Robert M. Stanley

THE Nomad was feverishly rushed to completion in June of 1938 just in time to leave San Diego and enter the National Soaring Contest at Elmira, New York. Even before it was finished, however, ambitious plans were fermenting in my mind for future aerodynamic and design problems which I would try out on this the only airplane at my disposal which I could do with as I saw fit. Even before it was finished the idea for the Vee tail had been formulated and was "Number One" on the list of things "to do next."

Some vandal with a twisted sense of humor deprived me, following a flight from Elmira to Delaware Water Gap, of the single elevator which was easily detached from the tail of the ship and without which I obviously could not continue the contest. Confronted with the necessity of building a new tail anyway this seemed the proper time to try out the idea of the Vee tail.

A normal airplane's empennage serves two functions —it controls the longitudinal attitude of the airplane by means of the elevators and controls the side-to-side heading of the airplane by means of the rudder. This arrangement is straightforward and requires no comment. However, sailplanes spend better than half their time in flight spiralling steeply, climbing within the limited confines of those bubbles of air which we call thermals and without which the art of soaring as we now know it would be impossible. With the sailplane banked up at a 45° angle it is obvious that the normal empennage no longer functions by controlling the two degrees of freedom mentioned but instead the elevator now controls direction as well as nose-up or nose-down attitude. The rudder is in a similar predicament. It controls not only direction but also the position of the nose relative to the horizon.

Thus we see that the conventional empennage which is designed for straight and level flight actually must perform a good proportion of its work when the sailplane is banked up at angles so precarious as practically to interchange the duties of rudder and elevator.

Since the Vee tail incorporates two surfaces instead of three and since these surfaces are inclined to each other at an angle of approximately 90° they can perform the same function as a conventional rudder and elevator if their motion is properly controlled. It is true that in level flight deflecting only one of the Vee controls will give a simultaneous yawing and pitching motion but one of the two components of such motion can be nullified by proper movement of the other Vee control component.

Such an empennage, having the same basic theoretical control characteristics as the original Nomad empennage was designed, built and flight tested immediately prior to the 1939 National Soaring Contest. The excellent performance which the Nomad demonstrated during the latter contest adequately vindicates the selection of the Vee tail, some of whose advantages are cited below:

(a) Less total area, (and hence, less drag).
(b) The empennage is lifted up above the wing wake, and hence, is more effective for a given area.
(c) The tail is lifted up out of the weeds.
(d) Only two movable surfaces instead of three need to be built.