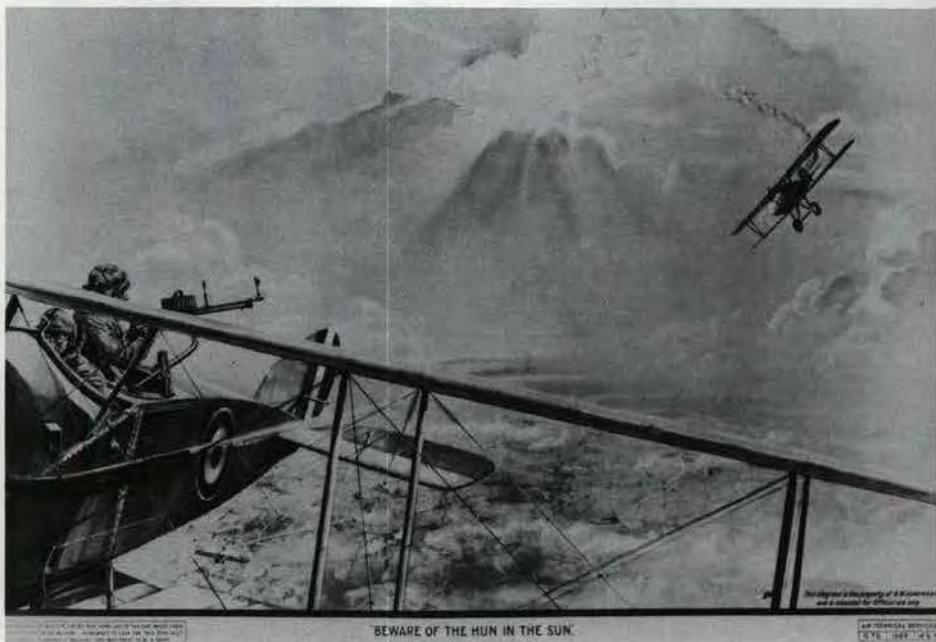


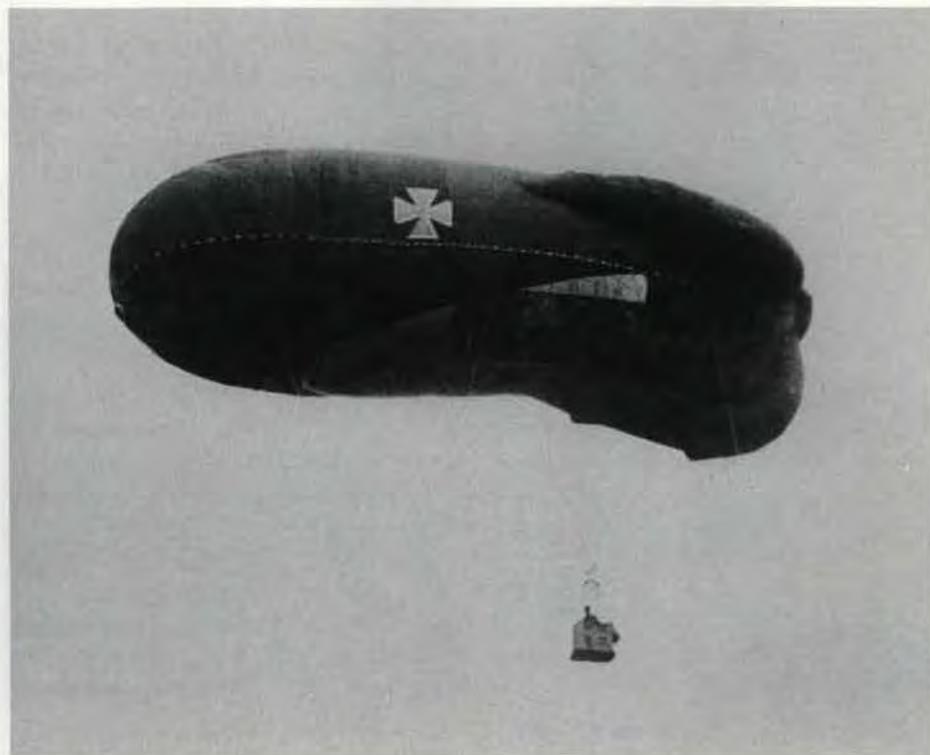
Grant A. Gooderham of Toronto in a BE2c at Chingford, Aug.-Sept. 1915. Note the Union Jack on the rudder, an identification marking that was soon dropped in favour of a tricolour roundel on the fuselage. (PMR 71-24)



This poster, illustrating one of the best remembered catchphrases of a First World War pilot, was used to drive home to airmen the need to keep a careful look-out. (AH 559)



Lt W.A. Bishop of Toronto (right) serving with the 8th Canadian Mounted Rifles at London, Ont., in February 1915. He subsequently went overseas with the CEF, then transferred to the RFC in December 1915. (RE 22064)



A German observation balloon on the Western Front (AH 490)



A captured Fokker E-III at Candas, France, 20 April 1916 (PMR 73-500)



The RNAS airfield at Furnes in July 1916. The Sopwith Triplane at left is probably the first prototype, N500, which was sent to Furnes in June to undergo operational trials. (PMR 71-40)

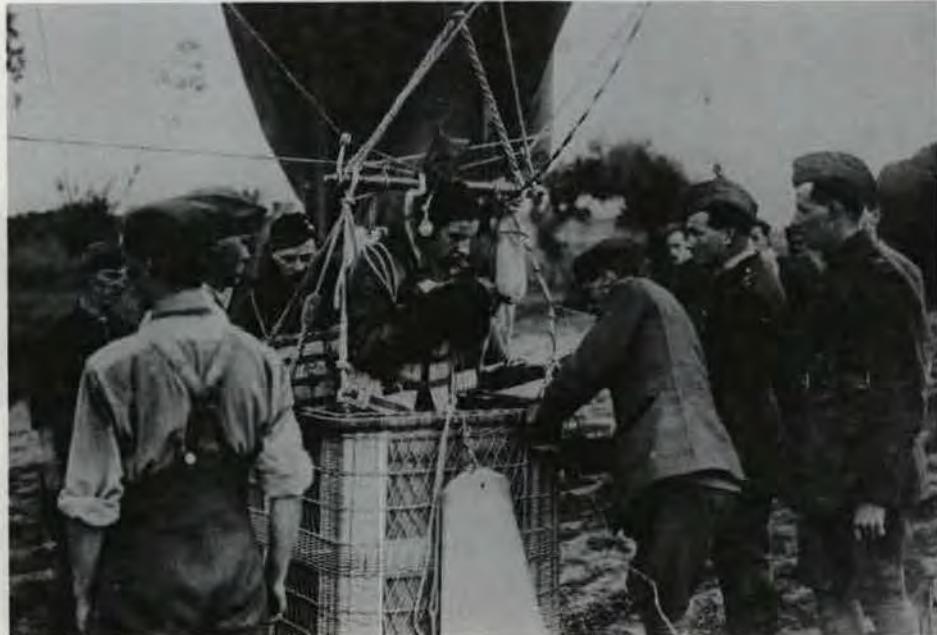
570  
Q  
106.114



A 1916 aerial photograph, clearly showing first, second, and third line German trenches, and, in the top right-hand corner, the communications trenches which linked them with the ruins of Beaumont Hamel. (Q 61479)



Morane-Saulnier Type L 'Parasols' of 3 Squadron, RFC, at La Houssaye in September 1916. When this picture was taken at least four Canadians – Lts K.A. Creery of Vancouver, W.W. Lang of Toronto, G.A.H. Trudeau of Longueuil, Que., and 2/Lt F.H. Whiteman of Kitchener, Ont. – were serving with the squadron. (AH 578)



An observer in the basket of an artillery observation balloon on the Somme in September 1916 tests his telephone before ascending. (PA 2057)



Oswald Boelke, one of the greatest of the German fighter pilots, was a tactical innovator and born leader who played a major role in the early development of fighter team tactics until his death on 28 Oct. 1916. (AH 508)



'B' Flight, 3(N) Squadron, RNAS, photographed at Bertangles in March 1917. The pilots are seated in the front row – A.W. Carter of Calgary, second from left, and L.S. Breadner of Ottawa (hatless), second from right – and the ground crew are behind them. At this time the squadron was commanded by another Canadian, R.H. Mulock of Winnipeg. (RE 17683)



A bulldog and three flying officers of 7 Squadron outside their quarters at Bailleul in December 1916. The officer on the right, wearing gloves and sheepskin flying boots, is Capt. E.J. Watkins of Toronto who served with the squadron from May 1916 to May 1917 - an unusually long and successful career for a corps squadron pilot of the time. (RE 64-487)



A 1917 German reconnaissance photo of the RNAS airfield at Bray Dunes, on the French coast near Dunkirk (Q 69454)



A photographic officer points out to the pilot of a BE12 the areas to be photographed. The map is resting on the aerial camera. (Q 12288)



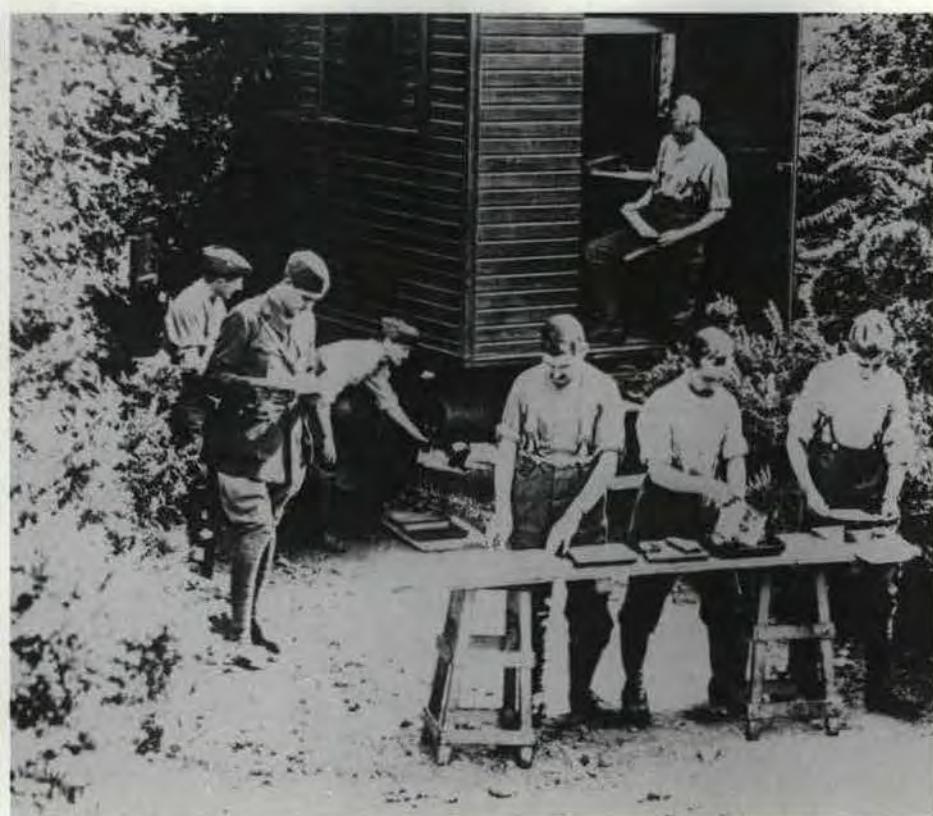
A chaplain used the forward cockpit of an FE2b night bomber as a pulpit while preaching his sermon during a service at an RFC airfield in France. (AH 438)



