

## **Military Intelligence at the Front, 1914–18**

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### **Introduction**

Military intelligence at the front advanced remarkably during the Great War, adopting methods and technologies that would remain in place through the 20th century. Before the modern era, national and strategic intelligence (*renseignement* and *Nachricht*, French and German, respectively) came mainly from espionage. With the introduction of aerial reconnaissance deep behind enemy lines, the tools of a modern era would contribute to shaping strategy and assessing enemy intentions.

On the World War I battlefield, as traditional sources—including the military commander's favorite force arm for intelligence, mobile cavalry—were rendered impotent, armies became entrenched along hundreds of miles of front. With each passing day of 1914, as opposing forces commenced a strategy of positional war, demand mounted for a constant stream of accurate and timely information to target field artillery, the most important weapon in the contemporary arsenal. This demand created new sources of intelligence derived from technologies that were

familiar to Europeans of the day but which had not yet been effectively employed in warfare.

At the front, the conservative military culture was forced to grapple with its tradition and make sense of combat in the new stationary environment. In the face of catastrophic casualties, military leaders soon learned that approaching battle through in-depth study and analysis would prove far more effective than reliance on the élan that spurred the first waves of soldiers to rush forward into walls of lead from machine guns.

They learned that access to accurate and timely information was essential to gain advantage in battle. Their command and control came to depend on constantly collected intelligence from a rapidly expanding list of sources to support decisions from the planning stages to their execution. Leading exponents of military intelligence reinforced this thinking. Within the first year, a French intelligence visionary portrayed intelligence information's contribution in simple terms—to follow the destructive work of our artillery and to reg-

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*ister the victorious advance of our infantry.<sup>1</sup>*

By late 1915, intelligence information, especially that acquired from airplanes, had demonstrated that it was credible and contributed effectively to the conduct of battle. Traditionalists, who had been skeptical of new intelligence sources at the beginning of the conflict, became firm disciples for the remainder of the war. The words of two British intelligence officers reflect the shift. The first was offered in 1915; the second after the war.

*Intelligence is very frequently looked upon as an affair that has nothing to do with regimental officers and men. A very general opinion seems to be that information about the enemy is obtained in some mysterious way from spies or other persons of doubtful character, but of surprising intelligence.”<sup>2</sup>*

*...[The] results [of intelligence] are produced by hard work, great diligence and untiring watchfulness, and the painstaking collection and collation of every possible form of information. Nothing is too small to be unworthy of the attention of I. D. [Intelligence Department] and no problem too big for it.<sup>3</sup>*

By 1918, sector surveillance of the positional battlefield had become a refined art, employing both traditional methods

and a host of new technologies. Continuous, timely, and accurate information made military intelligence at the front a lethal weapon beyond the contemporary arsenal—a major force multiplier, in today’s parlance—increasing lethality with an array of new technologies that made use of the light spectrum, photogrammetry, and sound and radio waves.

Along with exploitation of intelligence came improvements in communicating data to decisionmakers and combatants, which in turn led intelligence collectors and analysts to focus on communication networks throughout the trenches and rear echelons. Electronic technology, then in its infancy, was rapidly assimilated in the front lines and became a common fixture for all combatants. Radio transmitters achieved a role above the battlefield through airplanes.

The most lethal force arm, artillery, received three-dimensional, near-real-time updates of its accuracy. All conceivable ways of transmitting messages within the trenches were tried, including telephones, runners, carrier pigeons, messenger dogs and small rockets. In the absence of radio, airplanes operated from landing grounds and directly supported headquarters by dropping containers with message updates.

Major advances in camouflage and deception appeared, offering fascinating glimpses into the cognitive processes of modern war. With the stereoscope serving as the instrument of choice in the war of perceptions, imagery transformed the battlefield. In the trenches, deception was employed wherever possible and reinforced by cover of darkness and activities below ground. Above ground, master artists perpetuated illusion through a vast array of camouflage netting.

Radio deception was also employed. Techniques like the generation of intense radio traffic in quiet sectors and the reduction of wireless activity in the area of a planned attack were common practices. In the forward areas, construction of dummy trenches and artillery batteries, along with feints from raids and maneuvering artillery, contributed to the war of illusion.

### ***Eleven Primary Sources at the Front***

#### ***Radio Intercept and Radiogoniometry***

Radio intercept and radiogoniometry (direction finding) was the first of the modern sources to have a decisive impact on battle during a period of intense mobile warfare. Radio intercept had been evolving as an intelligence discipline before the war started, but its value was clearly demonstrated with

the interception of open radio transmissions at the battles at Tannenberg in eastern Poland and the First Marne, northeast of Paris. Tannenberg became the first battle in history in which interception of enemy radio traffic played the decisive role.<sup>4</sup> Success came to the Germans when they intercepted Russian radio transmissions containing exact force dispositions. French cryptological experts were never able to convince the Russians that their codes were easy to read and required better protection with frequent code and cipher changes.<sup>5</sup>

Aerial reconnaissance reinforced German command decisions at Tannenberg, but did not play as critical a role. Ironically for the Germans, Allied radio intercepts of transmissions a few days later at the First Marne undermined the German offensive near Paris. French intelligence intercepts led to successful analysis of German intentions. Partial credit went to the German lack of discipline in radio operation. By 4 September 1914, French intelligence had confirmed that the German First Army was not moving toward Paris. It also discovered the extent of German fatigue and logistical shortfalls. Finally, the French monitored German General Alexander von Kluck's order to withdraw and knew that the German retreat had commenced.<sup>6</sup>



