempting to fight the first major air war, this dogged determination to send fighters as far across the line as possible as often as possible demonstrated a failure to take lessons on board. Fighter formations would frequently find themselves unmolested during their patrols as the Germans had the luxury of deciding when and where to intercept the RFC patrols, sometimes choosing not to do so at all if they were going to be at a disadvantage. The further behind the lines the RFC aircraft pushed, the greater the warning that defending fighter units had. This, in turn, allowed the defending aircraft to gain height and intercept the RFC aircraft from a position of advantage. While the British squadrons were far from outclassed for most of the war, the Germans were able to exact a steady toll upon their adversaries. By the end of 1916, the losses excited comment in London, with criticism of Trenchard's approach being heard in several quarters. Although Trenchard considered this to be unhelpful, he was more concerned about the aircraft with which his pilots were being called upon to carry out the offensive policy.

As the Battle of the Somme concluded, it was clear that the German fighter types which had entered service during the summer of 1916, and those which were likely to appear during the winter were superior to those in RFC service. By Spring 1917, Trenchard was becoming increasingly anxious at both the lack of numbers of fighter squadrons with which to conduct the offensive and the quality of the aircraft his pilots would be called upon to use. Trenchard's regular complaints that the aircraft he had were inadequate, both in terms of numbers and performance, were regarded with

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irritation in London, with Henderson considering some of the missives he received to this effect as little more than personal attacks. Trenchard became aware of Henderson's feelings, and hurried to make clear that his criticism was simply to demonstrate the problems he was facing in France, and that he was willing to change policy if directed. It is difficult not to wonder whether this was, in fact, true or a diplomatic device, since Trenchard's views on the offensive value of air power were unshakeable. It should also be noted that for all his criticism of the offensive policy later, Sir Frederick Sykes was equally clear of the value of offensive air power (his contention often being that he would have adopted a more flexible and adaptive approach than his nemesis), as was Henderson. In early April 1917, Henderson gave his full support for the offensive policy, noting that casualties were all-but inevitable if the RFC was to ensure control of the air.⁵⁸

Despite the unsophisticated and dogmatic approach Trenchard adopted, much of the criticism that he has received for this subsequently is at risk of overlooking a critical point – which is that, in the main, the offensive policy worked. The German air service enjoyed superiority over their adversaries for limited periods, but for all its skill – particularly in air fighting – was unable to impose itself upon the RFC. Most of the successful German fighter pilots scored most of their victories over their own lines, while the life of the German reconnaissance and artillery cooperation machines over British lines was difficult and dangerous. Although German artillery observation aircraft did cross the lines and observe on a regular basis, they were always at risk from RFC, and later RAF, interference, while by the end of May 1917, RFC army cooperation squadrons were able to go about their business with much less risk of being attacked by enemy fighters. Even when the Germans were on the front foot, with the counterattack at Cambrai and the 1918 Spring offensives being supported by dedicated ground attack aircraft, the advantage was invariably localised and short-lived. The offensive policy was a blunt, unsophisticated instrument, but it did its job. It is, therefore, rather ironic that it was this part of air warfare, intended as an enabler for army cooperation, came to dominate the literature after the war.

The final element of the RFC's cooperation with the army came in the form of ground attack. As noted above, aircrew been willing to exchange fire with enemy ground units in 1914. A more formalised approach to attacking enemy targets evolved quite slowly. Army cooperation machines were used to carry out bombing raids against enemy positions during 1915, but the success of these sorties was low. In the summer, a review of all sorties flown between March and June was conducted, and revealed that

⁵⁸ James Pugh, *The Royal Flying Corps, The Western Front and Control of the Air, 1914-1918* (Abingdon: Routledge, 2017) p. 127.

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of 141 attacks against railway stations, only 3 had been successful.⁵⁹ This led to instructions that raids previously conducted on a 'go-as-you-please' basis, with aircraft sent out in a rather ad hoc manner, were abandoned in favour of formation attacks, with an appreciation that repeat visits to the target would be required to ensure that disruption continued.⁶⁰ The difficulty was that while these attacks were intended to support the efforts of the ground units, their effect was limited and tangential as far as the soldiers attacking German trenches were concerned. Thus, the emphasis began to move towards army cooperation machines carrying light bombs to attack targets of opportunity in the battle area. This was seen on the Somme with gun positions, trenches and billeting areas being attacked on a regular basis, while in late September German divisional headquarters which had been identified was subjected to a concerted attack by 19 Squadron, although the effect of the raid was hard to determine.⁶¹

