

BY JAY ANTOGNINI

THE SUPER CIRRUS

The author of this article, Jay Antognini, is a member of the American Institute of Aeronautics and Astronautics, the Soaring Society of America, the League of Silent Flight, and the Soaring Union of Los Angeles. In addition, Jay holds a B.S. degree in Aeronautical Engineering from California State Polytechnic University and is presently working as an engineer in the Flight Dynamics and Flight Controls Analysis group of the B-1 Division of Rockwell International. The purpose of this article, a modification to the popular Graupner Cirrus kit, is an attempt on the part of the author to show how modifying a highly renowned design can improve its performance in certain areas as well as allowing the builder with very little engineering experience to learn more about what makes his aircraft perform, and then to do some experimenting on his own. In the case of the Graupner Cirrus, there are many restrictions to the design due to the fact that this sailplane is designed as a scale aircraft. While its performance has already made it one of the most popular sailplane kits ever produced in the world, the modifications included in the following article will detract from its scale appearance while adding immensely to its appeal as a high performance thermal machine. - - - Don Dewey

The Graupner Cirrus is a fine sailplane when built right out of the box, but its thermal performance and handling qualities can be increased by a few simple modifications. Since the purpose here is to present the changes and how to incorporate them into the kit construction, no detailed effort will be made to explain the aerodynamics behind the performance and handling quality changes although the actual improvements due to the changes will

be discussed.

Polyhedral was added to the basic design to improve the turn capability and stability. These two properties are shown in the airplane's exceptional thermalling capabilities, and by perfect tracking on the tow with no rudder control required. The wing span is extended by approximately 4" to decrease the wing loading, thereby resulting in a lower sink rate and tighter turns. Wing tip fins were added to decrease the induced drag and also to produce outstanding stall characteristics. With the wing tip fins installed, no washout is required, which, in turn, results in a wing with a greater lifting capability. The horizontal tail was swept forward to better balance this control surface. The rudder was lightened to further reduce the airplane's wing loading while also decreasing the airplane's inertia. The partially balanced rudder results in much better turning capability, including quick and crisp entry and exit from spins, and excellent slow speed turns during spot landing attempts. Quik Stripe 1/8" trim tape is placed in appropriate places on the wings, horizontal tail, and rudder in order to reduce the total airplane drag by controlling the airflow over these surfaces. The Center of Gravity and tow hook positions employed result in perfect tows, and excellent flight characteristics.

Let's take a quick look at the kind of performance that can be expected from the Super Cirrus. The first flight of the Super Cirrus took place at the Soaring Union of Los Angeles (SULA) soaring field at California State College at Dominguez Hills, and resulted in a 21 minute flight which was the longest flight of the day. The next weekend saw a 10 minute test flight involving two loops, three stalls, and one spin. The Super Cirrus then put in a 30