The Eiffel Tower, served as a French collection site for enemy radio transmissions. The chief of staff to the French military commander of the Paris sector recognized its service in his description of events during the first Marne battle. He cited Gen. Johannes Georg von der Marwitz, the German cavalry commander of the First Army, violating radio discipline on 9 September by transmitting, "Tell me exactly where you are and what you are doing. Hurry up, I am going to bolt." French intelligence triangulated the transmission site and later found abandoned stacks of munitions, vehicles, and a field kitchen with a great store of flour and dough half-kneaded.<sup>7</sup> (Photo, 1910 © Bettman Corbis)

The successes at Tannenberg and the Marne clearly illustrated the value of radio intercept and radiogoniometric methods to the combatants. Positional war refined their role and value and created a processing cycle for evolving signals intelligence. Message interception, analysis to determine the originator, cryptanalysis, and event reporting all matured the discipline. Monitoring of units in fixed locations at the front allowed cryptanalysts to group emitters within a particular echelon—division, corps, or army. This analysis became a highly favored method for confirming enemy order of battle (OOB) and determining the depth of echelons in a given sector,

allowing combatants to position their own forces in response. Traffic analysis focused on enemy radio procedures and call signs.<sup>8</sup>

By 1915, incessant artillery fire had obliterated most communication networks at the front. As a result ground telegraphy was used within the trenches. However, electromagnetic currents of comparatively low frequency could still be detected directly by the telephone receiver. Wire-tapping units intercepted ground telegraph lines (French term for this ground telegraphy operation was *télégraphie par le sol* [T.P.S.]).<sup>9</sup> Three kilometers was the normal range for transmissions, enough to support the

average front line sector. In turn, intercept stations working from the most forward trenches tapped the lines to listen in to enemy telephone conversations in the opposite trenches. Their reporting provided indication of enemy relief and warning of imminent attacks.<sup>10</sup> By war's end a large part of the interceptions were of signals in Morse code.<sup>11</sup>

Codes and ciphers for secure communications were developed to unprecedented levels during the war. At first, this was primarily the domain of the French, who had established radio intercept stations against Germany before the war. British advances in the discipline focused on naval intelligence.<sup>12</sup>

Conversely, the Germans lagged in the field. They did not emphasize cryptanalysis for the first two years of the war. The Germans, forced to operate on captured French territory with radios, were more vulnerable to intercepts. The French, on the other hand, had at their disposal a well-established system of less vulnerable wire networks adjacent to their front on home territory. In addition, with French and British experience in analyzing German phraseology and idiosyncrasies, the Allies had an advantage they never lost.<sup>13</sup>

By the last year of the war, interception and decoding had become fully integrated components of the Allied intelligence discipline. As novice American

forces arrived in late 1917, the French army provided the equipment and technical support the newcomers needed. In mid-1917 senior American officers were discreetly informed by General Philippe Pétain's staff that the Germans were not aware of the success the French cipher section was having in breaking German codes—an insight not shared with the rest of the French army for fear of leaks.<sup>14</sup>

The culture of sharing intelligence within a limited circle of experts proved beneficial. American radio intercepts discovered that German battle preparations included implementation of a new code, known as the ADFGVX cipher, on 11 March 1918. The Americans

immediately forwarded the information to French and British cryptanalysis staffs. The brilliant French cryptanalyst, Captain Georges Jean Painvin broke the code on 6 April.<sup>15</sup> In the subsequent weeks Painvin's analysis was combined with intelligence reports from aerial reconnaissance and prisoner interrogations. The resulting analysis led to an effective French counter to Gen. Erich Ludendorff's 9 June 1918

GNEISENAU offensive at Montdidier and Compiègne.<sup>17</sup>

Front line security called for the most stringent enforcement of radio discipline. Soldiers were warned that the enemy overheard all telephone conversations. Radio intercept operators not only listened for enemy conversations but also kept track of communication violations by friendly forces. One friendly operator was able to deduce the entire US OOB for the St. Mihiel assault by listening to the complaints of a US switchboard operator that his communication lines were being broken by tanks and heavy artillery moving up for the attack.<sup>18</sup>

**CONFIDENTIAL ORDER No. 1.**

**[classified SECRET]**

**Published by Headquarters, 26<sup>th</sup> Division, American Expeditionary Force, in France, February 16, 1918.**

1. It is safe to assume that all telephone conversations within one thousand yards of the front line will be heard by the enemy. This necessitates great care in the use of the telephone. To prevent, as far as possible, the enemy gaining information through indiscreet use of our telephone, the following rules will be strictly observed:

(a) REFERENCE TO LOCATION will never be telephoned.

(b) From regimental P.C. forward, the telephone will be used for tactical purposes only; administrative matters will be transacted other than by telephone.

(c) Messages referring to movements or operations of whatever size must be in cipher (except in attack, when secrecy will give way to urgency).

(d) The designations of stations as used by the French will continue to be used; in all cases this represents a location and not an organization and does not change when new organizations occupy the locations.<sup>16</sup>

The newly established third dimension of warfare, aerial, also took on signal intelligence collection. Triangulated intercepts of radio transmissions from enemy artillery observers in airplanes provided intercept location data for pursuit escadrilles and squadrons.

