

# The "E-3" Two Seater

## HIGH - PERFORMANCE SAILPLANE



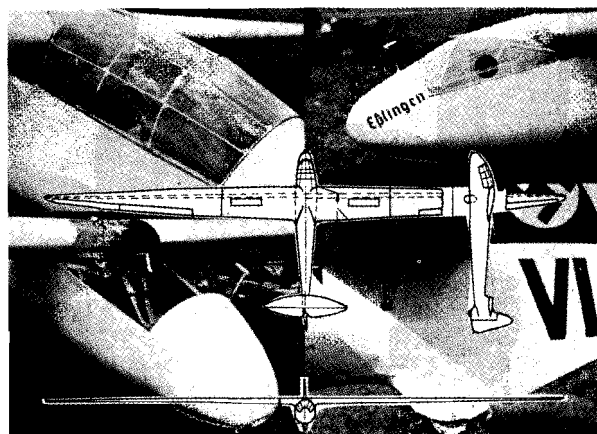
Interesting not only as the first multi-place high performance sailplane incorporating side by side seating but also for a number of new structural features, the "E-3" is the newest design of the Aviation Engineering Section of the Württemberg High School for Machine Construction in Esslingen. Developed for training in advanced soaring technique, it was designed for good performance and stressed for airplane towing.

The "E-3" is a high wing monoplane with a full cantilever monospar wing of nearly seventy feet span. The wing is built in three sections, the outer sections including double differential ailerons, the center section being equipped with spoilers hinged to the spar on the upper side. The planform of the highly tapered wings was chosen for minimum bending moments and lowest induced drag. They have a tip twist (washout) of  $3.5^\circ$  which results in the wing tips stalling after the center section.

Of particular interest to sailplane designers are the "E-3's" metal fittings joining the wing panels and the center section to the fuselage which are all made of dural. Also, to save weight, are tubular dural rivets holding these fittings onto the spar and fuselage. Reinforced by being glued in place, these rivets have a sheer strength of 35 to 40 kg./cm.<sup>2</sup>. This construction was worked out after much experimentation by the I. G. Farbenindustrie. Coupling bolts between the center section and outer wing panels are also of hollow dural with high sheer strength and built to a newly patented method. They have a glass-smooth polished finish as have the holes into which they fit, which avoids "biting" of the bolts.

The double ailerons are actuated together by lever arms on the underside. These are attached to dural push-pull tubes anchored by felt lined bearings inside the wing. Attempts to use plywood control rods showed a considerable saving in weight with the strength necessary for the small forces involved. However, they were not used because of excessive constructional cost.

The fuselage of conventional plywood construction is unusually compact. Longitudinal stringers are stiffened by narrow bulkheads spaced rather far apart. On the rear of the fuselage, the plywood covering is only 1mm. thick. The forward part ahead of the rear wing fittings is made as an open shell with double thickness plywood. In this part, sharp curves are avoided. The cockpit enclosure can easily be flung off, giving ample room for an emergency parachute jump. The nose is covered with thin plywood of 1.5 mm. maximum thickness.



Four views and three elevations of the "E-3" *Flagsport*

The seats are slightly staggered allowing a fuselage width of only 80 cm. Also remarkable is the very low overall height of only one meter made possible by a hanging stick for aileron and elevator control coming out between the pilots and fastened directly under the spar. This greatly simplifies the control system and eliminates its usual disadvantages. Play is largely eliminated and the stick forces are unusually low. This allows easy control natural to pilots familiar with the conventional stick. The controls are so well balanced that the ship will fly hands off.

A single retractable airwheel landing gear, equipped with a brake and mounted on two shock absorbers, is placed under the center of gravity. A very short, curved skid is placed under the nose and a small, pneumatic tail-wheel takes the place of a tailskid.

The large, balanced rudder has a big leverage necessary for such a great wing span. It also has good control when slipping or fish tailing as with the elevators pulled up  $45^\circ$  four fifths of the fin, and rudder area is free from wash. This rudder is placed low so that an equal area is below as well as above the center line of the fuselage. The horizontal stabilizer is placed high and braced by two small struts.

### SPECIFICATIONS

Span	21.2 m. (69.9 ft.)
Length	9.3 m. (30.7 ft.)
Width	0.8 m. (2.6 ft.)
Wing area	20 m <sup>2</sup> (215 sq. ft.)
Weight empty	200 kg. (440 lbs.)
Normal gross weight	360 kg. (792 lbs.)
Maximum gross weight	400 kg. (880 lbs.)
Wing loading	18 kg./m <sup>2</sup> (3.6 lbs./sq. ft.)
Best ratio	(45 m.p.h.) 1:25
Best sink	(38 m.p.h.) .64 m./sec.
Gliding ratio at 60 m.p.h.	1:22
Airfoil	NACA 2312-19

## A Review of 1938

(Continued from Page 1)

Although the total paid membership has not quite come up to last year's, this is very good considering the general business conditions and that it represents more than twice as much money received. The time is not far off when this magazine can be self-supporting, which is a most encouraging indication of solid growth.

We still have a long way to go and a great deal to do. As we look ahead, we should feel encouraged by what has been accomplished this year. It has been a busy year—a year of real progress.