WAY back in the early 'thirties there appeared on the model-building scene several highly successful tractors, which were quite similar to our present tractor designs. Until this time, nearly all models had been of a canard configuration. Because of the success of the tractor designs and the pleasing lines compared to canards of that era, it was only a short while before they began to dominate the model-building scene. Of course, there were many old-timers aware of the merits of a canard configuration, but as they kept dropping out of the picture, so did canards. Today if a model builder so much as suggests building a canard, he is suspected of having a few loose screws. This is primarily due to the fact that the majority of present-day model builders have taken up the hobby after the canard recession. Therefore, not being aware of its merits or not having the time to evolve successful designs through experimentation, the average builder is drawn towards more conventional designs.

To infer that canards are superior to the conventional tractors would be erroneous. It would be more exact to say there are times when the advantages of a canard configuration weigh heavily in its favor, overshadowing its disadvantages and also the advantages of conventional designs.

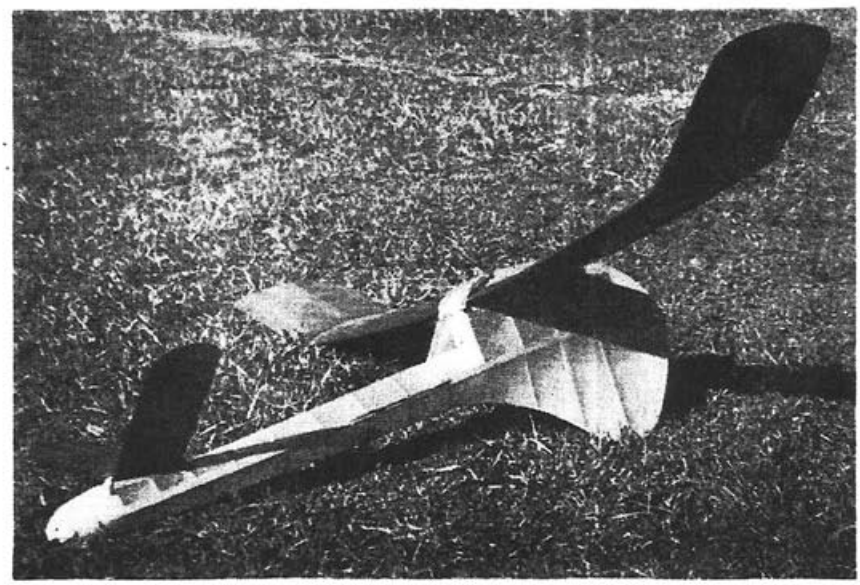
The canard configuration in the present case was chosen mainly to accommodate an unusual airfoil. As you will note from the drawing, the airfoil appears radically different from the types generally used on model aircraft. The airfoil is the LDC-2—a laminar-flow section developed by the *Low Speed Aerodynamics Research Association (L.S.A.R.A.)*, in England several years ago. The results obtained with the airfoil were considered astounding when compared with such popular airfoils as the Clark Y and the R.A.F. 32. However there are several drawbacks, which make it necessary to take certain precautions in order to obtain peak results.

Many of us are aware that the wake from an ordinary turbulent flow wing section is wide and diffuse, and although the tailplane on a conventional design is almost always within it, the resultant loss in tailplane efficiency is usually not more than 20%. However, in the case of the laminar flow LDC-2, the wake is very thin and concentrated. For this reason, it is imperative that the tail surface be mounted high enough to clear the upper camber of the wing surface. If not, the resultant tailplane efficiency may be as low as 50%. While this may more often than not constitute a major problem in a conventional design, the canard configuration presented herein lends itself quite readily to such an arrangement.

In view of the fact that the LDC-2 is not as stable as many of the popular airfoils, it is of prime importance to use that type of configuration from which longitudinal stability can most easily be obtained. The type which is best suited is the canard.

Many hours were spent working on the design to achieve a balance between ruggedness and streamlining. Both of the objectives were reached to a high degree. Although enough balsa was used to stock a hobby shop, the model weighed in at less than 8 oz. For flying in competition, this constitutes a minor problem since little or no ballast will be required to balance the model. In fact, the original model used no ballast whatsoever. Trim adjustments were made with a tab on the

TOMAHAWK



by PAUL E. DEL GATTO

right panel of the rear wing, and with the rudder tab shown on the plans.

Right now many of you are probably wondering how the model reacts on a towline. Since good towing is dependent on models stability, towing the *Tomahawk* is no more trouble than if you were towing a conventional model.

If you are looking for something new that is a sure fire threat in competition, you can't go wrong with the *Tomahawk*. So, why not scale up the plans and take a crack at it. All bulkheads, ribs and formers are shown full size, thus eliminating the greatest portion of the preliminary work.