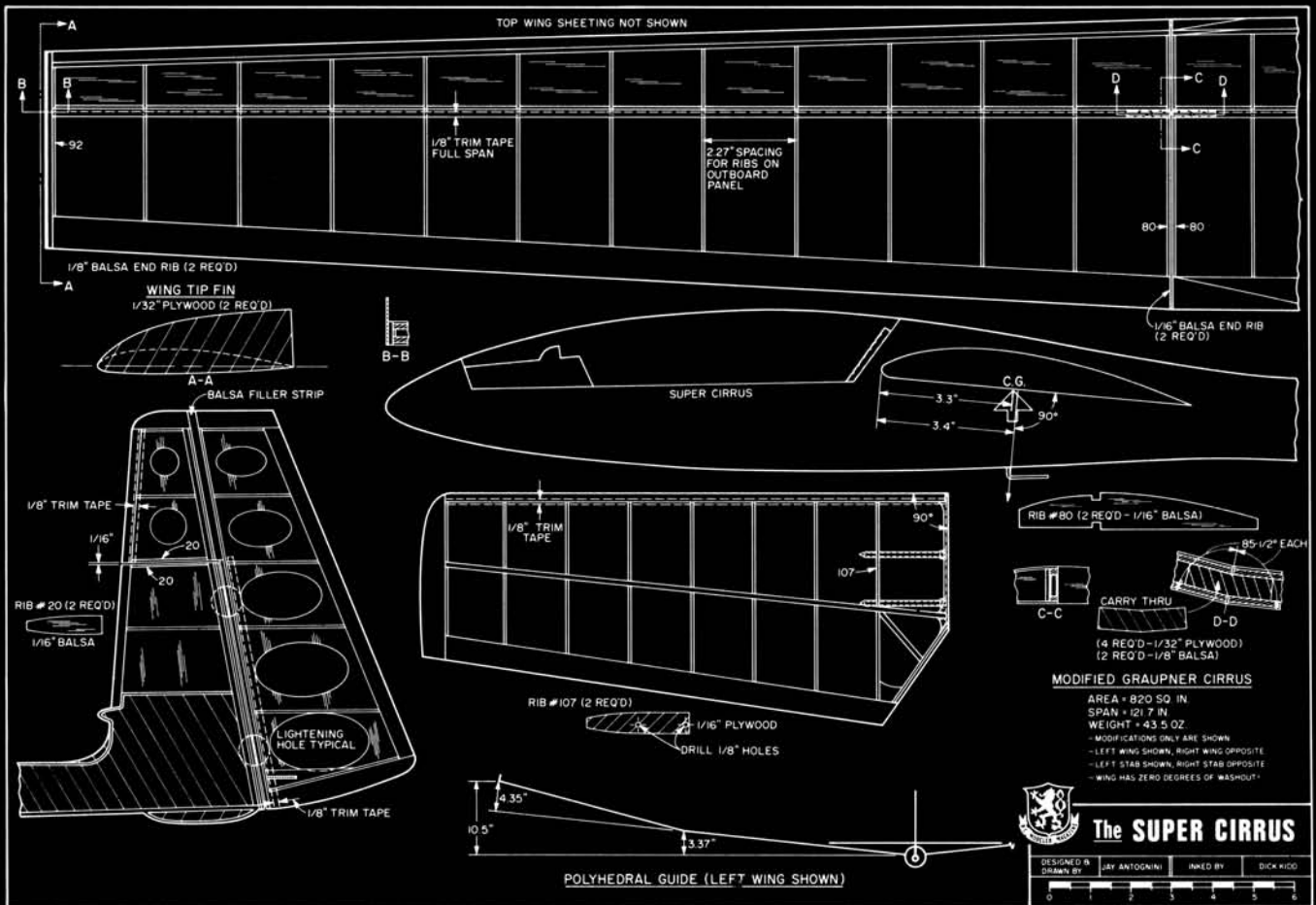
minute flight topped that day only by an experienced contest pilot putting in a 31 minute flight with an eleven foot span airplane.

The modifications are actually quite simple, and are very easy to follow with the help of the Super Cirrus modification plans and the plans provided with the kit.

Wings: Each wing is constructed in two panels by using one extra rib #80. Each rib #80 is glued at an angle of 85½ degrees to the lower spar in that panel. Before we get too far we have to increase the rib spacing on the outboard panel two tenths of an inch in order to get our span increase. After the two panels are constructed, a 1/16" balsa end rib is added to the inboard panel. Rectangular holes are then cut in the end rib and ribs #80 in order to insert the carry through spar into the panels. The carry through spar is a "sandwich" constructed of 1/8" balsa between two pieces of 1/32" plywood. The carry through spar is epoxied into the inboard panel which is then epoxied to the outboard panel making sure that the angle between the two panels is correct before the adhesive hardens. All we need to do now is glue on a 1/8" balsa end rib to rib #92 instead of the stock wing tips, followed by a 1/32" plywood wing tip plate.

Horizontal Stabilizer: The construction of the horizontal tail is almost identical to that indicated on the kit plans. The only difference is that the tail is swept forward so that the leading edge is perpendicular to the fuselage. The only new parts needed are two new ribs #107 made from 1/16" plywood with holes drilled to match the new position of the brass tubes.

Vertical Stabilizer, and Rudder: The vertical stabilizer and rudder are basically built as per the kit instructions with the exception that there are two ribs #20 which are spaced 1/16" apart. The rudder is then



hinged to the vertical. The space between the two is then filled with a balsa strip from the top rib #20 to the top of the two surfaces. The two surfaces are now one. To get your partially balanced rudder all you have to do is cut between the two ribs #20. After making the cut and unhinging the two surfaces the lightening holes are then cut in the rudder.

Finishing: Cover the wings and control surfaces with Super MonoKote while taking care to do a smooth clean job. Make sure that the wings have zero degrees of washout. Quik Stripe 1/8" trim tape is placed on the wings and control surfaces as shown on the modification plans (at the back of the sheeting for the wings, and just aft of the leading edges on the control surfaces). With the functional trim tape installed now add trim tape to spiff up the airplane in your own special way, being sure not to put any tape forward of the tape on the wing sheeting.

Center of Gravity, and Tow Hook Placement: The C.G. is placed 3.3" aft of the wing root leading edge. The tow hook is placed at the intersection of a line drawn perpendicular to the wing root lower surface 3.4" aft of the leading edge, and the bottom of the fuselage.

That's all there is to it. When you take your Super Cirrus out for its first flight, I'm sure you'll be as pleasantly surprised as I was. Good luck, and super soaring with your Super Cirrus. □