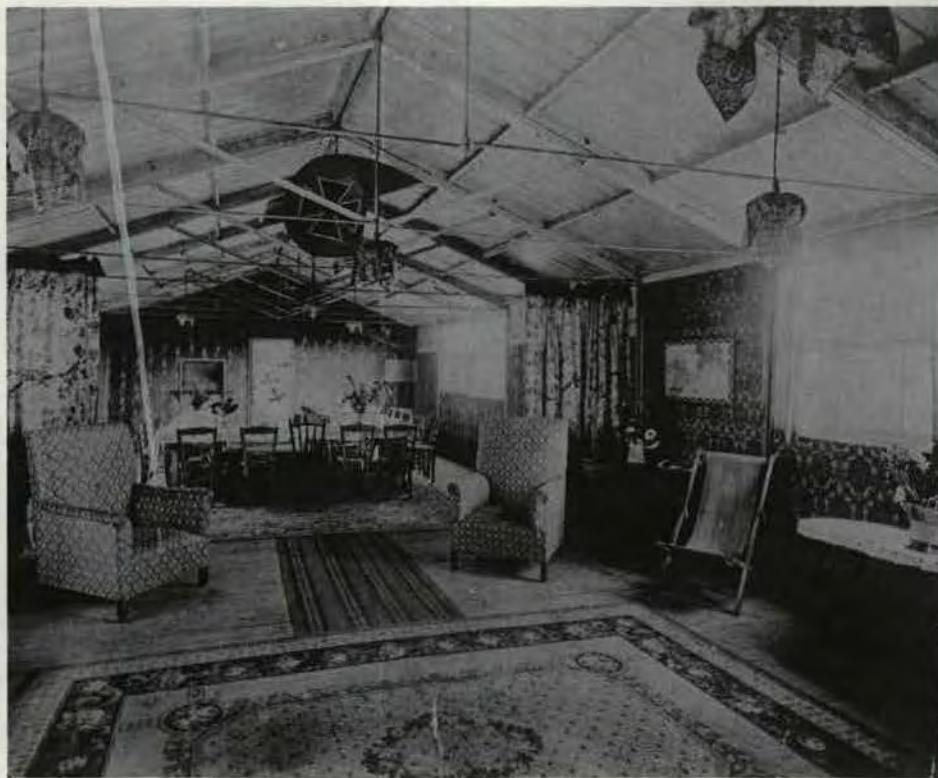
Ground crew stand by their machines as HM Queen Mary, with Maj.-Gen. Hugh Trenchard, GOC RFC in France, inspects aircraft and ground crew at St Omer on 5 July 1917. (Q 11848)



HM King George V inspecting pilots of 'B' Flight, 3(N) Squadron, 5 July 1917. They are (l to r): F/S/Ls Gordon S. Harrower, Montreal, two British officers, James A. Glen, Enderby, BC, Joseph S.T. Fall, Hillbank, BC, Fred C. Armstrong, Brockville, Ont., and F/L Harold S. Kerby, Calgary (shaking hands with the king). At extreme right is F/C Lloyd S. Breadner of Ottawa. (AH 476)



An RFC mobile photographic dark room and a section of photographers at work at an airfield in France. (AH 460)



The Officers' Mess at 'Naval Ten' in the summer of 1917, when all three flight commanders and half the flying personnel were Canadians. The Albatros rudder hanging from the roof came from a machine shot down by F/L A.W. Carter of Calgary.  
(RE 196-25)

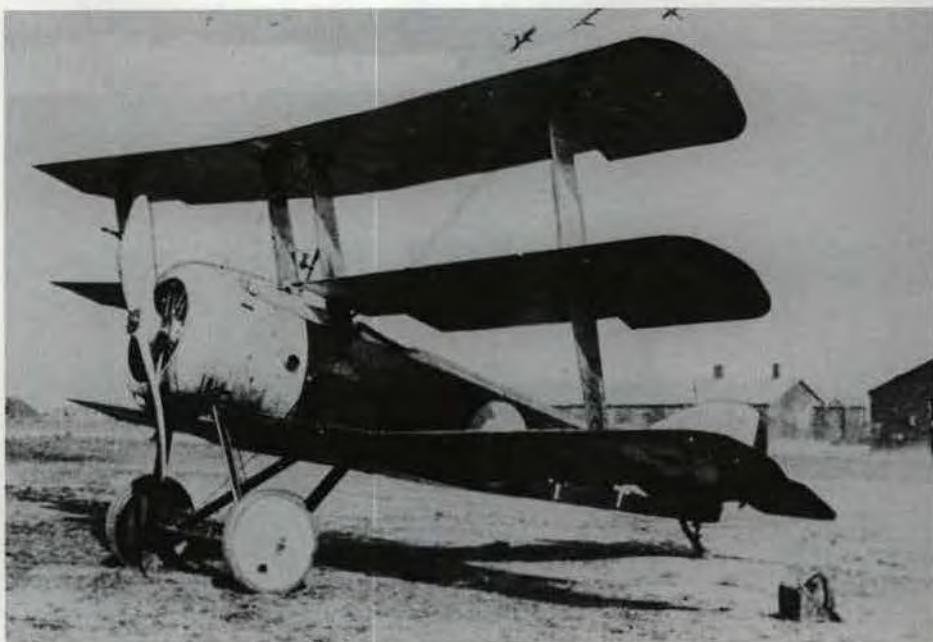


Capt. W.A. 'Billy' Bishop checking the mechanism of the Lewis gun mounted on the top plane of his Nieuport Scout. The picture was taken on 6 Aug. 1917, and 'up to this date he had brought down 37 German aeroplanes.' (AH 470A)



RFC mechanics examine a captured Albatros D.V. (DND 65-184)

Capt. A.E. Godfrey of Vancouver (left) served in 40 Squadron in the autumn of 1917 and was credited with his first seven victories while flying a Nieuport 17. His was the first British single-seat machine to mount twin machine-guns.  
(RE 21011-3)



The Sopwith Triplane in which Raymond Collishaw of Nanaimo, BC, scored many of his victories during 1917, when he led the famous 'Black Flight' of 'Naval Ten.' (RE 19255)



Nieuport Scouts of 1 Squadron, RFC, at Bailleul, 27 Dec. 1917. The officer in the foreground is Capt. Guy B. Moore of Vancouver, KIA 7 April 1918, a month before his MC was gazetted.



Lt A.G. Goulding of Holland, Man. (right), together with a British pilot and the crew of an Austrian aircraft brought down by the British pilots. (RE 20644)



An Austrian DFW, one of the thirteen machines out of 'thirty or forty' that were shot down or force-landed in the British area during the Boxing Day 1917 raid on Istrana airfield. Lt T.F. Williams, of Woodstock, Ont., recalled that 'We were pretty near all day picking up prisoners.' (AH 513)



On 19 Feb. 1918 eleven Sopwith Camels of 28 and 66 Squadron, RFC, each carrying four 25-lb bombs, attacked the Austrian airfield at Casarsa and set fire to one of the former airship sheds ('A' and 'B' on this marked reconnaissance photograph) being used as hangars. (RE 15537)



Lt C.M. McEwen of Radisson, Sask. (second from left, in flying helmet), poses beside his Sopwith Camel while serving with 28 Squadron in Italy in 1918. McEwen's flight commander was Capt. W.G. Barker of Dauphin, Man., in an 'all-Canadian' flight which included H.B. Hudson of Victoria, BC, and D.C. Wright of Toronto. (RE 15544)



An oblique reconnaissance photograph of the Val d'Assa. Austrian trench lines can be distinguished in the right foreground.



British airmen – probably of 34 Squadron RAF – at San Luca, north of Istrana, in the summer of 1918. Twenty-two Canadians flew with the squadron during the year.  
(RE 15551)



The caption held by the Imperial War Museum reads: 'Major W.G. Barker, Commander of 28 Squadron, beside his Sopwith Camel.' Barker did not command 28 Squadron, however, and he was not promoted to major – as he appears in this photo – until he took over 139 Squadron. (AH 517)



Sopwith Camels of 45 Squadron, RFC, on the Italian front during 1918. More than forty Canadians served with this squadron, which flew two-seater Sopwith 1½ Strutters in France before being equipped with single-seater Camels. It was moved to the Italian Front in December 1917. (AH 514)



An RFC aircraft repair park. The machine in the foreground, with an instrument mechanic sitting in the pilot's cockpit, seems to be a DH9. Other aircraft include Sopwith Camels, an SE5a, and a DH4. (AH 433)



Photographic plates being handed to the observer of a DH4 reconnaissance machine of 27 Squadron at Serny on 18 Feb. 1918. The crown of the pilot's head can just be seen, bent over his instruments. At least twelve Canadians were flying with the squadron at this time. (AH 543)



Damage to the engine cowling of a Sopwith Camel of 'Naval Three,' January 1918. The officer on the right is F/C Lloyd Breadner of Ottawa. (RE 64-3010)



Laying-out a photo-mosaic of pictures taken over enemy lines, near Arras, 22 Feb. 1918. (AH 479)



Capt. W.S. Stephenson of Winnipeg, Man., transferred to the RFC and went to France in February 1918 as a Sopwith Camel pilot in 73 Squadron. He was credited with 7½ enemy aircraft and considerable damage to enemy ground forces, winning an MC and DFC before being shot down in error by a French pilot while over enemy lines on 28 July. Ending the First World War in a German prison camp, he distinguished himself in the Second as 'a man called Intrepid.' (RE 19641-1)



Manfred, Freiherr von Richthofen, the famed 'Red Baron,' who had been credited with eighty victories when he was killed in action on 21 April 1918. Here he stands between four of his pilots. The dog's name was 'Moritz.' (AH 489)



Fokker triplanes of *Jagdgeschwader 1* – Manfred von Richthofen's 'circus' was distinguished by its vivid paint schemes and dramatic markings – lined up in readiness for a patrol. The 'Red Baron' was flying a 'pure red triplane' when he was killed. (AH 491)



The crew of an RE8 of 15 Squadron, stationed at Lechelle, near Amiens, report at the squadron 'office' after returning from a patrol. This picture was taken on 25 March 1918, at the height of the great German attack on the Third and Fifth Army fronts: 15 Squadron was part of III Brigade's 12 (Corps) Wing and therefore part of Third Army.  
(AH 544)



Maj. Raymond Collishaw, DSO and Bar, DSC, DFC, of Victoria, BC, credited with 60 victories and therefore the second-ranking Canadian 'ace.' (PMR 71-788)



Lt A.A. McLeod of Stonewall, Man., Canada's second VC of the air war. (PL 35319)



RE8s of 15 Squadron, III Brigade, lined up along a roadside near Albert on 25 March 1918. The untidy condition of the grass behind them was probably due to the pace of operations at the time, when Ludendorff's March offensive had driven deeply into the British front and the RFC was working flat out to stem the German advance. (AH 545)



Manfred von Richthofen's death on 21 April 1918 was then attributed to Capt. A. Roy Brown of Carleton Place, Ont. Subsequent research has made it difficult to accept that Brown shot down the 'Red Baron.' (RE 18431-24)



Von Richthofen's triplane after souvenir hunters had been at work. (AH 494)



RAF air mechanics pose beside an RE8 at Acq, 20 May 1918. Note the canvas hangar and the sandbag blast wall along the side. (AH 480)



Capt. A.A. Leitch, a Canadian of unknown address who lived at High River, Alta, after the war, standing beside the fuselage of an Albatros he shot down near Senlis on 25 May 1918. (DND 65-8)



Aircrew of 22 Squadron at Serney, 17 June 1918. Nearly fifty Canadians flew with this squadron during the last two years of the war. (AH 439)



Officers of 85 Squadron and their pets at St Omer on 21 June 1918, with their SE5a fighters and groundcrews lined up in the background. A third of the squadron's pilots were Canadian at this time. (AH 558)



Bombing up an FE2b in preparation for a night strike against the enemy, 18 July 1918  
(AH 436)



RAF armourers check their bomb supplies. This load of 112-lb bombs was dropped during a single night by FE2bs of 149 Squadron. (AH 435)



The nose of a Handley Page bomber. The drum on top of the Lewis gun is the magazine and the pouch below it, on the gunner's right, collected used casings and stopped them flying back in the pilot's face. (AH 530)



Capt. F.R.G. McCall of Calgary examines an aerial photograph. The 'Canada' badge on his shoulder has been scratched out by a censor. (AH 478)



Capt. A.T. Whealy of Toronto watches armourers 'bombing up' one of 203 (formerly 'Naval Three') Squadron's Sopwith Camels at Izel-les-Hameau on 10 July 1918. (AH 472)



A German 77-mm anti-aircraft gun mounted on the back of a truck (AH 487)



Bombing up a DH4 for a day strike against the enemy. At the right is a Nieuport fighter ready to fly as escort for the bomber. (AH 432)

Please send all  
my mail on the  
By gone I was  
a foolish boy but  
anyhow I taught them  
a lesson. The only thing  
that backs me up is  
to look back to see  
them going down in  
flames.

Part of a letter written by Maj. W.G. 'Billy' Barker of Dauphin, Man., while in the military hospital at Rouen recuperating from the wounds he received in the epic air battle that won him the VC on 27 Oct. 1918. (c 92620)



Maj. W.G. Barker, VC, DSO and Bar, MC and two Bars, Croix de Guerre, Valore Militaire, standing beside the engine and fuselage of the Sopwith Snipe in which he won his VC, at the Canadian War Memorials Exhibition in London in February 1919. Barker (here still convalescing from the wounds to his left arm) was eventually killed in an air crash at Ottawa on 12 March 1930: the Snipe is on permanent display at the Canadian War Museum in Ottawa. (M 804-c)



A postwar photograph of Capt. D.R. MacLaren, DSO, MC and Bar, DFC, Croix de Guerre, in a Sopwith Snipe. In eight incredible months MacLaren claimed 54 victories (48 aircraft and 6 balloons) to become the fourth-ranked Canadian ace of the war. (RE 20555)



A Fokker D-VII. This is one of the trophy machines turned over to Canada after the war's end. (PMR 72-489)



An SE5a – the most sophisticated allied fighter of the war – of the RCAF photographed at Camp Borden during the postwar era (RE 15536)

## Introduction

The most important developments in aviation during the First World War were those bearing on the relationship with the ground battle. In the popular conception, of course, First World War flying was about the exploits of the fighter 'aces,' a conception which omits the larger design of which fighter forces were only a part. The chapters in this section are concerned exclusively with the evolution of the air weapon on the Western Front, in Macedonia, and in Italy. In all these theatres the air arm was subordinated to the ground forces.

