Upkeep and Repair

The maintenance of a welded steel tube fuselage consists mainly of replacing the fabric covering when it deteriorates. Occasionally the tubes may have to be painted in order to prevent corrosion. The cost involved is very little.

Repairs can be made easily provided welding equipment is available. Any damaged portions of a fuselage can simply be cut out and a new element welded in.

Cost of Manufacture

No special equipment is needed in the manufacture of welded steel tube fuselages except for an acetylene welding set. A plane can be manufactured practically without any jigs but a small amount of jigging is preferable and pays dividends even when as few as ten planes of the same type are built. As far as the exact number of man hours needed for the fabrication of a present day glider fuselage is concerned, the writer has no data available. He recalls, however, that some fifteen years ago in the plant with which he was connected the piece worker received 80 hours' pay for the manufacture of the fuselage framework of an open-cockpit military biplane having a 500 HP engine.

Weight

It is easy to make theoretical comparisons of the strength-to-weight ratio of diverse materials of construction using as a criterion the ultimate tensile stress, the modulus of rupture of a solid square section beam, the buckling stress of a square flat panel, or the like. However, the results of such comparisons are of little value in judging the suitability of a material or a particular construction, since gages are too often determined by handling loads and the weight of the connections may well offset the weight advantage of a structure predicted by calculation.

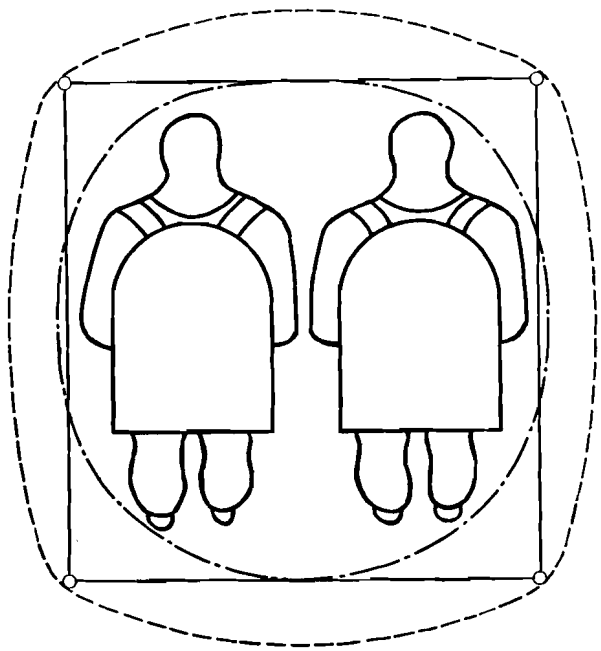

Figure 1

Cross sections of the framework fuselage and the monocoque fuselage.

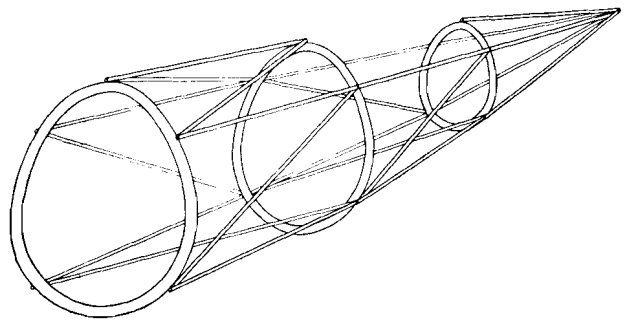

Figure 2

Schematic drawing of the pseudo-framework fuselage.

Comparisons should be made, therefore, on the basis of planes actually built. It appears that a welded steel framework covered with fabric is lighter than a monocoque structure of equal strength. The reason may be found in the smaller buckling stress of a shell than that of a strut. The weight difference is greater with a large cargo glider than with a single-seat high-performance soaring plane. This is due to the fact that with decreasing diameter the buckling stress of a shell increases.

If an external fairing is added to the welded structure in order to provide better streamlining, its weight may offset the weight advantage of the welded construction, particularly in the case of small planes.

Drag

The drag of a fuselage depends upon the following

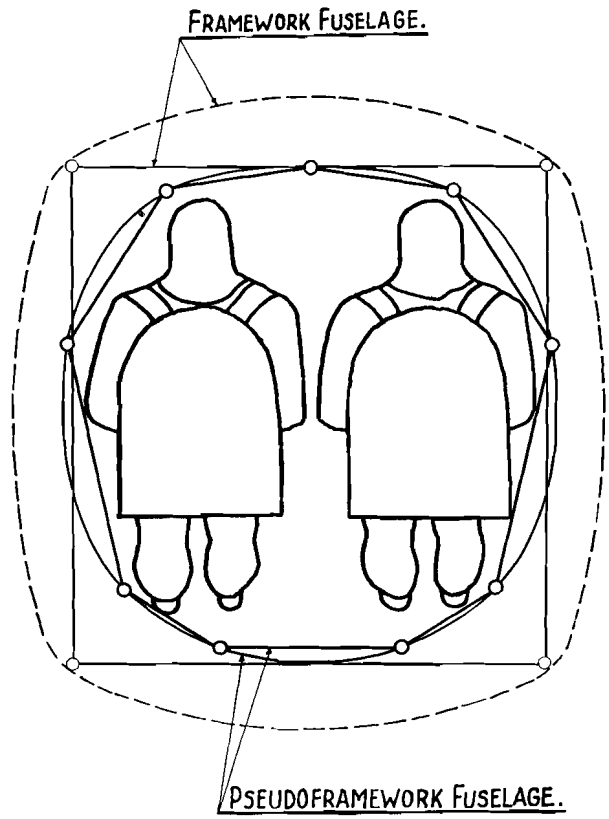

Figure 3

Cross sections of the framework fuselage and the pseudo-framework fuselage.