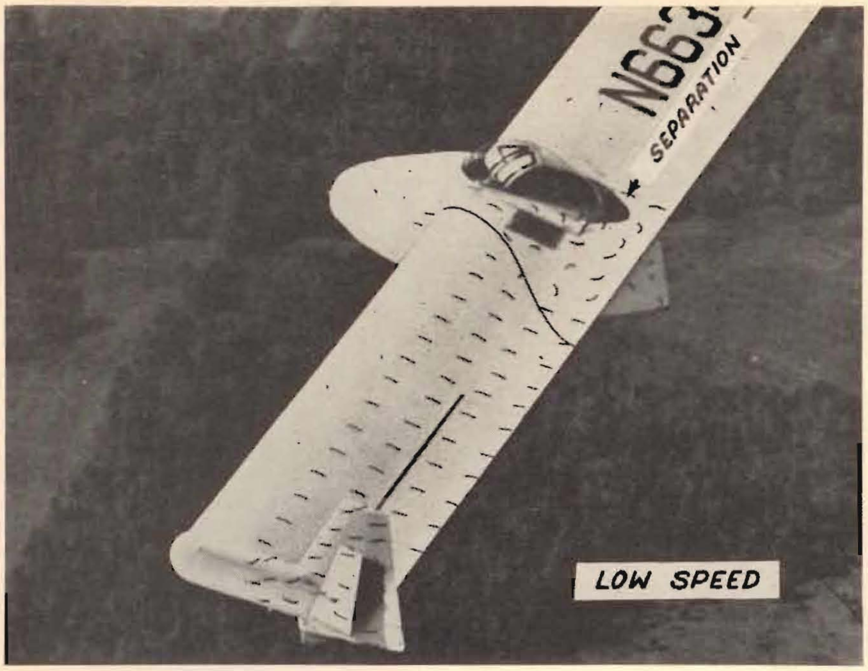

The separation on the upper surface will have its largest effect in the low speed range since it will reduce the lift and span efficiency factor. The separation in the lower surface intersection will reduce the high speed performance as it represents an increase in drag. No tufts were used on the bottom of the pod but an area of separation is expected aft of the wheel. Also it was found that the forward part of the tip fins were ineffective.

An area of separation has a large increase in drag, and a loss of lift if on the wing. It is now necessary to study the causes of separation. Separation is caused by a highly adverse pressure gradient and is aggravated by surface irregularities ahead of the separation area. This fact indicates that it should be possible to exercise a large degree of control on these areas of separation by the use of geometric boundary layer control. (Ref. 2). The requirements for the optimum use of geometric boundary layer control demands smooth transitions, not only in the flow direction, but also normal to the flow. In "Aerodynamic Drag," Hoerner (Ref. 3) points out that properly designed fillets can reduce the interference drag of an intersection to about 10% of its former value. Hoerner also states that the optimum fillet radius is from 4 to 8% of the chord and that the best effect will be obtained by extending the fillet aft of the intersection.

The use of this information should now allow a prediction of how modifications may be made which will allow the maximum gains in performance to be made for a minimum effort. The absolute shape of the modifications can be approximated but are best studied by incorporating them on the sailplane and making another measured flight evaluation. The use of this method will show up points that may have been missed during previous studies, or may become apparent due to improvements on the poorest areas.

On the Plank the predicted modifications required are outlined below:

A. On the canopy, a smooth juncture at the forward section is required.

B. Extending the rear section to the trailing edge will reduce the pressure gradients.

C. A fillet starting as far forward as possible should then be added.

D. Fillets should be added to the lower intersection.

E. The extension of these fillets aft of the trailing edges will serve to reduce the drag still further.

F. The use of a rounded skid will reduce the drag of the lower surface of the pod, and rounding out the bottom will result in an additional improvement.

G. The elimination of the forward section of the tip fins and rounding of the tip will serve to smooth out the flow in this region.

These modifications are shown and designated in Figure 5.

Also at this time the very obvious drag items should be eliminated where possible. On the Plank these are: eliminate external wing and nose tow hooks, eliminate tip wheels, install internal drag rudder actuators, add gap covers on lower surfaces of elevons, and seal elevon ends with fur strips.

When these are made and another series of performance flight tests are made, there should be a marked improvement in performance through the entire speed range.

The system of modification outlined here is based on making each change that is made tend toward more performance, rather than a random system which may or may

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