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# SHOOTING THE FRONT

Allied Aerial Reconnaissance and  
Photographic Interpretation  
on the Western Front —  
World War I

*with a foreword by General George A. Joulwan  
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# CHAPTER 1

## AUGUST TO LATE 1914: THE EVOLUTION OF AERIAL RECONNAISSANCE AS A FORCE MULTIPLIER

### **Aerial Reconnaissance at the Commencement of the War**

Aeronautical reconnaissance from the first five months of war clearly demonstrated the acceptance of aerial observation as an integral part of modern warfare. Both sides made significant advances through reconnaissance, thanks to the array of uniquely designed aeroplanes that provided the battlefield commander with a view from the “higher ground.” The opening weeks of combat established patterns that became the foundation for one of the most important roles of aviation in the 20th century. Information became an integral part of aeronautics. Observation became both science and art as aeroplanes maneuvered with ground forces, contributing data to commanders that helped reveal enemy intentions. The ability to detect the movement of forces meant that whatever was on the ground was now accessible to reconnaissance. These lessons were quickly learned by aviators and commanders alike. Confidence in the aeronautical arm was established. However, the initial salvos of the first months of combat also demonstrated the need for technology to reinforce aerial observation.

The roots of aerial reconnaissance for military purposes go back to the 18th century. Then the French demonstrated that a balloon was beyond novelty and could support military objectives. With each trial the aerial proponent discovered that an aeronautical advantage correlated to a combat advantage. The powers of Europe had

the resources to leverage aeronautics for their standing militaries. Pioneer British aerial historian Sir Walter Raleigh observed in 1922, “The pride of Germany was in her airships, and the pride of France was in her aeroplanes.”<sup>1</sup> Britain dabbled with both, albeit not to the extent of being competitive. It was preoccupied with the naval race against Germany. However, it was not blind to the advances achieved through military aviation. British assessments in 1911 concerning French aviation acknowledged it equated to national power projection. As Raleigh stated, “There is no doubt at all but that the Germans have suddenly realized that the French Army since the general employment of aeroplanes with troops has improved its fighting efficiency by at least twenty per cent.”<sup>2</sup>

Early aerial reconnaissance introduced a unique technology. Fragile prewar aerial platforms were incapable of sustaining meaningful sorties of long duration. Yet the opportunity to alert infantry and artillery to the advancing enemy provided the impetus to integrate aviation within the standing forces. The French were keen on this idea: “The aeronautic mission was

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<sup>1</sup> Sir Walter A. Raleigh and H. A. Jones, *The War in the Air; Being the Story of the Part Played in the Great War by the Royal Air Force* (6 vols., Oxford: The Clarendon Press, 1922-37; reprint, London: The Imperial War Museum, and Nashville, TN: The Battery Press, 1998), I, 75. Raleigh authored the first volume and Jones the others. Hereafter cited as Raleigh for references to vol. 1, and as Jones for vols. 2-6 and Appendices.

<sup>2</sup> Raleigh, I, 177-178.



**FIGURE 2. Capitaine Saconney, the French Aviation Militaire's visionary for aerial observation platforms.** Source: SHAA, photo contained in Charles Christienne and Pierre Lissarague, *A History of French Military Aviation* (Washington, DC: Smithsonian Institute Press, 1986).

initially fixed, strategic reconnaissance against a rapidly advancing enemy.”<sup>3</sup> Aerial photography at this moment was an experiment, considered by many in the military to be another minor novelty of technology. However, photography was a well-established part of the cul-

<sup>3</sup>“Aeronautics,” June 1921, 1, Part XXXVII, sec. 3, in American Mission with the Commanding General, Allied Forces of Occupation, Mainz, Germany, “A Study of the Organization of the French Army Showing its Development as a Result of the Lessons of the World War and Comprising Notes on Equipment and Tactical Doctrine Developed in the French Army, 1914-1921,” NARA, RG 120, Box 819.

ture of the day and was soon recognized as a medium that could contribute to the conduct of a campaign. Advances in aeronautics over the fifty years since the American Civil War had demonstrated observation roles for lighter-than-air balloons and the later-designed dirigibles. In France, the means to capture the aeronautical dimension for military purposes was accomplished through ongoing experimentation with man-carrying kites for observation.

During this vibrant period of experimentation, the roots of aerial photographic reconnaissance took hold. Public awareness of aviation's potential for acquiring information was demonstrated in unique ways prior to powered flight. Innovative aerial platforms for photography went beyond balloon units. In 1896, the public was entertained by the potential of aerial photography through publications describing successful coverage from parakites and pigeons armed with miniature cameras.<sup>4</sup> Throughout the latter half of the 19th century, photography and aerial platforms proved their military usefulness. As early as the late 1860s, the Prussian General Staff organized a corps trained in photographic methods to conduct aerial military surveys, aiding its planning for military operations in the Franco-Prussian War of 1870.<sup>5</sup> Campaigns were employing aerial platforms to commence initial planning. Innovations experienced by balloonists in the U.S. Civil War, the Franco-Prussian War of 1870, and the Spanish-American War confirmed the utility of balloon-hosted aerial observation and photography.

Experimentation blossomed as existing technologies were applied to aviation. In 1906, a British inventor, Samuel Franklin Cody, built a man-carrying kite that was accepted by the British Army. A year later, Cody built the first British-designed aeroplane, which was subsequently identified as Army Aeroplane No. 1.<sup>6</sup> In 1910 Robert Loraine, in a Bristol aeroplane fitted with a transmitting apparatus, succeeded in sending

<sup>4</sup>Gilbert T. Woglom, *Parakites* (New York: G. P. Putnam's Sons, 1896), 41-44.

<sup>5</sup>James W. Bagley, *The Use of the Panoramic Camera in Topographic Surveying* (Washington, DC: GPO, 1917), 12.

<sup>6</sup>Roy C. Nesbit, *Eyes of the RAF: A History of Photo-Reconnaissance* (Phoenix Mill, UK: Alan Sutton Publishing, Ltd., 1996), 9.

radio messages from a distance of a quarter of a mile.<sup>7</sup> The French Aerial Photographic Service conducted research in both aerial photography and restitution (analysis of photographic images applied to developing and enhancing information on a map) under the command of Capitaine Jacques Saconney.<sup>8</sup> French military trials in February 1910 used man-bearing kites to support artillery observation and attempt aerial photography. Saconney developed and employed a man-bearing kite to an altitude of 560 meters. The three-kite configuration allowed various passengers to both observe and photograph the area. Despite the apparent risk, Capitaine Saconney's commander Général Joly went aloft in the kite.<sup>9</sup>

Aéroplane reconnaissance quickly ceased being a concept and became reality. The command staff of the French Armée, the Grand Quartier Général (GQG), supported aviation's role in several instances. They put the idea into practice, demonstrating aerial reconnaissance for military purposes on 18 September 1911. During a military exercise, Capitaine Eteve and Capitaine Pichot-Duclas flew a 42-kilometer track in a Maurice Farman north from Verdun to Étraye and west to Romagne at an altitude of 1,000 meters, providing in-depth observations of activity.<sup>10</sup> The next year, four Blériot Type XI aeroplanes deployed to Morocco, providing aerial reconnaissance for the French Armée. These aircraft were not just a novelty; they were now part of the operational scheme.<sup>11</sup> At the same time, the French reinforced their traditional forces by establishing a Blériot Cavalry (BLC) unit with three Blériot aeroplanes.<sup>12</sup>

<sup>7</sup> Wireless and radio were interchangeable terms. Radio will be the primary term used in this book. Raleigh, I, 170.

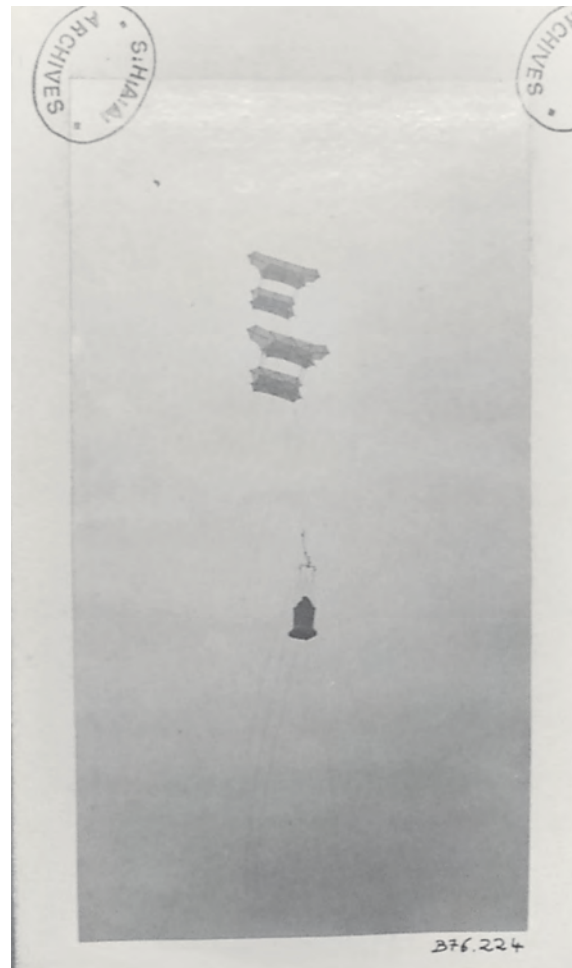
<sup>8</sup> "Lecture on Aerial Photography, Centre d'Etudes de l'Aéronautique," 25 April 1923, NASMA30.2/36.

<sup>9</sup> *Rapport du Capitaine du Génie Saconney, au Sujet des Expériences de Cerfs-Volants Effectuées avec Nacelle Lestrée à bout de Cable*, 21 February 1910, SHAA; Marcellin Hodeir, "La Photographie Aérienne: 'de la Marne à la Somme,' 1914-1916," *Révue Historique des Armées*, No. 2 (1996): 108 (translation by Commandant Marc Rivière, French Air Force).

<sup>10</sup> *Manoeuvres du 6<sup>ème</sup> Corps d'Armée*, Flight Log, 18 September 1911, SHAA.

<sup>11</sup> James J. Davilla and Arthur M. Soltan, *French Aircraft of the First World War* (Stratford, CT: Flying Machines Press, 1997), 55.

<sup>12</sup> Davilla and Soltan, 1.



**FIGURE 3. Général Joly observes a 1910 French military exercise from a Saconney-designed kite.** Source: SHAA, B76.224.

However, despite the progress through experimentation, aviation's potential was not fully understood. While attending an air race in eastern France in 1910, Général Ferdinand Foch commented, "Flying, you must understand is merely a sport, like any other; from the military point of view it has no value whatever."<sup>13</sup> His attitude was echoed by another future senior commander of the coming conflict, General Sir Douglas Haig. Haig spent his career in the cavalry, and as "the Apostle of Cavalry," he expressed his bias in 1911 on the technology that was being introduced. "Tell Sykes [Colonel F.H. Sykes, soon to become the first British chief of

<sup>13</sup> Foch, quoted in Georges Blond, *The Marne* (trans., London: Macdonald and Company, 1965), 163.



**FIGURE 4.** Prior to the war, French aviation actively exercised aerial reconnaissance in military operations and exercises. A Blériot pilot is in the process of debriefing the reconnaissance to an intelligence officer. Source: Claude Grahame-White, *The Aeroplane in War* (London: T. Werner Laurie, 1912), 192.

staff for aviation] he is wasting his time, flying can never be of any use to the Army.”<sup>14</sup> As the war proceeded, both became recognized advocates of aviation’s potential.

Though critics were wary, influential proponents saw potential value, and aviation became more legitimized. On 19 March 1912, Aviation Militaire was recognized by the GQG as an integral part of the French armée.<sup>15</sup> Ten days later, French Aviation Militaire units were formed under Colonel Hirshauer, comprising an aerial force strength of five escadrilles.<sup>16</sup> The British also commenced structuring their aeronautical force. The Royal Flying Corps (RFC) was constituted by a Royal Warrant on 13 April 1912.<sup>17</sup> In 1913 the French Aviation Militaire was placed under the command of French Corps d’Armée (CA) commanders, or local administrators, to diminish the authority of the permanent inspector for aviation. Military maneuvers that year showed reconnaissance information from Aviation Militaire was extremely useful. On 4 April 1914, Aviation Militaire became a separate department of the Ministry of War, making it an independent French military service.<sup>18</sup> Army sponsorship for aviation also occurred within the U.S. Army Signal Corps. This arrangement existed until the U.S. Air Service was created as a separate entity in 1918.

<sup>14</sup> Maurice Baring, *Flying Corps Headquarters, 1914-1918* (London: William Blackwood & Sons, Ltd., 1968), 306.

<sup>15</sup> “Report on Aeronautical Matters in Foreign Countries for 1913,” 16, TNA, PRO: AIR 1/7/6/98/20.

<sup>16</sup> Davilla and Soltan, 1.

<sup>17</sup> Raleigh, I, 199.

<sup>18</sup> Davilla and Soltan, 1-2.

The French and British militaries both developed coherent aviation organizational structures. The French promoted homogeneity of aircraft types for the various escadrilles to save on maintenance while promoting a diverse collection of craft primarily used in observation and reconnaissance missions. Along with infrastructure came development of a specific air doctrine for observation and reconnaissance missions. By 1913 Aviation Militaire comprised eight companies for aérostat (ballon/dirigeable) work and ten sections for aviation work.<sup>19</sup> British aviation worked with both resources. RFC squadrons comprised a mix of aeroplanes, while the Royal Navy deployed a dirigible fleet for naval missions.<sup>20</sup>

Military staffs also started to refine the routing of information from their aeronautical sources. French officers were encouraged to become familiar with aviation and its reconnaissance potential. Staff officers were expected to make passenger flights, and some were even detached for a period as observers. Absolute familiarity with the maneuvers and formations of all arms was considered essential. The French also realized early on the potential for having aéroplanes observe artillery fire. A British intelligence estimate described the process:

Two white lines are marked on the ground to show the observer where the battery is in position. The aeroplane ascends behind the battery and rises to a height sufficient to be clear of

<sup>19</sup> “Report on Aeronautical Matters,” 12, TNA, PRO: AIR 1/7/6/98/20.

