THE D-8 SAILPLANE

by KEN S. COWARD

Readers of *Soaring* have, for some time now, noticed a small advertisement for the D-8 sailplane and wondered – quite properly – who, what, where, how and why is the D-8 and Pacific Aircraft Company.

First of all, Pacific Aircraft Company is a one-man organization—the author—which offers engineering consulting services and currently makes available to soaring enthusiasts plans for a very simple sailplane—the D-8. The experience offered is 22 years of aerodynamics, stress analysis, flight test and preliminary design on many of the country's military and commercial aircraft. The complete engineering involved in the Wee Bee, Honey Bee (including the Approved Type Certificate—a major engineering headache), and Queen Bee airplanes is included in this experience.

Now to get down to the D-8: The D-8 was really born some 30 years ago while the author was in high school. He designed and built—and flew—a primary glider of his own design. In the intervening years of college (University of Washington, graduating with B.S. in Aeronautical Engineering) and making a living working for a number of the major and minor aircraft companies, the idea of a simple primary-type glider for the beginner remained simply as the germ of an idea—waiting for a little "spare" time to bring it fruition. Some two years ago, this time finally came, and the D-8 was born.

The question of whether or not to make the D-8 of wood or metal led to the choice of all-metal construction on the basis of the Bee aircraft experience in the simplicity of all-metal construction. Those who have no metal experience visualize all sorts of big machines necessary to do the job, which is just not the case. Simple hand tools can accomplish most of the task, with the help of a sheet metal shop's leaf brake (which can be rented for a short time at little cost) and shears. Riveting requires an air supply such as can be obtained with a home-type affair used for spray painting, etc. All-metal construction leaves little doubt about the effects of weathering, age, etc., while there is doubt (at least to me) about the structural integrity of a twenty-year old wood vehicle.

In all-metal, is it just as easy to design and build a fairly clean "primary" glider as it is an aerodynamically dirty one? The answer, I believe, is "yes." The question of wing aspect ratio resolved itself into "how high an aspect ratio can the beginning home-builder handle without making the job too difficult?" We admit that there is room for argument here. For simplicity, we chose to use the same construction as the Bee series aircraft, monospar, with the one spar assuming 100% of the wing normal bending. Using zero taper, the wing ribs in any chordwise bay are all identical, but this requires laminating the spar as you progress inboard. When these laiminations reach a certain thickness, it becomes quite difficult to rivet with the assurance that every rivet is a good one. We finally settled on an aspect ratio of 10 as being a good compromise between performance and ease of construction. If someone wants to use a higher aspect ratio wing on the D-8, he can do so and thus improve performance.

The only D-8 presently completed is the handiwork of Bruno Haufe, Klaus Hill and Ken Sargent of Coalville, Utah. They were able to build the all metal sailplane without the use of a rivet gun. First flight is scheduled soon, may have taken place by the time this is in print.

The fuselage uses a minimum of bulkheads, the .025 skin wrapped around an elliptical cross-section providing good stiffness without using stringers. Fuselage bending is taken by a single longeron at the top and bottom. There is no double curvature skin (with the exception of the nose cone, which is fiberglass) anywhere in the vehicle. In the fuselage this results in some drag penalty but greatly simplifies the construction.

The control surfaces use only two ribs at the horn, and one closing rib at the tip. Simple channels are used for spars to break up the panel size. Each surface is a closed torsion box, offering great torsional strength and stiffness. Piano hinging is used because of simplicity—no hinge brackets need to be built and installed.

The controls are of the same type which many years in the Bee aircraft have proven to be simple and fool-proof. The only machining in the whole system consists of a few simple lathe parts for tube ends and bell crank collars.

We have received a few letters on "why did you design the wing in one piece?" Again, for simplicity. Another reason the aspect ratio was kept low was to permit a one-piece wing and keep the span reasonably low to permit trailering. With the one-piece wing, heavy, expensive and hard-to-install root fittings are eliminated.

We have had many comments to the effect "how can you offer plans for a sailplane which has not yet been built and flown?". It is true that the first D-8 has not yet flown. Mr. Klaus Hill's in Utah is probably the nearest to flight of any being built. He has a few last-minute de-