Intercepted radio transmissions from goniometric stations also helped counter strategic aerial bombardment by Zeppelins, Gotha bombers, and Zeppelin-Staaken (*Riesenflugzeug*) giants. Radio transmissions from German ground stations providing bearings to aerial navigators were intercepted, location determined, and data passed to British defense squadrons.<sup>19</sup>

### **Prisoner Interrogations**

The most voluminous source of intelligence information in positional war came from the interrogation of prisoners. (According to popular estimates, some 8 million men on all sides were captured during the war.) The capture and retention of prisoners took place during all levels of operations on both sides of No Man's Land. Not only was a captive one less threat, prisoners were often treasure troves of information on critical issues that other forms of collection threw no light on. One senior British intelligence officer described the process:

*Most of the information which a prisoner has is information in detail regarding the enemy*

*defensive works on his own immediate front. To extract this information from him requires time. It is sometimes necessary to take the prisoner back in the front line trenches or to Observation Posts and almost always necessary to examine him with the assistance of aeroplane photographs.*<sup>20</sup>

Ludendorff's chief intelligence manager at the front, Oberstleutnant Walter Nicolai, testified to the value of prisoner interrogations, saying, "Our greatest and most valuable source of news in the western theatre of war—and at the front line the only one—was furnished by prisoners of war."<sup>21</sup>

Interrogation became a science of human emotion and psychology. German military intelligence was aware that the British had been told to expect beatings and other ordeals, and so "prisoners who, still feeling the violent emotions of battle, found themselves humanely treated ... spoke more willingly even than the deserters."<sup>22</sup>

Interrogation centers took great care in separating prisoners by ethnic origins. Polish and Alsace-Lorraine prisoners were kept in separate locations to promulgate their anger toward Germans, reinforced by better treatment and food, "which nearly always loosens their tongues."<sup>23</sup> At one French interrogation center, most of the staff were professors and lawyers, "who obviously make the best [interrogators], because

they are the most experienced, questioners."<sup>24</sup>

Interrogators used data from detailed photographic mosaics of his sector to trace with sources (prisoner or deserter) their itineraries from the rear to the front line trench network, confirming statements with specific details from photographs to include an isolated tree, house, or any other visible feature.<sup>25</sup>

Personal letters, documents, and correspondence taken from prisoners helped in identifying opposing units and provided information for tactical and strategic analysis.<sup>26</sup> A good example with German prisoners was the *Soldbuch* or paybook. It served not only to identify the prisoner, but the military record it contained provided discussion material for the first interrogation.<sup>27</sup>

Interrogated prisoners of both sides provided stereotypical responses. Officers regretted being captured. Privates were glad to be out of the hell of the trenches. German prisoners were confident in the success of German arms, at least early on. One Bavarian summed up the Allies in his interrogation by saying,

*The French have done wonderfully. They are the enemies that we like the best. We hate the English. We have regret for the French.*<sup>28</sup>

The first Americans became prisoners on 17 November



"Treachery was in the air day and night. This sector was full of German agent and spies. Special orders were issued to us and all were placed on guard, challenging everyone at night, both on cross-roads and at points entering our lines."—from a WW I memoir.<sup>29</sup> A German agent about to be executed by a British unit. (Photo: ©Corbis/Bettman) (Photo, 1915 © Bettman Corbis)

1917. Initially, during the their first six months in combat, American soldiers were not asked about their combat arms. Rather, discussions focused on the numbers of Americans in theater and en route across the Atlantic. Concerned about sustaining combat in the face of the arrival of new and fresh forces, the Germans were after everything they could get about the American reinforcements that would help shape their battle strategies for the remainder of 1918.

### Spies

Spies in the Great War provided intrigue, both in the minds of the combatants and of the practitioners of the art. The intelligence officer was responsible for preventing these agents of espionage from finding out anything about "ourselves." *Contre-Espionage*

required a disciplined, self-controlled existence, in the trenches and the rear. Keeping noise to a minimum was a requirement. Personal letters were potential intelligence documents detailing morale, locations, personal observations, and other relevant data. Censorship was imposed to curtail any chance of an enemy acquiring a critical snippet of information.

A British intelligence officer commented on this environment: "The enemy has many soldiers who speak English perfectly, and they recognize by our accent what part of the country we come from." The trench culture thus mandated that every combatant play a role in gathering information. "Every man should, therefore, look upon himself as a collecting agent of information," wrote a British

officer.<sup>30</sup> Concern about spying created a culture of distrust and uncertainty throughout the front. British warnings reflected a somewhat chaotic, even paranoid, culture:

*Because a man is dressed in British, French or Belgian uniform, do not necessarily assume that he is what he appears to be. Such a disguise is by far the most effective and safe one for a German spy, and there is little doubt that it has been frequently made use of. No matter who the man is, if he acts suspiciously—wants to know too much about the troops—detain him.*

Moreover, French and Belgian citizens near the front were also suspect.

*Barbers, cafe proprietors, waiters and waitresses may all be looked upon as potential spies, and it is most important that they should have no opportunity of picking up odd scraps of information.*<sup>31</sup>

### Information from Refugees—Repatriated Agents

Human intelligence also came from the interrogation of repatriated civilians who crossed through Allied lines from German-held territory. Interviews were normally conducted by intelligence personnel in the sector in which they crossed for whatever information the refugees had on nearby German activity and intentions.<sup>32</sup> After local French authorities confirmed that the repatriated

were authentic, follow-on interviews sought to gather more information on German activity seen in aerial photography or reported by other sources. The intelligence was applied to artillery target lists and documents. One example follows:

*The two French civilians who came into our lines near Pont-a-Mousson on Sept 2, have described in detail a water supply system by which water from the Fontaine du Soiron, 66.8-48.3, is pumped to reservoirs at 3 points.... This system is partly visible on photos, where it has the appearance of buried cable trenches, and it has been so represented on maps. The civilian's statement is entirely consistent with the photographic evidence and indicates that the further strengthening of the Hindenburg line is to be looked for at the points indicated.<sup>33</sup>*

