

capacity with a slow sink and good spiralling and landing characteristics could compete in international soaring competition and, if well flown, *win* any time in the next two or three meets, i.e. to 1968 or so. This (36 or 38 to 1 glide) defines, for this paper, "adequate performance."

On this premise it is theoretically possible to design a two-place side-by-side arrangement, to fly it single place and *win* an international tournament with it! From the standpoint of *usefulness* such a craft would also do for passenger flights, advanced, and even some primary instruction, record breaking in some categories, e.g. distance and altitude (less likely: closed courses). The side-by-side configuration results in a predictably wider machine, but the influence of this width on its overall performance looks much worse than it is, and 36 (or even 38) to 1 is quite possible. This is brought out just to show that an open mind is generally desirable, that some who plunge into single seater and 1½ and two-seater tandem configurations may be doing so without giving equal weight to all of the factors. There is nothing wrong with preferences, but if one makes comparisons between any of the aforementioned narrower configurations and the side-by-side jobs there should be comparable cockpit design for passenger safety, visibility, *utility per dollar of cost*, and comfort.

Let us now look at the drawbacks of side-by-side seating: the cabin is so wide that it is more difficult to "look down" out of the windows on the far side; when instructing, one finds students who are, for a while, disconcerted by the off-center seat in towed flight and in turns; when flown solo, ballast is often required and it usually requires a wider trailer. But most of all it *looks* bulkier and clumsier, and is objectionable to some because these people want sailplanes to be sleek, and if they are otherwise they simply don't want to be associated with them. Aerodynamically, wider gliders must obviously have more "pressure" drag than slim machines.

Staggered seats are sometimes used to get as much of both tandem and side-by-side concepts as possible; the gains are hardly worth the compromises in control complexity.

Tandem arrangements do exist with fair to good visibility, i.e. both occupants are ahead of the wing but, even with the rear seat elevated, vis-



No, it's not a Bowlus Baby but the Rowley R-100 (note vee struts), now owned by Dr. James L. Ross of Lapel, Indiana.

ibility is somewhat compromised by the opacity of the front-seated person's head and the long nose (of the glider). Location of the wing for maximum visibility is quite possible, i.e. leading edge about the ears of the rear-seated person. In such a configuration the overall length and weight can increase considerably, but extra equipment can be carried at or near the center of gravity (c.g.) (i.e. oxygen, batteries, barographs).

Note that the instructor in the rear seat of a high-winged tandem machine is a very trusting person if he cannot see up, aft or forward. The main gains here are minimal, c.g. shift, size and weight. The losses, besides visibility, are: immersion in the structure, limited weight and volume and access to stores at c.g.

Too many students have been taught to fly in tandem aircraft to make a strong point for great advantages of side-by-side instructing, but many find the latter arrangement very good for communicating. The instructor can watch the student's face, hands, feet, and can reach him in an emergency. For companionship in flight it certainly

has advantages. In general, more volume for stores at the c.g. is possible and more overall visibility for both is generally available, especially forward and aft, and both see the same set of instruments clearly.

If one studies the seating profiles of modern, comfortable automobiles, adjustable seats and all, he will recognize that he can turn around and look aft, that safety belts hold him comfortably and shoulder straps would fit functionally. Now, including c.g. change and head clearance, this profile can be enclosed within a streamlined, aesthetically beautiful volume of reasonably low frontal area. It will fit most people, for people who buy automobiles come in assorted sizes.

For comparison, let us try for the ultra sleek lines obtainable with minimum frontal area: visibility decreases quickly, one can neither see well forward nor look aft. The safety belt and shoulder straps may not hold one in the event of a crash, for one extrudes forward through the "loop"; the structure is shallower and more flexible if not flimsier. The instruments are squeezed or

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