SANTA MARIA 10

By PAUL VAN LEUVEN . . . This state-of-the-art Wakefield from Australia placed 2nd at the '79 World F/F Champs at Taft. Use of no fancy gadgetry or in-flight variable surfaces makes it super-reliable.

• My twin fin Wakefields originated in 1956. One won the Australian Nats, and a drawing of that model appeared in the *Aeromodeller Annual* of 1958.

I decided to use twin fins when the FAI proposed new Wakefield motor rules. And because I ventured onto new ground with the design, I adopted the name of "Santa Maria" from Columbus' ship, who also ventured onto new ground when he set out to discover America. There seems to be a lot in a name. All my twin fins did very well in contests, and No. 10 had to do well at Taft as the 1979 World Champs there was held over the Columbus Day weekend holidays.

No. 10 was designed to cope with all weather conditions. It was also designed for a variety of motors and has been flown with 12 and 14 strands of FAI rubber and 16 strands of Pirelli. However, since the model had a right-left flight pattern and had only to rely on the built-in trim, it was obvious that the 12-strand motor, with its 50 sec. motor run, would be best suited for Taft conditions. She could then climb longer in a thermal and stay in it to ensure a max.

We know from Frank Zaic that the further forward the C.G. is located, the smaller the natural gliding circle can be. Originally the model had a 65% C.G., but the final C.G. was located on the field. A weight was strapped to the model and shifted to obtain the most stable glide, then glued in place. It was found that a 67-1/2% C.G. was best suited for the flying surfaces on this model. She was capable of gliding in very small circles, so she would stay in a thermal better.

The differential tip washout makes the model not only safer in the climb, but produces a bank which is helpful in the glide and lets the model go into the left-hand glide instantly after the prop folds. The "V" dihedral in the stab contributes some extra stability for this.

With the wing at 0° incidence, the 2.5° downthrust provides a down force onto the stab, set at -4° incidence, and creates a balance condition for the climb. The model therefore will climb in the direction in which she was pointed at launch. It also provides a nose-up attitude during the cruise where she can gain still more height, particularly with the new prop design with its ARA-D airfoil, used for the first time in the world on a model.

A braided nylon fishing line is used for the D.T. hookup. The 40mm stretch pulls the stab down hard and thus assures proper alignment. A clockwork timer, which is spring activated in the "on" position and held "off" during thermal waiting, is preferable to a fuse D.T. One can then launch instantly and not miss that all-important thermal.

The construction, apart for the items I will deal with here in this article, in straightforward and the drawing is self-explanatory.

FUSELAGE

The motor length should have some stretch built in when fitted between hooks. This gives it more torque and provides smoother prop running toward the end of the motor run, and thus requires a Montreal stop. The rear peg design is for the use of a winding tube, in this case a piece of 25mm dia. O.D. PVC conduit slotted for the rear peg. The fuselage is built in the usual manner, wet formed on a mandrel. When dry, it is removed and the seam Hot Stuffed together. It may have to be soaked and dried again to remove all dents. The master tube, which is tissue covered and doped on the inside, is covered with light glass cloth or nylon on the outside and given three or four coats of "Everdure," an Epicraft 7% epoxy based wood preservative used in Australia on boats. I believe Superpoxy or Hobbypoxy could serve the same purpose. Sand with wet-and-dry between coats and polish.

The ply backing for the timer is set behind the balsa face. This allows the timer faceplate to be forced flat against the outside of the pylon body and makes a dustproof seal (the timer back cover is not used in this case). Glue the pylon on last, after the complete model (with motor) is assembled to balance at the correct C.G., then epoxy it on. The rear end of the fuselage is left open to give access to the D.T. line in case it needs replacing.

WING

It is best to trace the wing half shown onto good tracing paper, so that you can build one side over it, then reverse the tracing and build the other half. The wing airfoil is a blend of two proven types that suits this model ideally. It would therefore be better to plot this yourself from the airfoil ordinates, rather than rely on tracing it off the plan.

Wing ribs should be weighed against one another on a balance scale and the lighter ones used for the tips. Note the grain direction in the wing tips. It is simple and strong and provides one with a poor man's Hoerner tip.