<sup>20</sup> Charles Christienne and Pierre Lissarague, *A History of French Military Aviation* (Washington, DC: Smithsonian Institution Press), 59.

the trajectory of the shells. The battery commander then fires his bracket. The observer is provided with a sheet of paper across which two parallel lines are drawn indicating the two extremities of the bracket. Having observed the first rounds he marks on the paper the position of the rounds with reference to the space between the two lines representing the extremities of the bracket. He then drops the paper near the battery commander's position.<sup>21</sup>

In another maneuver, a suitable landing place for the dropped information was selected by marking it with a large white sheet. A party of two non-commissioned officers and eight troopers were permanently on duty so as to be ready to take messages to the proper quarter.<sup>22</sup> Additionally, the French started realigning their command centers to areas where *aéroplanes* operated. Messengers were stationed at designated landing zones to transfer reports to the various units. Over time the landing zones became the rendezvous point for military commanders to disseminate their own information.<sup>23</sup>

The French proceeded to develop an aerial camera, commencing development under strict conditions of secrecy.<sup>24</sup> An aerial camera was developed by the French Telephotography Laboratory prior to the outbreak of the conflict.<sup>25</sup> By August 1914 the *laboratoire des recherches aéronautique* (Aeronautical Research Center) at Chalais-Meudon had three wood-frame prototype cameras for *aérostat* observation. They employed 100 cm, 60 cm, and 50 cm focal lengths. However, despite the progress, the laboratory encountered a lack of interest as their cameras were demonstrated to artillery staffs.<sup>26</sup> By the time the French mobilized for war, they

had established three photographic sections to work with the *aérostat* units. The Paris section was led by Capitaine Georges Bellenger (chef d'avion VI<sup>ème</sup> Armée). He was an artillery officer whose aviation career had an auspicious beginning. He served as advisor to a leading French parliamentarian, Senator Reymond, on aeronautical matters.<sup>27</sup> Bellenger became the catalyst for creating the aerial observer's role in the upcoming first weeks of the war. The Verdun sector was led by Lieutenant Maurice Marie Eugène Grout, another French artillery officer by training who proved to be the most successful transformer for the French military's adaptation of aerial photography.<sup>28</sup> Lieutenant Grout was a brilliant and extremely hard-working staff officer. Educated at France's elite *École Polytechnique*, he was a key member of the staff at Chalais Meudon, developing aerial telegraphy and photography before the war started.<sup>29</sup> The third photographic section supported the eastern French region headquarters at Toul.<sup>30</sup>

The British did not strongly emphasize aerial photography prior to the war, although they did experiment with balloons during the Boer War in South Africa at the turn of the century. However, their attempts to combine aerial photography and *aéroplanes* remained experimental well into the first months of the war. In the first year of its existence, the RFC dabbled with taking photographs from the air (airships, balloons, and kites) at Farnborough using the "Panros" (Pan-Ross) hand-held camera and showing the results at the Annual Exhibition of the Royal Photographic Society. Before the outbreak of the war, an exhibition at Farnborough featured "Photographs from Aeroplanes."<sup>31</sup> The Pan Ross was a press camera with a 6-inch lens using 5-inch and 4-inch glass plates.<sup>32</sup> Interest in aerial photography generated a call for volunteers to join the Military Wing of

<sup>21</sup> "Report on Aeronautical Matters," 16, TNA, PRO: AIR 1/7/6/98/20.

<sup>22</sup> "Report on Aeronautical Matters," 16, TNA, PRO: AIR 1/7/6/98/20.

<sup>23</sup> "Report on Aeronautical Matters," 16, TNA, PRO: AIR 1/7/6/98/20.

<sup>24</sup> Raleigh, I, 177-178.

<sup>25</sup> Raleigh, I, 170.

<sup>26</sup> Gaston Labussière, "La Photographie Aérienne," in Maurice de Brunoff, ed., *1914-1918: L'Aéronautique pendant la Guerre Mondiale* (Paris: M. de Brunoff, 1919), 183 (translation provided by Commandant Marc Rivière).

<sup>27</sup> John H. Morrow, Jr., *The Great War in the Air: Military Aviation from 1909 to 1921* (Washington, DC, and London: Smithsonian Institution Press, 1993), 34.

<sup>28</sup> Hodeir, 108.

<sup>29</sup> *Lieut* Maurice Marie Eugène Grout, Personnel Records, SHAA.

<sup>30</sup> Hodeir, 108.

<sup>31</sup> Original spelling of the Pan Ross was Panros. *Lieut* Charles W. Gamble, "The Technical Aspects of British Aerial Photography during the War 1914-1918," TNA, PRO: AIR 1/2397/267/7; Raleigh, I, 250.

<sup>32</sup> Nesbit, 11.





the RFC. One volunteer was Frederick Charles Victor Laws. He transferred from the 3rd Battalion of the Coldstream Guards and became a First Class Mechanic Air Photographer. Laws improved the photographic laboratory at the Farnborough test grounds shortly after his arrival. He subsequently was promoted to sergeant and became the RFC's first noncommissioned officer in charge of photography.<sup>33</sup> Laws made RFC history by serving as aerial photographer using the first British-designed aerial camera, the Watson Air Camera. In 1913, Laws flew on a dirigible and took aerial photographs of the Basingstoke Canal. It was an auspicious start. Laws became the leader of many British initiatives in developing aerial photography for the remainder of his military career.<sup>34</sup>

RFC No. 1 Squadron became the initial aeroplane unit to explore aerial photography. In 1913, the British transferred all dirigibles from the RFC to the Royal Naval Air Service (RNAS). No. 1

**FIGURE 5. Capitaine Bellenger, an early French aviation pioneer, directed the French Armée photographic section for the Paris sector at the outbreak of the war.** Source: SHAA, B84.3023.

Squadron served as an “Aircraft Park” to experiment on new aerial capabilities.<sup>35</sup> While assigned to No. 1 Squadron, Laws proved the capability for developing a photograph in-flight. In early 1914, RFC No. 3 Squadron took the lead in developing British aerial photography. The officers purchased their own cameras and commenced to learn the art of photography on their own. They even learned Laws’ technique for developing negatives in the air and had them ready for printing upon landing. On their own initiative they

<sup>33</sup> Nesbit, 10.

<sup>34</sup> Nesbit, 11.

<sup>35</sup> The Royal Naval Air Service was the naval counterpart of the RFC until the RAF was established in 1918; Nesbit, 11.

photographed the defense of the Isle of Wight and the Solent at an altitude of 5,000 feet.<sup>36</sup>

In June 1914, Sergeant Laws flew as aerial observer in a Henri Farman (HF 7, “Longhorn”) with the Watson Air Camera mounted on the nose. The sortie ended when the engine motor cut off and the plane crashed. Not to be dissuaded, two days later Laws took off as observer in a Maurice Farman (MF 11, “Shorthorn”) and photographed a military review and parade in progress. What caught Laws’ attention as the photographs were developed was the difference in light reflection on the adjoining grass from personnel walking through the area. It gave reason to further explore the potential that aerial photographic interpretation could offer.<sup>37</sup> Despite the amazing effort underway, the prevailing attitude among military circles was mixed: “If that young fool likes to get himself killed, let him do so.”<sup>38</sup> With each demonstration of aerial photography, “those who came to scoff remained to pray.”<sup>39</sup>

French armées and aviation assets commenced mobilization when the war started. “At the time of mobilization military aeronautics was still in its earliest infancy. We may say it was as the fighting went on that this science was evolved and developed.”<sup>40</sup> French aéronautic units were governed under Plan XVII (14 February 1914) comprising both aérostation and aviation.<sup>41</sup> The French aviation section now comprised 21 flights of six aeroplanes. Two BLC flights of four aéroplanes were added at the start of the war. The mainstay Blériot XI was capable of flying for two hours at 1,500 feet, providing a mobile aerial platform that maneuvered over the countryside and acquired vital glimpses of enemy forces. Immediately after mobilization, new flights were created from aéroplanes delivered or salvaged behind the lines. Aviation personnel numbered about 3,500, including 480 officers and non-

commissioned officers.<sup>42</sup> Increased awareness of the value of “higher ground” reporting resulted in a support element to convey critical information. Each escadrille had a “fast car” and a motorcyclist assigned to rapidly disseminate airborne-acquired reports to the respective ground commander.<sup>43</sup>

French intelligence, known as the 2<sup>e</sup> Bureau, actively monitored the advancing German forces with all the resources at its disposal. The fledgling radio intercept function was effective in view of the capabilities of the time. Established in 1909, the French radio intercept specialists were recognized as experts in this field. 2<sup>ème</sup> Bureau also conducted cryptological analysis that served the highest levels of the government.<sup>44</sup> The French had committed their intercept service in full, even before the beginning of the war, and were following German Army traffic attentively. After a few days, they had a perfectly clear picture of the operational structure of the German Army in the west as it marched through Belgium in the direction of Paris.<sup>45</sup>

## The Commencement of Combat

French aviation was put to the test as battle commenced. Each armée included a flight of aéroplanes. Order of battle for Aviation Militaire comprised I<sup>ème</sup> Armée (six escadrilles), II<sup>ème</sup> Armée (four escadrilles), III<sup>ème</sup> Armée (four escadrilles), IV<sup>ème</sup> Armée (two escadrilles), V<sup>ème</sup> Armée (five escadrilles), and two BLC escadrilles.<sup>46</sup> When the war commenced, the French used their aéroplanes for daytime reconnaissance and dirigible fleet for nighttime observation. The first French wartime reconnaissance mission was accomplished by a Maurice Farman (MF) 7 from escadrille MF 2.<sup>47</sup>

Like the French Aviation Militaire, the British Military Wing prior to the commencement of

<sup>36</sup> Raleigh, I, 250.

<sup>37</sup> Nesbit, 13.

<sup>38</sup> Unknown source quoted in Gamble, “Technical Aspects of British Aerial Photography,” TNA, PRO: AIR 1/2397/267/7.

<sup>39</sup> Unknown source quoted in Gamble, “Technical Aspects of British Aerial Photography,” TNA, PRO: AIR 1/2397/267/7.

<sup>40</sup> “Aeronautics,” June 1921, NARA, RG 120, Box 819, 1.

<sup>41</sup> Christienne and Lissarague, 59.

<sup>42</sup> Christienne and Lissarague, 58.

<sup>43</sup> Douglas Porch, *The French Secret Services: From the Dreyfus Affair to the Gulf War* (New York: Farrar, Straus, and Giroux, 1995), 56.

<sup>44</sup> Porch, 56.

<sup>45</sup> Wilhelm F. Flicke, *War Secrets in the Ether*, ed. by Sheila Carlisle (2 vols., Laguna Hills, CA: Aegean Park Press, 1977), I, 23.

<sup>46</sup> Davilla and Soltan, 3.

<sup>47</sup> Davilla and Soltan, 219.

the war was designed for aerial reconnaissance, with the squadron assuming the role of the basic British aviation unit.<sup>48</sup> Five squadrons had been established prior to the war. On 31 July 1914, total operational aircraft from RFC Squadrons No. 2, 3, and 4 numbered 22 BE 2a, five Blériot XI monoplanes, and six Henri Farman F.20. An additional 24 aeroplanes were to be added prior to deployment to France.<sup>49</sup> It was indicative of the way aviation evolved between the French and British that a common airframe was used in the first years of the war. Both Blériot XI and HF 20/F.20 were flown by French and British pilots. Of the two, Blériot XI was a more recognized airframe due to the worldwide publicity gained from the first crossing of the English Channel in 1909. However, as an observation platform, the Blériot design was not ideal. The broad wings were a viewing obstacle to observers.<sup>50</sup> The British had yet to adopt homogeneous airframe types for each squadron. It was not yet practical due to the embryonic condition of the British aircraft industry at the time. However, despite the diversity of aeroplanes that complicated ground maintenance, squadron operations were effectively maintained. Sorties did not include formation flying. The standard procedure called for each aeroplane to act independently.<sup>51</sup>

The German adversary was no stranger to the potential of aerial reconnaissance. This resource had strong advocates within the senior headquarters, the German High Command (Oberste Heeresleitung [OHL]). During the first month of combat, successful aerial reconnaissance gave the German armies an advantage in their initial operations on the Eastern Front. Each active German corps and headquarters (8th Army) was assigned a six-plane Feld Flieger Abteilung, comprised of a composite of monoplanes (Tauben) and biplanes to provide timely information to German battlefield commanders. Priority for the mission and command of the two-seater aeroplane went to the observer, not the pilot. The Germans also em-

ployed Zeppelin craft for longer-range strategic reconnaissance.<sup>52</sup> German aerial reconnaissance gained favor in the war's first major battle at Tannenberg in eastern Poland. The OHL was personally briefed by Flieger Abteilung crewmembers as the Russians commenced the attack. German reconnaissance provided locations of maneuvering Russian units and aided planning for appropriate countermoves.<sup>53</sup> Intelligence information proved critical in this first major battle of the war. Success came to the Germans when they intercepted Russian radio transmissions containing exact force disposition and locations. Aerial reconnaissance had reinforced German command decisions, but not as decisively as the radio intercept. Tannenberg became the first battle in history where interception of enemy radio traffic played the decisive role.<sup>54</sup> Intercepts included Russian operational orders and, more significantly, the organization and destination of the Russian Second Army. The Russian maneuvers were successfully countered.<sup>55</sup> Modern intelligence technology had validated itself on the battlefield.

During the first days of combat on the Western Front, the Germans employed dirigibles for aerial reconnaissance and bombardment. Their first aerial bombardment sortie targeted Liège on 6 August 1914. During this sortie, a dirigible was hit by cannon and returned to the German base with damage. Another dirigible was hit over Alsace while on a reconnaissance mission. A third, dirigible ZVIII, was shot down by French artillery.<sup>56</sup>

On 13 August, the RFC under Brigadier-General Sir David Henderson deployed to France. The first unit to make the crossing was No. 2 Squadron, with the first aeroplane departing early that morning and arriving at Amiens approximately two hours later. The departure of

<sup>48</sup> Raleigh, I, 260.

<sup>49</sup> J. M. Bruce, *The Aeroplanes of the Royal Flying Corps (Military Wing)* (London: Putnam, 1982), xvi.

<sup>50</sup> Paul-Louis Weiller, "The French Aviation of Recognition," in de Brunoff, 63 (translation provided by Commandant Marc Rivière).

<sup>51</sup> John Terraine, *Mons: The Retreat to Victory* (New York: The Macmillan Company, 1960), 31.

<sup>52</sup> Dennis E. Showalter, *Tannenberg: Clash of Empires* (Hamden, CT: Archon Books, 1991), 152-153.

<sup>53</sup> W. M. Lamberton, comp., *Reconnaissance & Bomber Aircraft of the 1914-1918 War*, ed. by E. F. Cheesman (Letchworth, UK: Harleyford Publications, Ltd., and Los Angeles, CA: Aero Publishers, Inc., 1962), 9.

<sup>54</sup> Flicke, I, 3.

<sup>55</sup> Flicke, I, 6-7.