Canadians who flew on active service from 1914 to 1918 should have had no misconceptions about the relationship between aviation and the war on land. Most of them flew with units that were serving the needs of armies, for from the beginning of its existence, and especially after the outbreak of the war, the Royal Flying Corps was an auxiliary of armies in the field. Except for its home defence organization, the RFC was shaped, in every important particular, by its relationship to the army.

On the Western Front the size and organization of the RFC was a function of the size and organization of the British Expeditionary Force. Early in the war it was determined that the RFC's basic formation, the squadron, should serve an army corps; hence, as the BEF expanded, so necessarily did the corps squadrons of the RFC. Along with expansion went specialization. The first RFC squadrons in France performed the whole range of tasks then demanded of them, but from an early stage distinct duties, and therefore specialized aircraft, equipment, and training, were imposed on each squadron. At the corps level the prime requirements to be met were co-operation with the artillery and the provision of tactical and photographic reconnaissance. At the 'army' level were squadrons whose duties were also connected with ground operations, but in a less direct way: their tasks were bombing and air fighting. The prime duty of the fighter squadron was to provide protection so that all other formations could carry out their work. As the RFC reached organizational maturity by 1916, corps and army wings were grouped together, so that each of the British armies on the Western Front was served by an RFC brigade.

Just as RFC operations within each army were directed by a brigadier attached to army headquarters, so at the BEF's headquarters there was a general officer com-

manding the whole of the RFC in the field. In addition to his command over the brigades, the GOC had directly under his hand a strategic reconnaissance element and a number of units which could be shifted rapidly to points along the front where their services were most needed. These forces, first known collectively as 9 Wing, ultimately grew to brigade strength; as IX Brigade the formation, chiefly composed of fighter squadrons, was an easily disposable force which gave its commander a high degree of operational flexibility.

The organization of the RFC reached its fullest development on the Western Front, and was preserved intact when in 1918 the RFC became part of the Royal Air Force. In other theatres of war, where the ground forces committed were smaller, RFC organization did not reach the same degree of complexity. Nevertheless, within their limitations the RFC formations in Italy, Macedonia, and the Middle East conformed to the principles established on the Western Front: specialization of function, direct linking at every level to the army staff, and absolute subordination of roles to the requirements of the army.

Although all functions of the RFC in the field were dictated by the army, the air service, for the most part, decided how these functions were to be carried out. Here there was some room for variations from squadron to squadron. Corps squadrons, for example, acquired an exact knowledge of every feature of their section of the front, and developed the closest possible working relationship with artillery units, intelligence staffs, and so on. For this reason it was unusual for corps squadrons to be moved about and even more unusual for them to be detached from ground formations with which they had worked for some time. Inevitably much of the practical training of new pilots and observers lay in the acquisition of this local lore, just as in the fighter squadrons new pilots sought to survive, and to become effective in combat, through the lessons passed on to them by veterans.

But the RFC's norm was uniformity, not diversity. Its patterns were set mainly from the top; it was the GOC and his staff who laid down procedures, tactics, and operational objectives. More than anyone else General Hugh Trenchard, who commanded the RFC in the field for most of the war, put his stamp on the service. In his soldierly view the RFC existed to assist the army. Coupled with this was his intense and unswerving belief in the value of the offensive. These principles, enunciated by a commander of powerful personality, dominated the RFC's approach to the air battle. Trenchard adhered to them consistently even in the dark periods of heavy casualties when the German air force possessed a clear margin of technological superiority.

It was a service given form and spirit by Trenchard that most Canadians joined. A few were present during the opening phases of the war on the Western Front, but they began to appear in appreciable numbers only towards the end of 1915. By the time of the Somme campaign in 1916 Canadians were to be found in nearly every operational squadron. The heaviest Canadian involvement, however, was in 1917-18, when the air war reached its peak and their numbers alone became an important element in the eventual success of the British air arm. This was the period of large-scale fighter engagements, a form of war in which many Canadians won distinction. But, as these chapters show, many others were engaged in the

tasks which in Trenchard's view were essential to victory on the ground: artillery observation, reconnaissance, co-operation with the tanks, low-level strafing of German troops in close support of allied infantry. It was here, as well as in the more familiar and dramatic fighter role, that Canadians both on the Western Front and in other theatres made major contributions.

## Experiments on the Western Front, 1914-15

In 1914 the brunt of the land campaign in the west was borne by the French and the Germans. The British had only a minor part to play and no Canadian forces at all were caught up in the vast military movements with which the European war began. All the great powers had their plans; all failed. The German plan, however, came closest to success, and determined the subsequent line of battle in the west. It had been conceived in the first place by *Graf* Alfred von Schlieffen, Chief of the General Staff between 1891 and 1905, and was his solution to the problem of a two-front war.

To win a quick victory over France, Schlieffen proposed to avoid a frontal assault along the short and heavily fortified Franco-German frontier. Instead he would launch a great flanking movement on the right. The German armies, swinging through Belgium, would sweep down the Channel coast west of Paris, and then turn eastward, to take the main French forces in the rear and isolate the French capital. While five of the seven German armies were to join in this enormous encircling movement, pivoting on Metz, the two on the left would deliberately fall back in the face of the anticipated French attacks in Alsace and Lorraine, thus drawing French forces further into the trap. If the British chose to fight beside the French, Schlieffen believed that they could be shut up, along with the remnants of the Belgian army, in Antwerp where the British soldiers would be 'securely billeted ... much better than on their island.' But *General* Helmuth von Moltke, Schlieffen's successor, seeing the problem in slightly different terms, chose to modify Schlieffen's vision. While keeping the right strong, he considerably strengthened his left as well when additional troops became available. Whether he was right to ignore Schlieffen's injunction to put every possible ounce of weight into the right wing is still open to discussion.<sup>1</sup>

With the outbreak of the war the German western deployment included twenty-eight corps (plus one infantry and one cavalry division) on the right wing and eight corps on the left wing. The French forces of approximately thirty-one equivalent corps were distributed in four armies between Epinal and Reims, with one army in reserve behind Verdun. The small British Expeditionary Force of two corps and a cavalry division was to take up position on the French left and act in concert with the French. The German air arm consisted of five airships, twenty-nine field aviation sections of six aircraft, and four fortress flights of four aircraft. The French

had thirteen airships and twenty-one squadrons of six aircraft each, and the British were to send to France an air contingent of four squadrons, each having twelve aeroplanes. Air strengths in the west were approximately equal, but the Germans had a superiority of about 10 per cent in ground forces.<sup>2</sup>

As early as 1912 the British war plan had called for eight squadrons to accompany the British Expeditionary Force to France. Such an air arm would have required more than one hundred aeroplanes and pilots, with another hundred trained pilots and serviceable aeroplanes in the United Kingdom for replacement and training. In July 1914, however, the Royal Flying Corps was under strength and poorly equipped. Between 25 July and 9 August Brigadier-General David Henderson and Lieutenant-Colonel Sefton Brancker gathered up all the privately owned aeroplanes in the United Kingdom and most of the civilian pilots, all of whom were required to sign a declaration that they would not loop-the-loop or perform any aerobatics while serving with the RFC. Out of four weak squadrons and this makeshift increment, four full squadrons were mobilized, the Central Flying School was maintained on a low establishment, and a reserve squadron for training was created at Farnborough.<sup>3</sup>

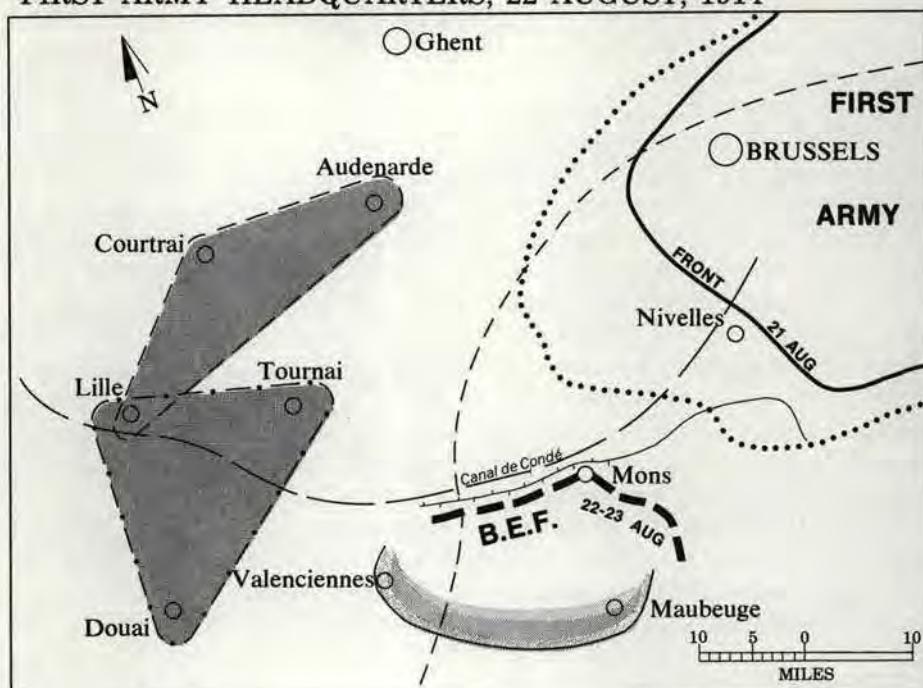
General Henderson was appointed to command the RFC in France; Brancker was left in charge of the Military Aeronautics Directorate in the War Office; and Lieutenant-Colonel H.M. Trenchard, who had been second-in-command at the Central Flying School, was made commander of the Military Wing. Nos 2 and 4 Squadrons were equipped with BE2s, 3 Squadron had a mixture of Bleriots and Henri Farmans, and 5 Squadron had Farmans, Avro 504s, and BE8s. The mechanical transport was equally variegated. Most of the vehicles were requisitioned from civilian sources and included two Maple furniture vans, a truck that had originally carried liquid refuse, and a huge red van with the gold letters 'Lazenby's Sauce (The World's Appetiser)' on its side, which went to 5 Squadron.<sup>4</sup>

An advance party was sent to France on 11 August to co-ordinate arrangements with the French authorities at Amiens. By then 2, 3, and 4 Squadrons had been mobilized and the next day they assembled at Dover aerodrome. On 13 August these three squadrons flew across the Channel to Amiens, except for one Maurice Farman flight of 4 Squadron that was left behind at Dover to protect the coast of Kent. No 5 Squadron, whose mobilization had been delayed, assembled at Southampton on the 13th and flew across to Boulogne the following morning, joining the rest of the RFC at Amiens on 15 August.<sup>5</sup>

Meanwhile, the British Expeditionary Force was beginning to concentrate in the area south of Maubeuge, on the left flank of the French armies. Commanded by Field Marshal Sir John French, the BEF consisted of I Corps, under Lieutenant-General Sir Douglas Haig, and II Corps, under Lieutenant-General Sir Horace Smith-Dorrien. On 16 August the aircraft and motor vehicles of the Royal Flying Corps left Amiens for Maubeuge, where all four squadrons, with a total strength of 105 officers, 755 other ranks, and sixty-three aircraft, concentrated in the vicinity of the BEF's General Headquarters (GHQ). The aircraft park remained at Amiens. The first two RFC reconnaissance missions of the war were flown on 19 August but both pilots got lost and returned without having discovered either the enemy or the Belgian army, whose respective whereabouts they had been asked to