### **Patrol Reports**

Everyday combat operations at every echelon, especially by infantry and artillery elements, led to intelligence collection opportunities. Each combat unit had its own patrol procedures requiring collection and dissemination of information within its sector. Reports generated by daily operations supplemented other material, including aerial photography, and contributed to three intelligence objectives: understanding of the layout of one's own front line; detailed knowledge of the configuration of No Man's Land up to enemy wire; and exact analysis of enemy lines,

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including locations of saps (trench construction into No Man's Land), mine locations, and forward listening posts.<sup>34</sup>

When information was needed to refine operations, trench raids were mounted to capture prisoners for interrogation or to gather material from enemy trenches. Raiding parties were given prioritized requirements. Objectives might have included, for example, taking note of trench and revetment configurations. Any article of equipment was potentially valuable. Captured helmets, caps, rifles, shoulder straps, and identity discs complemented analysis of other sources. Patrols also had a counterintelligence component when they were instructed to look for the antennae of enemy listening devices.<sup>35</sup>

### **Ground Observation—Reporting from Infantry and Artillery**

Positional war meant continual observation of the enemy through a network of stations along both sides of the front line. The French referred to this as the *service des renseignements de l'observation du terrain* (SROT).<sup>36</sup> Incessant focus on one enemy sector day after day led to fleeting opportunities that became intelligence for artillery unit and local ground commanders. Among the tools observers used were the scissoring telescope, the subterra-

nean microphone, the perpendicular and horizontal range finder, and the elongated three-power French binocular.<sup>37</sup> Panorama photographs, pasted together to form mosaics along the horizon were generated to provide photographic detail for infantry analysis. The panoramic mosaics were annotated to show compass bearings to recognized permanent points as reference points for all observations.

Ground observers, usually highly experienced infantrymen, were required to maintain total concentration. With the experience of combat, these observers could piece together an evolving situation and report back quickly with artillery targeting data or other information.<sup>38</sup> Additional tasks included keeping the lines of communication in working order at all times and under any and all conditions.<sup>39</sup>

An American observer trained and deployed to an SROT observation post before the St. Mihiel offensive provided insight into the French observation process:

*They showed us how to locate German batteries, machine gun nests, railroads, troop movements, supply trains, aerial activity, observation balloons, etc. We paid particular attention to watching how often Hun airplanes arose,*



The Salmson 2A2 was one of the finest airplanes of the Great War. The aerial camera is a French, 26 cm "Grand Champ." This airplane was assigned to the US Air Service's 1st Aero Squadron. Today, the US Air Force's 1st Reconnaissance Squadron operates the Lockheed U-2 and the RQ-4 Global Hawk surveillance aircraft. (Original image at USAF Academy Library, Davis Collection, SMS 54)

*where they crossed our lines, whether or not they were fired on by our anti-aircraft guns, the number of Hun planes in the air, the purpose of their flights, etc. It was particularly important to get the point where the German aviators crossed the Allied lines.*<sup>40</sup>

### Sound-ranging

Target acquisition of enemy artillery evolved as a science in the Great War using principles of sound and light. The process became so refined on both sides that by the time of the armistice once an enemy artillery battery commenced fire it was quickly registered to a precisely known location and became a target for counterbattery fire.<sup>41</sup> Sound-ranging microphones—usually composed of six-microphones set up