<sup>56</sup> Christienne and Lissarague, 61; André-H. Carlier, *La Photographie Aérienne pendant la Guerre* (Paris: Libraire Delagrave, 1921), 16 (translation provided by Commandant Marc Rivière).

other RFC aeroplanes that day was not so fortunate. Several aircraft of No. 4 Squadron were damaged while following their leader in a forced landing on a plowed field.<sup>57</sup> The following RFC squadrons and aeroplanes that flew to France on 13-15 August 1914 were: No. 2 Squadron, 12 BE 2a's; No. 3 Squadron, 6 Blériot XI's, a Blériot Parasol, 4 F.20s; No. 4 Squadron, 6 Blériot XI's, a Blériot Parasol, 4 F.20s; No. 4 Squadron, 11 BE 2a's; No. 5 Squadron, 4 F.20s, and 3 Avro 504s.<sup>58</sup> Those were the aeroplanes that arrived; others were lost on the way. Two days later, a British pilot met an unusual welcoming committee while landing near Boulogne-la-Grasse. Lieut. R.M. Vaughan of No. 5 Squadron was arrested by the French and held in prison for nearly a week while local officials tried to determine his true nationality and purpose. Lieut. Vaughan was able to rejoin his squadron on the eve of the Battle of Mons.<sup>59</sup>

These the were the state-of-the-art aeroplanes of the time. The BE 2a had a maximum speed of 65 mph at 6,500 feet. It took approximately 35 minutes for the aeroplane to reach 7,000 feet.<sup>60</sup> Aerial observation commenced at a speed that fit available airframe and motor technology. Despite Sergeant-Major Laws' successful demonstration of aerial photography, the RFC did not employ his talents when the British Expeditionary Force (BEF) arrived in France. Instead, Laws was assigned to an anti-aircraft unit as an aeroplane spotter and identifier.<sup>61</sup>

Initial RFC attempts to commence aerial reconnaissance operations against the Germans were precluded by weather. The heat of summer brought thunderstorms, mists, and haze. Flight logs described these conditions as "unsuitable for reconnaissance."<sup>62</sup> Aerial reconnaissance op-

<sup>57</sup> Henderson was a career intelligence officer who was a recognized authority on reconnaissance. His work, *The Art of Reconnaissance*, provided vision to the use of aeroplanes in a reconnaissance role; Terraine, 31.

<sup>58</sup> Bruce, *Aeroplanes of the Royal Flying Corps (Military Wing)*, xvi.

<sup>59</sup> Boulogne-la-Grasse is located southeast of Amiens; original text says only Boulogne; Terraine, 31.

<sup>60</sup> Bruce, *Aeroplanes of the Royal Flying Corps (Military Wing)*, 353.

<sup>61</sup> Nesbit, 14.

<sup>62</sup> Lyn Macdonald, *1914: The Days of Hope* (New York: Atheneum, 1987), 74.



**FIGURE 6. The first RFC aerial reconnaissance in wartime was flown by Captain Philip Joubert de la Ferté.** Source: Blériot No. 260 Netheravon, 1913 (Crown Copyright reserved). Sir Philip Joubert de la Ferté, Air Chief Marshal, *The Fated Sky, An Autobiography* (London: Hutchinson & Co., 1952), 33.

erations got underway on 19 August with the first RFC aerial reconnaissance flight flown by Captain Philip Joubert de la Ferté, No. 3 Squadron, and Lieutenant G.W. Mapplebeck from No. 4 Squadron. Joubert de la Ferté flew a Blériot XI-2 (without observer) while Mapplebeck took off in a BE 2a from Maubeuge (south of Mons) that morning. Mapplebeck flew to the north while Joubert de la Ferté was ordered to inspect the Belgian country west of Brussels and report on any evidence of enemy troops. Shortly after take-off, the pilots struggled with cloudy weather and a general unfamiliarity with the region, resulting in their getting lost. Both considered it "rather bad form to come down and ask people the way," but discretion was soon applied.<sup>63</sup> Joubert de la Ferté recalled:

I wandered round Western Belgium for some time and then seeing a large town over which the Belgian flag seemed to be flying. I landed on the parade ground. I discovered that this was Tournai, still in Belgian hands, and I was given a most excellent lunch by the commandant of the garrison. Leaving

<sup>63</sup> Bruce, *Aeroplanes of the Royal Flying Corps (Military Wing)*, 131-132; Terraine, 61-62.

an hour later, I lost myself again very quickly. Finally I recognized the Bruges Ship Canal, flew south from there, and landed near Courtrai. Here my reception was not at all cordial. The local police threatened to put me in jail. I was saved by the kindness of a little North of Ireland linen manufacturer, who was visiting Courtrai, where there are a lot of spinning mills. He placed a Union Jack on my aircraft, and the tone immediately improved. I got what I wanted, which was petrol, and the directions how to find my way back to Maubeuge, and flew off very thankfully, completed my reconnaissance, and landed back at Maubeuge at 5.30.<sup>64</sup>

As for Lieutenant Mapplebeck in the BE 2a, he flew over Brussels itself without recognizing it. The result of both reconnaissance missions was negative. Joubert de la Ferté and Mapplebeck reported with assurance on where the Germans were not, but had nothing to say about where they were.<sup>65</sup> The time had come for aerial observers to be included on reconnaissance sorties.<sup>66</sup> Mapplebeck's aerial legacy included a narrow escape. While conducting aerial reconnaissance over German lines near Lille, he experienced engine problems, landed, and two German soldiers literally grabbed one of the wings. Mapplebeck escaped into Lille wearing peasant clothing that he found on the way. He found a French businessman who cashed a London cheque that provided him with French notes bearing a German stamp. Mapplebeck proceeded to buy a new suit and walked from Lille through Belgium to the Dutch border. He obtained passage to London and reported in at Farnborough. The Air Ministry provided him with a new aeroplane to fly to France. When he showed up at the squadron in France, Mapplebeck reported for duty "just as though nothing unusual had happened."<sup>67</sup>

<sup>64</sup> Capt. Philip Joubert de la Ferté quoted in Terraine, 61-62.

<sup>65</sup> Terraine, 61-62.

<sup>66</sup> Nesbit, 16.

<sup>67</sup> Account related by J. T. C. Moore-Brabazon to Frederic Coleman, quoted in Frederic Coleman, *With Cavalry in 1915: The British Trooper in the Trench Line* (Toronto: William Briggs, 1916), 130-132.

That same day, the French committed their dirigible (dirigible balloon) forces to reconnaissance missions. The French dirigible *Fleurus* became the first Allied airship to fly over Germany by successfully flying over the Saar and Trèves while on a night reconnaissance sortie.<sup>68</sup> The irony of early French dirigible experience was they suffered more from friendly fire than from German anti-aircraft artillery. Two dirigibles were damaged. One French dirigible, the *Dupuy de Lome*, suffered casualties (the pilot was killed) as well as being shot up fairly severely while heading toward the French city of Rheims. Following these mishaps, the French delayed dirigible operations until April 1915.<sup>69</sup> For the remainder of the war, French dirigibles played a secondary role serving the armée. They were eventually discontinued from serving armée objectives in 1916 and were eventually transferred to the navy.<sup>70</sup>

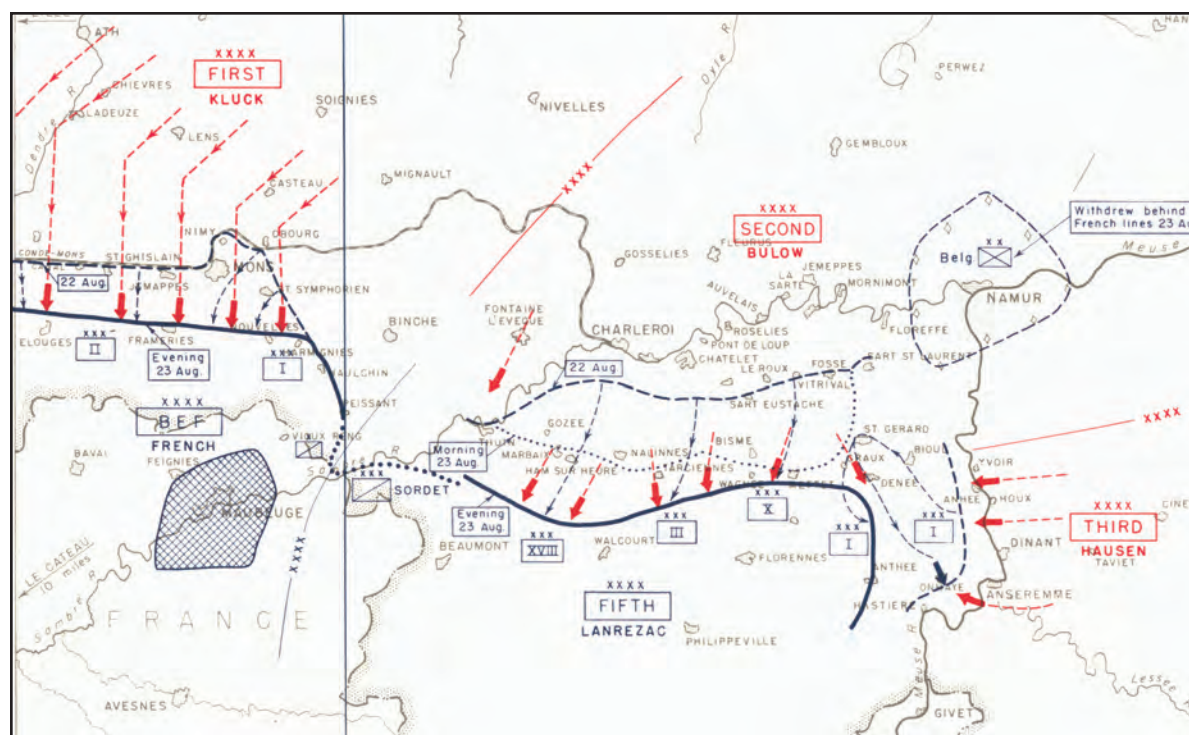
On 20 August British cavalry were on the move in Belgium. They pushed forward as far as Binche (16 kilometers east of Mons) without encountering the enemy. At the same time, RFC aerial reconnaissance was ordered to find the German Army, pinpoint its position, and estimate its strength. The RFC discovered elements of the German Army heading through Louvain (approximately 25 kilometers southeast of Brussels). Aerial observation estimates of strength proved too difficult since German Army columns went beyond the visual horizon. That day the German Army moved into Brussels. The main echelon was heading toward France.<sup>71</sup> On the morning of 21 August, aerial reconnaissance was incapable of operating due to ground mist. Reconnoitering squadrons and patrols were pushed out toward Soignies and Nivelles in southern

<sup>68</sup> Christienne and Lissarague, 62.

<sup>69</sup> Christienne and Lissarague, 63.

<sup>70</sup> Christienne and Lissarague, 64.

<sup>71</sup> Macdonald, 1914, 75; Raleigh, I, 298-300; Constance Babington-Smith, *Air Spy: The Story of Photo Intelligence in World War II* (New York: Ballantine Books, 1957), 9; Brig-Gen Sir J.E. Edmonds (general editor), *Military Operations: France and Belgium, 1914*, 3<sup>rd</sup> ed. (2 vols., London: Macmillan and Co., Ltd., 1922-25; reprint, London: The Imperial War Museum and Nashville, TN: The Battery Press, 1996), I, 50. Hereafter, titles in this series, 1914-1918, will be referred to as Edmonds, followed by the war year; see bibliography for complete citations for each title.



**FIGURE 7. German Advance on Paris 22-23 August 1914.** Source: *The West Point Atlas of American Wars*. Vol. 2, 1900-1953. Ed. Vincent J. Esposito (2 Vols., New York: Frederick A. Praeger, 1959), map 6. Courtesy, Department of History, U.S. Military Academy.

Belgium.<sup>72</sup> Once the weather cleared, RFC reconnaissance commenced and quickly acquired significant observations of German cavalry and artillery maneuvering southeast of Nivelles.<sup>73</sup>

Aerial activity assumed a more dynamic role as the armies came in contact. On 22 August British cavalry engaged the Germans for the first time near Soignies.<sup>74</sup> That day the RFC flew twelve reconnaissance sorties from Maubeuge, France (on the French-Belgian border, 15 kilometers south of Mons), reporting on extensive German maneuvers and the presence of large masses of troops. One critical RFC reconnaissance revealed a long German column estimated at army corps strength marching along the road from Brussels

due west to Ninove. Upon reaching the town, the German forces turned southwest to Grammont. RFC aerial reconnaissance reported that the German infantry was in close support of the advancing German cavalry heading south.<sup>75</sup> Soon the German Army's maneuver brought it outside the British left flank. This critical issue was personally brought to the attention of the British Commander-in-Chief Field-Marshal Sir John French by the RFC commander, Brigadier-General Henderson. French was initially skeptical until he received further verification from his French counterparts.<sup>76</sup> The first losses from aerial combat then occurred. An Avro 504 from No. 5 Squadron was shot down while performing aerial observation. The downed aeroplane provided the Germans with their first positive confirmation that British forces were now engaging them.<sup>77</sup> The significance of the occasion was recalled by German commander General Alexander von Kluck, observing that a British reconnaissance aeroplane from Maubeuge was shot down.<sup>78</sup> Aerial combat now commenced in earnest. One RFC pilot,

<sup>72</sup> Field-Marshal Viscount French of Ypres, *1914* (London: Constable and Company, Ltd., and Boston: Houghton Mifflin Company, 1919), 47.

<sup>73</sup> Edmonds, *1914*, I, 52.

<sup>74</sup> Terraine, 77-78.

<sup>75</sup> Edmonds, *1914*, I, 63; Baring, 22.

<sup>76</sup> Terraine, 77-78.

<sup>77</sup> Bruce, *Aeroplanes of the Royal Flying Corps (Military Wing)*, 112.

<sup>78</sup> Gen Alexander von Kluck, *The March on Paris and the Battle of the Marne 1914* (trans., London: Edward Arnold, 1920), 40.