The wing is built flat on the board with only the straight ribs. Make a rectangular balsa blank and tack glue this diagonally between two straight ribs. With a felt pen, mark the top and bottom of the adjacent straight ribs. Sand the diagonal blank down until the coloring on the straight ribs is just touched. Remove this diagonal rib and use it as a template for the remaining tip ribs. Once glued in, sand all ribs to conformity. The main spar web is of various thicknesses to provide lighter wing tips. All spars are cut from selected straight B/C grain sheets. The built-up T.E. pieces are glued first, then shaped to size and rib slots cut up to the glue line with a modified hacksaw blade.

The outer dihedral ribs are sanded to the correct angle and epoxied together with the tips blocked up to the same height. Once set, the dihedral braces are set into slots cut with a hacksaw blade and epoxied to the spars.

The stab is also built flat on the board, minus the center rib, which is glued in place when the dihedral is set.

All surfaces are covered with light model span and doped with 50/50 dope. The wing wash-out is set during this time and checked to conform with the plan. Wing and stab are given one final coat of spray varnish, the kind used by artists as a fixatif, after all trimming and test flying has been carried out.

PROPELLER

This is the heart of a Wakefield and requires time and care to be produced. The original has the ARA-D airfoil and was carved from Pacific Cedar Pine. It took me two weeks to make, working two to three hours nightly, but was well worth it. Any hard C-grain balsa could also be used, covered with light glass cloth or nylon and given three to four coats of Everdure epoxy and polished glass smooth.

Transfer the stations from the top of the cut-out prop blank to the sides and draw in the L.E. and T.E. lines. Carve the underside to this line perfectly flat, check with a straightedge, then transfer all stations to the bottom and carve away the top to about the thickness shown and shape it to the ARA-D airfoil section. Note that the first 40% of this airfoil top is a relatively flat curve and that the L.E. is parabolic in shape, for this gives it more thrust. Check the thickness frequently with calipers at each station. Do this to both blades at the same time, taking off a little from one blade and then doing likewise to the other, to make both blades conform to one another.

Sand in the undercamber last, removing approx. 0.5 to 1.0mm, but less at the tip and none at the hub. Cut a slot for the prop studs and epoxy these in place before you cover the blades. During the last stages, keep checking that both blades are of the same weight and recheck the thickness with calipers. While the machined aluminum spinner front end is beyond the capabilities of those without a lathe, the other type shown is easier to make. Note the grain direction in the balsa nose block, which

can be turned on a drill and given lots of dope to prevent the grain from splitting. The Montreal stop spring in this type is retained by a circlip music wire fitting that fits in a groove in the pin. The pin is from the wire of a pop rivet, as this is not too hard a material.

TRIMMING

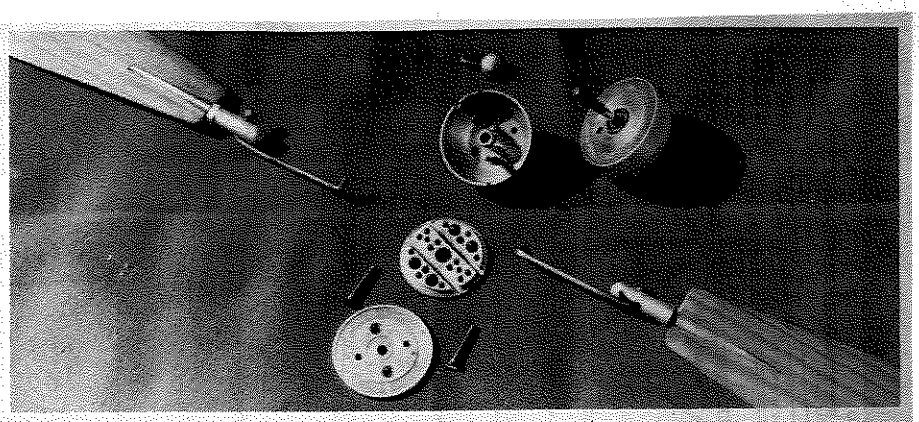
The early mornings, before sunup, would be best. After the normal glide tests to arrive at the incidence on the stab for a very flat glide, make flights on 100 turns and adjust the climb with side and downthrust. Then make a series of test flights on 3/4 full turns and 1-1/2 minute D.T. Observe the glide and adjust this for a safe right glide. The glide should be trimmed so she turns a full circle in 18-20 seconds. This is about 23 meters (75 feet). If she loses height quickly, open up the circle or add more incidence under the stab. If she has a tendency to spin in, check for warps or open the turn.