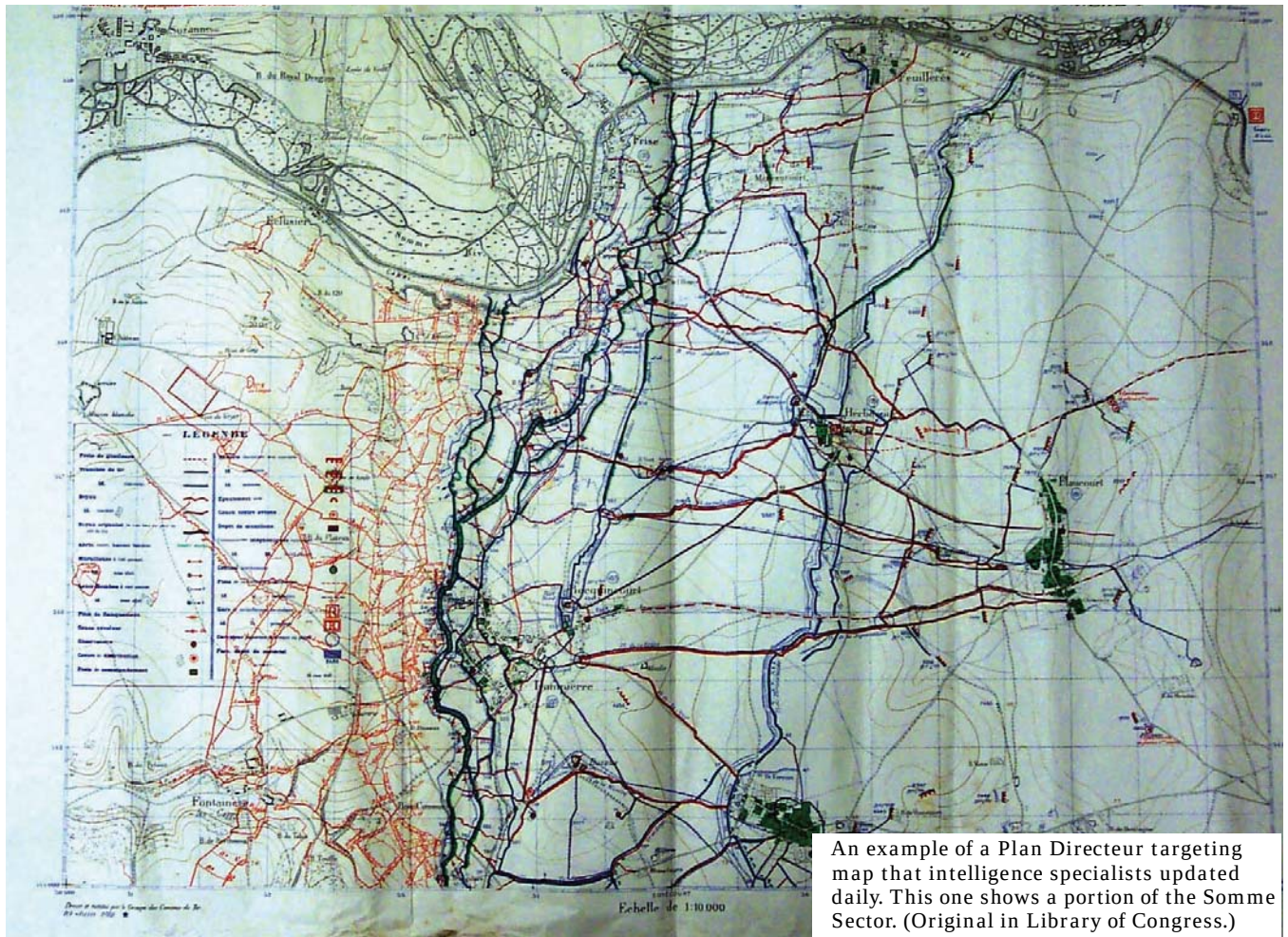
along a 9,000-yard sector—recorded the sounds of artillery rounds as they traveled from their guns. With the rounds travelling at 1,100 feet per second, the sounds created measurable arcs that were plotted on sector maps. The signals from the microphones were tracked and superimposed on a regional map. The data were synthesized using a mechanical device called a "computer." The resulting information was sent to friendly artillery units over telephones. Sound-ranging equipment was also used to track and correct friendly fire.<sup>42</sup>

The German sound-ranging section (*Schallmesstrupp*) posts did not possess automated capabilities. Interrogated *Schallmesstrupp* prisoners credited the Allies with better

collection because of the technological sophistication of their networks. According to Allied intelligence the *Schallmesstrupp* inventory included a stopwatch, telephone, anemometer (wind-gauge), weather vane, and thermometer. As each post heard a definitive report from an artillery piece, operators started their watches. When the warning post linked to the section started vibrating, the watches were stopped. Their calculations took into consideration measurements of atmospheric conditions, temperature, and the direction and velocity of the wind. The results were sent to the central post for final calculations with the targeting data forwarded to the heavy artillery unit commander for counterbattery salvos.<sup>43</sup>

### Flash-Spotting

Flash-spotting (*Licht-Messstellen*) applied optical measurements to locate enemy artillery. The essential equipment for flash-spotting control at headquarters was the Flash and Buzzer Board and the plotting board—generally a 1/10,000 map for tracing and synchronizing responses from posts. A telephone switchboard provided connectivity. All calculations on identified artillery batteries were forwarded to artillery for counterbattery operations.<sup>44</sup> The combination of sound-ranging and flash-spotting proved to be a vital part of front-line intelligence networks supporting artillery targeting. Aerial reconnais-



An example of a Plan Directeur targeting map that intelligence specialists updated daily. This one shows a portion of the Somme Sector. (Original in Library of Congress.)

sance complemented these collection systems.

The German flash-spotting Section [*Lichtmesstrupp*] comprised a central station and eight observation stations over a 20-km front. Each post had eight men, with four providing relief every two days. Observation was accomplished by one individual at a time. Each post had a pair of periscopic field glasses, a device called an alidade that allowed one to sight a distant object and use the line of sight to perform the required computational task, an ordinary pair of field glasses,

a chronometer, and telephone. Like sound-ranging, the central station reported observations to the heavy artillery unit commander for counterbattery targeting.<sup>45</sup>

#### **Captured Documents**

Captured documents were gold mines for intelligence analysis on both sides of the lines. The French described enemy documents as “perfect interpretation,” particularly when aerial photographs matched dates and items noted in documents. Sometimes sketches with notes about machine guns, trench mortars (*Minenwerfer*),

dummy complexes, and other projects of interest were found. By correlating aerial photographs with captured documents, analysts identified more features. Photo interpreters required detailed knowledge of trench organization, such as could be found in published German regulations and other captured documents. Their tactical approaches often found the keys to enemy intentions. Analysis of strategic aspects would be done by the intelligence staff.