Lieutenant Louis A. Strange, fitted a Lewis gun on his F.20 and took off in pursuit of a German aircraft discovered in the area. However, it was to no avail since the German simply out-climbed the Farman.<sup>79</sup> Additional opportunities for the first aerial combat occurred when two British BE 2a's armed with Lewis guns chased an Albatros biplane for 45 minutes.<sup>80</sup>

## The German Advance on Paris

With the campaign now under way, the benefits of aerial observation were beginning to take hold among senior commanders. In his post-war reminiscence, Field-Marshal French described his view of aerial reconnaissance during the German advance on Mons:

The opening phases of the Battle of Mons did not commence until the morning of Saturday, 22 August. The intelligence reports which constantly arrived, with the results of cavalry and aircraft reconnaissance, only confirmed the previous appreciation of the situation, and left no doubt as to the direction of the German advance; but nothing came to hand which led us to foresee the crushing superiority of strength which actually confronted us on Sunday, 23 August. This was our first practical experience in the use of aircraft for reconnaissance purposes. It cannot be said that in these early days of the fighting the cavalry entirely abandoned that role. On the contrary they furnished me with much useful information. The number of our aeroplanes was then limited and their power of observation were not as developed or accurate as they afterward became. Nevertheless, they kept close touch with the enemy, and their reports proved of the greatest value. Whilst at this time, as I have said, aircraft did not altogether replace cavalry as regards the gaining and collection of information, yet, by

working together as they did, the two arms gained much more accurate and voluminous knowledge of the situation. It was, indeed, the timely warning they gave which chiefly enabled me to make speedy dispositions to avert danger and disaster. There can be no doubt indeed that, even then, the presence and cooperation of aircraft saved the very frequent use of small cavalry patrols and detached supports. This enabled the latter arm to save horse-flesh and concentrate their power more on actual combat and fighting, and to this is greatly due the marked success which attended the operations of the cavalry during the Battle of Mons and the subsequent retreat.<sup>81</sup>

French was a career cavalryman. However, his follow-on comments reflect the special significance of military intelligence transformation: "At the time I am writing, however, it would appear that the duty of collecting information and maintaining touch with an enemy in the field will in future fall entirely upon the air service, which will set the cavalry free for different but equally important work."<sup>82</sup>

With the Germans pressing in on Mons, the need for more information on their advance became critical. On 23 August 1914 the RFC launched 12 reconnaissance sorties with key sightings of enemy activity and reports of heavy rifle fire. One RFC pilot had been airborne by half past four that morning and was hovering over the German right flank by first light. He was back at the landing ground with his report by breakfast time. It was not a settling experience, for the RFC was on the move, traveling south in a fleet of lorries to set up a new headquarters near Mons (Casteau). Aerial observation did not operate from airfields as understood in today's terms. Aeroplanes and support were totally mobile, operating from any suitable area, known as the "landing ground." It was well past ten a.m. before the day's vital information reached General Fergusson, Commander of the BEF 5th Division. RFC observers were now see-

<sup>79</sup> Lieut. Strange flew a French-designed, British-built aeroplane called the Henry Farman F.20; Bruce, *Aeroplanes of the Royal Flying Corps (Military Wing)*, 233.

<sup>80</sup> Raleigh, I, 327-328.

<sup>81</sup> Field-Marshal French, 43-44.

<sup>82</sup> Field-Marshal French, 44.

**FIGURE 8. Aircraft recognition proved challenging for both sides in the first days of the war; resulting in incidents of friendly fire. A Maurice Farman (MF) 11 is observed flying low over infantry.** Source: SHAA, photo contained in Christienne and Lissarague, *A History of French Military Aviation*



ing thousands of Germans moving southwest on the Belgian plain. Some twenty miles to the north of Casteau, long columns of troops were passing through Lessines and veering westward. To the west another large force snaked over ten miles of road between Ath and Leuze-en Hainaut. The Germans were now a few hours march away from Mons. Over Elouges and Quiévrain on the Belgian-French border, RFC fliers saw signs of more immediate danger. An entire German army corps was there, split into four echelons like the prongs of a fork and massing for an advance. Maneuvering around smoke from burning villages, the observers sighted entire batteries of German guns moving up to cover the immediate attack. German forces were at the same time digging in along the Mons-Valenciennes railway and road, covering the high ground to the north.<sup>83</sup>

The RFC observers drafted their in-flight reports on enemy movements and forwarded information to commanders immediately upon landing. Confusion reigned as the battle heated up. Captain Joubert de la Ferté recalled, “We were rather sorry they [the British soldiers arriving on scene] had come because up till that moment we had only been fired on by the French whenever we flew. Now we were fired on by French and English. To this day I can remember the roar of musketry that greeted two of our machines as they left the aerodrome and crossed the main Maubeuge-Mons road, along which a British column was proceeding.”<sup>84</sup>

Aeroplane recognition posed a significant challenge for the early aviator. Infantry on both sides were not accustomed to aeroplanes and

their role. The priority for establishing and assigning distinguishing marks of nationality became a necessity to safely operate at lower altitudes. “Union Jacks have been put on the under surfaces of the lower planes. They are not large enough and larger ones are necessary. The French have a blue spot, surrounded at an interval, by a red ring. The Germans have a black cross on some of their machines.”<sup>85</sup> Confusion over identity eventually led to the British adopting the French-style roundel with a blue outer circle and red spot.

That afternoon of 23 August, the RFC made further reconnaissance toward Charleroi (about 40 kilometers south of Brussels) and ascertained that at least two German army corps (Guard Corps and the Guard Cavalry Division) were attacking the French V<sup>ème</sup> Armée on the line of the Sambre. When the observers returned in the evening, they presented grave news that the French center had been driven back.<sup>86</sup> Field-Marshal French learned in the evening when he returned to his headquarters that the French armées on the left flank were pulling back. Since the BEF was still advancing, this news, coupled with further ominous reports

<sup>83</sup> Macdonald, *1914*, 118-119.

<sup>84</sup> Raleigh, I, 288-289; Terraine, 31-32.

<sup>85</sup> W. S. Douglas, “Notes on Equipment of Units of RFC with BEF,” 27 September 1914, TNA, PRO: AIR 1/836/204/5/268.

<sup>86</sup> Edmonds, *1914*, I, 66.



from the RFC that German movements were putting his forces at risk, made it clear to French that the BEF must fall back as well.<sup>87</sup>

The next day, a German column the size of a corps was observed moving due west on the Brussels-Ninove road. It proved to be General von Kluck's Second Corps. Armed with this critical information, the British senior staff was able to map an accurate picture of the German advance.<sup>88</sup> That evening French met with his staff to discuss the intelligence and determine courses of action. The battle map showed the British Army's position in relation to the advancing Germans. RFC aerial reconnaissance began to tell the story that the German commander, General von Kluck, was preparing to envelop British forces. The value of aerial observation proved itself to senior staff. The information gleaned enabled the British forces to keep ahead of the German maneuver and avoid a catastrophic situation. Decisions were quickly made. The British now commenced the famous "retreat" from Mons and headed south.<sup>89</sup>

Aerial observation leading up to the retreat from Mons exemplified a dysfunctional reconnaissance routine. Lyn Macdonald described an aerial operation in flux:

For the past week the Flying Corps, like the Army, had been moving gypsy-like round France sleeping wherever chance had led them, in barns, in châteaux, in lorries, under hedgerows, even occasionally in hotels. Every day they had spent many hours in the air searching for the enemy and half as long again searching to find their own base, for there was no guarantee that the makeshift airfield the patrols had left would still be in the same place when they returned. Standing orders were not much help—Fly approximately twenty miles south and search for aircraft on the ground.<sup>90</sup>

Despite the confusion, the RFC was demonstrating its potential. On 25 August Major Hubert D. Harvey-Kelly and two other pilots from No. 2 Squadron forced a Rumpler Taube to land near Le Cateau.<sup>91</sup> Two RFC pilots from No. 5 Squadron demonstrated aviation's liaison role with the British command in a harrowing confrontation with German forces. In an effort to deliver a critical message to General Haig, they "landed between the firing lines in a field protected by a rise in the ground from the direct fire of the enemy. With the aid of a cavalry patrol they succeeded in delivering their message to General Sir Douglas Haig, after which they returned to their machine, started up the engine, and flew away in the presence of two Uhlans, who had just ridden into the field." The quickening pace of battle created a greater challenge for successful communication within the British Corps. Every possible means of liaison, including the creation of new links with aviation assets, was being put to a critical test.<sup>92</sup>

On Friday, 28 August, du Général Commandant en Chef les Armées, Général Joseph Jacques Césaire Joffre, asked French to undertake air reconnaissance on the western flank of the Allied forces covering French territory.<sup>93</sup> RFC aerial reconnaissance during the day showed German columns sweeping southward over the Somme between Ham and Peronne, coming down on the French VI<sup>ème</sup> Armée and between the Oise and Somme west of Guise. Aerial observation reported several sightings of devastation as the Germans continued south.<sup>94</sup> Meanwhile, the German commander, General Alexander von Kluck, continued to employ his own aerial reconnaissance near Albert-Doullens-Amiens, but his pilots were unsuccessful in locating the retreating British forces.<sup>95</sup>

While the Germans were advancing on Paris, the most pressing question on the minds of Allied commanders was in what direction the Ger-

<sup>87</sup> Terraine, 124-125.

<sup>88</sup> Raleigh, I, 301-302.

<sup>89</sup> Raleigh, I, 304, 314; Babington-Smith, 9.

<sup>90</sup> Macdonald, 1914, 244.

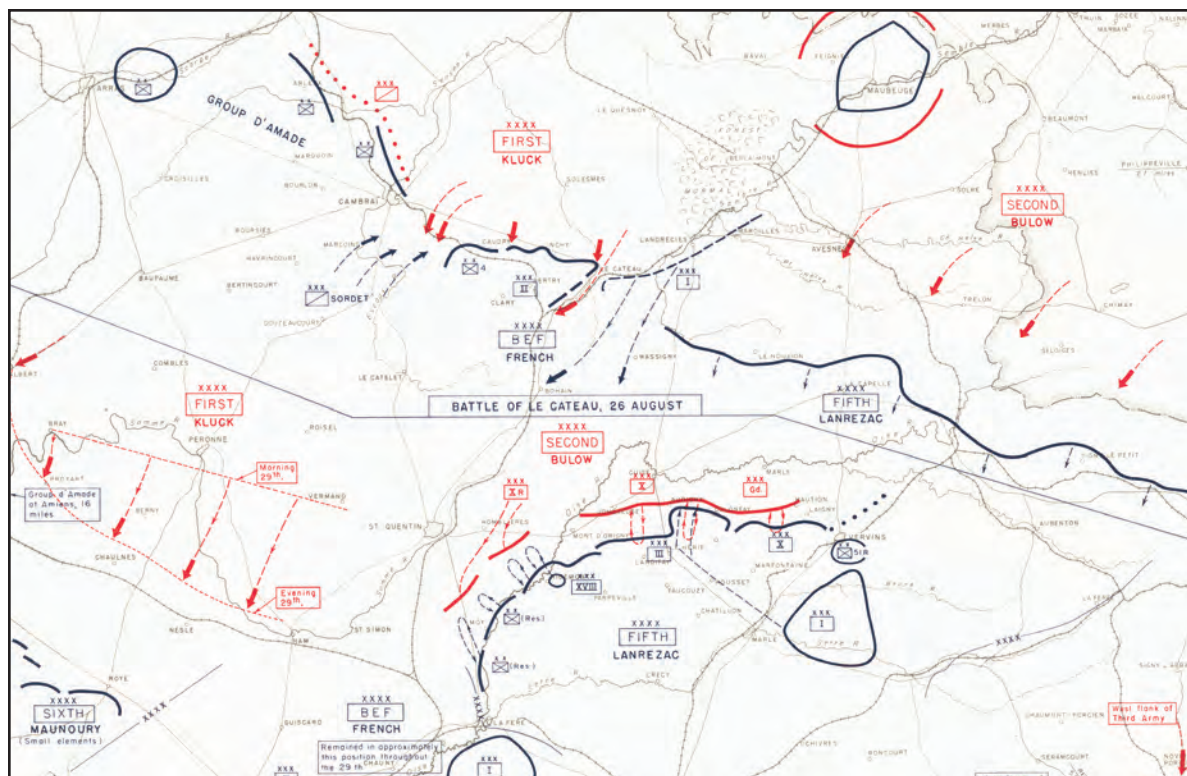
<sup>91</sup> M. L. Skelton, "Major H. D. Harvey-Kelly, Commanding Officer, No. 19 Squadron," *The Journal of the Society of World War I Aero Historians* 16, No. 4 (Winter 1975): 365.

<sup>92</sup> Terraine, 150.

<sup>93</sup> Field-Marshal French, 91.

<sup>94</sup> Edmonds, 1914, I, 241.

<sup>95</sup> Von Kluck, 73.



**FIGURE 9. Battle of Le Cateau and Battle of Guise, 26-29 August 1914.** Source: *West Point Atlas*, map 8. Courtesy, Department of History, U.S. Military Academy.

man forces were heading. Unbeknownst to them, General von Kluck deviated from the original strategy of advancing directly on Paris and decided to go after the retreating Allied armies. Von Kluck's solution was to annihilate the French armies in the field without enveloping Paris.<sup>96</sup> Von Kluck was convinced that he had crushed the BEF and considered the time opportune to crush the French on the flanks away from Paris.<sup>97</sup> On the evening of 30 August, a message from the overall German commander, General Karl von Bülow, ordered von Kluck's maneuver to help von Bülow "gain the full advantage of victory" over the retreating French V<sup>ème</sup> Armée. Von Bülow's request complemented von Kluck's perspective and the decision was made to move to

the southeast toward Noyon and Compiègne.<sup>98</sup> The next day RFC aerial observation began to see signs of the maneuver. Despite the constant flux of RFC operations as a result of continued mobility, RFC sorties over the Compiègne region managed to detect signs that the Germans were changing direction.<sup>99</sup> On the afternoon of 31 August, RFC pilot Captain E.W. Furse discovered the lead German cavalry corps spearheading the German Army in a new direction. A subsequent sortie from RFC No. 4 Squadron flown by Captain Pitcher and Lieutenant A.H. L. Soames confirmed the maneuver.<sup>100</sup> This, combined with reports from French cavalry, alerted the Allied commanders that something significant was in progress with the German forces. The Germans had reached the limit of their western advance

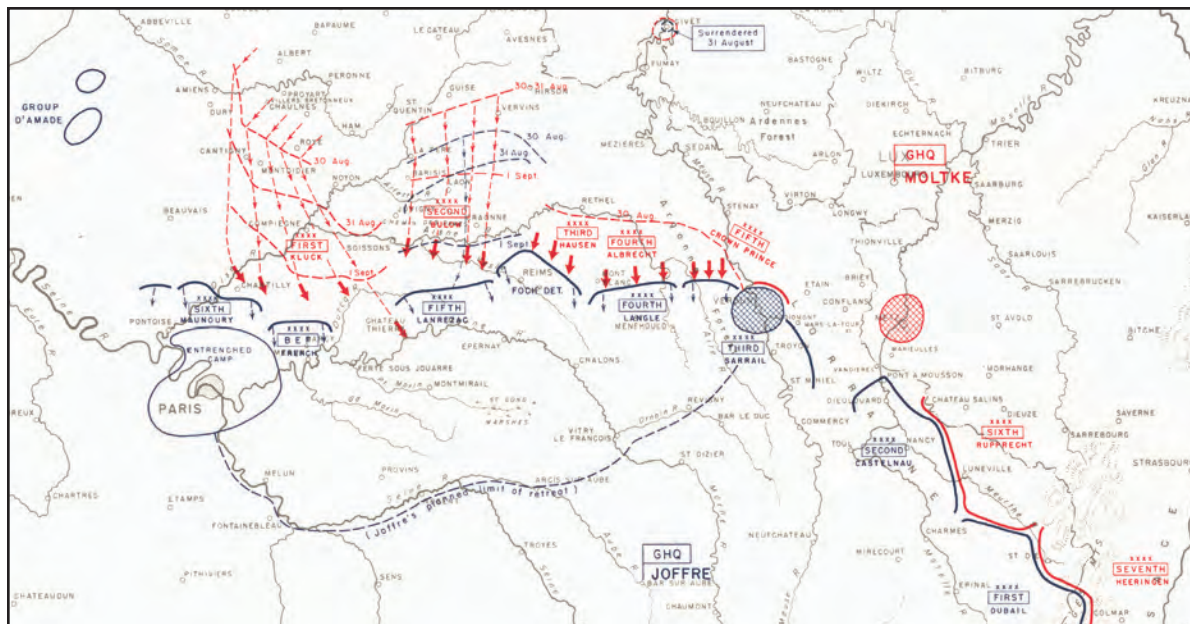
<sup>96</sup> Barbara Tuchman, *The Guns of August* (New York: Ballantine, 1962), 443-444.