# SEARCHING FOR THE BRITISH ARMY

## AERIAL RECONNAISSANCE TASKS ORDERED BY GERMAN FIRST ARMY HEADQUARTERS, 22 AUGUST, 1914



PLANNED RECONNAISSANCE BY NO. 7 FELDFLIEGER ABTEILUNG



PLANNED RECONNAISSANCE BY NO. 30 FELDFLIEGER ABTEILUNG



RECONNAISSANCE AHEAD OF ARMY ADVANCE BY



NO. 11 FELDFLIEGER ABTEILUNG



LIMIT OF RECONNAISSANCE BY NO. 12 FELDFLIEGER ABTEILUNG



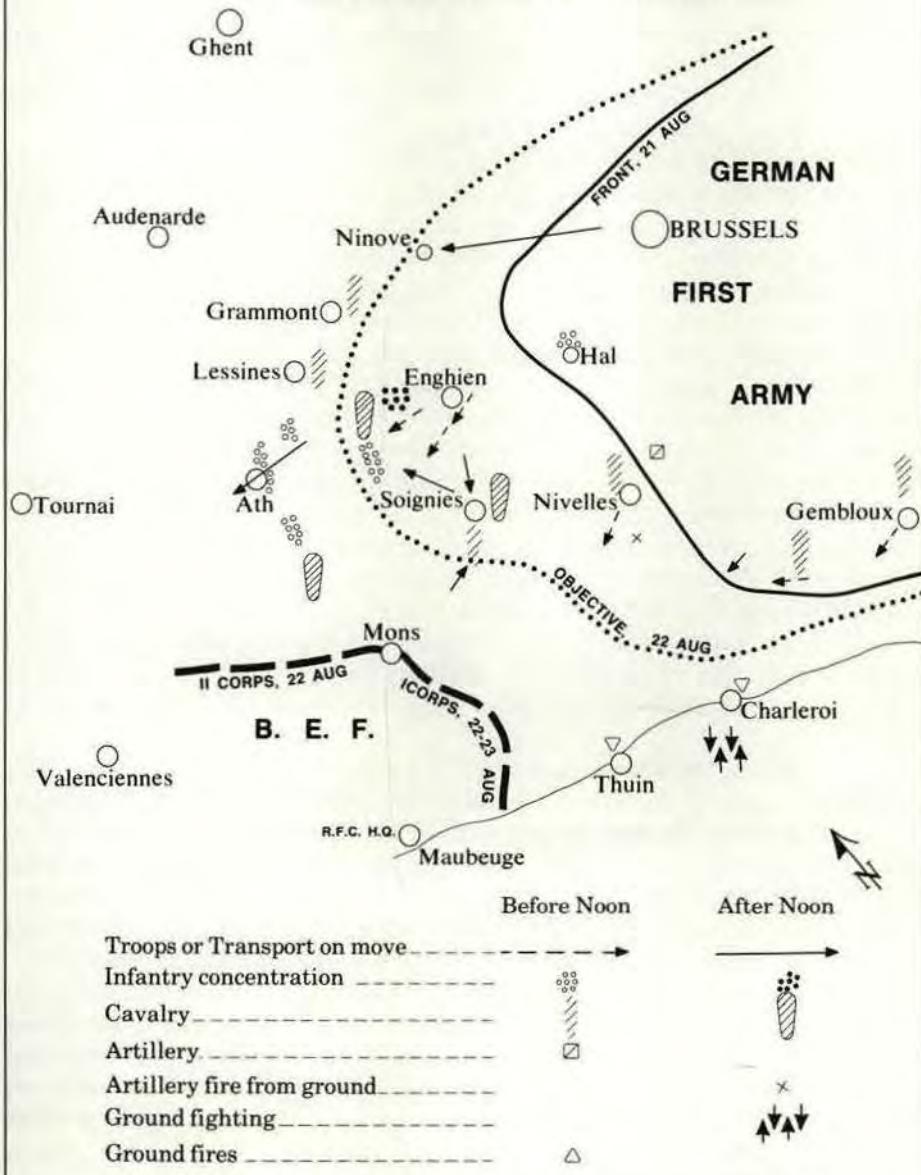
report. On the 20th air reconnaissance discovered large columns of enemy troops near Tervueren and Wavre. On the 21st, although it was too misty to do any flying until the afternoon, further German concentrations were sighted near Nivelles and Charleroi.

That morning the British Expeditionary Force had begun its advance to contact, marching north towards Mons. During the afternoon aerial reconnaissance reported at least two German corps attacking the French on the Sambre and late reconnaissance that evening brought back word that the French were now five to ten miles south of the Sambre River. By late afternoon of the 22nd the BEF was in position about Mons, with II Corps holding the line of the Mons-Condé Canal and I Corps almost at right angles to it, facing eastward between Mons and the Sambre River. Only cavalry skirmishes had so far occurred on the British Front.<sup>6</sup>

Here the Royal Flying Corps made its first vital contribution to the allied cause. Twelve reconnaissance missions were flown on 22 August\* and one of them brought back word that a German corps had been observed marching westward

\* At least two British aircraft were fired on from the ground (one was brought down) during the course of this day and one observer was wounded, thus gaining the distinction of becoming the RFC's first battle casualty.

**ROYAL FLYING CORPS**  
**AIR REPORTS FOR 22 AUGUST, 1914**



along the Brussels-Ninove road, then turning southwards towards Grammont. General Henderson at once recognized the significance of this information and lost no time in bringing it to the attention of the Commander-in-Chief, for this was the first positive information that the German right was certain to outflank the British left. Until this time GHQ, in common with the French High Command, had believed that the Germans were advancing in column of route through Belgium, turning inwards as they reached the Sambre. According to French intelligence estimates, a movement further north could not have been in serious strength nor have presented any grave threat.<sup>7</sup>

Now, however, an entirely different and much more ominous picture began to form. The German armies marching through Belgium were swinging down far to the west of the French and, it seemed certain, west of the BEF as well. That evening Sir John French cancelled the offensive which had been scheduled for the 23rd and decided to remain where he was for the time being. The following morning six divisions of the German First Army, commanded by General Alexander von Kluck, made contact one after the other with Smith-Dorrien's II Corps along the Mons-Condé Canal. The German attacks were launched with dash and pressed with determination for about six hours but were everywhere beaten back with heavy losses by British rifle and field artillery fire. The French Fifth Army was also heavily engaged, and its commander, *Général Lanrezac*, decided to retreat just before dawn on the morning of the 24th.

In order to keep in touch with the French and because he was naturally apprehensive about his exposed left flank, Sir John French ordered a withdrawal in a southerly direction towards the line La Boisserette-Bavai-La Longueville. No sooner had the British begun to move than another air reconnaissance reported a German column five to ten miles long marching south towards Peruwelz – that is, well to the west of the British left. The retreat from Mons had begun only just in time.

The RFC moved from Maubeuge to Le Cateau on the 23rd and remained there during the first day of the retreat. Thereafter RFC Headquarters and the squadrons moved almost daily. During the next twelve days, as the whole allied line swung backwards, pivoting on Verdun to escape the groping claw of the German right, the RFC had both to keep pace with the retreat and act as the eyes of the army. Flying at 50 to 60 mph (provided there was no headwind), in machines cobbled together from wood, wire, fabric, and glue, its pilots scoured the Flanders countryside. A few hundred feet above the ground, monitoring the beat of their uncertain engines, calculating their endurance in terms of fuel margins, and always facing the threat of ground fire from either side, almost the only thing that airmen did not have to worry about was attack by enemy aircraft. Although pilots were armed with a pistol for self-defence in the event of a forced landing, the day of air-to-air combat had not yet dawned and the concept of aircraft recognition had not been thought of by other than a few specialists.

The pilots who took off each day could never be sure whether their 'aerodrome' would still be there when they returned from patrol. If they found that their base had moved, standing orders were that they should fly approximately twenty miles to the south and look for the remainder of the machines and their transport on the

ground. Fortunately, the heterogenous transport of the RFC was relatively easy to spot from the air and 5 Squadron's gaudy scarlet van, which had been pressed into service to carry bombs and ammunition, proved a useful marker.<sup>8</sup>

Haig's I Corps broke clean at Mons but Smith-Dorrien's II Corps had to fight several sharp actions as Kluck continued to attack from the west and northwest. On the 24th and 25th II Corps suffered almost twice as many casualties as at Mons itself. The Forest of Mormal lay athwart the path of the BEF's retreat and the British Commander-in-Chief ordered I Corps to fall back to the east of this wooded area and II Corps to the west of it, leaving the British force dangerously separated. Smith-Dorrien decided that it would be necessary for him to make a stand at Le Cateau. With the 4th Division added to his corps that morning,\* his strength increased substantially, but the decision to stand and fight was nevertheless a choice between desperate alternatives. The Battle of Le Cateau began early on the morning of 26 August.

During the day several air reconnaissances were made from GHQ but for some reason the results were not sent to Smith-Dorrien. It is an astonishing fact that all through the 26th there was no direct communication between I and II Corps, although both were in touch with GHQ. In the early morning GHQ had sent one aircraft to Smith-Dorrien who promptly used it to reconnoitre both his flanks and then returned it. By 1340 hrs Smith-Dorrien felt his troops under such pressure that he ordered a further withdrawal, although this meant breaking off an engagement in broad daylight while being attacked by superior forces. II Corps suffered severely. Of the 40,000 men engaged some 7800 became casualties and almost forty guns were lost.<sup>9</sup>

It appeared that the Schlieffen Plan was unfolding almost exactly as its originator had hoped. The slight checks that had been delivered to the advancing Germans by the British at Le Cateau and by the French on the 29th at Guise had done little to secure the situation. These were days of great danger for the allied cause, for if the retreat became disjointed, if a portion of the swinging line was pinned by battle, or if a serious gap developed between the various armies, utter and irretrievable disaster would almost certainly ensue. The RFC kept pace with the BEF on the outer arc of the swing, working every day to obtain the overall strategic picture and to bring back tactical reports of the immediate British front. The airmen also began to observe enemy artillery in action and report its position to the British gunners.

The vast bulk of the RFC's work revolved about the reconnaissance function but some bombing experiments were carried out in an effort to hamper the German advance. Each day 'the usual orders on the retreat were dawn reconnaissances [and] dropping hand grenades and petrol bombs on the enemy.'<sup>10</sup> There was no sighting or bomb-dropping gear; grenades were usually carried in the airman's pockets and the home-made bombs were either placed inside the observer's cockpit or slung on cords along the sides of the fuselage.

On 31 August the French government abandoned Paris and fled to Bordeaux,

\* On 30 August III British Corps, consisting of the 4th Division and the 19th Brigade, was formed under Lieutenant-General W.P. Pulteney.

but the next day Joffre, the French Commander-in-Chief, allotted his Sixth Army to *Général* Galliéni, and it became part of a new 'Army of Paris' under the operational command of *Général* Maunoury. On 3 September the Germans took Reims and on this day RFC reported to Sir John French (who at once told Joffre) that Kluck had turned southeast and that some of his columns were now marching due east. Early on the morning of 4 September RFC reconnaissance reported sighting German bivouacs northeast of Paris. In fact, the German Supreme Command had now completely abandoned the Schlieffen Plan. Instead of marching all the way around Paris, Kluck, who believed that he was dealing with a defeated enemy, had shortened his wheel by turning east and southeast in the hope of driving in on the flank of the retreating Allies and cutting them off from the French capital. This manoeuvre meant that the German First Army was marching across the front of the Paris defences, presenting its flank to a counter-stroke. Joffre's opportunity had come. Now at last the long retreat came to an end as the French Commander-in-Chief ordered a major counter-attack for 6 September.

On the 5th the British retreat continued, but on the following morning the BEF was on a line Brie-Tournan-Rozoy and also preparing to counter-attack. The general plan for what was to be the Battle of the Marne envisaged the Army of Paris driving east and northeast to get around the flank of the Germans; the BEF was to attack in the centre across the Grand Morin and Petit Morin rivers; the Fifth French Army was to launch a converging assault almost due north; and the Ninth Army under *Général* Foch was to hold the exits of the marshes of St Gond.

Joffre had visited Sir John French at Melun on the 5th and outlined his plan for the coming counter-attack. The French Commander-in-Chief paid generous tribute to the work of the RFC, saying that 'The British Flying Corps had played a prominent, in fact a vital part, in watching and following this all-important movement on which so much depended. Thanks to [the British] aviators he had been kept accurately and constantly informed of Kluck's movements. To them he owed the certainty which had enabled him to make his plans in good time.'<sup>11</sup>

This tribute was well deserved. Indeed, it is difficult to escape the impression that of all the mighty armies that were deploying across the countryside of Europe that summer, from East Prussia to the Carpathians and from the Channel coast to the Swiss frontier, only the tiny British Expeditionary Force was adequately served by its aerial arm. In the east both the Austrians and the Russians blundered blindly into tremendous battles, and the Germans, who did not, owed little of their success to aerial reconnaissance.<sup>12</sup> Only the BEF knew from day to day with any reasonable degree of accuracy what enemy forces were facing it, what their strengths were, and in what direction they were advancing. This information came almost entirely from the RFC. Moreover, it was, as Joffre had admitted, on the strength of RFC reports, and not initially by any other means, that the French general staff at long last was able to form a correct impression of the strategic situation.

