



AFTER



BEFORE

AERODYNAMICS OF THE SAILPLANE "TINY MITE"

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The Tiny Mite (Ref. 1) belongs to the class of small sailplanes, which are intended for high cruising speeds in strong thermals. Flights tests on the Screamin Wiener in 1947 by Paul MacCready showed on analysis that the effective aspect ratio of that sailplane was only 8. It was suspected that the fuselage-wing juncture was improperly designed on each of the small sailplanes, Screamin Wiener, Tiny Mite and Rigid Midget. Because of this the Engineering Research Station undertook a very careful flight testing of Tiny Mite when it was brought to Mississippi State College by Dick Johnson, its owner. The results of these tests, the analysis of the results and the improvement obtained by the subsequent modification are the subject of this paper. The modification of the wing-fuselage intersection followed the general philosophy laid down in the Flat Top TG-4A refinement. (Ref.2).

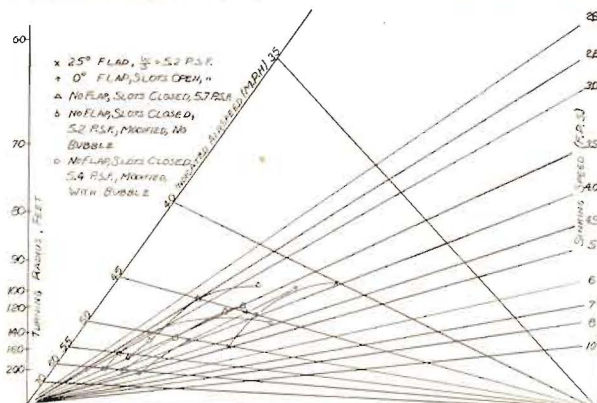
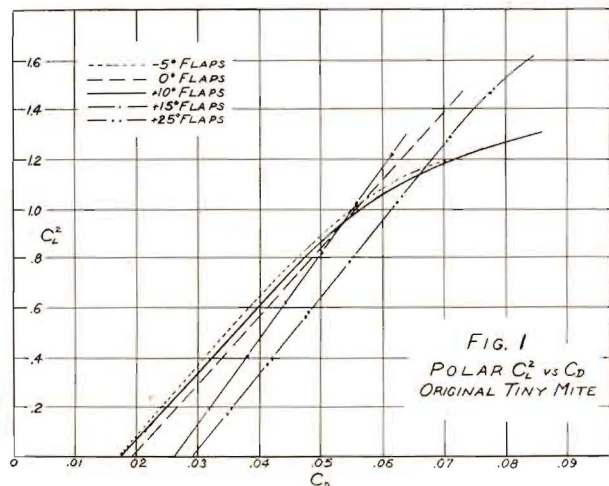
Flight Tests On Original Tiny Mite

On arrival at Mississippi State College Tiny Mite wore external airfoil flaps, was equipped with fixed leading edge slots, and had quite a large volume of fuselage over the wing. This volume not only increased the frontal area but also acted as a diffuser, thereby accelerating the flow around the fuselage and wing so that an early separation of the flow over the wing occurred. This means that the drag of the craft

increases sharply at the lower speeds.

These facts are displayed in Fig. 1 where the polar lift squared versus drag is plotted for various settings of the external airfoil flap. The best effective aspect ratio is seen to be 8.6 at 0° flap. Furthermore one sees that the minimum drag coefficient as the best flap setting, -5°, is quite high, 0.0156. Since it was felt that the true virtue of a small sailplane would lie in its very high cruising speeds, this rather large minimum drag coefficient appeared uncompromisable when compared with the Orlik's 0.0120 and Zanolis's 0.0128. Furthermore, the flight tests showed a maximum glide ratio for the sailplane with the best flap setting of only 19.8.

In order to determine if the flaps as designed on the Tiny Mite (partial span extending to the aileron) serve a useful purpose in spiralling flight the sinking speed polars are plotted on special nomographic coordinates devised by R. Hakkinen. (Ref. 3). These



data are displayed in Fig. 2. One merely needs to extend a line from the desired turning radius, tangent to the sinking speed polar, to the sinking speed scale on the right side of the nomograph. Here one reads the sinking speed in spiralling at the selected radius. It is easily seen that there is some gain in the use of these flaps in circling flight. However, when one considers the loss in high speed flight these flaps show an overall loss in cross-country soaring speed.

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