<sup>97</sup> Michael S. Neiberg, *Fighting the Great War: A Global History* (Cambridge, MA: Harvard University Press, 2005), 26.

<sup>98</sup> Tuchman, 443-444.

<sup>99</sup> Macdonald, *1914*, 245.

<sup>100</sup> Michael Occlshaw, *Armour against Fate: British Military Intelligence in the First World War* (London: Columbus Books, 1986), 56.



**FIGURE 10. Western Front Situation 30 August to 2 September 1914, Battle of the Marne.**

Source: *West Point Atlas*, map 10. Courtesy, Department of History, U.S. Military Academy.

and were now heading southeast.<sup>101</sup> The French V<sup>ème</sup> Armée commander, Général Charles Louis Marie Lanrezac, and VI<sup>ème</sup> Armée commander, Général de Maunoury, were provided the information at the most critical moment, saving their forces from a decisive German maneuver.<sup>102</sup> The RFC was achieving tremendous credibility at this climactic moment.

Throughout the campaign, the French were equally aggressive in maintaining aerial observation on the advancing German forces. Unfortunately for their aviators, they not only had to find the Germans but also had to convince their seniors of what was observed. The French GQG had a variety of intelligence sources to draw from in determining the location and direction of the German advance. French agents had reported that the German campaign plan called for marching from Brussels toward southwestern Belgium, eventually heading to the Oise River. However, by 1 September the direction of the German advance did not validate that intelligence source.

Aerial reconnaissance kept confirming the southeast advance. At this critical moment, French Armée headquarters staff became reticent, not following up on the new information due to apprehension that it contradicted the prevailing opinion of the GQG. With indecision, critical time was lost. French staff began withholding information, afraid to admit possible mistakes. Capitaine Bellenger, commanding the air section of the French VI<sup>ème</sup> Armée, became increasingly alarmed at this state of affairs. He quickly sent one of his observers, Lieutenant André Wateau (a lawyer by training), to the GQG to make the case for their aerial observation sighting of the German maneuver in progress. Wateau successfully explained the case and at the same time took credit for the discovery.<sup>103</sup>

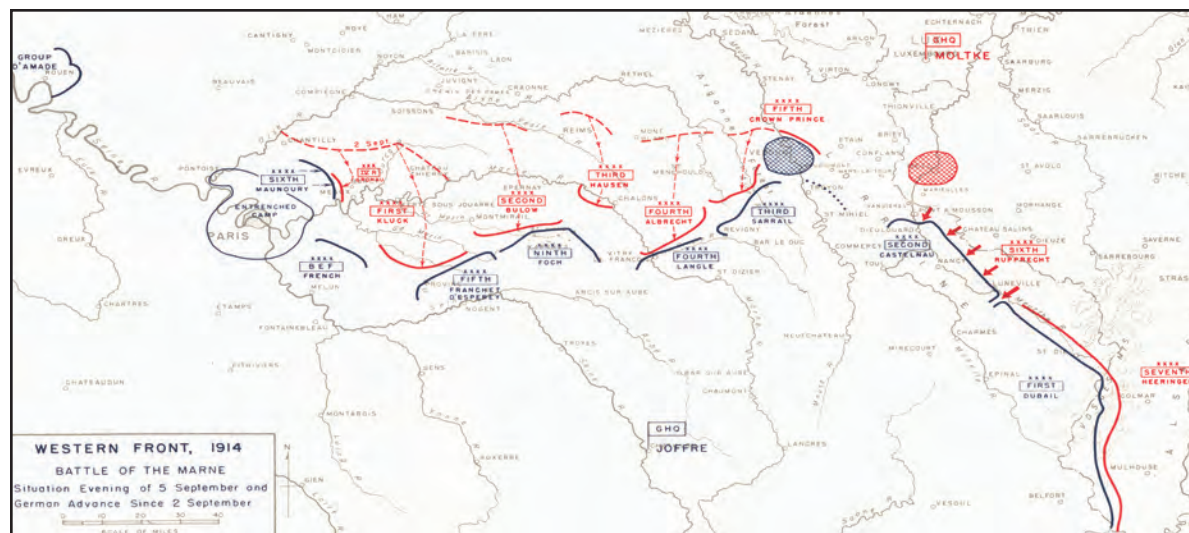
The Allies' aerial observation reporting on the German maneuver received further substantiation from a map retrieved from a German officer.<sup>104</sup> Armed with this more convincing information, the Allies gained an advantage. German

<sup>101</sup> Robert B. Asprey, *The First Battle of the Marne* (Philadelphia: J.B. Lippincott Company, 1962), 85; Edmonds, 1914, I, 248.

<sup>102</sup> Occleshaw, 56.

<sup>103</sup> Lt Col Georges Bellenger, letter to François Baban, 6 February 1954, SHAA (translation provided by Commandant Marc Rivière).

<sup>104</sup> Asprey, 86.



**FIGURE 11. Western Front Situation 2–5 September 1914, Battle of the Marne.** Source: *West Point Atlas*, map 11. Courtesy, Department of History, U.S. Military Academy.

forces were now surprised when they came into contact with British forces in unsuspected locations such as Compiègne. With the increase in fighting, the British maneuvered to a more strategic and defensible position.<sup>105</sup> Meanwhile, the RFC demonstrated new roles in the campaign with initial attempts at aerial bombardment. They dropped two bombs on two columns of enemy troops at a crossroad, causing confusion and a stampede.<sup>106</sup>

Allied aerial coverage continued to monitor the enemy's southeastward maneuver. Aviator confirmation of German movement toward Noyon alerted the headquarters that the enemy was maneuvering toward Soissons on the Aisne. The BEF General Headquarters (GHQ) set up north of Paris at Dammartin-en-Goële, receiving progress reports on several German columns from RFC patrols.<sup>107</sup> The French were equally successful in their observations. On the evening of 2 September, French aerial reconnaissance confirmed the presence of two large German encampments (German First Army) between the Oise and Ourcq Rivers.<sup>108</sup> It was a brief respite for an increasingly fatigued Ger-

man force. General von Kluck ordered a further march hoping to envelop the BEF. Again, the British were able to escape the trap, crossing the Marne just in time.<sup>109</sup>

Corporal Louis Breguet, an early pioneer in airplane design, accomplished one of the key observations of the day. Flying his own prototype Breguet AG 4, Breguet spotted the German Army moving to the east of Paris. The reconnaissance suggested von Kluck was moving southeast to eliminate the British corps and surprise the French forces moving to the rear. Subsequent aerial observation by escadrilles REP 15 and MF 16 confirmed the information. The French VI<sup>ème</sup> Armée was quickly dispatched to attack the German's flank.<sup>110</sup> Breguet's report further confirmed General von Kluck's intentions were shifting. Capitaine Bellenger complemented the reports by personally flying in the sector. His challenge continued to be with the GQG. This time the intelligence assessment did not confirm the aerial observation. French 2<sup>e</sup> Bureau sources showed von Kluck was working according to the Schlieffen Plan and was maneuvering to encircle Paris.<sup>111</sup> Bellenger was now forced to call on additional aviators to testify to the ongoing observations,

<sup>105</sup> Asprey, 86.

<sup>106</sup> Raleigh, I, 327-328.

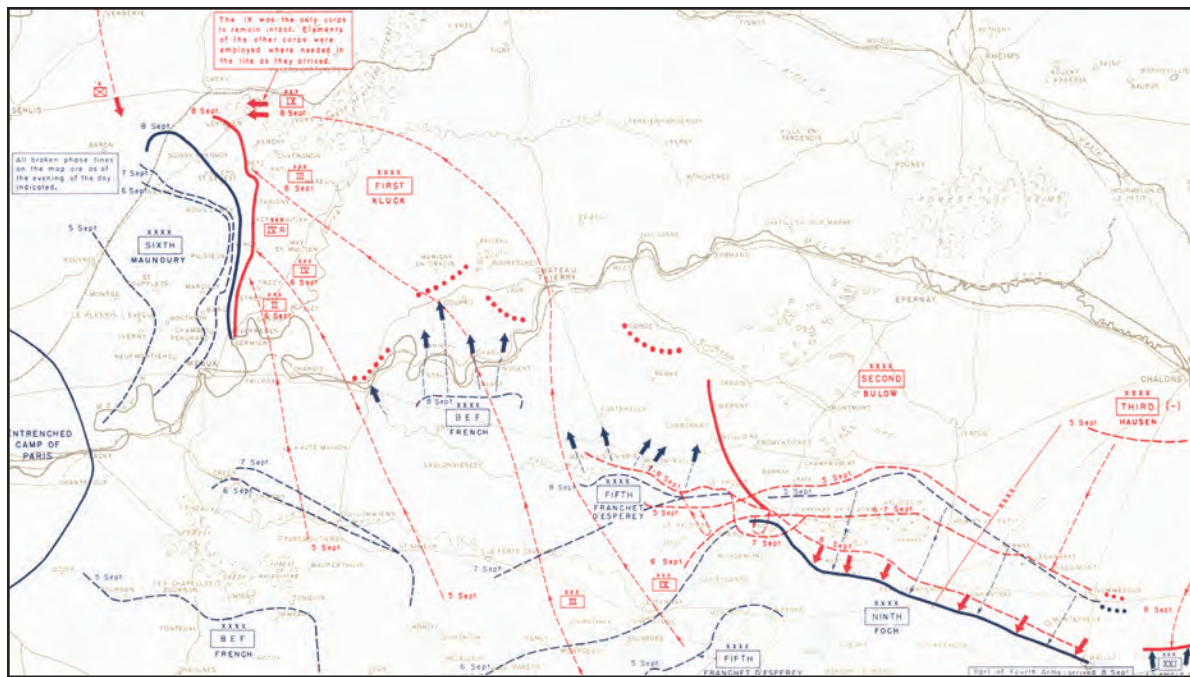
<sup>107</sup> Edmonds, *1914*, I, 270; Macdonald, *1914*, 245.

<sup>108</sup> Bellenger letter, SHAA.

<sup>109</sup> Tuchman, 445.

<sup>110</sup> Davilla and Soltan, 3.

<sup>111</sup> Christienne and Lissarague, 79.



**FIGURE 12. Western Front Situation 5–9 September 1914, Battle of the Marne.** Source: *West Point Atlas*, map 12. Courtesy, Department of History, U.S. Military Academy.

while trying to maintain an aggressive aerial observation sortie rate.<sup>112</sup> The Germans under von Kluck also continued their aerial reconnaissance effort. On 2 September, they were ordered to monitor Allied forces across the Marne.<sup>113</sup>

Capitaine Bellenger’s luck changed when he made contact with the British Third Army. He finally gained an audience that listened to what he had acquired from the aerial observations. He subsequently went to Général Joseph Simon Gallieni, commander of French forces within the region of Paris, to emphasize further the meaning of observations from aerial reconnaissance at this critical time. Gallieni proved invaluable in accepting Bellenger’s recommendations and taking the time to persuade Général Joffre of their value.<sup>114</sup> Bellenger always retained a high regard for Général Gallieni: “He is one of the rare generals that believe in aviation; he is a man of decision and is not afraid of responsi-

bilities.”<sup>115</sup> Général Gallieni’s success with Général Joffre helped to direct French maneuvers to counter the Germans at the Marne. This significant event was the final death knell of the German Schlieffen Plan.<sup>116</sup>

RFC aerial reconnaissance of 3 September also substantiated French observations on the German maneuvers. The BEF Intelligence Director, General Sir George Mark Watson Macdonogh, was profuse in his praise: “A magnificent air report was received disclosing the movements of all the Corps of the 1st German Army diagonally South East across the map toward the Marne.” The resultant battle between the French VI<sup>ème</sup> Armée under Général Michel de Maunoury and the German army under General von Kluck helped thwart the Germans’ offensive strategy. Key to the battle was the effective position of the BEF, which permitted exploitation of a gap between the German armies in the region, eventually forcing a German retreat.<sup>117</sup>

<sup>112</sup> Bellenger letter, SHAA.

<sup>113</sup> Von Kluck, 93.

<sup>114</sup> Bellenger letter, SHAA; Hodeir, 108.

<sup>115</sup> Christienne and Lissarague, 78.

<sup>116</sup> Porch, 73.

<sup>117</sup> Occleshaw, 57.

Despite the positive response to aerial observation, other intelligence sources performed an even more key role. Ironically for the Germans, Allied radio intercepts of German transmissions describing their maneuvers were critical in the overall analysis. Partial credit went to the German “lack of discipline in radio operation.” By 4 September French intelligence confirmed “The German First Army, neglecting Paris and our Sixth Army, before which nothing has shown itself, continues its march toward the Marne.” German fatigue and logistical shortfalls were also discerned. General von Kluck’s order to withdraw, which was being monitored by the French, gave evidence to the French radio intercept analysts that the German retreat had commenced.<sup>118</sup> Finally, Général Joffre personally learned of the Russians’ defeat at Tannenberg through a radio intercept of a German transmission that described the destruction of three Russian corps, the capture of two corps commanders and 70,000 other prisoners, while announcing, “The Russian Second Army no longer exists.”<sup>119</sup>

## The Battle of the Marne

At the Marne, the Germans attempted to swing around the western end of the Allied line and envelop it. Concurrently, they planned to break through the Allied center, forcing the remainder of the western half of the line back to Paris, thereby completing the process of envelopment and creating a second Sedan on a grand scale. The French had a similar plan—flank around the west end of the German line, break through the center, and split the German forces. The two flank attacks began on the plain north of Paris, while the two attempts to break the enemy’s center were staged on the low plain of Champagne.<sup>120</sup>

A French aerial observation report reflected extensive activity and a concern for France’s future:

Came down at Tours-sur-Marne to report to Général Foch; then at Heitz-le-Maurupt, to the staff of Langle de Cary.

<sup>118</sup> Porch, 75.

<sup>119</sup> Tuchman, 429; Porch, 74.

<sup>120</sup> Douglas Wilson Johnson, *Topography and Strategy in the War* (New York: Henry Holt and Company, 1917), 31.