However, German aerial reconnaissance on 2 and 3 September had warned Kluck of his danger from the area of Paris, and accordingly on the 6th he turned west and made sharp contact with Maunoury's Sixth Army. As he did so he pulled away from von Bülow's Second Army. If this gap could be widened, and if the French Sixth Army could overlap it from the north, then Kluck's First Army

might be destroyed. Unfortunately the allied counter-stroke lacked precision. Foch's Ninth Army was repulsed by von Bülow, *Général* D'Esperey's Fifth Army was diverted from its advance into the gap by this development, and Sir John French did not push the BEF forward with sufficient vigour. Throughout the day the RFC flew reconnaissance missions from Melun, providing a continuous, accurate, and detailed picture of German movements and dispositions on the BEF's front. Many of the flights were used to determine the location of the British columns and to investigate the flanks.<sup>13</sup>

Moltke, on the other hand, was ignorant of the location and exact position of his armies. On 8 September he sent one of his staff, *Oberstleutnant* Hentsch, to investigate the situation, giving him full power to co-ordinate a retreat, if such proved necessary. Hentsch spent the night at Second Army Headquarters, while the BEF, which crossed the Petit Morin on the 8th and reconnoitred to the Marne, seized a bridge over the latter. At 0900 hrs the following morning a German air report informed Bülow that five British columns were near or across the Marne, and his troops therefore began to retire north. Hentsch had earlier proceeded to First Army Headquarters where he had ordered Kluck to conform to Second Army's movements. It was a momentous and probably unavoidable decision: now the entire German right wing of five great armies reversed direction and began to pull back towards the Aisne.

Both sides thereupon began that progressive extension of the battle line known as the 'Race to the Sea.' The coast was eventually reached, but getting there was not, in fact, the object of the operation. Rather, the aim was the outflanking of the opposing line. Both the Allies and the Germans moved north-westward in bounds, feeling for an exposed flank, but they did so cautiously because the troops were tired and the weather was bad. This last factor seriously restricted aerial reconnaissance during the period. In any case, neither side was successful in developing a turning manoeuvre. Thus the result of these operations was the mere prolongation of the battle lines past Ypres to the Channel coast. By mid-October there was a continuous front, partially entrenched, from the Swiss border to the English Channel and the first phase of the war was over.

The Battle of the Marne was a strategic but not a tactical victory for the Allies. Nevertheless, those who spoke of 'the miracle of the Marne' were certainly right, for it was here that Germany lost the war. Opposed on both the east and the west by forces that were potentially much stronger than she could herself muster, Germany's only hope of victory had lain in a quick decision. Failure to achieve this flowed from faults of organization, administration, command and control, the willfulness of some army commanders, and the weakness of Moltke. On the allied side we must count the fighting quality of the troops, the imperturbable resilience of Joffre, and the self-sacrificing pressure of the Russians in the east. There must be added to this list – and in a prominent place – the reconnaissances of the Royal Flying Corps that provided in time the essential information that enabled the German dispositions to be understood and without which the counter-stroke of the Marne could not have been conceived.

No Canadian airman had been involved in the flying operations that were such a vital part of the so-called mobile war. Fewer than two dozen flew in the fledgling RFC on the Western Front during the 1914-15 period, and only one actually saw

war service in 1914. He was Captain Frederick A. Wanklyn of Montreal, a 1909 RMC graduate serving in the British Army. Wanklyn was a gunner by trade and in 1910 had visited Port Arthur, in Manchuria, a city whose siege and capture had been a key event in the Russo-Japanese war of 1904-5. There he had walked over 203 Metre Hill, which the Japanese had taken at a cost of 14,000 casualties while the Russian defenders lost 6000 (he was told 30,000 and 25,000 respectively), primarily in order to establish an observation point for their artillery. It had occurred to Wanklyn shortly afterwards that 'in days to come, a man lifting kite, a balloon, or possibly an aeroplane could do this job.'<sup>14</sup> Two years later he applied to learn to fly; he earned pilot's certificate No 284 and was seconded to the RFC in November 1912. When war broke out he was an assistant instructor at the Central Flying School and joined 4 Squadron at St Omer on 26 November with the appointment of flight commander. Wanklyn flew several reconnaissance missions over the lines of Ypres, when operating out of St Omer and Bailleul after the front had begun to congeal, and he was gazetted for the Military Cross in June 1915, probably for these early reconnaissance flights although it has not been possible to find a citation for the award.\*

The RFC, in its embryonic form, had withstood the first shock of mobile battle well, perhaps as much by good luck as good judgment, by individual improvisation and initiative more than staff foresight and planning. Now, however, as entrenchments deepened across the front and field fortifications multiplied, the war underwent a fundamental change. Static, siege warfare was setting in and the deadlock would not be broken for nearly four years. Air doctrine had to adapt itself to the new conditions and to the new demands placed upon it by the army. By the end of 1915, when Canadians in significant numbers began to take their places in squadrons flying on the Western Front, the RFC had undergone important organizational changes, and the roles and tactics of the air arm had evolved remarkably from the simplicity of the early days of the war.

Changes in organization stemmed from the growth of the BEF and from the consequent necessity to decentralize flying operations. By mid-September 1914 there were three corps of two divisions each plus the Cavalry Division under Sir John French's command; then in December the BEF was reorganized into two armies totalling eleven infantry divisions and five cavalry divisions. On 30 October Henderson (already a major-general) had submitted a plan to reorganize his squadrons into wings and to attach one wing to each army, should the BEF be divided into separate armies. Sir John French approved these proposals on 1 November and that month 1 Wing, commanded by Lieutenant-Colonel Trenchard, was formed from 2 and 3 Squadrons, and 2 Wing, under Lieutenant-Colonel C.J. Burke, was made up of 5 and 6 Squadrons. The reorganization was approved by the Army Council in mid-December and when, on 25 December, the BEF corps were converted into armies, 1 Wing was assigned to First Army and 2 Wing to Second Army.

\* Wanklyn was posted to the Aircraft Repair Park in January 1915, to 5 Squadron in May, and to the newly-arrived 15 Squadron at the end of the year. He was promoted and appointed OC the Experimental Station at Orfordness in July 1916. He commanded training establishments in Canada from mid-1917 until the end of the war when he returned to the Royal Artillery, retiring from the service in 1928.

No 3 Wing was formed in March 1915; it consisted of 1 and 4 Squadrons and was commanded by Lieutenant-Colonel H.R.M. Brooke-Popham. On 8 December 1914 the wireless unit had become 9 Squadron although it continued to supply wireless aeroplanes on detachment as required by the corps. These aircraft served as nuclei for flights which were transferred to 2 and 6 Squadrons in February 1915 when it was realized that each wing needed its own wireless flight. Later 16 Squadron was added to 1 Wing and by the end of March the strength of the RFC in France was seven squadrons and one flight (of 9 Squadron), totalling eighty-five aeroplanes in the line and eighteen in reserve. Six months later it had grown to twelve squadrons totalling 161 machines in the line and forty in reserve, plus four Kite Balloon Sections.<sup>15</sup>

The rapid expansion of the RFC was accompanied by startling technological advances. Once the opposing armies had adopted fixed positions and dug in, so that lines of trenches scarred the landscape from the Swiss border to the Channel shore, aerial observation entered a new phase. Strategically, railheads, aerodromes, camps, and dumps had to be located and mapped; tactically, the minute changes in enemy dispositions and installations that, taken together, might indicate a forthcoming attempt to break the deadlock, had to be identified and assessed; positions of enemy artillery batteries needed to be identified for counter-battery work and the whole enemy trench network uncovered.

Strategic air reconnaissance was equally important to both sides, for there was no way that light cavalry, the traditional reconnaissance arm, could operate once the lines of wire and trenches ran uninterruptedly from the Alps to the sea. But while tactical air reconnaissance was useful to the Germans, it was vital to the western Allies. Because they had driven deep into Belgium and northern France during the mobile phase of the war, when the lines began to solidify the Germans had a freedom of operations denied to their opponents. For political and psychological reasons the Allies could never afford to surrender another inch of ground. Their enemy, in contrast, need not hesitate to exchange territory for tactical advantage. Consequently, the Germans had withdrawn a little in places where it suited them and dug their front lines high on the forward slopes of the gentle, low ridges about Ypres, Armentières, Arras, and Albert, where they could see far over the British or French lines. Their own reserve dispositions, lines of communications, and gun positions were hidden behind the crests of the ridges, only visible to airborne observers. In fact, as early as mid-November Sir John French had asked the War Office to ensure that all artillery officers in England receive instruction in directing fire by aeroplane observation.<sup>16</sup>

The location of hostile batteries was particularly important, as the British guns were often outranged and outnumbered, and observation by wireless aircraft quickly proved to be faster, more accurate, and economical of ammunition. The first aeroplanes used for this purpose were BE2as from 4 Squadron, equipped with transmitters but lacking receivers which were still too weighty and cumbersome to be fitted into the machines. Indeed, even the carriage of a transmitter meant that the pilot had to fly alone and observe and transmit as well as fly the aircraft. The primitive sets then in use weighed about seventy-five pounds and had a range of no more than three or four miles. Very lights and battery-operated signalling lamps were also used until well into 1915, while messages from the ground were either

received in Morse code flashed by signalling lamps or by codes employing white cloth panels (known as Popham panels) laid out on the ground.<sup>17</sup>

Initially the gunners were not always prepared to use this new form of direction. Trenchard, commanding 1 Wing, complained in December 1914 that the batteries 'crept up' to the targets instead of making the bold corrections requested by the pilots. Furthermore, only a few artillery commanders trusted the observers sufficiently to allow them to engage targets discovered on their own. Trenchard concluded that 'The co-operation with the artillery is fairly good, and will undoubtedly get rapidly better as soon as the gunners realize that our observers in the air are to be trusted in marking shots.'<sup>18</sup> Observers were soon beset by a variety of other problems, including the virtually smokeless burst of TNT which made registration most difficult in anything less than perfect weather, wireless 'jamming' by enemy transmitters, interference due to improper allocation of wireless frequencies, improvement of enemy camouflage techniques, and the use of faked gun flashes to frustrate counter-battery work.

Improvement was also needed in the system of describing the position of targets on a map if more accuracy were to be achieved. At first, the target was indicated by such imprecise map-based directions as 'under the Y in VIMY.' A Royal Engineer officer in 4 Squadron soon devised a gridded reference system using letters and numbers, so that a target could be pinpointed to within a few yards. Major W.G.H. Salmond, a staff officer at RFC Headquarters and a gunner by training, quickly saw the value of this and had a number of maps overprinted with the grid system. They were first used for artillery co-operation by I Corps during October 1914 and were soon taken into use on the whole of the Western Front. Shortly afterwards the infantry 'clock code' method was adopted for reporting the fall of shot, and air/artillery co-operation became an established and accepted part of military doctrine.<sup>19</sup>

Still another technique, of great significance for the field of military intelligence, was developed very closely with, if not exclusively for, artillery co-operation. Early air photographs were usually oblique exposures, taken from a fairly low angle. Vertical shots, made from greater heights, could include larger areas and gave less distortion. Pieced together in a mosaic, they provided an accurate and up-to-date map of the area photographed. The first successful British aerial camera, referred to as the 'A Camera,' was a conical box with a five-by-four-inch slide and envelope, and a lens set at a fixed distance from the plate. By the summer of 1915 the camera had been secured to the side of the aeroplane for greater vertical stability and a semi-automatic plate-changing device had been introduced. Until these developments took place the observer had to lean over the cockpit, holding on to the camera's brass handles or straps. He was required to go through ten distinct operations for each exposure (eleven for the first), while fighting against the wind and the cold and all the other aggravations of operational open-cockpit flying. Before the end of February a complete mosaic of the Neuve Chapelle area – where, in the battle that began on 10 March 1915, Sir John French made his first great attempt to break the trench deadlock – had been compiled by 2 and 3 Squadrons. No Canadians were involved, however, because Wanklyn, who was still with 4 Squadron where he served for a time as squadron commander, remained the only Canadian airman in France.<sup>20</sup>

Only three days before the Battle of Neuve Chapelle began a second Canadian arrived at the front, the first of what would soon become a trickle, then a stream, and finally a torrent. The newcomer was more representative of those who would follow, for he was the first of the war volunteers. Lieutenant Malcolm McBean Bell-Irving, the son of a Vancouver civil engineer and pioneer salmon canner, H.O. Bell-Irving,\* had left home only three days after the BEF had clashed with Kluck's army at Mons and paid his own way to England, determined to get into the air war. The relentless determination to fly that he displayed in London, combined with an instinctive and almost irresistible charm, led to his acceptance for flying duties without the customary formalities and enabled him to jump the queue for instruction. On 9 October 1914, after only nine days' training, he was awarded the Royal Aero Club's pilot certificate No 928. Within twelve days he had been gazetted a second lieutenant in the RFC and posted to 1 Squadron.

