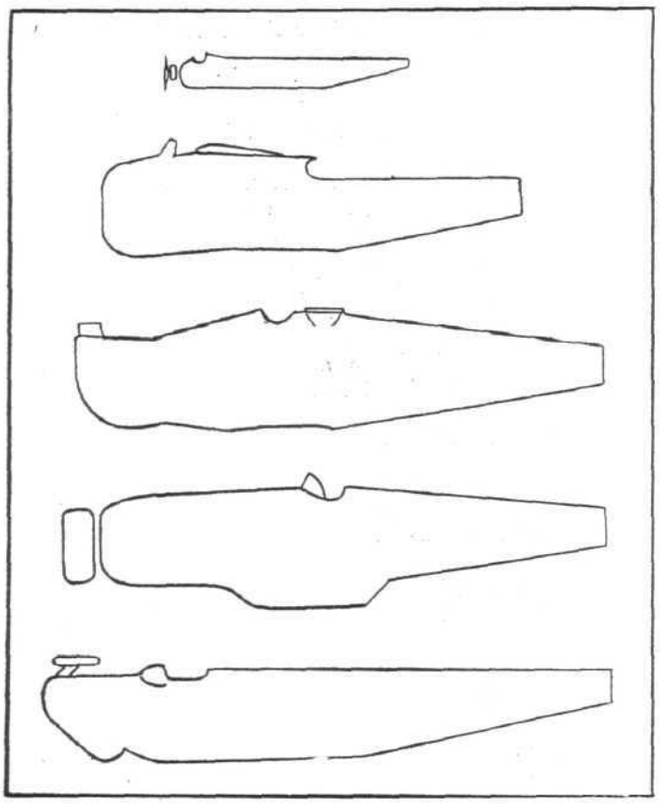

Fig. 2.

Taking it as an accepted fact that the primary function of a commercial 'plane is to transport a weight over a distance in the shortest time and for the least money, it matters little to the commercial man whether it be a monoplane or a biplane. To the designer, however, the maintenance costs for the biplane are likely to be larger, due to having, amongst other things, to keep up a staff of expert "riggers" (a charge upon the debit side, when in competition with a firm quoting a monoplane service) and there are some that will tell one that a biplane must necessarily present greater difficulties to the designer, in the direction of reducing head-resistances and improving the "fineness," due to the essential external members of the normal biplane design.

That this is not so, and that, by skilful design the two types can be brought into line, is fairly clearly illustrated by the comparison herewith, between the Junkers G.24 L., the Pander Sesquiplan, and the Vickers "Virginia," where the ceiling in each case is about 12,000 ft., with an L/D = 5·58; 5·44; and 5·36, respectively, showing real skill in the design of the two types. Perhaps it would be more correct to say the three types, for we have in comparison here a large monoplane, a large biplane and a machine that is half-way between the two, and is in addition in the "light plane" class. Of the three, the Pander is probably the most interesting, being a two-seater with a single engine of 45 h.p.; though considerable skill must have been required to produce such a structural design as the "Virginia," within a ratio of 1 : 5·36.

Remembering that the Fokker firm has recently received orders for machines for use in America, it is enlightening to compare the L/D and ceiling of this machine, with the two skilful "Mail plane" biplane designs by the Boeing and the Douglas companies of America. Note that the ceiling of the Fokker is some 15,500 ft., with an L/D = 4·4., and that the American biplanes have a ceiling of some 4,000 to 4,500 ft., higher than we design for in this country, and that in addition, they attain L/D values of 5·0 and 4·8 respectively.

As has already been said, some light can be thrown upon one of the reasons for the low values of L/D for many English designs, by a study of their bodies, and if comparison is made between the outline of the racing American machines as an ideal, with those of the well known commercial machines, and the one or two Service machines shown in Fig. 2, one cannot fail to note what truly wasteful bodies they must be.

Perhaps one might point out that with a machine like the Junkers, for 1·33 lbs. saved in resistance, approximately 1·0 gallon more petrol can be carried; with its consequent increase in range, and that the advantage increases as the process is continued. Or again, one might compare the flying costs of the Junkers with a machine like the "Hampstead," where the former carries 10 passengers for 264 lbs. of petrol per hour, or 0·242 lb. per passenger mile, while the latter absorbs 0·27 lb. per passenger mile—taking the consumption per horse-power to be the same for the two engines —which figures are, of course, equivalent to 0·41 lb. per ton-mile, and 0·58 lb. per ton-mile, upon the total weight of machine. We see, therefore, that as the Junkers has a value for L/D = 5·58, the cost of keeping the machine in the air, compared with the "Hampstead," whose L/D = 3·9, is approximately in the inverse proportion, or as 3·9/5·6 per unit.

It would seem, therefore, that more attention is needed in the external design of the bodies of the machines, possibly more care with regard to the selection of wing sections, the elimination of all external projections—be they upon the body, or the wings—that are not absolutely essential, and

MACHINE	DESCRIPTION	TOTAL WEIGHT IN LBS.	H.P.	W/H.P.	W/A	SPEED IN M.P.H. QUOTED	SPEED IN M.P.H. CALCULATED	L/D	APPROX. AB. CEILING IN FEET	GRAPH REF.
ARGOSY	LARGE NORMAL DESIGN OF 3 ENGINED BIPLANE	17500	1150	15·2	9·3	110	108	4·45	11,000	■
HAMPSTEAD, W.9.	" " "	14500	1155	12·55	9·28	117	116	3·92	12,000	♦
VIRGINIA	LARGE NORMAL DESIGN OF 2 ENGINED BIPLANE	16750	900	18·65	6·62	108	90	5·36	13,000	●
VANGUARD	" " "	18500	1300	13·3	8·5	112	108	4·25	14,000	▮
ALBATROS, L73.	" " "	10142	460	22	9·75	90	93	5·3	9,850	✖
JUNKERS, G24.L	THICK WING 3 ENGINED MONOPLANE.	13205	690	19·15	13·8	109	109	5·56	12,500	✚
FOKKER, F VII	" " "	7950	600	13·3	12·6	125	125	4·42	15,500	▭
BOEING	SINGLE ENGINED, SINGLE SEATER, NORMAL BIPLANE	5495	400	13·71	10·05	135	122	4·94	17,000	△
DOUGLAS, M2	" " "	4968	400	11·8	12	145	135	4·8	17,000	▽
PANDER	SINGLE ENGINED, TWO SEATER SESQUIPLAN.	1180	45	26	6·2	78	81	5·45	11,500	◇

Fig. 3.