HULL and FUSELAGE CONSTRUCTION
Different Methods Compared : Installation
Difficulties with Small Monocoques

In the Saro London flying boats a somewhat unusual type of planking is used. Instead of riveted-on stringers, the planking itself has widely-spaced corrugations. This construction makes for simplicity.

With the demand for high performance during the last few years has come the necessity for using perfect streamline forms and smooth finishes. Skin friction plays an important part at high speeds, and any roughness of surface or departure from smooth lines has a considerable effect on drag. Hence the introduction of the metal monocoque or semi-monocoque construction. Flying-boat designers had to face the problem much sooner than landplane designers, although for a different reason. In the landplane sheer performance has forced the metal covering on the designer. In the flying-boat the need arose largely because of the liability to water soakage of wooden hulls. In a boat of average size this might amount to several hundred pounds. Consequently metal-covered hulls came into use several years before metal-covered fuselages.

Fundamentally the principles involved in the construction of a hull and a fuselage are similar. But the hull designer is faced with certain problems which do not arise in the design of a fuselage. These are chiefly due to the fact that the hull has to have a planing bottom the plating of which is capable of standing up to the impact of the water. Moreover, it becomes necessary to introduce steps, which cause a break in the main structure and thus add considerable complication. In other respects the two types of construction are very similar.

The hull of a flying boat and the fuselage of a landplane may be regarded as a hollow beam which has to carry bending loads caused by air loads on the tail at one end and certain other concentrated loads along its length and possibly in the nose (the engine in the case of a single-engined landplane fuselage). In addition, the beam has to be capable of resisting torsion.

If the fuselage were a plain cigar-shaped body it would be possible to make a very light structure. Unfortunately it has to have various openings in it, and as soon as a hole has to be cut in the covering it becomes necessary to provide paths for the stresses around the opening. This fact introduces complications and adds considerably to the weight.

In the basic design of a monocoque fuselage or flying-boat hull the general scheme is to have a series of hoops or rings which provide the cross-section at any given point. In the landplane sheath performance has forced the metal covering on the designer. In the flying-boat the need arose largely because of the liability to water soakage of wooden hulls. In a boat of average size this might amount to several hundred pounds. Consequently metal-covered hulls came into use several years before metal-covered fuselages.

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The longitudinal stringers in the Short Empire boats are interrupted at the frames, which are uncut.

By curling over one edge of each fuselage “plank,” stringers are avoided in the Fairey Battle, and one row of rivets is saved.