Bell-Irving crossed over to France with his squadron on 7 March 1915 and was soon engaged in the whole gamut of duties then expected of every airman: reconnaissance, photo-reconnaissance, artillery co-operation, and that embryonic form of air combat then known as patrolling. Two more Canadians arrived at the front a month later, Lieutenant Edmund Tempest, of Perdue, Sask., and Lieutenant William Ewart Gladstone Murray of Vancouver. Murray, a Rhodes scholar at Oxford when the war began,<sup>†</sup> had joined a British infantry regiment, been wounded and awarded a Military Cross for his bravery before transferring to the RFC and qualifying as an observer. Both Murray and Tempest flew to France with 7 Squadron on 8 April 1915.

It is unlikely that any of the four Canadians at the front in mid-May, except possibly Bell-Irving (the sole Canadian in 1 Wing at the time), played any part in the battle of Festubert from 15-22 May. But Wanklyn, temporarily attached to 16 Squadron, and Lieutenant William Reid of Port Arthur, Ont., a pilot who arrived in 2 Squadron on 4 June, both flew artillery registration missions during the First Army action at Givenchy on 15 June. Lieutenant T.D. Leeson of Vancouver, an observer posted to 16 Squadron on 9 May, may also have flown there. Lieutenant K.E. Kennedy of Sherbrooke, Que., arrived at the front with Leeson but was sent to a detached flight of 4 Squadron, with 2 Wing. The experiences of these Canadians, and of the others who were to follow them over the next several months, were typical of those of the RFC as a whole. Most of them found themselves flying in two-seaters and working near the lines. Though by July distant reconnaissance missions were normally flown by aircraft armed with machine-guns, those flying closer to home still relied largely on rifles and revolvers to defend themselves.

A refinement of the reconnaissance role arose out of the nature of trench warfare itself. Once attacks were launched, many commanders soon found themselves isolated from their troops by a curtain of enemy artillery fire that cut most of their communications with the front. This communication problem was never fully solved during the war, but the aeroplane, flying over the advancing lines, offered one means of bridging the gap. Such missions were later called contact patrols.

\* Bell-Irving's five brothers and two of his four sisters all served in the war, two of them, Alan Duncan and Richard, in the RFC.

† In 1936 he became the first general manager of the Canadian Broadcasting Corporation.

One of the first uses of aircraft in this role occurred at St Julien on 25 April 1915. Unfortunately, although the resulting report stated that there was a continuous and intact line, it was discovered later that some Germans had been mistaken for British troops and the situation was not nearly as favourable as the report had suggested.<sup>21</sup> Such misfortunes did nothing to develop staff confidence in airmen as reporters of the ground battle.

Another attempt to solve the problem of keeping track of the forward infantry was made two weeks later at Aubers Ridge. Three Maurice Farmans of 16 Squadron were ordered to patrol continuously over the troops and report the progress of their advance. The infantry upon reaching a certain line were to spread out strips of white sheets each measuring seven by two feet, and their positions were then to be relayed from the Farmans by wireless to any one of four ground wireless stations set aside for this purpose. Forty-two messages were sent down during the battle, but the information received was neither sufficiently detailed nor reliable enough to impress the staff. Observers had had difficulty distinguishing friend from foe, much more training was obviously required, and simpler signalling procedures had to be devised.<sup>22</sup> Nevertheless, contact patrols were to be persevered with until a system was developed for obtaining a reasonably accurate picture from the air of what was happening in the heat of battle on the ground.

Whatever the problems that beset attempts at contact patrols, the proven value of information collected by aerial reconnaissance and artillery co-operation aircraft led directly to efforts to intercept and bring them down, and then, consequently, to protect them with armed escorts. Yet despite experiments in the arming of aircraft carried out before the war, aerial fighting only slowly became one of the characteristic aspects of air warfare over the Western Front. Rifles and revolvers remained the general armament in most RFC aircraft well into the summer of 1915. There are very few first-hand accounts of early air combats, since it was not until 20 April 1915 that squadrons were ordered to forward combat reports to wing headquarters for record and intelligence purposes and, even then, it took some time to convince squadrons that such reports were of value. Malcolm Bell-Irving, showing the aggressive spirit that had served him so well in training, tried to shoot down a German machine on some unspecified date during these early days. His younger brother, Alan Duncan, many years later recalled the event in words which suggest that the story may have gained something in the telling: 'Finally he came up to a Hun from behind, a German single seater, which, as you know can be done without being seen or heard. He attempted to shoot the German but his revolver jammed so he threw it at him and hit him on the back of the head, which upset him but otherwise no known damage.'<sup>23</sup>

The earliest official reports involving Canadians show that inconclusive aerial fighting was an almost inevitable consequence of the simple weapon technology of the time. However, squadron commanders were beginning to complain about the lack of light machine-guns in the RFC. In a memorandum of 29 April Bell-Irving's Commanding Officer used the Canadian's experiences of the previous day to illustrate the need, commenting that 'It was impossible to arm Lt. Bell-Irving with a machine gun, since all three machine guns [held by the squadron] were out ...' His squadron was 'responsible for the protection of the batteries belonging to the

2nd Corps,' a difficult assignment under the best of circumstances since 'the Ypres Salient has now become so contracted that it has become possible for hostile aeroplanes over their own country on the north side to observe artillery fire directed on our batteries stationed on the East and South East side.' Bell-Irving, in a Martinsyde Scout and armed only with two automatic pistols, had been ordered to 'patrol' the salient on the afternoon of the 28th. He had an exciting time:

*First Engagement. Three Machines.* At about 4.30 p.m. two machines were observed approaching from Handzaeme and another from Thourout. Of these, two (apparently L.V.Gs.) were slightly slower, and the other (apparently an Aviatic [sic]) faster than Lt. Bell-Irving's machine, which was at 5,500 ft. at the time. Lt. Bell-Irving attacked these with an automatic revolver, and when all his ammunition was expended did his best to turn them by nose-diving. One of the machines did not observe Lt. Bell-Irving when he was nose-diving, and a collision was only narrowly avoided. After this incident it took the pilot 10 minutes to gain sufficient height before he could attack the other machines, and while doing so he pursued one of the slower machines which dived towards Nachtigal [sic] Forest, where an anti-aircraft gun opened fire. Lt. Bell-Irving pursued the faster machine, but could not succeed in forcing him down. He gave up the chase after he had succeeded in driving him six miles beyond our lines. Lt. Bell-Irving reports that had he had a machine gun he ought to have accounted for one of the slower machines, and also for the faster machines, but adds that at 5,500 ft. the Martinsyde without machine gun has to be flown at 65 m.p.h., in order to fly level, and with a machine gun his speed would be reduced below this. Consequently, unless the hostile faster machine failed to observe his approach (as in fact he did for a considerable time) a machine gun on a Martinsyde would be of no great assistance when attacking an aeroplane of superior speed.

*Second Engagement. Two Machines.* About 20 minutes later an 'Aviatic' came from the same direction in which the fast machine had disappeared, and when dived upon descended about 500 ft. and opened fire with a machine gun. Shortly afterwards an L.V.G. was engaged in a similar manner and chased over Nachtigal Forest.

*Third Engagement. Three Machines.* The Martinsyde was now at 3,800 ft. and it took 20 minutes to ascend to 5,800 ft., by which time three machines were observed over Merckem, two of which were probably L.V.Gs., and a third either an Aviatic or an Albatross, but more like the latter. All these machines were at much the same height, and owing to the time taken in regaining height after diving and forcing one of them to descend, Lt. Bell-Irving reports that it was quite impossible to interfere with the two remaining machines which could do exactly as they pleased until he was in a position to engage them. Actually he engaged them all.

*Fourth Engagement. One Machine.* Hardly had the last of these three machines gone down, when another machine came from the direction of Dixmude, but dived on being approached. Lt. Bell-Irving's general impression was that there were only 3 or 4 machines really, and that they were playing with the slow-climbing Martinsyde.<sup>24</sup>

On the same day Murray reported that a German machine, apparently co-operating with enemy anti-aircraft batteries near the Forêt d'Houthulst, climbed into his vicinity. He engaged it with his service rifle and the eleven rounds he fired drove the German away. Another Bell-Irving report recorded a combat on 7 May over

Gheluvelt, against a 'big pusher, with long-span "Voisin" undercarriage, wide tail and tubular fuselages running to [the] tail carrying two rudders.\* The enemy opened up with very rapid but inaccurate machine-gun fire, to which Bell-Irving replied with forty-five rounds from his revolver, fired at a range of seventy to a hundred yards. The enemy aircraft was last seen gliding towards Menin at 4000 feet, his engine shut off, and 'if he was not hit he was badly frightened.'<sup>25</sup>

In early February 1915 a set of notes on aerial fighting had been distributed by Lieutenant-Colonel Brooke-Popham to each RFC flight commander in France. Their elementary nature was an accurate reflection of the current state of the art. 'The moral effect of a fast machine, however skillfully manoeuvred, will be very small if no weapon of offense is carried,' he ventured. Suggested forms of fighting hostile machines included dropping steel darts, bombs, and even 'charging the enemy' if need be. This last resort was hardly likely to prove acceptable to pilots who were not even equipped with parachutes. In any case, Brooke-Popham recognized the use of firearms as the most effective method of air-to-air fighting and he pointed out that their effect depended upon the volume and accuracy of the fire that could be brought to bear. An increase in the relative volume could be obtained by more efficient weapons, proper manoeuvre, and concentrating the fire of two or more aeroplanes. Accuracy could be improved by training gunners properly. He recommended an automatic pistol for single-seaters and a carbine or rifle in most two-seater machines, since the weight of a machine-gun was likely to reduce the rate of climb far too much. Nevertheless, a Lewis gun expert was assigned to tour 2 Wing squadrons during April to impart a more systematic approach to 'aiming-off,' based on established theories of fire deflection. Short burst and the idea of traversing fire were also emphasized.<sup>26</sup>

Less than two months later aerial fighting became part of the reorganized duties of RFC squadrons. On 29 March 1915 16 Squadron, recently formed from flights of 2, 6, and 5 Squadrons and part of 1 Wing, was ordered to 'patrol between 9 a.m. and 12 noon the line Aire-Lille-Béthune-Estaires to attack any hostile aircraft,'† in addition to reconnaissance work and photographic missions. The order was repeated with slight variations on 1, 7, and 12 April, and on 7 May all squadrons in the wing were assigned various patrol hours for the next day. This procedure was formalized on 24 June 1915, when the squadrons of 1 Wing were instructed to prepare fighting patrols to prevent observation by hostile aircraft beyond a specific line in the dawn and early evening hours.<sup>27</sup>

\* Probably one of the rare, double-fuselage, twin-engined Aviatik biplanes. These were actually tractor aircraft but the protruding crew compartment behind and in the centre of the wings may well have deceived Bell-Irving into identifying it as a pusher.

† The rise of air fighting meant that the identification of friend and foe became a vital consideration. Tricolour roundels (or *cocardes*) painted on the wings and on the sides of the fuselage were the most common form of marking national identity. France, Italy, Belgium, Austria-Hungary, Russia, and later the United States all adopted the roundel, using their respective national colours, and striped the rudder in similar colours. Germany (and shortly after the outbreak of war, Austria-Hungary, whose aircraft were being confused with Italian machines) adopted the Maltese cross from the symbol of the old order of Teutonic knights. The British initially decided to use the Union Jack, but this proved to be a liability because it was indistinguishable from the German cross at medium distances in the air. The RFC therefore adopted the roundel, reversing the order of the colours used by the French.

Since the first duty of the RFC was still reconnaissance and, on occasion, bombing and artillery-spotting, its few single-seaters were essentially high-speed scouting machines, not fighters. As of 10 March 1915 the RFC's Order of Battle consisted of twelve different types, yet there was only one genuine fighter aircraft among them, a solitary, pusher type, two-seater Vickers FB5 in 16 Squadron. The observer sat in front, where he had an unobstructed field of vision and could swing a machine-gun through a 60-degree arc. The FB5's presence was entirely due to the foresight of Vickers Ltd, who had begun constructing a batch of fifty before the outbreak of war without a government contract. But not until the end of July 1915 would the first full squadron of FB5s reach the front.<sup>28</sup>

At the same time as the RFC was moving to improve its fighting efficiency, the German air arm was taking steps that would give it dominance for the balance of 1915. The first was the reorganization of the German air corps, which was removed from the sphere of the Inspectorate of Military Transport and henceforth commanded by a *Feldflugchef*, appointed to advise the High Command and initiate measures for making the air force more effective. This post was given to Major Hermann von der Leith-Thomsen. In quick order additional field units were organized, the replacement units in the homeland increased to meet the growing demands of the front, and a chaotic supply situation rectified.<sup>29</sup>

What was most urgently required, however, were specialized aircraft to replace the obsolescent all-purpose machines. Towards this end the hitherto haphazard production of aircraft was streamlined. The industry was organized in accordance with official directives, and operational experience made available to the design staffs of manufacturers. The first result of this was an improved reconnaissance machine, the 150-60-hp C-plane, a tractor-type aircraft of improved flight characteristics, increased speed, and greater climbing capacity. It was equipped with an air-cooled light machine-gun on a mount, operated by the observer from a rear cockpit. Machines of this type were usually fast and manoeuvrable enough to escape from any contemporary allied aeroplane when attacked, but what was even more badly needed was an aircraft that could deny the advantages of aerial reconnaissance to the Allies, for whom, as we have already noted, it was vital.