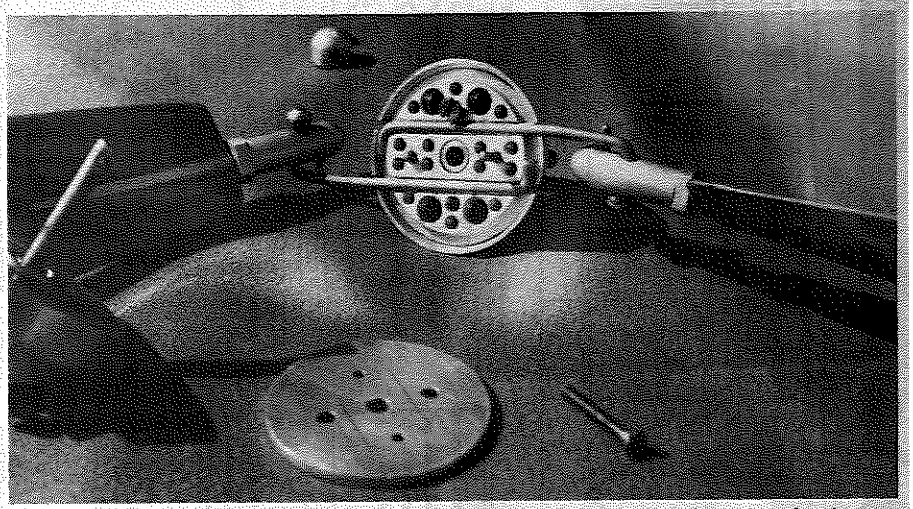
Do this over and over again, for no two weather conditions are the same. It took me 14 flights to get it right, so take your time. Experience is the best teacher. The model should glide safely in a tight circle and have some wing bank, but should not lose much height. Only then is it right, and the model will virtually fly itself. Before each launch, I automatically check the following points:

1) Nose plug properly fitted.
2) D.T. line functioning and hooked up properly.
3) D.T. timer set to the proper time.
4) Wing properly seated (keyed to pylon).
5) Stab properly seated (keyed in).
6) Trim tab on fin set in the same position as before.

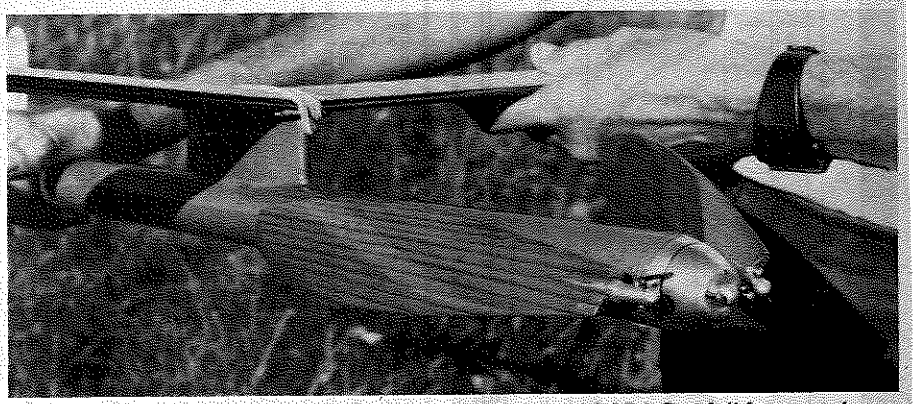
A successful rubber lube I've used for years is Repco rubber grease. It comes in tubes and is sold by auto supply houses here in Australia (I'm not sure if it is available in the U.S., you will have to check this out for yourself). It does not fly off as castor oil does, and is better than glycerin and soap.

To ensure success one can leave NOTHING to chance. Failure is only one's own mistake and therefore I prefer the simple Wakefield with built-in trim. Happy Maxing! •





Santa Maria's front end requires some intricate machining, is fully detailed on plan. An alternate wood front end is also shown for those without access to machine tools.



Author's prop is carved from Pacific Cedar Pine and uses special ARA-D airfoil for extra thrust, thus allowing fewer strands of rubber for a long 50-second power run.