## APPENDIX "E."—*cont.*

NON-OPERATIONAL SQUADRONS.

| *Group.* | *Squadron.* | *Station.* | *Type of Aircraft.* |
|---|---|---|---|
| 9 Group | 308 (Polish) | Baginton | Hurricane |
| 12 Group | 306 (Polish) | Church Fenton | Hurricane |
| | 307 (Polish) | Kirton-in-Lindsey | Defiant |
| | 71 (Eagle) | Church Fenton | Buffalo |
| 13 Group | 263 (½) | Drem | Whirlwind |

NOTE.—Two "B" Squadrons, Nos. 74 and 145, had already been thrown into the battle, leaving only two available at the end.

## APPENDIX "F."

NOTE ON THE OFFENSIVE AND DEFENSIVE EQUIPMENT OF AIRCRAFT.

1. The general principle of developing the maximum possible fire power, which is accepted in all Armies and Navies, must presumably be applicable to Fighter Aircraft, provided that this can be done without unduly sacrificing Performance and Endurance.

2. The 8-gun fighter may be said to exemplify this principle, and at the beginning of the war its results were decisive against German Bombers, which were unarmoured at that time.

3. Our Fighter pilots were protected against the return fire of Bombers by their engines, and by bullet-proof glass and armour, for their heads and chests respectively.

4. Furthermore, at this time the return fire from German Bombers was negligible. They had concentrated on Performance as the principle means of evasion (a false lesson drawn from the low speed of the Fighters used in the Spanish War) and the few guns which they carried were manually controlled, and so badly mounted that they were practically useless. These facts, in combination with the fire power and armour protection of our own Fighters, made the latter virtually immune to the fire of unescorted Bombers, and their casualties in Home Defence fighting up to the Spring of 1940 were quite negligible.

5. The German Bombers had good self-sealing tanks, and this was perhaps the only important particular in which they were ahead of us. In our development work we had demanded that tanks should be "Crash Proof" as well as self-sealing, and the drastic conditions, which our experimental tanks had to meet had made them unduly heavy and cumbrous.

6. So far as our Fighters were concerned, the wing tanks in the Hurricane were removed and covered with a fabric known as "Linatex" which had fairly good self-sealing characteristics. The reserve tank in the fuselage was left uncovered, as it was difficult of access and it was thought that it would be substantially protected by the armour which had been fitted. During the Battle, however, a great number of Hurricanes were set on fire by incendiary bullets or cannon shells, and their pilots were badly burned by a sheet of flame which filled the cockpit before they could escape by parachute.

7. The reserve tanks were therefore covered with Linatex as a matter of the highest priority, and a metal bulkhead was fitted in front of the pilot to exclude the rush of flame from the cockpit.

8. The Germans soon began to fit fuselage armour to protect their pilots and crews, but for some unexplained reason neither side had fitted armour behind the engines of their Bombers. The back of the engine is much more vulnerable to rifle-calibre bullets than the front, owing to the mass of ancillary equipment which is there installed. While the back of the engine lies open to attack, the rifle-calibre machine gun remains a useful weapon, and the fact is a fortunate one for us.

9. The application of armour to Bombers did not, of course, come as a surprise to us, and its implications had long been discussed.

10. Excluding devices such as hanging wires, exploding pilotless aircraft, etc., I have always thought that the courses open to the Fighter, when rifle-calibre machine-gun fire from astern becomes ineffective, may be summarised as follows:—

(A) Deliver fire from ahead or from a flank.
(B) Pierce the armour.
(C) Attack the fuel tanks with incendiary ammunition.
(D) Destroy the structure of the aircraft by means of direct hits from explosive shells.
(E) Use large shells with Time and Percussion fuzes.

Discussing these in order:—

11.—(A) Fire from ahead or from a flank is effective but difficult to deliver accurately at modern speeds. Fire from ahead proved very effective on occasions during the Battle, but relative speeds are so high that the time available for shooting is very short, and Fighters generally find themselves in a position to deliver such an attack more by accident than by design.

12. Beam attack is very difficult to deliver accurately, owing to the amount of deflection which had to be allowed. The deflection ring on a Fighter's sight allows for an enemy speed of 100 m.p.h., and therefore a full diameter outside the ring must sometimes be allowed.

13. The method is effective against formations, when the aircraft hit is not always the one aimed at, and certainly the Gladiators in Norway developed this technique with great success. On the whole, however, Fighters which were constrained to this method of attack would have a very limited usefulness.

14.—(B) The simplest reaction for the Fighter is to pierce the armour, but it entails the use of bigger calibres. It must be remembered also that it is not sufficient merely to pierce the armour, but the bullet must have sufficient remaining velocity to do lethal damage thereafter. High velocities, in addition to bigger calibres, are therefore necessary.