

Frequency " Radio Telephony was still in progress. The V.H.F. was an immense improvement on the H.F., both in range and clarity of speech; but the change over, which had started nearly a year before, was held up by the slow output of equipment. This meant that much work had to be done on aircraft Radio equipment during the Battle, and Squadrons equipped with V.H.F. could not communicate with H.F. Ground Stations, and *vice versa*.

219. Some of our worst losses occurred through defective leadership on the part of a unit commander, who might lead his pilots into a trap or be caught while climbing by an enemy formation approaching " out of the sun." During periods of intense activity promotions to the command of Fighter squadrons should be made on the recommendation of Group Commanders from amongst Flight Commanders experienced in the methods of the moment. If and when it is necessary to post a Squadron Leader (however gallant and experienced) from outside the Command, he should humbly start as an ordinary member of the formation until he has gained experience. Only exceptionally should officers over 26 years of age be posted to command Fighter Squadrons.

220. The experience of the Battle made me a little doubtful if the organisation of a squadron into 2 Flights, each of 2 Sections of 3 aircraft, was ideal. It was, of course, undesirable to make any sweeping change during the Battle, and I relinquished my Command shortly after its termination; but the weakness lay in the Section of 3 when it became necessary to break up a formation in a " Dog Fight." The organisation should allow for a break up into pairs, in which one pilot looks after the tail of his companion. A Squadron might be divided into 3 Flights of 4 (which would limit the employment of half-Squadrons), or it might consist of 2 Flights of 8, each comprising 2 Sections of 4. This latter suggestion would upset standard arrangements for accommodation.

221. The matter is not one which can be settled without consultation with various authorities and Branches of the Air Ministry. I therefore merely raise the point without making any definite recommendation.

222. A great deal of discussion took place before and in the early stages of the war as to the best method of " harmonisation " of the guns of an 8-gun Fighter: that is to say the direction, in relation to the longitudinal axis of the aircraft, in which each gun should be pointed in order to get the best results.

223. There were three schools of thought:—

One maintained that the lines of fire should be dispersed so that the largest possible " beaten zone " might be formed and one gun (but not more than one) would always be on the target.

The second held that the guns should be left parallel and so would always cover an elongated zone corresponding with the vulnerable parts of a Bomber (Engines, Tanks and Fuselage).

The third demanded concentration of the fire of all guns at a point.

224. Arguments were produced in favour of all three methods of harmonisation, but in practice it was found that concentration of fire gave the best results. Guns were harmonised so that their lines of fire converged on a point 250 yards

distant: fire was therefore effective up to about 500 yards, where the lines of fire had opened out again to their original intervals after crossing at the point of concentration.

225. It was very desirable to get data as to the actual ranges at which fire effect had been obtained. The Reflector Sight contained a rough range-finder which the range of an aircraft of known span could be determined if it was approached from astern, but, in spite of this, pilots, in the heat of action, generally underestimated the ranges at which they fired.

226. Cinema guns, invaluable for training purposes, were used in combat also; and many striking pictures were obtained, from which valuable lessons were learned.

227. The types of ammunition used in the guns varied during the course of the Battle. It was necessary to include some incendiary ammunition, but the type originally available gave a distinct smoke-tracer effect. Now tracer ammunition in fixed guns at any but very short range gives very misleading indications, and I wished pilots to use their sights properly and not to rely on tracer indications. (The above remarks do not apply at night, nor to free guns, where tracer is essential for one of the methods taught for aiming.)

228. During the Battle " de Wilde " ammunition became available in increasing quantities. This was an incendiary ammunition without any flame or smoke trace, and it was extremely popular with pilots, who attributed to it almost magical properties. 8-gun Fighters, of course, were always liable to be sent up at night, and it was therefore desirable to retain some of the older types of incendiary bullets. These were preferred to the " tracer " proper, which gave too bright a flame at night.

229. A typical arrangement, therefore, was:—

Old-type incendiary in the 2 outer guns,  
de Wilde in one gun while supplies were limited,

Armour piercing in 2 guns, and ball in the other 3.

230. A discussion on the offensive and defensive equipment of aircraft will be found in Appendix F. It will be of interest to all concerned with the Design of Technical Equipment of Aircraft.

### PART III.—NIGHT INTERCEPTION.

231. No story of the Battle would be complete without some account of the Night operations. It is true that they constituted only a subsidiary activity in comparison with the main German objective of fighting us to a standstill by day so that Air Superiority might be attained as a preliminary to Invasion. The night attacks did little directly to affect the efficiency of the Day Fighting Squadrons, though they had certain indirect effects. Although actual casualties were insignificant, disturbance and loss of sleep were caused; damage was done to factories where aircraft engines and accessories were produced; and the stress of continuous operations, day and night, imposed a very heavy strain on Formation Commanders and Staff officers, and upon the personnel of all Operations Rooms.

232. I had long been apprehensive of the effect of Night attacks, when they should begin, and of the efficacy of our defensive measures.