

THE SIGNAL CORPS METEOROLOGICAL SERVICE, A. E. F.<sup>1</sup>

Excerpts from Annual Report of the Chief Signal Officer, 1919, pp. 352-356, 5 photos, 1 diagr. In other parts of this report are to be found: Details of personnel and organization, pp. 38-40; details of the meteorological schools, pp. 86-87.]

The meteorological work [for the U. S. Army] was planned as a result of investigations [of existing services, of terrain, and of French weather] and orders were placed for equipment in order that when personnel began to arrive in March, 1918, its instruction both in observational and forecasting work might be taken up without delay. The observational work included, first, data on wind effects for use of artillery; second, the determination of upper winds for use in aviation work; third, such observations as were required for forecasting, in addition to data supplied by the French Bureau Meteorologique Militaire and the British Meteorological Service, both of which received in return such meteorological data as they desired from the Meteorological Section, Signal Corps, American Expeditionary Forces. Later, certain observations desired for sound-ranging units were added. \* \* \*

The first American meteorological stations were established early in May, 1918, the first observation being made on May 9 at Ourches (Meurths et Moselle) in the zone of advance at the flying field of the First Corps observation group. Other stations were established at aviation and artillery training centers in the area of the Services of Supply, where they took part in the regular training programs, both by obtaining experience for their own personnel and by furnishing data for the use of other services.

The meteorological stations functioning in the battle areas were in general equipped with wireless, which was used to communicate the meteorological information to the desired points. The stations were situated near the headquarters of the army corps and were in connection, by telephone when possible, with the corps headquarters. The first station to take part in combatant operations was the one which operated with the First Army Corps when this corps entered the lines near Chateau-Thierry. This station furnished artillery and aviation with the necessary meteorological information. During the advance the station moved forward with the corps, being located at the position of one of the observation balloons and remaining in the area until the army was withdrawn.

Another station furnishing artillery data to combatant troops was established on July 27, 1918, near Roy-aumeix (Meurthe et Moselle) in the area occupied by the Fourth Army Corps. This station operated continuously furnishing artillery data for all trajectories every four hours, day and night, from the time of its establishment until three days after the signing of the armistice, when orders were received, from the office of the Assistant Chief Signal Officer, to discontinue the work. The station remained at its locality until it moved forward with the corps during the St. Mihiel drive, so that observations were made at practically all times within 6 to 10 kilometers of the front-line trenches. At times this station was under shell fire, at one time the shells dropping within 30 meters; at least one observation was made during a gas alert. The information of wind speeds was greatly desired by observation balloon officers, who appreciated its usefulness more particularly after one case when the balloon officer doubted the data and sent his balloon up until the winch began to rise from the ground.

At 11 p. m., October 18, [1918,] a request was received at headquarters, Army Meteorological Stations, for the immediate establishment of a station near Verdun, in connection with the heavy long-range railway artillery which was installed in that vicinity. This necessitated, in addition to the selection of the personnel and its transportation with equipment for a distance of more than 100 kilometers over congested roads, the determination of reduction factors for 10,000 meters, 5,000 higher than the existing tables permitted. The station was operating and data being furnished the artillery within 26 hours from the time the request was received. \* \* \*

The stations operating in the army areas, in addition to the sending out of observations by radio every four hours, made special observations whenever called upon by artillery, aviation, gas, and sound-ranging units. There were also continual calls for special information and other types of cooperation with operating units which were handled informally by the men of the detachments: so varied and numerous that the record would be long. In most cases forecasts and special wind-warning were communicated to these detachments and distributed by them to the operating units concerned. \* \* \*

Forecasting began at the headquarters station of the Army Meteorological Stations, at Colombey les Belles (Meurthe et Moselle). On August 16, 1918, the first forecast of the Lorraine sector was issued to the American First Army. This forecast included a statement of the weather conditions relating to operations for each arm of the service, followed by detailed forecasts of the wind direction and speed, both at the earth's surface and in the upper air, conditions of the sky, cloud height, visibility, precipitation, fog, haze, temperature, and, when needed, statements that weather conditions were favorable for the use of gas by the enemy.

A unique feature of this forecast was the statement at the end as to the probable accuracy of the forecast. The accuracy was expressed in odds in favor of the forecast. For example, odds of "five to one" indicated that in the opinion of the forecaster there were five chances to one in favor of the forecast being correct. By this statement of odds it was possible to make the forecast absolutely definite and such qualifications as "probable" or "possibly" have never been used. The material upon which the forecast was based was that received from our stations, 25 in number, from the French Meteorological Service, and from the British Meteorological Service. To facilitate the receipt of French and British reports a Signal Corps telegraph office was opened at Dugny, Seine, the headquarters station of the Service Meteorologique aux Armees. These reports included the usual elements of the International Weather Code.

Informal cooperation of the most satisfactory character was maintained with the Meteorological Section of the Royal Engineers attached to the Independent Force of the British Royal Air Force, and later, when Capt. Brunt moved to Autigny-la-Tour (Vosges), complete information from the British Isles was telephoned four times daily to Colombey les Belles. Forecasts were made on the basis of four weather maps a day drawn from the foregoing information.

At first a forecast was issued at 6 p. m. covering a 24-hour period and another at 8 a. m. covering a 12-hour

<sup>1</sup> For discussions of the meteorological work of the Signal Corps in the United States see MONTHLY WEATHER REVIEW, 1918, 46: 555-582; 1919, 47: 84, 210-225.

period. This forecast was sent by telegraph to army and corps signal officers and to the Air Service. These units repeated the forecasts to the operating units directly concerned. The Air Service soon found it desirable to have a forecast made in the early afternoon covering the late afternoon and the first part of the night, particularly for use in connection with bombing and artillery observation.

