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The Prue 160, caught with its flaps down.

EXTERNAL AIRFOIL FLAP

By IRVING PRUE

Reprinted from THE THERMAL

IN early flight tests of the Prue 160 the most glaring fault of the ship seemed to be its stall characteristics. An investigation of the airflow at the stall with wool tufts demonstrated clearly what was happening. The breakdown of flow started at the root trailing edge and progressed outward, finally causing one wing or the other to lose its lift very rapidly.

The wing section characteristics curves had indicated a sudden loss in lift at the lift curve peak but in the original design wing tip ailerons had been planned whose incidence was 5 degrees negative to the wing proper.

The first attempt to cure the poor stall characteristics was the installation of a half round leading edge spoiler, located approximately three feet from the root of the wing and centered on the center line of the leading edge radius. The spoiler was twelve inches long.

The result of the spoiler installation was a more gradual stall with a slight tendency to fall off to either side. The most detrimental effect was the increase in stalling speed of about 10 mph. plus considerable turbulence inboard of the spoiler installation.

This necessitated spiralling in thermals at 60 mph., limiting the performance for which the ship was designed. It also necessitated high speed approaches and landings which would be nerve wracking to any pilot.

The second attempt to cure poor stall characteristics was the installation of fixed trailing edge tabs on the root of the wing bent downward so that the top surface of the tab was in line with the top contour of the airfoil.

The flight test of the configuration was very gratifying. Tip stall was completely eliminated and the stall speed was materially reduced. The ship was now taking on the aspect of "an old woman's airplane," to quote Harold Huber, who had been doing all the test work and at the same time trying to compete in the National Soaring Contest with it.

The bent tab installation pointed the way toward the need of a good high lift flap with low drag. A slotted flap was suggested by Dr. August Raspet, technical director of the Soaring Society of America.

After considerable investigation of NACA reports on flaps, it was decided to install the external airfoil type since this seemed the easiest to install for test purposes. It would give slotted action, materially reducing drag at the lower angles of attack of the flap.

The installation consists of one flap on each wing,

(Continued on page 16)