A DIFFERENT APPROACH TO HIGH PERFORMANCE

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The EPB-1 flying plank was built as an experiment in obtaining a sailplane which could be easily and quickly constructed. From this ship we found that satisfactory stability, control, and handling characteristics could be obtained from this basic configuration. The results of early performance tests on the EPB-1 indicated a drag coefficient below that anticipated for a glider of this class were obtained (Ref. 1). This prompted investigations of potential performance which have been reported elsewhere (Ref. 2,3). Briefly, these studies indicated that Cdo on the order of .0065 to .007 could be obtained on this configuration with proper attention to details covered under the late Dr. Raspet's term of "geometric boundry layer control."

The possibility of attaining a Cdo on the order of .007 led to the concept of a sailplane based on the flying plank configuration which would be intended almost entirely for speed dash flying or cross-country soaring in strong weather conditions. The low Cdo would provide very good penetration with a moderate wing loading and the moderate wing loading would allow good thermal working characteristics even though a high Cl max would not be obtained. The high speed performance would place the indicated airspeed for an L/D of 20 to 1 above 100 mph.

A study was made at Mississippi State University using the EPB-1 as a test bed for development. This study included development of the pod configuration for minimum drag and delaying mass flow separation which caused a loss in Cl max. on the original configuration. This investigation was carried through to flight test stages but was discontinued due to lack of directional stability. The configuration at the time of flight test is shown in Figure 1.

Based on the findings from this investigation, John Powell proceeded to make layout lines for a new ship which featured smooth contours rather than the slab sides of the EPB-1. The pod was laid out using waterlines which are elliptical back to the maximum thickness point and faired to the trailing edge of the rudder. A conventional fin and rudder were incorporated. Spoilers were fitted on the upper surfaces of the wing. The configuration is illustrated in Figure 2. This arrangement, with carefully faired intersections, low drag tips, etc., should have a Cdo equal to the target .007. Not evident in the photo is the use of the NACA 8-H-12 airfoil which was to cause trouble that will be reviewed later.

The structural design was based on Federal Aviation Agency CAM 3, Appendix A, except that the basic flight envelope and landing loads from CAM 5 were used. The CAM 5 flight envelope establishes the load factors from a 24 fps gust at design dive speed (Vd). The use of the 24 fps gust load at Vd was felt to be appropriate as the ship would be cruised at speeds near Vne in turbulent conditions. A Vd of 140 mph gives a limit load factor of 6 for this sailplane. Appendix A to CAM 3 contains simplified loading criterion. The internal tow hook would not be acceptable for standard category certification on the basis of current FAA policy, nor would the provisions for inspection.

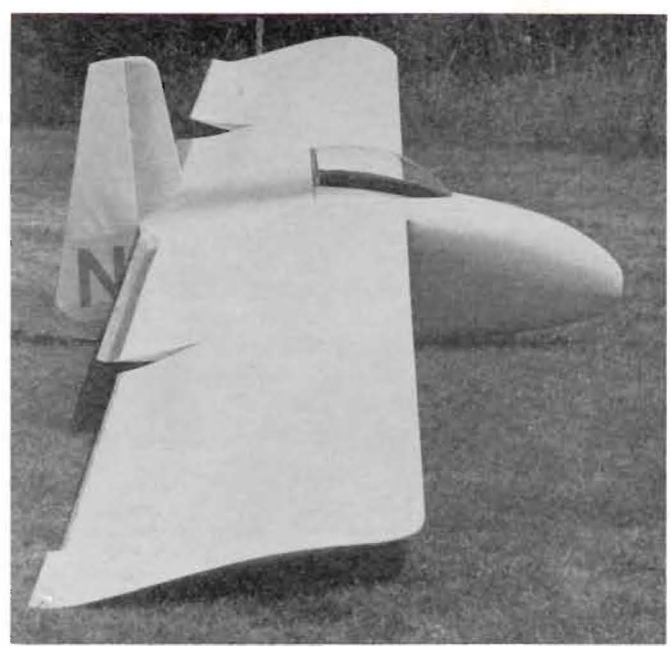

Figure 2. The latest Plank. Note added tabs on trailing edge.

Figure 1. The EPB-1 as flight tested at Mississippi State

Construction is all wood using 1.5 mm birch plywood skin throughout except for the rudder which is 1mm birch plywood. The forward section of the pod was skinned in six-inch sections and filled to contour with polyester resin mixed with "microballoons." Fillets are wood and