Fuselage. With the aid of pins, place the longerons for the crutch on the plans. Then fasten the crossbraces in position. Allow ample time for drying, otherwise the rear end may spring apart or get out of alignment. While the crutch is drying, the bulkheads can be cut out. The two 1/8" sheets of balsa which run the complete length of the crutch should also be cut to shape.

Notch the top sheet to receive the bulkheads. Such a joint insures correct alignment, and also increases the strength and rigidity of the joint. Cement the sheets in place and allow them to dry for a while. Then add the additional sheeting at the rear of the fuselage. Cement the bulkheads and diagonals in position. Be certain that they are aligned properly,

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otherwise you will experience trouble later, trying to get the component parts aligned with respect to each other. To complete the fuselage framework, carve the nose block, then the balsa fin which rounds out the rear end of the fuselage. Cement the wing supports or runners in position, and add the remaining accessories, such as gussets and wing pegs.

Rear Wing. Since the main supporting surface has a large main spar, wing construction should start with cutting and cementing this spar to form the correct dihedral angles. This is done by pinning down each section of the spar on the full size dihedral layout. Do not apply too much cement at the joints, otherwise it will be difficult to get the dihedral gussets to fit flush on the spar. Cut out the dihedral gussets and cement them in position on the side that is up, while the spar is still pinned to the board. This eliminates any possibility of incorrect dihedral angle. After the dihedral joints have dried thoroughly, the spar can be lifted from the plan and the dihedral gussets applied to the opposite side.

If you have not as yet cut out the ribs, do so now. It is very important to be as accurate as possible in cutting the ribs, and be certain to use "C" stock.

Cut the trailing edge of the center section to the correct length and notch 1/16" at each rib position; next, pin the trailing edge down and cement the ribs in position. The spar can then be cemented in position. If everything is in proper alignment, the spar should fit in without any difficulty. Using 1/4" square hard balsa cut the leading edge to the correct length and cement in position. Allow at least a half hour before removing from the plans. The same procedure is followed through for the other panels until the basic wing structure has been completed; then the sheeting is applied. To insure proper wing alignment, it is best to proceed by sheeting the top surface of the wing so that the wing can again be pinned in position as each panel sheet is being applied. Since the camber is shallow, use a "B" cut that is not too soft and pliable. To insure good joints, it is also advisable to use a slow-drying grade of cement for sheeting. This can be obtained at your local hobby shop. After the upper camber wing sheeting has been applied, remove the wing from the plan and trim off some of the excess cement. Then apply the sheeting to the underside of the wing. To complete the wing, cement the cap strips and balsa tips in position and sand the completed structure to the desired airfoil shape.

Front Wing. The construction of the minor supporting surface is a little different since it has no spar of considerable depth. The procedure is to cut the trailing edge of one panel and notch at each rib location. Pin the trailing edge down on the plans and then cement the ribs in position. A 1/16" square hard balsa stringer is next cemented in position. The 1/8" square hard balsa leading edge is then cut to the correct length and cemented in position. Since there is no spar with the included dihedral angles, it will be necessary to prop up the completed panel, affixing it to the second panel while it is still being constructed. The remaining procedure is the same as outlined previously, with the exception that there are no cap strips to worry about.

Covering and Doping. The original model was covered with orange *Silkspan* on the fuselage, and prewar blue tissue on both wing surfaces. The main reason for doing this was because it was thought the model would be above the required weight. Since the completed model was underweight and required little or no ballast, it would seem logical to cover with *Silkspan* throughout, or even use silk or nylon on the fuselage. In this manner additional weight can be added and ruggedness increased many times. Before proceeding with the covering, dope the framework of the completed model with two thin coats, sanding between each coat. After the model has been covered, apply four to five coats of clear dope. Since it is very unlikely that the model will be overweight, it is not necessary to use the dope sparingly.

Flying. The procedure is the same as it is with any conventional design. Hand-glide the model and observe whether there is a tendency to stall or turn. If the model does have stalling tendencies, place your trim tab on the rear right wing panel, as on the original model. However, should the model have a definite nose-heavy condition (which is very unlikely), place the tab on the front right wing panel. Since the tow hooks are located on the left side of the fuselage, it will be necessary to adjust it for a left turn. Before attempting a tow, adjust the glide for a shallow left turn with a definite nose-high condition. Then with a towline of approximately 30', tow it up using the most forward hook. Should you have to run too fast to get it in the air, use the second hook, or even the third, if necessary. The first hook is best for use on very windy days. After you have the model towing properly, tighten up the turn, which will also have the effect of bringing the nose down. Then if you want that O.O.S. flight, let out a full length towline and watch her go!