Second reconnaissance on Somme-Suippe and Cuperly; landed at Saint-Dizier. Today’s was the maximum speed of retreat attained in one day. How far are we to retreat? To the Loire, some say, to the Central Massif, according to others. It is terrible!<sup>121</sup>

Meanwhile, French radio intercept units were providing extensive reporting. In the course of 14 days during the German advance on the Marne, the French radio intercept service picked up approximately 350 radiograms from the cavalry corps under General Johannes Georg von der Marwitz alone. The French radio intercept service did not fail to note the movement of the German First Army toward the north in order to avoid being outflanked by French Général Maunoury’s VI<sup>ème</sup> Armée.<sup>122</sup>

RFC aerial observation was also accelerating by keeping track of every German corps of the First Army. Information was forwarded to the GQG and marked on the battle map. The whole of the German right wing had now thrust itself into the arc of a vast circle, with the French VI<sup>ème</sup> Armée on one side of it, the III<sup>ème</sup> and IV<sup>ème</sup> Armées on the other, the V<sup>ème</sup> and IX<sup>ème</sup> Armées and BEF at the base. The time to attack, Joffre decided, had come.<sup>123</sup> The next day French reconnaissance kept seniors informed amid a flurry of activity:

Saint-Dizier, Reims, Fismes, Bergeres-les-Vertus, where we descended to report to Général Foch, who is in command, it is said, of three army corps, forming the IX<sup>ème</sup> Armée which is from this time to come between us and the army of Franchet d’Esperey on our left. We saw four German army corps today marching in order of battle across the camp of Châlons and the neighborhood of Reims. What feelings it aroused! But what a splendid spectacle it was! I dropped two bombs on a large

<sup>121</sup> Brindejone des Moulinais, “Journal de Bord, Guerre Aérienne,” in Charles Henri Le Goffic, *Général Foch at the Marne: An Account of the Fighting in and near the Marshes of Saint-Gond* (trans., New York: E. P. Dutton and Company, 1918), 199-200.

<sup>122</sup> Flicke, I, 23-24.

<sup>123</sup> Terraine, 205.



**FIGURE 13. Escadrille commander, Capitaine Zarapoff, in the cockpit of a Blériot XI.** Source: SHAA, B90.2389.

bivouac and saw dense smoke rising from the very center of it. The bombs had gone home. We then went on to Saint-Remy-en-Bouzemont near Vitry-le-François, where we descended; we lunched off a crust of bread, then went on to Brienne-le-Château. I heard afterwards that my bombs had wounded a captain and three men.<sup>124</sup>

The early escadrilles were often shifted around the battlefield to support the ongoing battle. Among the early Allied aerial inventory, the Blériot XI was a favored airframe because it could be rapidly disassembled, placed in closed containers and reassembled for transport to a new sector. In a two-month period (September to November 1914) escadrille BL 3 moved to seven locations along the front. It was not without hazard. On 5 September escadrilles supporting Général Foch's IX<sup>ème</sup> Armée were ordered to Mailly-Champagne (near Reims) to support operations in the sector. At seven in the morning, escadrilles BL 3 and BL 10 assigned to the IX<sup>ème</sup> Armée were operating from the aerodrome at Belfort in eastern France. The 12 Blériot XI's at Belfort had a support unit of motor-drawn trailers readied to provide necessary transport should the *aéroplane* have maintenance problems. The fragile *aéroplanes* were wearing down and required delicate handling. Exposure to the cold night air and rain caused structural problems as the airframe wood ex-

panded and canvas stretched.<sup>125</sup> However, the urgency of the moment required that the escadrille reach Mailly (approximately 250 kilometers to the northwest) in the shortest time possible. The Blériot XI escadrille station commander, Capitaine Constantin Zarapoff, set off from Belfort by road with supplies and equipment while his pilots took off with their machines for the aerodrome at Mailly. Unfortunately, one pilot was killed while taking off. Two other pilots then stayed behind to bury him. Of the twelve *aéroplanes* in the escadrille, nine eventually landed at Mailly.<sup>126</sup> The stresses on the older airframes were beginning to take their toll. New airframes were ordered to handle the demands of both mobility and endurance. Conversion to more effective aircraft such as Morane-Saulnier Ls, Caudron G.3s and G.4s would take place in late 1914. For the moment, they had to rely on fragile *aéroplanes* enduring greater stresses.<sup>127</sup>

On 6 September the British reorganized their aerial reconnaissance resources to reflect the cur-

<sup>124</sup> Des Moulinais, 199-200.

<sup>125</sup> The Blériot XI flew at 60 mph and carried enough fuel for a 2½-hour flight. Armament then consisted of one carbine. Blond, 163-164; Davilla and Soltan, 56.

<sup>126</sup> Blond, 164.

<sup>127</sup> Davilla and Soltan, 56; Weiller, in de Brunoff, 63; Blond, 164.

rent battle situation. French reallocated three of the RFC aeroplanes directly to the British I and II Corps for tactical reconnaissance—the first time that aircraft were decentralized under Corps authority. The realignment enabled the British commanders to observe the retirement of the German II Cavalry Corps on Coulommiers (due east of Paris) and established that the French V<sup>ème</sup> and VI<sup>ème</sup> Armées were engaged in battle.<sup>128</sup>

Meanwhile, French reconnaissance of the Marne region reported that the Germans were occupying Châlons and the district of Ay due east of Paris.<sup>129</sup> Upon hearing this, Général Gallieni ordered the French 7<sup>ème</sup> Division to move up to the front line. Rail could only move half of the division. The French had only 250 Army motor vehicles available, resulting in the famous employment of Paris taxis to move the troops of the XIV<sup>ème</sup> Brigade of the 7<sup>ème</sup> Division that evening to Nanteuil-le-Haudouin.<sup>130</sup> In all, they transported five battalions of 4,000 infantry a distance of thirty miles.<sup>131</sup>

The Germans were now being pressed by Allied maneuvers. Fighting created a gap between the First and Second German Army, forcing them to stabilize their position. To compensate for this discrepancy, the cavalry corps under General von der Marwitz was ordered to create a screen between the two armies. However, the deception unraveled due to the lack of discipline among the German radio operators who transmitted in the open and provided a clear picture of the situation while being monitored by French radio intercept units. This intelligence breakthrough provided French and British forces the opportunity they needed to counter the German advance at its weakest point.<sup>132</sup> On 7 September aerial reconnaissance confirmed the general impression that the Germans were withdrawing two corps to the north, despite sightings of cavalry and infantry in the same general area of the battleground.<sup>133</sup>

<sup>128</sup> Sir John Slessor, "Air Reconnaissance in Open Warfare," TNA, PRO: AIR 75/131; Edmonds, *1914*, I, 299.

<sup>129</sup> Des Moulinais, 200.

<sup>130</sup> Blond, 170-172.

<sup>131</sup> Blond, 182.

<sup>132</sup> Flicke, I, 23-24.

<sup>133</sup> Edmonds, *1914*, I, 309-311.

Allied aerial reconnaissance on 8 September monitored the German withdrawal. A large number of infantry were observed waiting their turn to cross the river near La Ferté-sous-Jouarre.<sup>134</sup> French aerial reconnaissance provided a broad overview of the situation. A French pilot recalled:

Reconnaissance on Vitry and Châlons. We were told to watch the arrival of enemy reinforcements on the Châlons highroads; other machines were to watch the east of Vitry-le-François. The battle was raging below, following a line decidedly east and west. To the right this line seemed to incline toward the northeast of Verdun. To the west, it passed by Sompuis and inclined toward the Marshes of Saint-Gond. A second flight with twenty-three shells: I dropped them on the heavy batteries to the east of Vitry: then I disturbed an artillery brigade (echelons of ravitaillement [resupply]), which scattered in every sense, but reassembled as soon as I had gone. I discovered the positions of twenty-four guns on the line to the west of Vitry. I marked them on the map at 1/80,000 and informed the corps concerned.<sup>135</sup>

The next day's morning reconnaissance (9 September) reported that "large hostile forces" were marching north of Château-Thierry.<sup>136</sup> A noon report placed the Germans about four miles from Château-Thierry with additional small columns on roads to the east all going north. In this moment of high drama, RFC aeroplanes were employed to discover their own BEF positions as well as provide aerial observations of the British flanks. At the same time, RFC aeroplanes were keeping watch on the French units in the area. The nearest troops of the French V<sup>ème</sup> Armée were seen that morning near Viels-Maisons (24 kilometers south of Château-Thierry) moving northeast away from the BEF.<sup>137</sup> Both French and British aerial reconnaissance remained active with a French liaison to GHQ who passed on the first

<sup>134</sup> Edmonds, *1914*, I, 319.

<sup>135</sup> Des Moulinais, 200-201

<sup>136</sup> Edmonds, *1914*, I, 333.

<sup>137</sup> Edmonds, *1914*, I, 333.



indications that German movements were underway. The reporting was further substantiated by British aerial reconnaissance. At 1535 hours on 9 September, Captain Grey and Captain Bonger of RFC No. 5 Squadron took off in an Avro to reconnoiter the area in front of the II Army Corps. They landed at approximately 1700 hours and reported indications of the withdrawal of von Kluck's left from opposite the French VI<sup>ème</sup> Armée west of the Ourcq River. Additional afternoon aerial reconnaissance discovered an eight-mile-long column marching northward from Lizy (northwest of Soissons on the river Aisne) at the back of the Ourcq battlefield and then other columns of transport and troops retiring north-northeast on La Ferté-Milon (southwest of Soissons on the river Ourcq). The ground on the left flank of the BEF in the angle between the Marne and the Ourcq was reported clear.<sup>138</sup> With each report greater attention focused on accuracy. Debate arose over aerial reconnaissance's "provisional analysis of how it will be employed tactically, for the benefit of those commanders that have to use it."<sup>139</sup> The lack of headquarters staff and intelligence personnel familiar with the limits of aerial observation was showing strains. Inflated reporting was becoming an issue of concern.<sup>140</sup> German aerial reconnaissance kept General von Kluck apprised of the situation, reporting on the advance of four long Allied columns maneuvering toward the Marne with advance troops on the line at the river Ourcq at Nanteuil-Citry-Pavant.<sup>141</sup>

On 10 September the RFC reported that near Troesnes (on the river Ourcq above La Ferté-Milon) German artillery and cavalry were retreating at a rapid pace. Villers-Cotterêts was blocked with trains and all the rail sidings were very full. Later that evening additional reporting observed numerous bivouacs around Soissons, where the troops coming from the south were assembling.<sup>142</sup> French reporting confirmed the fact that the Germans continued to withdraw, on our left [IV<sup>ème</sup> Armée], toward the camp of Mailly, there

were no forces opposing us. There was a gap, a space between the two German armies, with only some cavalry a long way behind. Our division of cavalry was in the camp at Mailly. The obvious thing was for us to drive in a division or a corps if possible. Général Dubois was charged with this task. We watched closely for the moment when this movement could be effected without being noticed by the enemy, and we flew over Sompuis, Mailly, Sommesous, Lenharree, Coole [flight went west-northwest in an area 20 kilometers southwest of Châlons-sur-Marne] in spite of heavy clouds. And we never saw any German reserves. Second reconnaissance with Capitaine Thiron. We alighted beside the XXI<sup>st</sup> corps, informing them as to the positions of batteries and troops, telling them that our troops were too far in the rear, that our guns did not carry far enough, and that there were no troops on our left. While we were at Saint-Ouen [Saint-Ouen-en-Brie, approximately 20 kilometers east-southeast of Paris], the général sent us a message that the cavalry had signaled an enemy division in front of him. We told him that that was not the case. But we proposed to make another reconnaissance. We set off, saw a French infantry division which was marching slowly forward, sustained by the artillery. We also saw the French cavalry division in the camp at Mailly. We flew low down, for it was late. No Germans. We returned to carry our information to Saint-Ouen. We had made three reconnaissances. Returned to Brienne [Brienne-le-Château] for the night.<sup>143</sup>

That evening Field-Marshal French estimated that the Battle of the Marne had concluded. Now the Battle of the Aisne was to be fought.<sup>144</sup> The outcome of aerial observation at the Marne was that it had secured for itself an integral role in battle. Daily observation defined the battlefield. Both French and RFC sorties had been successful in reporting the movements of the maneuvering German advance in a timely manner. The observer cadre made the difference, with inputs covering enemy forces sighted, status of bridges and road networks, and other information critical to the command's battlefield awareness. The aerial observation role also had another benefit. British aerial reconnaissance not only

<sup>138</sup> Slessor, TNA, PRO: AIR 75/131; Edmonds, *1914*, I, 340.

<sup>139</sup> Unknown source quoted in Slessor, TNA, PRO: AIR 75/131.

<sup>140</sup> Slessor, "Air Reconnaissance," TNA, PRO: AIR 75/131.

<sup>141</sup> Von Kluck, 136.

<sup>142</sup> Edmonds, *1914*, I, 359.

<sup>143</sup> Des Moulinais, 201-202.

<sup>144</sup> Field-Marshal French, 140.

covered German positions; it also clarified locations of the British vanguard. The Allied commanders were impressed. Général Joffre heaped praise on the RFC, saying, "Please express most particularly to Marshal French my thanks for the services rendered to us every day by the English Flying Corps. The precision, exactitude, and regularity of the news brought in by them are evidence of their perfect organization and also of the perfect training of pilots and observers."<sup>145</sup> For the British, the campaign had an additional impact. Those engaged in the early campaign became the strongest proponents of aerial reconnaissance for the remainder of the war.<sup>146</sup>

## The Battle of the Aisne

After the conclusion of the Marne campaign, Field-Marshal French and his staff remained optimistic, persisting in their plans to push across the Aisne. French wired Lord Kitchener, the British Secretary of State for War, "Very heavy rain falling to-night, making roads most difficult. Should much hamper enemy's retreat. Pursuit continues at daybreak."<sup>147</sup> The greatest threats to aerial reconnaissance at this critical time, in early September 1914, were torrential rains that made aerial operations impossible. GHQ was desperate to learn where the Germans were digging in. All they could do was hope for an improvement in the weather so that flights could resume. One storm was so violent that British aeroplanes were tossed into the air and wrecked. Unfortunately for RFC squadrons arriving at Saponay (about 20 kilometers north of Château-Thierry) landing ground, the storm wrecked half of the unit. The No. 3 Squadron diary recalled:

Before anything could be done to make the machines more secure, the wind shifted, and about half of the total number of machines were over on their backs. One Henri Farman went up about thirty feet in the air and crashed on top of another Henri Farman in a hopeless tangle. BEs of No. 2 squadron were blowing across the aero-

drome and when daylight arrived and the storm abated, the aerodrome presented a pitiful sight. The Royal Flying Corps in the field could not have had more than ten machines serviceable that morning.<sup>148</sup>

Aerial reconnaissance now transitioned from recording maneuvers to pinpointing targets for the artillery. At the beginning of the Battle of the Aisne, on the morning of 13 September, the BEF attempted to continue the pursuit of the German forces over the Aisne and succeeded in taking a bridge at Venizel (directly east of Soissons on the river Aisne). However, the Germans had entrenched several hundred yards behind the crest of the ridge north of the Aisne. By mid-morning, it was clear to British commanders that considerable artillery support was required. Additional problems occurred when initial rounds were fratricidal. That night, a British attack could not break through German positions that were being reinforced with more troops. The British were suddenly at a disadvantage since the Germans were staying put in terrain that gave them dominance of the area. Artillery directed at German lines proved ineffectual due to the topography of Aisne valley, which provided excellent cover for German machine guns.<sup>149</sup>

Since the Battle of Mons, the Germans had experimented with aerial observation to increase artillery effectiveness. Now the British realized that they needed any available resource to increase their artillery's effectiveness. At the Aisne, they turned to the aeroplane to meet that urgent need. The British Army had tried aerial spotting for artillery prior to the war, but had not followed up on enhancing the capability.<sup>150</sup> However, there were not enough Allied aeroplanes to meet the immediate demand. The stalemate at the Aisne portended the battle to come. The RFC was still recovering from damage suffered during the recent storm. The critical lack of aerial and cavalry reconnaissance prompted the GHQ to work with mere assumptions about the threat location instead of relying on actual

<sup>145</sup> Général Joffre quoted in Raleigh, I, 334-335

<sup>146</sup> Raleigh, I, 324.