These attacks, while a welcome boost to the morale of the soldiers who saw them, did not achieve a great deal in the main, but showed some promise. The result was a decision to allocate some units to ground attack missions during the Arras offensive in April 1917. It had been concluded that fighters carrying light bombs were best for the task, particularly since their assignment to the task did not remove the army cooperation machines from their duties. The squadrons assigned to these duties were called upon to attack enemy guns which had not been suppressed, machine gun positions or strongpoints which were otherwise holding up the assault and to both report upon and attack enemy formations massing for a counter-attack. While these formations would be broken up by artillery fire, aircraft attacks would disrupt their ability to advance upon the troops who had recently dislodged the defenders from their trenches.⁶² Ground attacks increased in frequency during Third Ypres, although at the cost of complaints from some infantry units at the apparent lack of friendly aircraft overhead. This prompted Haig to circulate a memorandum from Trenchard explaining that the RFC had been busy attacking German positions out of sight of British troops, a point endorsed by Haig's direction that the memorandum's content was to be widely disseminated amongst the troops.⁶³ The effect that ground attack could have on the battle was further demonstrated at Cambrai in November 1917.

⁵⁹ Jones, *War in the Air*, Volume 2, p. 117.

⁶⁰ Ibid, 'Some Notes on Bombing Attacks', p. 461.

⁶¹ Ibid, p. 293.

⁶² Lord Douglas of Kirtleside, *Years of Combat* (London: Collins, 1963), pp. 193-194.

⁶³ TNA Air 1/524/16/12/20. Trenchard to GHQ 1 August 1917 and covering note from Lt Gen Launcelot Kiggell, Chief of General Staff, BEF; Jones, *War in the Air*, IV, pp. 167-168.

The RFC's fighter bombers ranged widely across the German lines – taking heavy losses as they did so – as part of what was becoming an integrated use of the ground attack role in offensives. The success of the opening phase of Cambrai was overturned when the Germans counterattacked, with their own ground attack squadrons – the *Schlachtflieger* – were able to achieve a considerable physical and psychological effect on the British troops, who were thrown back.

A further illustration of the potency of the ground attack aircraft followed during the German Spring Offensives in 1918. The RFC undertook considerable planning during the winter of 1917-18 to ensure that coordination with artillery and other units was refined.⁶⁴ In keeping with the adage that no plan survives contact with the enemy, the offensives in March began in poor weather when little flying was possible to begin with, and the German advance was much swifter than anticipated. With the artillery in retreat, the RFC (RAF from 1 April), ground attack sorties inflicted considerable disruption upon the German advance as second wave formations found their supply lines interdicted and their advance hampered by seemingly incessant air attack. Widespread low-flying attacks by both fighters and army cooperation machines caused serious localised difficulties for the Germans. As the offensive began to slow, German commanders started to place (exaggerated) blame upon the RAF's attacks, with General von Kuhl, Chief of Staff of Crown Prince Rupprecht's Group of Armies claiming that half of the German casualties were caused by air attack, and General Ludendorff lamenting how '...the ammunition was not sufficient, and supply became difficult. All troops, especially mounted troops, had suffered heavily from bombing by hostile airmen'.⁶⁵

The German offensives petered out by June, and the Allies counterattacked. At Hamel on 4 July, the Australian Corps conducted an all-arms attack which saw effective use of air support, a precursor to the work undertaken on 8 August at Amiens.⁶⁶ The success of the Allied advance on the first day saw the RAF diverted from battlefield support in attacks against bridges over the Somme in a bid to cut the German army's means of retreat across the Somme, but the results were disappointing, with over 70 RAF aircraft being shot down amidst heavy air combat as German fighter units were rushed to the area in a bid to mitigate the effect of air attack⁶⁷. As had been the case when the disappointing results of bombing in 1915 had been assessed, the accuracy that could be obtained was insufficient for the attacks to hit their targets, while most

⁶⁴ TNA Air 1/526/16/12/36, Cooperation of the RFC in Defence and Counter Attack, December 1917-January 1918.

⁶⁵ Wise, *Canadian Airmen and the First World War*, p. 507.

⁶⁶ Jordan, *Army Cooperation Missions*, pp. 284-287.

⁶⁷ *Ibid*, pp. 530-531; Jordan, *Army Cooperation Missions*, Chapter 10.