French manuals included reminders about the impor-

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*Balloons with forward aerial observers were the prized resource of artillery.*

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tance of handling documents properly, noting, for example, that a commander's responsibilities included reviewing captured documents for indications concerning every possible phase of attack or defense, including lines of approach and lines of defense.<sup>46</sup>

On the German side, captured documents were no less important. In 1918, for example, General Ludendorff referred to a captured British guide to photo interpretation, *Notes on the Interpretation of Aeroplane Photographs* (SS 550), which was one of the most important documents on the subject prepared during the war. In his directive to forces engaged in an operation against British forces in the Cambrai Salient, Ludendorff quoted from the document's description of German practices:

*It is evident that increasing care is taken to conceal emplacements and to defeat the camera. As, however, the Germans usually start to construct camouflage after a battery emplacement has been completed, their attempts are rendered abortive, owing to the fact that the emplacement will probably have been photographed several times during the various stages of construction.*<sup>47</sup>

German actions before the operation demonstrated that they took Ludendorff's admoni-

tion seriously. Priority was given to maintaining proper camouflage and deception, and officers were assigned to arrange for aerial photography of emplacement sites *before* construction was begun and during and after construction to test camouflage.<sup>48</sup>

Toward the end of the conflict during the Meuse-Argonne campaign, captured German documents provided American intelligence analysts (in a unit known as the Enemy Works Subdivision) with information, including orders, weapon system manuals, tactics for defeating tanks, intelligence summaries, and reports on the interrogations of prisoners. The data provided a concise view of the German estimate of the strength of Allied forces and demonstrated that late in the war German leaders had come to fear the effects of Allied propaganda and had issued repeated orders to soldiers to turn in papers dropped by Allied airplanes.<sup>49</sup>

### **Aerial Observation from Balloons**

A natural extension of the ground observation reporting system was the captive balloon or kite balloon (*Dracheballon*), which allowed observers from both sides to spy on more distant enemy locations than could be seen from ground sites. Reports from balloon observation covered enemy infantry,

artillery, and aeronautical activity; movements on road and rail; and sightings of explosions—all within the limits imposed by terrain, weather, and countering enemy activity.<sup>50</sup> Balloons with forward aerial observers were the prized resource of artillery. Balloons had one advantage over airplanes: instant telephone connections to those in need of the information. Notably, the Germans extensively employed aerial cameras from captive balloons to provide coverage of the front.

Balloons were assigned to support army- to division-level requirements. A German balloon detachment was tactically under the command of every division on the front. Since these tasks also belonged to the aviators, the commander of the balloons had to keep in constant contact with the Army Aviation Commander (*Kommandeur der Fliegertruppen*) to allocate work among aircraft and balloons.<sup>51</sup>

German long-range artillery groups (*Fernkampfarteriegruppen*) firing on key strategic targets such as command centers, lines of communication, and ammunition dumps had their own dedicated aerial observers and balloon sections.<sup>52</sup> French and British aligned their balloons units to the army echelon requiring support. American balloons assigned at the army echelon were attached to a "Balloon Group," which reallocated

observation to the lower echelons. Balloons supporting divisions helped regulate divisional artillery fire as well as provide surveillance and liaison for the infantry divisions.<sup>53</sup>

### **Observation from Airplanes**

The primary and most lucrative military intelligence resource in the Great War was aerial photography. From 1915 to 1918, aerial photography was the cornerstone of military intelligence at the front. In cases of conflicting data, the photograph was acknowledged by the French as the one source for settling discrepancies.<sup>54</sup> As one American instructor summed up intelligence:

*Under the conditions of modern warfare, no army can long exist without using every possible means of gathering information; and of all these means aerial photographs present probably the best medium.*<sup>55</sup>

It not only provided the viewer with a concise portrayal of the threat that existed at a particular moment in time; the interpreted information could be effectively and accurately applied to the most important medium of the Great War, the targeting map. Photographs provided all combatants with the ability to wage positional war in the most effective and devastating manner.

Aerial observations (*observation aérienne* and *Fliegerbeobachtung*) played key roles during the first months of the

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### ***Aerial photographic interpretation was a team effort.***

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mobile campaigns on both Eastern and Western Fronts; the evolution and extensive use of aerial cameras and photography proved to be decisive in shaping the battlefield throughout the war; and in subordinate roles, such as infantry contact (*Infanterie-Flieger*), aircrew observations added to a battlefield commander's timely update of forces in contact.

