

components of the Battle, of extruded sections, and the actual section used can, perhaps, be described as a π section, having a faint similarity to the letter pi. The free edges of the flap portion are bevelled, while the channel edges are swelled out to a larger area to give the free edges added stiffness. Where extra strength is required, due to local loads, a plain channel section is inserted in the main longeron. Towards the stern of the fuselage the longerons are tapered off by machining away the bulbous edges of the main-section channels.

A point of interest is that the rivets used for fastening the planking to the frames, and the edges of the planks to one another, are mushroom-headed, i.e., flush-riveting is not used.

Wing Construction

In the front fuselage portion the steel tube girder construction is jointed chiefly by bolting and pinning, although a certain number of welded joints are to be found in the engine mounting. As the construction is of orthodox type it does not call for further comment.

The wing construction of the Battle is as interesting in its way as is that of the fuselage. In the main it can be said that the wing is a two-spar structure, with Z-section stringers running spanwise between the two main spars. The latter are of built-up I section, with each flange made up of two extruded L sections placed back-to-back. In the inner portions, where the loads are heavy, the section formed by these two L sections is reinforced by substantial steel strips of plain rectangular section, one on the front of the spar and one on the back. The spar web takes two forms; in the centre section, and for some distance outwards, it is an N girder, the details of which are illustrated. The different limbs of the N formation are of box section, being built up of two halves with their external flanges riveted together. Over the outer wing portions the spar webs are plain light-metal sheet reinforced by vertical stiffeners.

Stiffening the skin of the wing between the main spars are a number of Z-section stringers. The stringers are parallel, and as the wing tapers in plan view the front and rear stringers stop short where they meet the spars, as shown in the general sketch on another page. The wing planking is in strips approximately one foot wide, and is, of course, riveted to the stringers. The latter, by the way, are extruded sections with quite sharp corners.

In order to give access to the interior of the wing, and also to avoid almost impossibly awkward corners during wing assembly, one complete panel on the under surface is manu-

factured as a unit and is secured to the stringers by Simmonds elastic stop nuts. This panel can thus be removed at any time and the interior of the wing can be examined or drained of any damp or moisture which may have collected.

The ribs are plain light-metal sheet, with flanges bent over and riveted to the skin. The ribs are, of course, cut out for the stringers, and support them via a small L-section strip running chordwise, just inside the inner flange of the stringers.

This strip has spaced slots in its horizontal flange and is riveted to the ribs. Attachment of stringers to this strip is by bolts, the spaced slots making it possible to line up the stringers before finally bolting down.

An interesting system has been adopted for the leading edge of the Battle's wings. A series of short "boxes," spaced several feet apart, are riveted by their free edges to the front spar flanges and web. These "boxes" form the main supports for the leading edge, the gaps between them being afterwards covered with rather lighter intermediate structures, which are bolted by Simmonds elastic stop nuts to the spar flanges and main leading edge portions. Thus the greater part of the leading edge can be removed for inspection.

Centre-section Mounting

Attachment of the wing to the fuselage of a low-wing cantilever monoplane is always interesting because there are obviously so many ways in which it can be done. When, moreover, the fuselage is of monocoque construction and the wing a two-spar cantilever the problem becomes doubly interesting, as the concentrated loads from two points have to be distributed into a shell structure.

In the Fairey Battle the wing centre-section is attached to the forward part of the monocoque portion, and not to the girder portion of the fuselage. The system adopted is partly shown in the general drawing on a later page, partly in the detail sketch G. In addition to four bolted joints, two on the front (sloping) bulkhead and two on frame 7, which take the bending loads, the shear loads are distributed to intermediate fuselage frames and skin via an L-section strip on a centre-section rib and another L-section strip above it, but the depth of the wing stringers away from it. This latter strip is riveted to fuselage skin and frames. These two L-section strips are spaced by distance pieces through which pass a large number of very substantial bolts. The fuselage frames have their lower portions cut off, the free ends being so proportioned in length as to conform to the upper curvature of the centre-