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of the bombs were too light to have any effect on their well-constructed targets even if they hit them.

Attacks against the usual targets of enemy positions holding up the advance, or which were not in range of the artillery proved to be effective, as they had been previously. As the offensive closed, the threat presented to tanks by German field guns was mitigated by air support. As part of the lessons identified from the Amiens attack, 73 Squadron's Sopwith Camels were tasked with the suppression of enemy field guns, a role which they conducted to great effect. As the war entered its final stages, the RAF ranged well behind the German lines, attacking targets of opportunity, particularly transportation heading for the front.⁶⁸

Attack sorties proved to be effective, but they caused considerable concern to the RAF. During the Cambrai offensive, losses amongst 'trench strafing' squadrons were high, and the casualty rates were equally worrying during the battles of 1918. This led to a situation where 'trench strafing' – what we would now term Close Air Support – was regarded as being far too dangerous in most instances when casualties were measured against the results achieved. This, in turn, led to the RAF's institutional preference for interdiction – attacking targets at depth as they approached the battlefield, not amidst of the fury of battle where ground fire directed at them was intense. This was, perhaps, a case of lessons being misidentified: while the casualty rates amongst the strafing squadrons were high in the beginning, revised tactics – such as the direction from which the attack was launched, or with near simultaneous attacks from different directions to dilute the weight of ground fire – saw losses drop significantly. This appears not to have registered fully as the war ended, and the RAF became convinced – to the angst of the Army – that close air support was a task only to be performed in the gravest possible emergency, if at all.⁶⁹ There was clear concern about casualty rates during 'The Hundred Days', with one RAF report noting:

Very valuable work was done in attacking ground targets, but this work is costly and must be directed with discretion.⁷⁰

⁶⁸ Ibid.

⁶⁹ See Alistair McCluskey, *The Battle of Amiens and the Development of British Air-Land battle 1918-1945* in Gary Sheffield and Peter Gray (eds.), *Changing War: The British Army, the Hundred Days Campaign and the Birth of the Royal Air Force 1918* (London: Bloomsbury, 2013), pp. 236-238.

⁷⁰ TNA Air 1/725/97/2 – this is misleadingly catalogued as 'Artillery Observation by the RAF', but covers more than the name suggests; also, TNA Air 1/725/97/9 'Reports on Low Bombing Attacks by 10th Brigade RAF Units' July-November 1918'.

Although it would be easy to claim that this was a wilful misunderstanding so as to enhance the RAF's arguments in favour of bombing, such a charge would miss the point that many pilots believed that close support was a dangerous and flawed conception, replete with heavy casualties; some of these pilots, such as the 'ace' Raymond Collishaw, would remain in the RAF and attain high rank, and it is not unreasonable to assume that their perceptions and experiences coloured their views rather than the statistics which suggested that the role was less costly than they had believed.⁷¹

When assessing the RFC/RAF's role during the First World War, it is all too easy to be distracted by the coverage of air combat, but while the importance of gaining control of the skies was an undeniable lesson that air forces took to heart, the major function of air power was as an enabler for the BEF's operations. This required the patient development of tactics and procedures to deliver effective reconnaissance and artillery spotting, and, as the war entered its final 18 months, in the provision of effective air attack against enemy positions via communication with the artillery CBSO which would use ground signal panels to point patrolling fighter bombers in the direction of the urgent target. The quality of air support improved considerably in 1917 as a result of the significant changes to training which meant that aircrew reached the front better able to conduct their key duties. Learning lessons was not a smooth process – the need for trained observers was understood at the outbreak of war, but it took nearly two and a half years for this to be properly enacted. Trenchard's approach to the offensive was, on occasion, perhaps too blunt and unthinking, although its efficacy should not be downplayed. Lessons about the need for standardised cooperation techniques between aircraft and the artillery took rather longer to implement than might have been expected, and it appears that the lessons about ground attack were at best misinterpreted. Yet for all these problems, the air services played a significant part in the final victory won by the BEF. Without their efforts, final success would have been more difficult. The way in which aircraft were employed became a model for the manner of aircraft employment in the future, and the roles and missions of today's RAF can be traced directly to the Great War – it was, indeed, the point when the RAF 'learned to fly'.

⁷¹ See, for example, Arthur Gould Lee, *No Parachute: A Fighter Pilot in World War I* (London: Jarrolds, 1969), p. 177; Wise, *Canadian Airmen and the First World War*, p. 550.