Owing to the congested condition of telegraph wires as the First Army advanced in the Argonne area, the forecasters became convinced that an early issue of the forecast was desirable. Upon studying the situation it appeared that telegrams from the Signal Corps meteorological stations of the Services of Supply at 1 a. m., together with the 1 a. m. observation sent by telephone by the British, would permit of the construction of a satisfactory weather map, and the morning forecast was, therefore, issued between 5 and 6. The early arrival of the British data also permitted the afternoon forecast to be made before 6 p. m., and these changes were accordingly made. \* \* \*

From information received from Artillery, Aviation, and General Staff officers, it appears that practically all bombing and a great deal of the artillery, gas, and other operations of the First and Second Armies were based upon the weather forecasts issued by the Meteorological Section of the Signal Corps. Gen. Mitchell stated that the forecasts were indispensable to the operations of the Air Service. The stations maintained by the Meteorological Section furnished timely notice of all squalls, and squall

warnings reached all Air Service units before any squall reached the lines. Timely notice of all dangerously high winds at the 300 and 800 meter levels was also given.  
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When the American Expeditionary Forces entered the field the Service Meteorologique aux Armees had developed a method of determining wind direction and speed above a cloud sheet; the method of "Sondage par le son." A study of this method showed that it was entirely feasible, and the results obtained by the French stations were used in determining artillery winds, and in weather forecasts on cloudy days. When the armistice was signed arrangements had been practically completed for taking over and operating as a part of the Meteorological Section, Signal Corps, American Expeditionary Forces, the Sondage par le Son station at Chaumont sur Aire (Meuse).

Two factors essential to the success of the Signal Corps Meteorological Service should be mentioned. The first of these is the faithful and capable personnel which was furnished for the work. It was largely through the efforts of the Science and Research Division of the Signal Corps in Washington that the supply of these men was continued up to the end. The second factor is excellent communication service furnished. In spite of the fact that the meteorological messages are difficult of transmission and require night as well as day service, communication once established was thoroughly reliable. Failure in either of these essential elements would have rendered the work of the section less efficient in both the local and the forecast services.

#### NOTES ON THE METEOROLOGICAL SERVICE IN THE GERMAN ARMY FROM TRANSLATIONS OF GERMAN DOCUMENTS.<sup>1</sup>

(From Bulletin de la Meteorologie aux Armees, January, 1918, pp. 65-79.)

Translated by C. LEROY MEISINGER.

### I.

#### THE RÔLE OF THE METEOROLOGICAL SERVICE.

The documents analyzed show that the meteorological service in the German Army experienced a great development and that the command attached a high importance to all the reports furnished by the stations and the secondary posts. These reports were then adapted to the needs of modern warfare.

*Forecasting.*—The meteorological bulletins and the forecasts for the succeeding 12 hours were communicated twice daily, in the morning and in the evening. The bulletin contained:

1. A general forecast.
2. A forecast for wind. (Probable direction of the wind for the next period of 12 hours.)
3. A discussion of the possibilities for the use of gas shells. (C.)<sup>2</sup>

*Collaboration with artillery.*—For the useful employment of artillery tables, collaboration with the meteorological

logical service was necessary. The new organization of the meteorological service of the army and of the artillery satisfied this necessity. The meteorological information ought to be communicated at least three times daily, or more frequently if the need for it arises, especially at night, and in case of a sudden change. The reports contain:

1. Direction and speed of the wind in meters per second (if possible to an altitude of 2,000 meters).
2. Barometric pressure at the altitude of the battery.
3. Temperature. (E.)

Conforming to these instructions, the artillery command says, in its note of September 5, 1917: "The meteorological bulletin is issued three times daily. Each bulletin remains in force until the arrival of the next (except for precise firing, when the mean trajectory of the projectile is greater than 500 meters, and also for firing at night; in this case, it is necessary to have readings of barometric pressure and temperature immediately before firing). If, in the meantime, changes in the direction of the wind are noted, corrections are made by approximation." (F.)

For the execution of these requirements, a special service was created in the division. "A section, charged with the recording of atmospheric conditions (*Tageseinflussttrupp*), is created for the division. Between 6 a. m. and 6 p. m., every four hours, the *Tageseinflussttrupp* takes the barometric pressure and the temperature of the air, and from these given values the density of the air. The surface wind speed is noted at the same hours. Soundings are made in the morning, at noon, and at 6 p. m. The results are telephoned to the various units.

<sup>1</sup> (A) *Le service de surveillance contre les gaz dans l'armee.*—No. 7337, E. M. de la III<sup>e</sup> armée, du 28 octobre 1918.

(B) *Tir de projectiles de Minenwerfer a gaz.* (Indications meteorologiques.)—Groupe d'armes du Prince heritier de Baviere.—E. M. Genie.—No. 8315, du 31 janvier 1917.

(C) *Organisation du service meteorologique du front.*—No. 432/17 du Q. G. de la 52<sup>e</sup> D. I., du 9 aout 1917.

(D) *Instruction provisoire pour le service meteorologique du front de la VII<sup>e</sup> armée,* du 13 juillet 1917.

(E) *Perfectionnement de la precision des tirs d'artillerie.*—G. Q. G. allemand.—Mo. 60.336 op., Ludendorff, 20 juillet 1917.

(F) *Étude sur l'utilisation rationnelle des tableaux journaliers de corrections atmospheriques.*—Commandement de l'artillerie.—No. 6783/17/1, du 5 septembre 1917.

(G) *La guerre mondiale.* (No. du 1<sup>er</sup> decembre 1917.)—*Le service meteorologique dans l'armee allemande.*

(H) *Collection de bulletins meteorologiques.*

<sup>2</sup> Capital letters refer to documents listed in footnote 1 from which this information has been obtained.