

APPENDIX No. 4.

AIRCRAFT WIRELESS.

Eastern Front.—Not until the end of 1916 did aircraft wireless come into general use on the Eastern Front. Till then work in that direction had been experimental. Early in 1917 began the serious business of co-operation with the artillery. No. 1 Australian Squadron was at this time a corps reconnaissance squadron, and all its machines were fitted to take the Sterling No. 1 transmitter set, at that time the regulation apparatus for co-operation with artillery. These sets were small and light, and were in the B.E. machines fitted immediately in rear of the pilot's seat. The aerial on the machine consisted of 120 feet of stranded copper-wire, with a 3-lb. lead weight at the free end in order to keep the wire hanging as perpendicular as possible. It was wound on a drum placed in the cockpit of the observer and convenient to his right hand, and from the drum the aerial was led through the bottom of the fuselage by means of an insulated gland. To run out the aerial the observer released a brake on this drum. At the conclusion of transmission the aerial was wound in, and the brake held the drum secure with the lead weight home against the bottom of the gland through the fuselage.

As Bristol Fighter machines were used by the squadron when it became an army squadron, a different method of installation had to be adopted. The observer's cockpit in this machine was larger than that of a B.E., and the instruments, suspended by rubber shock-absorber, were usually placed in front of the observer. The wind-driven generator, in the case of a wireless set employing one, was clamped to the under-carriage of the machine in such a position that its propeller was in the slip stream of the aeroplane's propeller.

The aerial arrangement was similar to that of the B.E., except that the drum was fitted with a quick-release device, by means of which, should the aeroplane be attacked while wireless work was proceeding, the aerial could instantly be freed from the machine, thus permitting of sudden manoeuvres being carried out without the danger of the aerial fouling the wings or the tail.

The Sterling No. 1 sets had a range of approximately eight to ten miles, and in No. 1 Squadron operated on a wave-length of 180 metres. Different wave-lengths were adopted by different R.F.C. squadrons, in order to obviate interference.

The battery wireless-stations were, for obvious reasons, made as inconspicuous as possible. The usual arrangement was a single aerial about 100 feet long, supported by two light poles twelve feet high, with one end of the aerial wire led down into the operator's dugout. The receiving instrument used throughout at the batteries was the Short Wave Mark III. Tuner, a piece of apparatus remarkable for simplicity of adjustment, robustness, and reliability. The earth system normally consisted of two copper-gauze nets, either spread on the bottom of the dugout, or on the ground near the receiver.

Two flying corps operators were allotted to each battery wireless-station, and it was their duty to maintain a continuous watch during the hours of daylight for aeroplane wireless-calls to their battery,

each of which had its own call letters. Signals from the machine were passed on to the battery-commander usually by telephone. Signals from ground to aircraft were made by means of white strips placed on the ground, the arrangement of the code being such that four strips were the maximum necessary to convey any message. In addition to the battery stations it was usual to establish a wireless receiving-station at artillery brigade headquarters. The function of this station was to check aeroplane "shoots" of various batteries, and, in response to wireless requests from the air, to detail batteries to fire on any particular target. Throughout its period of service No. 1 Squadron maintained an average of twelve battery wireless-stations.

In 1917, when No. 1 Squadron became an army squadron, the system of wireless necessarily changed, as the work now being done comprised long strategical reconnaissances, and made the use of long-range apparatus necessary. The sets then employed were the type 54A (200-watts power, worked from accumulators), the type 52A (150-watts power, worked from a wind-driven alternator fitted to the machine), and, towards the end of the war, the type "W" Continuous Wave transmitter, worked by a 600-volt wind-driven generator. These sets had a range of about 70-80 miles, the two former operating on a 200-metre and the latter on a 1,200-metre wave-length. Reconnaissance machines telegraphed back to the aerodrome any bombing targets which they saw during flight, and these targets were then attacked by machines held in readiness. Principally from considerations of space and weight, it was not usual to fit receiving instruments in machines. But towards the end of the war reception in the air was practised at the aerodrome. It was about this time that the latest wireless-telegraph (aircraft) sets began to arrive in Palestine, but wireless-telephone sets, such as were being used on the Western Front, never made their appearance in this war-theatre.