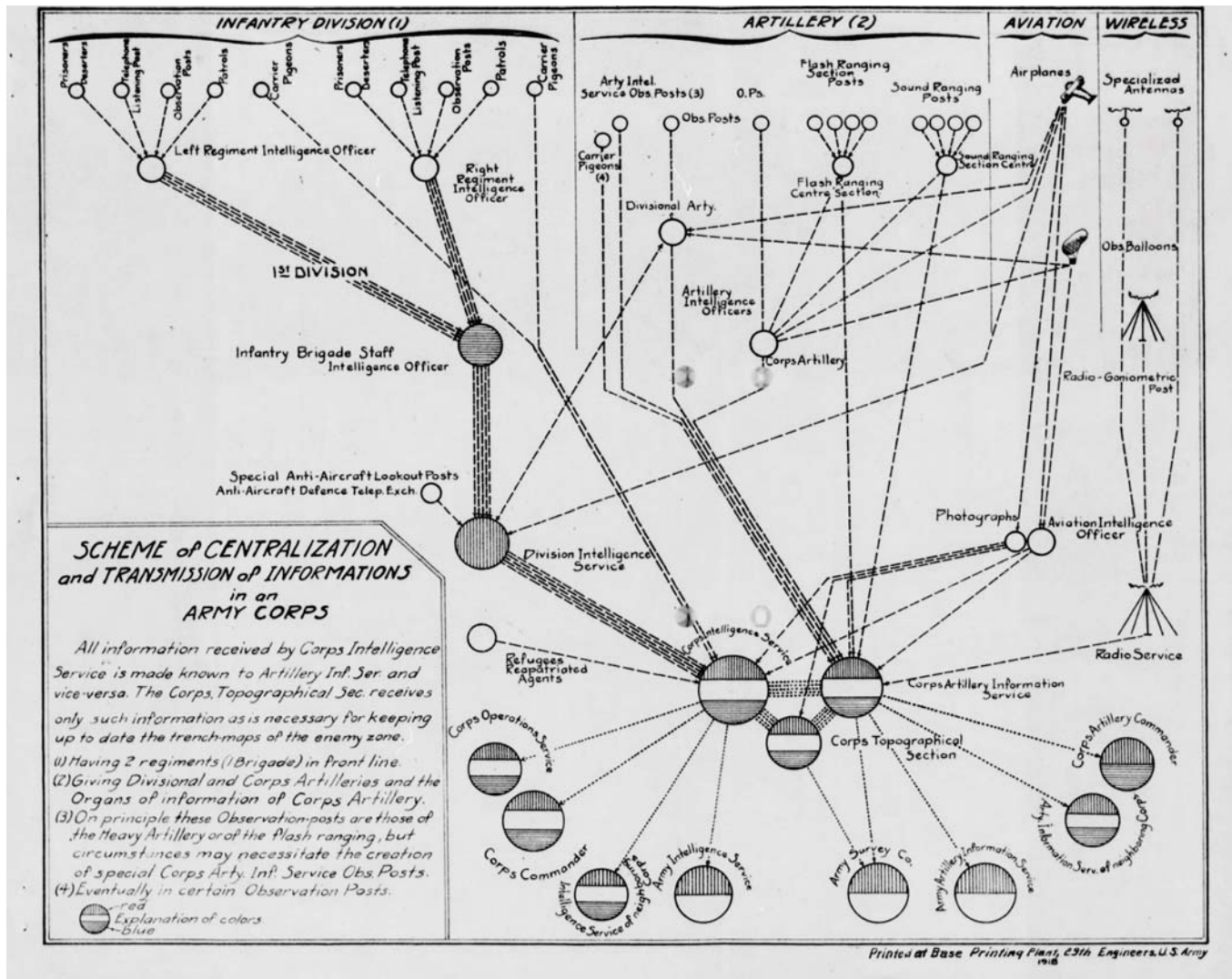
Notwithstanding its enormous importance, the aerial reconnaissance inventory on both sides of the front has been ignored or forgotten. Airplanes such as the Maurice Farman (MF) 11, Farman Experimental (FE) 2b, Albatros C.I, Reconnaissance Experimental (RE) 8, Breguet 14 A2, Halberstadt C.V and Salmson 2 A2, to name a few, delivered the information necessary to make critical battlefield decisions. Indeed, many airplanes of this era, in particular those of the French and Germans, were specifically designed to house cameras within their fuselages. For most of the war the British relied on smaller cameras attached to the outside of their airframes. Americans generally flew aerial reconnaissance missions in French aircraft.

Aerial photographic interpretation was a team effort. An intelligence officer usually identified sets of photographs for exploitation; draftsmen compared duplicate sets with the history of

coverage to detect new works or defenses.<sup>56</sup> The exploitation process was accomplished by placing tracing paper over photographs and tracing objects requiring further attention. Sketches of important items were then completed and delivered along with photographic prints to command staffs.

Draftsmen sketched the features of new positions and points of interest in coordination with the aerial observers who flew the missions. Short notes attached to the maps included impressions of the enemy's organization gained from the study of photographs and of the ground. By war's end, US military leaders, like the French, had concluded that photographs taken from airplanes could be considered the final intelligence on enemy works, regardless of other information acquired.<sup>57</sup>

Strategic analysis at the front focused on the enemy's ability to sustain major operations. In 1918 Supreme Allied Commander Marshall Ferdinand Foch tasked his best reconnaissance pilot, Capt. Paul-Louis Weiller, to command a group of three escadrilles to monitor key targets in a given sector for changes related to operations at the front. Weiller was supported by an elite team of strategic aerial photographic interpreter/analysts based in Paris. When his Weiller Grouping converted to aerial reconnaissance of tar-



The complexity of the World War I intelligence enterprise is evident in the contemporary schematic above, which shows American Expeditionary Force division-level intelligence supported by corps architecture in 1918. (Original at NARA, RG 120; also accessed through Footnote.com, NARA M923 The Supreme War Council.)

The skills of the people needed in this enterprise were neatly described after the war by British General Macdonogh.

*Intelligence personnel may be divided into two main groups, a very large one which collects information and whose main characteristic is acquisitiveness, and a very small one which extracts the substance from that mass of facts and fiction. The mental requisites of this last class are: (1) clearness of thought, (2) grasp of detail, (3) a retentive memory, (4) knowledge of the enemy, (5) the power of projection into his mind, (6) imagination tempered by the strongest common sense, (7) indefatigability, (8) good health, including the absence of nerves, and (9) above all others, absolute impartiality. A high intelligence officer who allows himself to have any preconceived notions or prejudices is useless. He must look at friend, foe and neutral alike—that is, merely as pieces on the chessboard.*<sup>64</sup>

gets well beyond the front, they institutionalized an intelligence collection and analysis process that remains to the present day. In turn, Foch developed an operational strategy of determining offensive operations based on what the strategical assessment portrayed.<sup>58</sup>

### Analysis

Analysis was aimed at deepening understanding of tactical and strategic situations—including events in progress, the value of planned friendly operations, and details of enemy forces on the opposite

side of No Man's Land. Ultimately, intelligence officers were called on to validate all military activity planned against the enemy.