Suddenly good fortune, helped along by engineering skill, solved the problem. Lieutenant Roland Garros, a French airman, had the misfortune to be forced to land near Ingelmunster behind the German lines when his Morane-Saulnier was hit by a rifle bullet. Of more serious consequence than the capture of Garros – an innovator and experimenter as well as an excellent and aggressive airman – was the discovery of the apparently magical device which had permitted him to fire through his revolving airscrew. The Morane's armament was a single Hotchkiss machine-gun mounted centrally in front of the pilot, and the new device consisted of two hard steel deflectors mounted on the inside of the propeller at the level at which its rotation coincided with the bullets' trajectory. Some bullets ricochetted off the steel plates but those that missed the propeller travelled forward along the line of flight. Garros could aim his machine-gun simply by aiming his whole aeroplane at the target. The first true fighter aircraft had been created.

A hasty attempt to copy the Morane-Saulnier armoured airscrew was a dismal failure, but the Dutch designer, Anthony Fokker, was loaned the French propeller and a Parabellum machine-gun in the hope that he might discover something

equally workable and less hazardous. The solution was a device which allowed shots to be fired through the propeller arc by automatically interrupting the flow of bullets whenever the blade passed before the gun muzzle. Fokker has been generally credited with inventing this synchronizing mechanism. In fact, the invention was not his, although it was on a Fokker M5K flown by him that the first demonstration of firing a synchronized gun was successfully carried out in the air. After making some refinements on both, Fokker married his synchronized machine-gun to his new single-seater monoplane, the Fokker E (for *Eindekker*) 1, and demonstrated it to German pilots in the Verdun and Arras areas. When he left Douai on 12 July 1915 eleven pilots were already flying the E-1 in that vicinity.<sup>30</sup>

Among the German pilots of *Fliegerabteilung 62* at Douai were Oswald Boelcke and Max Immelmann. Together these two German 'aces'\* established new tactical standards for air fighting and it was to be some time before allied airmen could catch up with the concepts they introduced. The use of height and the sun, combined with aerobatic excellence and good marksmanship, characterized their tactics, summed up by RFC pilots in the pithy maxim, 'Beware of the Hun in the sun.' Immelmann's use of the roll off the half loop, a manoeuvre that enabled him to change quickly from attacked to attacker or to resume an interrupted attack with a sudden height advantage, was not invented by him, but the 'Immelmann turn' became part of the standard repertoire of German pilots, and of those allied airmen lucky enough both to see and survive it. As for Boelcke, he was not only an outstanding pilot with a flair for leadership, but a thoughtful student and innovator of group tactics in which one machine provided the offensive striking force while one or two more were solely responsible for guarding his tail.<sup>31</sup>

In July 1915 the Canadians began to experience the growing strength and efficiency of the German air force. On 26 July Bell-Irving was unsuccessfully attacked by an LVG armed with a machine-gun, near Roulers. Three days later Kennedy, observing in a Vickers FB5 (fondly termed the 'Gun Bus' by its air-crews), opened fire on a Fokker near Cambrai; the German aircraft, faster and more manoeuvrable, made a steep spiral descent which brought it underneath the Vickers, from where it fired and hit the lower plane, cutting two bracing wires and breaking a rib. Kennedy and his pilot, well over the German lines, flew home very cautiously.<sup>32</sup>

Air fighting imposed new psychological strains on airmen and turnover was rapid. New arrivals had to learn quickly the lessons acquired in combat by those who had gone before, or suffer the consequences. In July and August Murray, Wanklyn, and Kennedy were replaced by Lieutenant J.H. Scandrett of London, Ont., F.F. Minchin, an ex-PPCLI 'original' of British descent, who went to 1 Squadron, and Captain R.W. Bruce of Winnipeg and Lieutenants S.W. Caws of Edmonton, Alta., and J.L. Williams of Toronto, all of whom went to 10 Squadron. Caws and Williams were pilots, the others observers. Scandrett's tour with 5 Squadron was abruptly halted on 1 August when he was shot down and shortly after posted to

\* The use of the term 'ace' originated with the French, who bestowed the title upon any pilot who had scored five or more confirmed victories. The idea was soon adopted by other countries, although at first a German pilot had to be credited with ten victories to achieve the corresponding title of *Aberkanone*. The British never formally accepted the system.

England. No 2 Squadron's William Reid of Port Arthur, Ont., was wounded and taken prisoner the same day.<sup>33</sup>

A number of significant changes in RFC organization and personnel occurred during the summer, as preparations went ahead for the forthcoming Battle of Loos (25 September-10 October 1915), Sir John French's third and last attempt to break the trench deadlock with a frontal assault.\* Trenchard was appointed General Officer Commanding the RFC in the field, *vice* Sir David Henderson who returned to the War Office to administer the growing Military Aeronautics Directorate. The RFC's Order of Battle, which had consisted of three wings since 1 March 1915, had increased by three more squadrons - Nos 10, 11, and 12 - and all three wings got new commanders. Lieutenant-Colonel E.B. Ashmore, an expert on artillery co-operation, was given command of 1 Wing; Major John Salmon, who had proven himself a most successful squadron commander, was promoted to command No 2; and 3 Wing was given to Seston Brancker, who had helped Henderson recruit those first wartime flyers and had since been serving in the position that Henderson now took up.<sup>34</sup>

Trenchard, whose character and outlook have already been mentioned in earlier sections of this book, had no doubt at this stage in his career that the prime duty of the air arm was to support the army. He also saw clearly that it would not be able to do so effectively unless it could establish and secure aerial superiority. His strategy may have been questionable - indeed, it will subsequently be questioned in the course of this narrative - but his aim was certainly correct. How effective his attempts to achieve that aim could be in 1915 is another matter.

A production crisis in Britain had left the BEF seriously short of ammunition for its heavy guns. In planning for the forthcoming attack at Loos, therefore, it was vital that every available shell be used to best advantage. The artillery found it necessary to choose carefully the targets most likely to threaten the success of the offensive, judgments which required extensive and repetitive aerial photography, and to rely heavily on visual inspection and direction during and after their bombardments in order to programme their fire for maximum benefit. The brunt of the work at Loos fell on the four squadrons of 1 Wing (supporting First Army). The front was divided into four zones, one for each army corps and its supporting squadron; of the twelve flights, ten were earmarked for artillery co-operation, with an emphasis on counter-battery work.

By the time that the battle began the new Sterling wireless set, a transmitter with a range of eight to ten miles, had been issued to most of the squadrons and fitted in the artillery co-operation aeroplanes. Its antenna consisted of a stranded copper wire 120 feet long, weighted by a three-pound lead plumb dangling through an insulated aperture. Wound on a drum in the observer's cockpit, it was allowed to run out by releasing a hand brake and had to be rewound by hand following a shoot.

Prearranged signals were devised for informing contact patrols of the infantry's situation. In addition to displaying white strips of cloth to indicate the position of

\* Blamed for the failure at Loos, French was relieved of his command and succeeded by Sir Douglas Haig on 17 December 1915.

the line, certain designated soldiers were to light yellow smoke candles and all were to wave their helmets on the points of their bayonets. A system of cloth bars and arrows was also devised for use by battalion HQs to indicate the direction and distance of obstacles holding up their advance. Arrows would point to the obstacle and bars placed across the stem would indicate the distance, each bar denoting two hundred yards. Contact patrol aircraft were sent up by 3 Squadron, but no one had been appointed to replace casualties among the individuals responsible for displaying signal sheets or lighting flares, and the system broke down.<sup>35</sup>

Before the Battle of Loos began, Lieutenants Alan Duncan Bell-Irving (the younger brother of Malcolm McBean) and John Beverley Robinson, a Torontonian, the former an observer and the latter a pilot, had arrived in France. Three more Canadians arrived by the end of the month; Lieutenants R.C. Morgan of Farrans Point, Ont., a 1909 RMC graduate, went to 6 Squadron and J.S.B. Macpherson of Ottawa, a 1914 RMC graduate (who would return to Britain in December to qualify as a pilot) to 1 Squadron. Second Lieutenant K.A. Creery of Vancouver was posted to fill an observer's slot in 1 Squadron. Morgan's arrival in 6 Squadron on 21 September coincided with Caws' death.

Stanley Winther Caws was the first Canadian airman to be killed in action.\* Caws was Canadian by choice, having been born on the Isle of Wight and, at thirty-six, was unusually old to be flying in the RFC. He had served in the Boer War as a trooper in Paget's Horse, and afterwards emigrated to Canada, where he had been 'on an important and remunerative expedition in North-West Canada when the war began.' Returning to Edmonton, he enlisted in the 19th Alberta Dragoons and went overseas with the First Contingent. In February 1915 he transferred to the RFC. Another RFC candidate remembered him thus:

Barely had we been shown to our rooms, when a strikingly good-looking man made his appearance, grinning, and asked us if we were the two 'new guys.' In an obviously Canadian accent he ... welcomed us to Brooklands ... when we first met him [he] was the doyen of the learners at Brooklands. A grand character, the life and soul of our little party ... he was always with us to give advice where it was needed ...

Caws always sat at the head of the table in our little mess-room in the Blue Anchor, and I can hear him now, saying grace when the maid had served dinner, on the night of our arrival. It was a solemn little utterance that went like this: 'For what we are about to receive, may the Lord make us truly thankful, and see to it that we have the strength to keep the god-damned stuff down!'

He had the disconcerting habit, while we were waiting for the next course to be brought in, of suddenly snatching up any table-knives within reach, and slamming them, one after the other, across the room, into the woodwork of the door.<sup>36</sup>

\* Second Lieutenant John Parker was the first airman from Canada to be killed. He was observing from a Voisin machine on 21 July 1915 when it was forced down over the German lines. His pilot was unwounded but Parker died in hospital as a result of four wounds he had received. Parker was a British student (his father was a warrant officer in the British Army) who had completed a first-year programme at the University of Alberta in the spring of 1914. He returned to England to enlist and there is no evidence that he ever thought of himself as Canadian or intended to stay when he had completed his education.

Manners were more stereotyped in 1915 and a man like Stan Caws must have impressed the sheltered eighteen- or twenty-year-olds with whom he was thrown into such close contact. Perhaps his peculiar social graces help to explain how Canadians in the RFC got their reputation for unorthodoxy and mild rowdyism in a service where unorthodoxy and mild rowdyism were a way of life.

Caws graduated as a pilot in May 1915 and was posted to 10 Squadron, where he flew BE2cs. With a British observer he was flying a reconnaissance mission on 21 September when their machine was attacked by several German fighters and, after 'a great fight, lasting fifteen minutes, in which they expended all their ammunition ... Caws was shot dead when they were 11,000 feet up, the bullet afterwards hitting [the observer] Mr. Wilson in the leg.' The aircraft must have glided down, or Wilson managed to control it, for he came down in enemy territory and survived to write an account of the combat from a German prison camp.<sup>37</sup>

The day before Caws' death Alan Duncan Bell-Irving, who had been posted to 7 Squadron, was observing from a BE2c when he opened fire with rifle and Lewis gun on a nearby Albatros two-seater. The enemy observer, 'with ample room to use his machine gun, which was mounted on a swivel and turn table,' fired back from two hundred yards and one of his shots hit the BE's engine, putting it out of action and compelling Bell-Irving's pilot to start a glide towards his own lines. The Canadian removed his Lewis gun from its simple peg mount in an attempt to get the enemy in his sights, but the German machine 'crossed and recrossed our front so that we were unable to return his fire except for a few seconds on his turns.' His pilot managed to land the disabled machine near Poperinghe, luckily behind the allied lines. Two days later Bell-Irving was observing for another pilot in a RE5 near Menin when they were overtaken by an Albatros similarly armed. A round from the enemy's machine-gun hit Bell-Irving's own gun, causing it to jam, but they completed their reconnaissance even though two other German aeroplanes rose to meet them. On 26 September Bell-Irving was attacked once more, this time by a Fokker monoplane armed with a machine-gun and allegedly (there was no two-seater monoplane in service at this time) carrying an observer, but the encounter was again inconclusive. The next day Leeson's pilot was taken in by a trick used fairly often. While on a reconnaissance over Courrière the BE2c encountered an Albatros. Leeson fired a whole drum of ammunition at it without success, when the Albatros went down 'almost vertically' to a height of 1800 feet, followed by the BE2c. The enemy then fired a white flare and heavy rifle and machine-gun fire from the ground focussed on the British machine, forcing it to give up the chase.<sup>38</sup>

Whatever the technical difficulties of air fighting or battle reconnaissance, they paled into insignificance beside those that beset the development of air bombing. The first organized attempt had come at Neuve Chapelle when 2 and 3 Wings had been instructed to carry out tactical bombing raids in support of the attack, using 20- and 100-lb bombs against targets that included Courtrai, Menin, Lille, Douai, and Don railway stations. Raids took place on 10, 11, 12, and 13 March; a few direct hits were scored on junctions, on a stationary troop train, and a suspected divisional headquarters. But as Trenchard's biographer noted, 'piecemeal blows falling almost at random could not influence the main land battle, since even their

nuisance value was small.' The first bombing raid ever carried out in darkness by the RFC was a total failure, as all four machines assigned to attack the rail junction at Lille crashed before reaching the target.<sup>39</sup> Again, on 9 May the battle of Aubers Ridge had been opened by an aerial bombardment preceding the usual artillery bombardment. The bombing, planned to interrupt rail communications and harass back areas and army headquarters, was another failure. None of the bombs were observed to hit their targets.