<sup>147</sup> Nikolas Gardner, *Trial by Fire: Command and the British Expeditionary Force in 1914* (Westport, CT: Praeger, 2003), 86.

<sup>148</sup> No. 3 Squadron diary, quoted in Macdonald, *1914*, 300.

<sup>149</sup> Gardner, 87.

<sup>150</sup> Gardner, 92-93.



**FIGURE 14.** One of the great innovators of the aerial targeting support for artillery was Captain Douglas Swain Lewis. His recommendations revolutionized British artillery operations through the squared map and clock code. Source: Peter Mead, *The Eye in the Air* (London: Her Majesty's Stationery Office, 1986).

information.<sup>151</sup> That night Field-Marshal French and staff were under the impression that the German Army was retiring. GHQ issued orders the following day directing “the Army will continue the pursuit tomorrow at six a.m. and act vigorously against the retreating enemy.”<sup>152</sup> The next morning, the strongly entrenched German forces were successful in holding back the BEF attack and conducting a counterattack.<sup>153</sup>

15 September was frustrating for Field-Marshal French and the BEF. They made no progress on the battlefield and had to endure an intense German barrage. French remained convinced that the German withdrawal was, in fact, over. He wired Lord Kitchener that evening, “We have

been opposed not merely by rearguards but by considerable forces of the enemy which are making a determined stand in a position splendidly adapted to defense.”<sup>154</sup> At 2030 hours Operation Order 26 finally brought the advance to a close, stating “The Commander-in-Chief wishes the line now held by the Army to be strongly entrenched, and it is his intention to assume the general offensive at the first opportunity.”<sup>155</sup> The British military historian Brigadier-General James E. Edmonds noted that Operation Order 26 “proved to be the official notification of the commencement of trench warfare.” For the rest of September, the BEF endured daily artillery bombardments as well as sporadic artillery infantry attacks.<sup>156</sup>

The demands on aerial observation to locate artillery targets during the Battle of the Aisne now assumed greater prominence. The requirement soon transformed cartography. Artillery targeting required detail that prewar maps lacked. It took the initiative of several RFC members to meet the challenge. Major Geoff Salmond, Commander of No. 3 Squadron, was approached by Captain Douglas Swain Lewis concerning a role for the radio. Lewis was convinced that radio communication could increase the reconnaissance advantage and better serve the needs of artillery units. Geoff Salmond, an experienced artilleryman prior to his transfer to aviation, understood that artillery fire demanded accuracy. The two set up a radio experiment with the artillery that was an immediate success. They created two maps lined with 400-yard squares. One map was provided to the battery commander involved in the experiment, the other to Lewis. The successful demonstration initiated a cartographic revolution for the British. From then on, maps were reconfigured to serve aerial-field artillery radio coordination.<sup>157</sup> The “squared map,” as it was called, revolutionized British maps issued to artillery and aviators. The numbered and lettered squares allowed aerial reconnaissance to effectively identify the target area and relay information to the battery. The process of finding the target was called pinpointing. Soon the en-

<sup>151</sup> Macdonald, *1914*, 310.

<sup>152</sup> Gardner, 88.

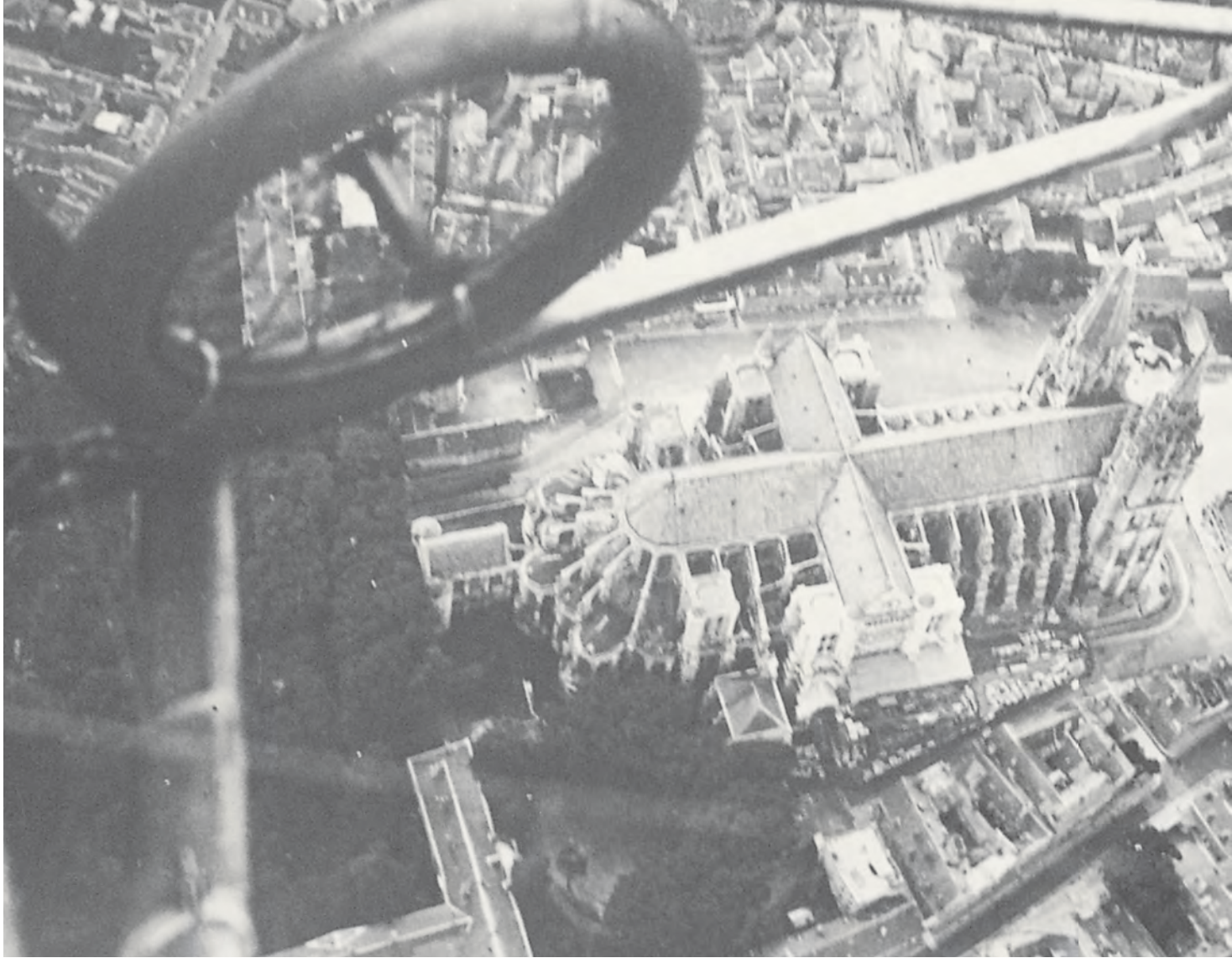
<sup>153</sup> Gardner, 88.

<sup>154</sup> Field-Marshal French quoted in Gardner, 88-89.

<sup>155</sup> Gardner, 88-89.

<sup>156</sup> Gardner, 89.

<sup>157</sup> “Papers Collected by Air Vice Marshal Sir W. G. H. Salmond,” TNA, PRO: AIR 20/705.



tire battle area was covered by a series of contiguous sheets.<sup>158</sup>

The experiment was then continued with British forces at the front. On 15 September the British III Corps assigned its aeroplanes to the divisional heavy and howitzer batteries. Later that month the British 3rd Division reported to its higher headquarters at II Corps that an RFC radio-equipped aeroplane had successfully supported the artillery in acquiring direct hits on several previously hidden German positions. By early October the following procedure described by the staff of the I Corps prevailed throughout the BEF: “The hostile batteries are first located as accurately as possible by aeroplane; these results are then communicated to divisions and an hour at which fire is to be opened is fixed. At that hour the aeroplane again goes up, observes the fire, and signals any necessary corrections by wire-

<sup>158</sup> Col George O. Squier, “Intelligence Services of the British Army in the Field,” 16 February 1915, 5, Squier Papers, USAMHI; Jones, II, 85-87.

**FIGURE 15.** Interest in aerial photography grew as aviators acquired photographic souvenirs for loved ones such as this shot of the famous Chartrés Cathedral. Source: Service Historique de l’Armée de Terre (SHAT).

less.”<sup>159</sup> However, despite these significant successes, the equipment was a liability over time. A few weeks later when the British advanced to the Ypres sector, the radio equipment began to malfunction. It required extensive maintenance with each sortie.<sup>160</sup>

The genesis of aerial photography within French aviation circles involved a mixture of innovation, mission necessity, and personal

<sup>159</sup> Gardner, 93.

<sup>160</sup> Anthony Farrar-Hockley, *Death of an Army* (London: Arthur Barker, Ltd., 1967), 110.



**FIGURE 16.** Capitaine Barés was the first chef de l'aéronautique à GQG. However, his animosity toward aerial photography in the beginning of the war did not aid Bellenger's attempts to make aerial reconnaissance more effective.

Source: SHAA, photo contained in Christienne and Lissarague, *A History of French Military Aviation*.

motives. The first aerial photographers were amateurs. Their intent was not to confirm or complement aerial observation in progress. It was to generate souvenirs for loved ones showing off the “pretty landscapes” of the front lines. Such acts of bravado soon caught the attention of artillery staff, who saw the opportunity of using photography as a means of “investigating German batteries.”<sup>161</sup> French aviation also applied its aerial resources to artillery spotting. By mid-September, as the French faced a standoff against German forces at the Reims-Vosges sector in eastern France, French artillery personnel demonstrated an important initiative. Artillery personnel flew with the escadrilles to gain a better idea of the German artillery positions. It was during these sorties that the French artillery observers carried their own personal cameras to detect and locate

<sup>161</sup> Labussière, in de Brunoff, 183 (translation provided by James Davilla).

the batteries. The results were beneficial, alerting the French GQG that aerial reconnaissance was better served with a camera on board.<sup>162</sup>

While success was demonstrated with artillerymen on board the aéroplane, the actual liaison with the artillery unit was challenging. The pilot tried conducting various maneuvers with the aéroplane to link up with the battery. That proved confusing at first. Subsequent means of controlling the rounds included using a specific brand of tracer round to allow the aerial observer the ability to track the shell toward impact. However, attention to the challenge soon met with success.<sup>163</sup> Still in September 1914, French pilots succeeded in spotting the artillery of a German army corps in maneuver. They identified the location for the French artillery at Thiaucourt (Thiaucourt-Regniéville), whose subsequent barrage destroyed half of the corps, a feat recognized and cited by Général Joffre.<sup>164</sup>

The stalemate at the Aisne set the stage for significant evolution of aerial reconnaissance. Taking aerial photographs was on the minds of several RFC aviators. On 15 September 1914 an RFC No. 3 Squadron pilot, Lt. G. Pretyman, took five photographs of German gun positions on the Aisne. Photo quality at this early stage was not impressive, but the experiment demonstrated that aerial photographic technology was possible in a combat environment.<sup>165</sup> Major H. R. M. Brooke-Popham, commander of the RFC No. 3 Squadron, was the driving force for his squadron's efforts to employ photography. His prewar photographic trials laid the groundwork for the first aerial photographs of the German forces.<sup>166</sup> However, existing camera technology did not function well in the new combat environment.

<sup>162</sup> Alain Dégardin, “Un Observateur de la Guerre 1914-1918: Eugène Pépin,” in *Vues d'en Haut: La Photographie Aérienne pendant la Guerre de 1914-1918* (Paris: Musée de l'Armée, 1989), 17 (translation provided by Commandant Marc Rivière).

<sup>163</sup> Weiller, 68.

<sup>164</sup> Christienne and Lissarague, 80.

<sup>165</sup> Nicholas Watkis, *The Western Front from the Air* (Stroud, UK: Sutton Publishing, Ltd., 1999), 8-9; Jones, II, 88-89; Edmonds, *1914*, I, 420; A. J. Insall, *Observer: Memoirs of the R.F.C., 1915-1918* (London: William Kimber, 1970), 152.

<sup>166</sup> Jones, II, 88-89.

The “press” type cameras of the Pan-Ross pattern became available later that year.<sup>167</sup>

French acceptance of aerial photographic reconnaissance commenced after British recognition of its value. Despite the notable success with the Marne observations, Capitaine Bellenger still met resistance from GQG staff. He continued his struggle to institutionalize aerial photographic reconnaissance. In October 1914, he attempted to create a new photo service, promising to provide maps of the enemy. To some, aerial photography represented a fad, not an integral part of the military. His counterpart at GQG, Capitaine Barès, chef de l’aéronautique a GQG, responded to one query with “use a Kodak that you can purchase from the local shop. Don’t ask the government to pay for this.”<sup>168</sup> Bellenger continued to find cameras, organize a lab, create a team of photographic interpreters, and teach aerial observers the techniques of aerial photography. All were essential, but advocacy for his efforts was still absent.<sup>169</sup> In post-war reminiscences, Bellenger recalled his confrontations with GQG. In December 1914, in an attempt to gain favor with Général Henri Berthelot, 2<sup>e</sup> Bureau, by showing aerial photos from various missions, Bellenger was told with a sarcastic comment that “he already had a map.” Berthelot concluded the conversation with “I don’t care about your pictures.”<sup>170</sup>

The solution to GQG’s intransigent attitude was found by Bellenger’s counterpart, Lieutenant Grout of the French Artillery. Grout developed the right contacts at GQG and proceeded to establish the seminal French aerial reconnaissance program. While flying as an observer on a reconnaissance mission on 7 October 1914, Lieutenant Grout photographed German batteries threatening Fort Douaumont in the Verdun sector. The photographs aided French artillery in subsequent targeting. Grout also examined methods for transferring the information onto a map. The success of the mission resulted in Grout being placed in charge of an elite element to establish aerial photography’s role. He proceeded to test cameras on aérostat platforms. One such



**FIGURE 17. Lieutenant Maurice Marie Eugène Grout, the leading French pioneer of aerial photography, acquired command trust early in the war, resulting in his establishing the French Section photo-aérienne (SPAe). Source: SHAA.**

design evolved into the mainstay 120 cm camera. Another long-term legacy from this advance group was the introduction to aerial photography of one of the greatest aerial photographic interpreters of the war, Lieutenant Eugène Marie Edmond Pépin.<sup>171</sup> Grout’s persistence in proving aerial photographic reconnaissance continued into the next year, providing a successful example for not only the French staff, but an increasingly curious British staff.<sup>172</sup>

As the Marne campaign came to its conclusion, aerial reconnaissance was also on the minds of the German General Staff. General von Kluck

<sup>167</sup> Insall, 151-152.