Analysts had to remain abreast of the status quo on the front lines to recognize changes

that would permit timely discovery of enemy plans.<sup>59</sup> Thus, the search for signatures associated with an enemy offensive operation was a top priority. Signatures included construction of roads and railroads, increased presence of supply depots, new artillery battery positions, and new trench work into No Man's Land. Confronted with deception, analysts depended on aerial reconnaissance and photographic interpretation as the ultimate arbiters of uncertainty. Whether on the defensive or on the offensive, planning required currency of analysis at all times, and experience demonstrated that time spent on proper surveillance and intelligence was essential to ensure that "the enemy cannot pass by unperceived."<sup>60</sup>

French analysts went further, based on the belief that the German adversary was methodical, and closely followed senior headquarters [*Grosses Hauptquartier*] policies.<sup>61</sup> Thus, *Deuxième Bureau* colleagues roleplayed German leaders in attempts to better understand German decisionmaking as lines changed hands, troops moved among sectors, and artillery targets shifted. They applied logic to defensive strategies in attempts to allow maximum resistance with minimum personnel at hand.

As understanding of the status quo was also achieved by having clear knowledge of German OOB, a singular focus on

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*The persistent emphasis on order of battle led to frustration because such detailed knowledge of the enemy never led to decisive breakthroughs and victory.*

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the subject—especially on the part of the British—plagued intelligence analysis. A senior UK analyst justified the protracted attention by saying:

*As everyone knows, the basis [of intelligence work] is the building up of the enemy's order of battle, for when this has been done the identification of one unit is prima facie evidence of the presence of the division to which it belongs and possibly also of the corps or even army."<sup>62</sup>*

One of the most brilliant senior intelligence officers in the war, Lt. Gen. Sir George Macdonogh, the British War Office's Director of Military Intelligence, would echo this after the war in the *Infantry Journal*.

*If you were to ask me which is the most important function of the offensive intelligence [intelligence on the enemy], I should probably surprise you by saying that it is the building up and constant verification of the enemy's order of battle."<sup>63</sup>*

In the final analysis, the persistent emphasis on order of battle led to frustration because such detailed knowledge of the enemy never led to decisive breakthroughs and victory.

### **Collaboration**

Interaction among the Allied experts became an important part of reaching understanding

of enemy intentions and sharing trends in analysis. Conferences enabled intelligence and photographic specialists to share ideas and techniques for collection and analysis, a phenomenon that led to closer cooperation between the infantry combatant and the affiliated arms, including artillery and aviation.<sup>65</sup>

### **Production and Dissemination**

Military intelligence generally was packaged into two mediums. Cartography was the primary form, with written reports providing greater detail. The core Allied targeting map comprised either the French *Plan Directeur* or the British firing map (also known as the trench map). Both provided commanders with updates of the situation they faced. The *Plan Directeur* was the focal point for French battle planning.<sup>66</sup> Maps ranged in scale from 1/5,000 to 1/50,000.<sup>67</sup>

British GHQ's intelligence was disseminated in two products, the *Daily Intelligence Summary* and the *Daily Summary of Information*. Both were geared to serve the commander-in-chief on developments in the war in the British theater. The content of the *Summary* was established by General Macdonogh, who dictated that it contain only information on

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adversaries and nothing about Allied forces.<sup>68</sup>

The Germans developed a comprehensive array of battle maps at the headquarters for each army through their survey detachments (*Vermessungs-Abteilungen*) and subordinate map-printing section (*Karten-Felddruckerei*). The Germans created topographical sections (*Kartenstelle*) to complete observations of the artillery survey sections and evaluate the topographical implications of reconnaissance information from aircraft and balloons. Their equivalent of the French *Plan Directeur* was called the *Messplan*. The Germans worked with 1/80,000 maps for general purposes and the 1/25,000 as the normal trench map. Trench maps as detailed as 1/5,000 were also issued. When the Germans acquired captured *Plan Directeurs*, the maps were copied and sometimes combined with enlargements from smaller scale maps.<sup>69</sup>

## **Conclusion**

Military intelligence evolved as a significant force arm from the first shots of August 1914 to the Armistice more than four

years later. Traditional intelligence methods quickly gave way to a juggernaut of technological innovation involving a spectrum of scientific principles applied to the rigorous demand for battlefield knowledge. Most significantly, aviation defined the role of intelligence in industrial age warfare. In addition, the miracles of mass production made available the tools of intelligence—aircraft, cameras, radio intercept equipment, sensors, printing presses, and much more—across the battlefield and provided the most effective means of acquiring timely, detailed, and readily understood intelligence.

With each advanced source and method, the institution of intelligence assumed greater stature, and commanders realized that the intelligence component of warfare had progressed far beyond their early imagining. Further testament to the expanding intelligence art was the fact that advances made known in the field were quickly copied by all the combatants, and camouflage and deception aimed at overcoming these advances, especially in aerial observa-

tion, became critical facets of all operations. Finally, the ability of the new tools to see beyond the front lines began to affect strategy and the deployment of forces on a strategic scale.

In all probability few in 1918 would have seen the long-term implications of their experience, least of all those who might have thought there would be no second world war. For most, intelligence was about winning or losing that particular conflict. As General Macdonogh wrote in 1922:

*I will venture to say that the chief reason why the Germans lost the war was because they had a bad intelligence system ... and it failed from the very outset of the campaign.<sup>70</sup>*

Thanks in part to the expansion of military intelligence and its exploitation of science, the Great War became the harvest of death for which it is remembered to this day. Today's intelligence challenges, however, go well beyond a narrow strip of devastation separating enemies. Instead, military intelligence at the 21st century front covers every facet of human existence. It remains to be seen how such knowledge and ability will shape the future.

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