The French were doing no better and, to try to solve this intransigent technological problem, a conference was called on 7 August between representatives of the French air service, the RFC, and the Royal Naval Air Service to review these picayune results. It was reported that in a total of 483 bombing operations carried out by the three services between 1 April and 18 June, 4062 bombs had been dropped with little material result. Attempts to hinder enemy movements by bombing railway junctions and stations had been made on 141 occasions during which 991 bombs were dropped. Of these attempts only three had been successful. Nevertheless, the potential was there if only the technological problems could be mastered and the RFC persevered in its efforts to turn bombing into a practical proposition.<sup>40</sup>

Only two makeshift bomb-sights had been in general use until mid-1915, the 'nail-sight' and the 'lever-sight.' The former was simply a piece of board with a spirit level attached and two nails set at an angle, only useful for dropping bombs from a fixed height and speed. The lever-sight incorporated changes which allowed for several heights and speeds according to a pre-established angle sighting table. In mid-1915 the CFS (Central Flying School) bomb-sight came into use; it had a vertically moveable foresight which, when used in conjunction with a stop-watch and timing scale, permitted bombing at varying heights and ground speeds, although it was still necessary to bomb directly up or down wind. A modification was subsequently introduced which did away with the watch and the scale and consisted of a horizontally sliding backsight which was appropriately nicknamed 'the trombone.' Like playing a musical instrument, bomb aiming in 1915 was much more an art than a science.\*<sup>41</sup>

The CFS sight brought better results. Over five-and-a-half tons of bombs were dropped in support of the Loos attack at the cost of two aircraft lost and two wounded pilots. The railway line was damaged in fifteen places, three trains were partly wrecked, two ammunition trains were blown up, a signal cabin was destroyed, and locomotive sheds were set on fire, despite extremely adverse weather conditions which forced the bombing machines to fly under heavy fire at very low altitudes. On 4 October, even before the end of the battle, Sir John French cited the RFC's contribution in a special order of the day. Yet the delays to German troop

\* The CFS sight held the field until replaced during 1917 by the 'drift' sights, devised by H.E. Wimperis and produced in several versions, which could be used for both low and high altitudes and allowed flying in from any direction regardless of wind; drift sights were to remain in standard use until the end of the war. Other types of bomb-sights used were the 'low height bombsight,' developed by the RNAS, the 'equal distance sight,' invented by W.O. Scarff in 1916, the 'negative lens sight,' and later on, the 'RAF periscope bombsight,' used on heavy bombers. None of them were much good.

transports were only temporary and, according to the German official historians, all reinforcements to the front arrived in good time.<sup>42</sup>

In the realm of air fighting, however, the technological keys to effective combat were already firmly in German hands. The Fokker E-III was appearing at the front: stronger and faster than the original *Eindekker*, by December there would be forty of them. Allied aircraft could be attacked from above or behind without awkward jockeying to bring fire to bear and, even in a dogfight, the difficulties of double deflection shooting were eliminated through the use of the Fokkers' fixed, synchronized machine-gun. The consequences for both German and allied morale were considerable as the idea of the 'Fokker scourge' spread. No consistent statistics of sorties flown were kept at this time. Indeed, no one had yet defined exactly what constituted a sortie. Although the ratio of combat losses to sorties flown was certainly increasing, however, it was probably not excessive in view of the numerical expansion of the RFC that was taking place at the same time. RFC losses jumped towards the year's end, owing in large part to the steadily rising curve of British aerial activity. The number of aircraft on squadron strength had doubled – from eighty-five to 161 – between 10 March and 25 September and the rate of increase was speeding up all the time. The fortnightly casualty lists sent home by RFC Headquarters in France make possible a compilation of those missing or killed in action (no distinction was made between airmen wounded in action and those hospitalized for other causes) and the total for June 1915 was six. In July, when the first *Eindekker* with a synchronized gun appeared, the total was fifteen, in August, ten, September, fourteen, and in October, twelve. In November and December, because poor weather was probably reducing the number of sorties flown, the numerical expansion of the RFC was of less significance, although the casualty figures were sixteen and seventeen, respectively. In January 1916 the total would rise to thirty. The scourge was then reaching its heights. The psychological impact was, in fact, more significant than the actual losses. In the later months of 1915 RFC Headquarters became increasingly concerned at the frequency with which its pilots broke off combat. On 20 October Trenchard minuted four such combat reports, and although he suggested that the pilots concerned 'are not good at describing their combats,' his questions make it plain that he was disturbed about what was happening.<sup>43</sup>

In these anxious days Canadians acquitted themselves as well as any airmen in the RFC. On 10 October Leeson had fallen victim to Immelmann while on a photographic reconnaissance mission near Lille; his pilot, with six bullet holes in him, died soon after their forced landing and Leeson, with a slight leg wound, was taken prisoner. Somewhat luckier, Williams, with 10 Squadron, photographing German defences in a BE2c near Lille on the same day, managed to escape with a damaged propeller and a few hits on part of the fuselage and in the petrol tank after being surprised by an Albatros. On 26 October he was attacked by a Fokker. His observer was hit in the left hand and Williams, attempting to manoeuvre out of a precarious position, was wounded in the arm and shoulder and lost consciousness. His BE2c began to spin down out of control, but the observer climbed over between the two back struts and attempted to regain control of the machine. He was able to crash-land behind the French reserve trenches, where the machine

turned over and Williams was thrown out. Both men survived the crash but Williams was subsequently evacuated to England.<sup>44</sup>

Winnipegger R.W. Bruce was observing in a BE2c of 10 Squadron near Valenciennes on 14 October when he and his British pilot were attacked by an Aviatik. Bruce's Lewis gun jammed and they were pursued as far as Douai by the Germans. On 28 November the same pair were attacked by another Aviatik near La Bassée while on reconnaissance duty. This was a very brief encounter but the enemy machine was driven off. Bruce and his pilot also showed the required offensive spirit two weeks later, while flying as escort to a reconnaissance machine, another BE2c of 10 Squadron. They drove off both an Albatros and a large two-engined enemy machine allegedly equipped with fore-and-aft-firing machine-guns. During the fight one of the enemy machines 'threw out a white light' and the BE returned to its escort duty under heavy anti-aircraft fire.<sup>45</sup>

Four more Canadians arrived on the Western Front by Christmas 1915, Lieutenants E.S. Wilkinson from Montreal and J.R. Dennistoun of Winnipeg, as observers to 1 and 7 Squadrons, respectively, and Lieutenants F.D. Pemberton of Victoria and C.V.G. Field as pilots, Pemberton to 5 and Field to 2 Squadron. All four of them were destined to be killed in action. Field and Wilkinson went down together on 12 January 1916, and Dennistoun, mentioned in despatches for his work in April, was killed while observing for Macpherson on 4 May 1916. Pemberton lasted until 21 August 1917, but life was getting nastier, more brutal, and shorter for airmen on the Western Front.

A.D. Bell-Irving was wounded on 14 December and evacuated to England. His irrepressible elder brother, Malcolm McBean (who had been promoted captain on 9 July), was also wounded on 19 December when, in a single-seater Morane Scout, he took off after an unidentified enemy aircraft which quickly disappeared. Over Perenches he found and attacked another German machine which made off toward Lille without fighting. He then attacked a third opponent over Quesnoy and sent it down in a steep dive emitting large puffs of smoke, before the pilot seemed to regain control and disappeared in a heavy mist. The Canadian climbed to 12,000 feet, spotted two more enemy aircraft, and dove on the larger. As he followed it down three more enemy machines joined the fight and Bell-Irving wisely withdrew. Then he sighted yet another enemy aircraft over Polygon Wood, but while he was manoeuvring for position he was hit in the hand by a splinter from a British anti-aircraft shell, compelling him to abandon the chase and return to his aerodrome. For his conspicuous and consistent gallantry and skill during the past nine months, but notably for his efforts on this last occasion, he was awarded the Distinguished Service Order, the first Canadian airman to be so decorated.

By Christmas 1915 the nature of aerial warfare on the Western Front had changed as dramatically as the ground fighting. Initially the excitement (and danger) had been almost exclusively in the act of flying itself. In 1914 enemy aircraft had posed no threat to the pioneers who, in their reporting of the movements of great armies, had been able to accomplish, virtually unimpeded, a revolution in the art of warfare. Now the air itself had become a battlefield: aircraft had become far handier to fly and far more reliable, but as their machines became safer the lives of the men who flew in them became daily more hazardous.

The BEF had increased in size to three armies of ten corps, totalling nearly sixty divisions, and the RFC had grown proportionately. Other air forces had also expanded. At the end of the year the Germans could muster about eight hundred aeroplanes for their eastern and western fronts, and France deployed that number on the western front alone. The Flanders sector, where the BEF held most of the allied line, was the vital one in the west and the Germans concentrated a high proportion of their best machines and airmen there. Even so, and despite the enemy's technological edge, the RFC had been able to increase its monthly flying time from some 2100 hours in July 1915 to over 4700 hours in September, during the battle of Loos. At year's end, ten of the twenty-one Canadian pilots and observers who had joined operational squadrons were still at the front, one had been killed, and three others were prisoners. Of the six returned to England, two would later fly in the Middle East and three would come back to fly again over France, next time in the company of many more of their countrymen.

## The Birth of Airpower, 1916

The fighting on the Western Front in 1916 occupies a special place in the history of the First World War. Its two biggest battles, Verdun and the Somme, were not different in kind from what had gone before, but they were so huge in scale and so grievous in losses that they opened a new and critical phase of the war.

At the outset of the season for active operations each of the high commands had its particular vision of what was to be gained through a massive offensive. In July 1915, at Chantilly, the Allies had agreed on a joint Anglo-French offensive in 1916. To *Général Joffre*, the aim, aside from involving the British more fully, was to wear out the enemy. To General Sir Henry Rawlinson, commander of the Fourth British Army, the objective was simply to push the enemy back, step by step, after thorough bombardment. But to General Sir Douglas Haig, who had taken command of the British forces on 19 December 1915, the aim was nothing less than a massive rupturing of the enemy's front. By passing cavalry through the break, he hoped to ensure that the victory so won was chiefly accomplished by 'the Forces of the British Empire.' Though Haig's ideas were greeted with derision by his critics in the War Cabinet, he remained firm in his resolve, despite his recognition that the bulk of the troops he proposed to employ were new to combat. 'I have not got an Army in France really,' he confided to his diary in March, 'but a collection of divisions untrained for the Field. The actual fighting army will be evolved from them.' Since fire and movement tactics were thought too advanced for inexperienced troops, the British soldiers, following thorough artillery preparation, would simply walk to their objectives, inserting themselves through breaches in the German wire blasted by the guns. It was a recipe for disaster.<sup>1</sup>

The attack on the Somme was planned for midsummer. Long before then, however, the German High Command had unexpectedly taken the initiative. On 21 February it opened an offensive against the fortress of Verdun and the terrible battle of attrition that ensued altered the complexion of the war. The Germans had determined to break the French will to fight. In the words of *General Erich von Falkenhayn*, First Quartermaster-General of the High Command and therefore in effect the Commander of the German forces in the field, 'If we succeed in opening the eyes of her people to the fact that in a military sense they have nothing more to hope for, that breaking point would be reached and England's best sword knocked out of her hand.'<sup>2</sup> The immediate effect of Verdun was an extension of the BEF's share of the front, as French forces were drawn into the cauldron. Moreover, as