<sup>168</sup> Capitaine Barès quoted in Hodeir, 109.

<sup>169</sup> Hodeir, 109.

<sup>170</sup> Hodeir, 8.

<sup>171</sup> Dégardin, in *Vues d'en Haut*, 18.

<sup>172</sup> Labussière, in de Brunoff, 183; Carlier, 16.

blamed the campaign's failure on several issues including the lack of critical information from aerial reconnaissance. "Both cavalry and air reconnaissance have failed during the past few days."<sup>173</sup> Von Kluck was relieved from command along with the senior German commander, General Helmuth Johannes Ludwig von Moltke. Dismissal did not result in a transfer for these senior officers. Von Moltke was ordered to stay in the background while General Erich von Falkenhayn commenced command of the Aisne campaign.<sup>174</sup>

The stalemate at the Aisne continued into late September with British commanders resolved to transfer the BEF to the left of the allied line. If the war was to go in favor of the Germans, they wanted to be in place to best defend British interests. Their choice for the remainder of the war was to defend the coast and critical ports. On the afternoon of 1 October, GHQ directed the Army to move north to Flanders, ordering three British corps to withdraw in succession.<sup>175</sup> In preparation for the move, Field-Marshal French directed the RFC Commander, Brigadier-General Henderson, to establish aerial reconnaissance toward Antwerp. Field-Marshal French then expedited the move of all the British forces to the northern theater.<sup>176</sup>

The First Battle of Ypres signified the termination of mobile warfare on the Western Front for the next four years. The rapidly evolving battlefield demonstrated to commanders on both sides that mobility was a secondary consideration to firepower. As the Germans headed north in the "Race to the Sea" toward the British lifeline of the Channel ports, they were stopped through an effective combination of artillery and infantry fire. Artillery preparation had assumed the dominant position in warfare.<sup>177</sup>

The German General Staff had envisioned the Flanders plain as ideal territory for enveloping the Allied armies. The plain consisted of an abundant network of roads, railways, and canals that could

transport and supply a great army.<sup>178</sup> However, geological and topological factors were the ultimate gauge of how the battle would be fought. A clay formation typified the Flemish landscape.<sup>179</sup>

For the next four years, Flanders became the stereotype of all the horror associated with the Great War. The German attempt to take Ypres led to a series of catastrophic battles fought over the worst imaginable terrain. Damage from artillery fire was greatly reduced when shells exploded in the mud. Shell holes filled with water that did not drain away, turning the battlefield into an almost impassable morass that prevented any advance prepared by the ceaseless bombardment. In addition to the landscape, Flanders was a logistical nightmare. Munitions and other supplies could not be moved in time to support an advance properly. Reinforcements floundered in the mire, while attacking forces were forced to relinquish hard-fought positions. Artillery suffered from an inability to operate off the roads. Light field artillery required macadam-like material to convert the shell-torn route to one meeting the weight and bulk demands for its movement. A British artillery officer, reflecting on the continual challenge, remarked, "I am carrying forward my guns and ammunition, the material for making my road as I go along, and the material for fortifying my new position.... I am half expecting orders to bring along an acre of ground with me, too."<sup>180</sup> "Stationary warfare now the rule" summed up the condition for most of the war on the Western Front.<sup>181</sup> In light of the topological horror, aerial reconnaissance assumed prominence. It served as the catalyst for the aerial photograph.

As positional war established itself with networks of trenches from the Belgian coast to the Swiss border, aerial observation assumed a permanency with employment of aérostats. The French had originally discontinued their efforts in developing captive balloons (captif ballon) in 1911 in favor of aéroplanes. The Germans had

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<sup>178</sup> Douglas Wilson Johnson, *Battlefields of the World War, Western and Southern Front: A Study in Military Geography* (New York: Oxford University Press), 7.

<sup>179</sup> Johnson, *Battlefields of the World War*, 11.

<sup>180</sup> Johnson, *Battlefields of the World War*, 23-24.

<sup>181</sup> Count A. E. W. Edward Gleichen, ed., *Chronology of the Great War, 1914-1918* (3 vols., London: Ministry of Information, 1918-20; reprint, 3 vols. in 1, London: Greenhill Books, 2000), 38.

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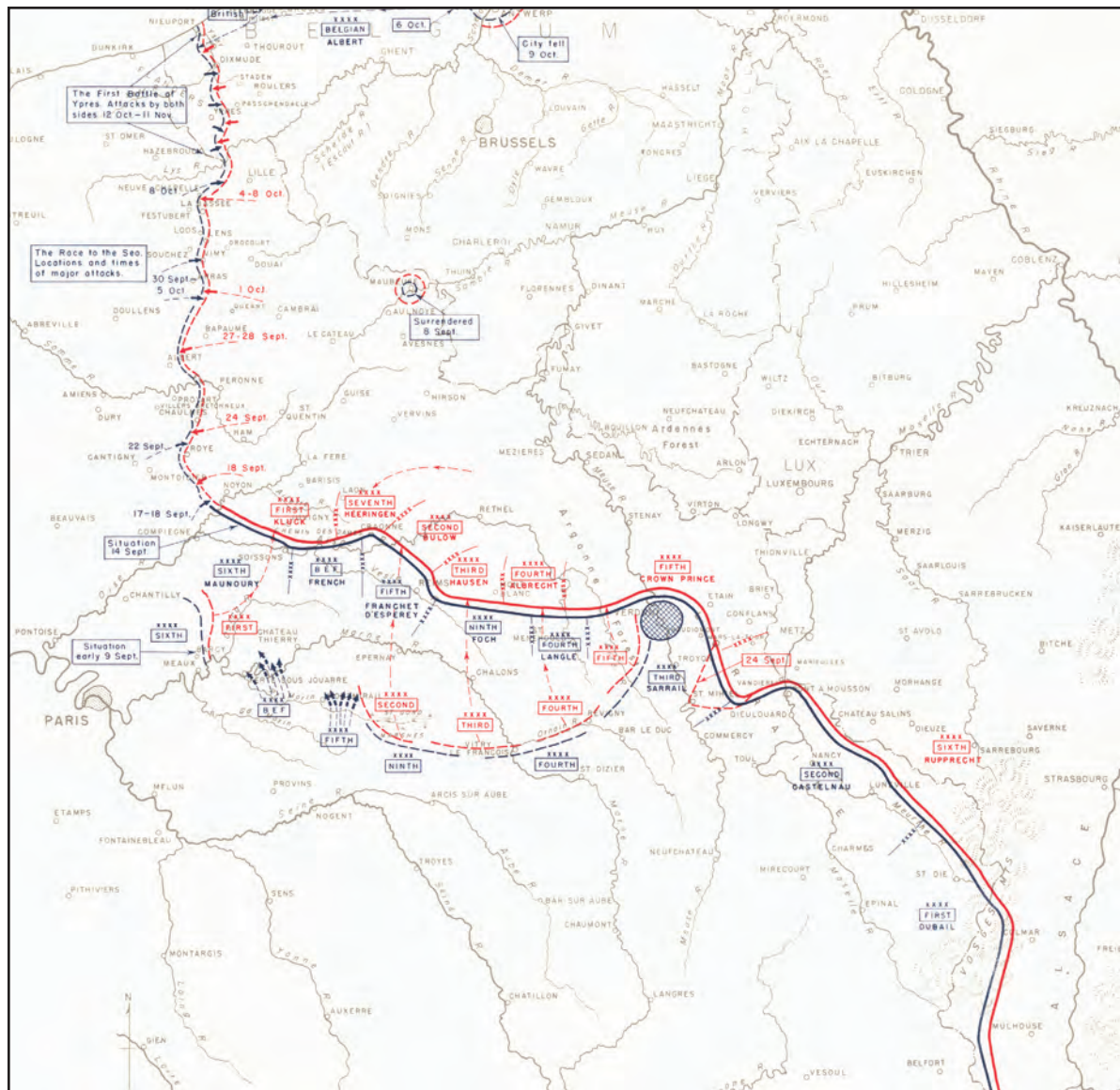
<sup>173</sup> Von Kluck, 166.

<sup>174</sup> Macdonald, *1914*, 310.

<sup>175</sup> Gardner, 89.

<sup>176</sup> Field-Marshal French, 189.

<sup>177</sup> J.B.A. Bailey, *Field Artillery and Firepower* (Oxford: The Military Press, 1989), 128-129.



**FIGURE 18.** Race to the sea, September—October 1914. Source: *West Point Atlas*, map 13. Courtesy, Department of History, U.S. Military Academy.

continued to develop a captive balloon variant known as the Drachen. These proved of great value to the Germans when the war commenced in August 1914. The aerial pioneer behind manned kite observation, Capitaine Saconney, quickly rectified the shortfall in French balloon observation (ballon observateur) by assembling an initial cadre of aérostats to support French armées engaged in battle against the Germans. By October 1914, the French had assembled a force of 30 aérostats (3 sections of 10 captif ballon) providing the front lines with a fixed platform to both monitor the Germans and support artillery.

By early 1915 the French had an additional 10 captif ballons at the front.<sup>182</sup> The innovative aerial pioneer Capitaine Saconney not only led the design of the ballon observateur but also configured its operational employment for combat determining suitable missions such as observation, artillery ranging, verification of demolitions, and sector reconnaissance.<sup>183</sup> The aérostat also had an advantage over the aéroplane. It could be connected directly to the headquarters

<sup>182</sup> Christienne and Lissarague, 69.

<sup>183</sup> Christienne and Lissarague, 70.



or artillery battery via telephone, reducing communication time to a minimum. The best captif ballon used in the Great War, the Caquot (designer Capitaine Albert Caquot), was designed and deployed to the front in early 1916. The Caquot became the standard for balloon observation for the remainder of the war.<sup>184</sup> The British Army acquired their first balloons from the Royal Navy and fielded their first balloon observation unit in May 1915.<sup>185</sup>

With the decline and eventual termination of mobile warfare, observation by *aéroplane* assumed a more vigorous role. The French Aviation Militaire expanded from 31 flights to 65, of which the predominance served the reconnaissance mission. Each French flight consisted of approximately six *aéroplanes*. By March 1915, the French had 53 flights of *aéroplanes*.<sup>186</sup> The Aviation Militaire now comprised 16 army reconnaissance and pursuit flights, 16 aerial bombardment flights, and 30 army corps observation flights.<sup>187</sup>

The last phase of mobile warfare cemented a relationship that continued for the remainder of the war. As the forces adopted positional warfare, there was an impetus for greater cooperation between aerial observation and the traditional infantry and artillery forces. The principle that “Photography is the basis of good artillery” started to evolve.<sup>188</sup> After the war Air Vice Marshal (AVM) Geoff Salmond stated that aerial photography owed its existence to radio and artillery.<sup>189</sup> His seminal efforts with Captain Lewis established a base for subsequent aerial observation efforts to support artillery. However, officers from the artillery arm were still slow to accept the critical role of aerial observation, despite the successes at the Aisne. Greater liaison was required to communicate aerial reconnaissance capabilities to both artillery and infantry senior officers and staff.<sup>190</sup> The pioneer in British aerial photog-

raphy, John Theodore Cuthbert Moore-Brabazon, reflected later in life that the artillery culture felt that its ballistics were an exact science and did not require assistance from the aviation community. Moore-Brabazon related that it took one of the first British aerial celebrities, Major Harvey-Kelly, to drive home the value of aerial reconnaissance for the artillery. One day during the Battle of the First Ypres, Harvey-Kelly transmitted via radio a “very curious message.” The British had moved several large mortars, the pride of the artillery, to the front. Near the Ypres battleground was a large lake (Bellewaarde Lake) well within RFC aerial coverage. During a mortar barrage, Harvey-Kelly commented on the accuracy of the mortar fire: “If anybody is firing on the middle of Bellewaarde Lake, he is hitting it.” Moore-Brabazon stated that this dry assessment did more to convince the British Army to rely on British aviation to help direct artillery fire than any other effort.<sup>191</sup>

The experiences of the first five months of combat did little to impress British commanders of the value of their aerial reconnaissance. By the time the First Battle of Ypres had commenced, it was clear among the members of the staff that intelligence and operations had to learn to coexist. The BEF’s first senior intelligence officer, General Macdonogh, was probably the most brilliant of any who served in the forces for the duration of the war. Despite conclusive information provided to British commanders, there was always an air of suspicion. When Field-Marshal French was informed that the Germans had reinforced their position at Ypres with three new reserve corps, he flew into a rage at Macdonogh: “How do you expect me to carry out my plans if you will bring up these bloody divisions!”<sup>192</sup> It took technological advancement in aerial photography to lend credibility to the assessments and eventually convince the operators to accept the information provided.

In early 1915 the U.S. military attaché to Great Britain, who later commanded the U.S. Army Signal Corps for the remainder of the war,

<sup>184</sup> Christienne and Lissarague, 69-70.

<sup>185</sup> Edmonds, 1914, I, 303.

<sup>186</sup> Christienne and Lissarague, 82.

<sup>187</sup> Christienne and Lissarague, 82.

<sup>188</sup> Unknown British officer quoted in Harold Porter, *Aerial Observation: The Airplane Observer, the Balloon Observer, and the Army Corps Pilot* (New York: Harper & Brother Publishers, 1921), 167.

<sup>189</sup> “Papers Collected by Salmond,” TNA, PRO: AIR 20/705.

<sup>190</sup> Jones, II, 82; Lamberton, 10.

<sup>191</sup> J. T. C. Moore-Brabazon, *The Brabazon Story* (London: William Heinemann, Ltd., 1956), 88.

<sup>192</sup> Occleshaw, 28.

Colonel George O. Squier, commented in his report on the changing face of battle:

It is strange, this modern war, when a [modern] strong fortress like Antwerp falls in ten days and then a simple trench dug in the open field can completely stop the German Army at its best. At Ypres 4 corps stopped something like 8 or 10 corps, including the Prussian Guards. What are we going to do about fortresses in the future? One thing is clear, concealment comes first, and protection is secondary.<sup>193</sup>

Squier's comments were prophetic. The evolution of warfare in the coming year brought aerial reconnaissance to the point of threatening the prevailing military mindset. The battlefield had been transformed.

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<sup>193</sup> Squier, "Intelligence Services," Squier Papers, USAMHI.