Experiments in wireless telephony with apparatus made up in the field were undertaken by No. 1 Squadron about the middle of 1918, and although the results obtained were satisfactory from an experimental point of view, the lack of apparatus and renewed activity on the front prevented their development. Greater success was achieved in the adaptation of captured German aircraft wireless-gear, particularly as ground transmitters for inter-squadron work. Some consternation was caused at G.H.Q. when work with these Telefunken transmitters was first undertaken, but upon identity being established, the use of these extemporised transmitting-sets was permitted.

Western Front—On the Western Front, when No. 3 Australian Squadron arrived in England (December, 1916), a wireless section, consisting of a wireless officer and thirty other ranks, was attached to the squadron, and when training operations commenced, the wireless section was sent to the R.F.C. Wireless Training School at Farnborough (Hants.). The wireless operators, without their officer, were sent to Belgium in July, 1917, and were temporarily attached to various R.F.C. squadrons for artillery co-operation; shortly after their arrival they were in the Passchendaele action, during which they suffered a number of casualties. In August of the same year another detachment of thirty operators proceeded to France, and these were similarly attached to R.F.C. units, while No. 3 Squadron was undergoing final training. When this squadron was attached for work with the Australian Corps. all A.F.C. wireless operators were collected again under their own wireless officer.

Thenceforward the wireless section assisted in aircraft co-operation with all classes of artillery, from heavy batteries to trench-mortars. The maximum number of battery stations under the control of No. 3 Squadron was ninety-six. These stations were not entirely manned by A.F.C. wireless operators, whose total strength was 108.

Artillery co-operation was carried out by means of the Standard Sterling Transmitter in the R.E.8 machines, and Mark III. crystal receivers on the ground. At the squadron station and the central wireless station, amplifiers were used for reception, and, as it frequently happened that six machines were carrying out "shoots" at the same time, these two stations were called on to intercept the signals from all six machines simultaneously, with remarkably good results. The crowding on the fighting front of machines fitted with transmitters called for special skill by mechanics in correctly tuning transmitters and in the reception of the correct signals. "Wireless-failure" reports were very few.

Shortly before the Armistice, when a few Bristol Fighters were supplied to No. 3 Squadron, special continuous wave-receivers (C.W. Mark III) and 52A type C.W. transmitters were fitted in these machines for communication to and from the ground. Owing to the Armistice, however, only a small portion of the work intended for these machines—i.e., long-distance "shoots"—was carried out.

No. 2 and No. 4 Australian Squadrons did not possess machines fitted with wireless, and were not supplied with wireless personnel until August, 1918, when two operators were supplied to each squadron, so as to equip stations at squadron headquarters for the interception of reports and instructions from the wing, sent by wireless.

For the improved communication of intelligence from machines to the ground there was brought into operation in August, 1918, the "Central Information Bureau" (C.I.B.) system. All machines, especially corps counter-attack patrols, reported all enemy movements, transport, tanks, aircraft, or information about our own troops, by wireless to a station in an advanced position, which was constantly moved forward, as the fighting front advanced, to keep in touch with aeroplanes on the line. The station collected all "C.I.B. calls" from the air and sent them, by telephone or by wireless, to the various units concerned. Most of these calls were sent on to the army wing, which kept scout machines standing by ready to take the air at any moment. The C.I.B. system of collecting and distributing information allowed machines to carry a weaker and less cumbersome wireless set than would have been necessary if they had had to transmit messages direct to more-distant stations in the back areas.

Each corps squadron also had its own central wireless station (C.W.S.) some distance in advance of the aerodrome and situated in a central position as regards the heavy artillery. It was connected by telephone with squadron and artillery headquarters. It kept a running record of all "shoots" and zone calls, in order to assist in any difficulty which might arise between pilots in the air and batteries