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TOP SLIDER

By KEN WILLARD

Primarily for slope racing, the Top Slider also doubles as a fast, maneuverable sport slope soarer that requires only light winds to stay aloft. When the wind comes up, add ballast and hold on tight!

● The Top Slider is a special-purpose airplane. Its prime objective is to win slope soaring races. It's a slope soarer, and a fast one . . . up to 80-90 mph at times . . . not recommended for beginners. However, if you like slope soaring, you'll like the Top Slider. Actually, if you want to, you can add a rudder to make it more aerobatic, but it will do most of the maneuvers, except a spin, just with the ailerons. But I like to race, and the Top Slider is great for that purpose.

There are certain things that must be kept in mind when designing a slope racer. Naturally, it must be fast . . . but it also must have the ability to remain airborne in light winds. Normally, if the wind is light . . . less than six miles an hour or so . . . racing is not attempted. There are times, though, when the wind is light, and a reasonably good racer will stay up. Then the contest director can say, "Let's race!" So a race is started. If none of the racers complete the course, the race is cancelled and re-run later. But if any one racer finishes, the race is official. So, a good racer should be able to stay up in light winds . . . because you'll have them.

Then there is the opposite end of the spectrum, when the wind gets up to twenty-five or thirty. That's when you want to ballast your racer to the maximum for high speed penetration. And it better be rugged, to withstand the landings. You must also keep in mind the FAI limitations for models . . . eleven pounds maximum weight, and 24 oz/sq. ft. wing loading (this loading includes the horizontal projected area of the stab).

The Top Slider meets all the requirements. Empty, it weighs about five and one-half pounds, and will stay up in a six to seven mile wind, when the wind is blowing straight in. When the wind gets up to around twenty mph, the Top Slider can be ballasted right up to eleven pounds and still have slightly less than a 24 oz. wing loading.

Now there's no particular secret about the design. It evolved over several years of racing, during which I had good racers, but not good enough. They had one thing in common, and that was the Francis Products Del Gavilan fiberglass fuselage, now put out by A & L Distributors, Inc. (Bud Anders and Larry Leonard). It's a well designed, streamlined and rugged body that takes a beating and comes back for more. *(If your hobby shop can't supply you, write to A & L, 16509 Saticoy, Van Nuys, CA. 91406. wcn).*

The shortcoming of previous designs was the wing. And that's what I decided to fix. I noticed that on all previous designs, when the wind was suitable for racing, I had to carry ballast, and that's wrong. If you need weight, it should be in the structure.

I had seen the ability of foam core wings, when covered with balsa and then fiberglassed, to survive not only hard landings but midair crashes as well. So that's what's needed. But then the 1/64 inch plywood became available, and it's even better.

What about the airfoil? Everybody seems to have their own idea in that regard, so I called upon my aerodynamicist friend Bob Andris, who designed the Peregrine. He recommended the Eppler 374 as a section that would do well in both light and fast winds. So that's what I used.

Because the Del Gavilan fuselage has a relatively short nose, considerable ballast is needed up front to compensate for a heavy empennage. To help reduce this factor, I decided to sweep the wing aft. I later discovered that this sweep yielded the best aerodynamic configuration, according to Bob, since it sweeps the quarter chord line aft at the optimum 5°.

Finally . . . and this may be purely psychological on my part . . . I went to the trouble of making a closed hinge line for the full span ailerons. At a seminar I attended in Seattle a couple of years ago, a modeler gave a talk on the benefits of eliminating the gap along the aileron hinge line, claiming it added about five mph to his slope soarer. Now that's significant, if it's true. Even if is isn't, and only a mile or two per hour is added, it's still worth it.

The Top Slider can be cleaned up even further, but when I built it, the big spring races were only a few weeks away. You will note that the wing is held on by the old reliable rubber bands; I didn't have time to fit an internally mounted bolting system. Tried one, but it didn't hold up on the landings. So, back to the rubber bands. And that's also why there are protecting rails on either side of the aileron servo, in case a rough landing makes the wing shift.

At first glance, you may think the CG is pretty far aft as shown on the plans. Remember, though, that the wing is swept, so the CG can be farther back. It still is at a relatively normal position with respect to the mean aerodynamic chord.

Then you will note that the stab is mounted low, and some of the Del Gavilan fiberglass is cut away, since it is not needed and only adds weight. The stab was lowered for racing to give a cleaner intersection between the stab and the fuselage. Again, a small thing, but every little bit helps when you're out for speed.

The experienced builder can put the Top Slider together from the plans, and frankly, I don't recommend it for inexperienced builders or fliers. Here's a couple of building hints as you put it together.

FIN AND STAB

Use hard balsa on the stab. It takes a beating on landings because it is mounted low. You could even fiberglass over the 1/4 inch balsa, but that much weight back at the tail means even more ballast in the nose. Just be careful as you can on landings.

The fin can be medium hard balsa, since it doesn't get banged around quite as much.

I used trim strip Monokote for the elevator hinge. Works fine.

To the extent possible, shape the surfaces to a thin airfoil section. It should help a little on speed.

FUSELAGE

The main effort here is cutting away the fiberglass at the rear of the wing cradle, leaving as much as possible for strength, and then shaping the new balsa wing cradle to fit the 12 inch Eppler 374 profile of the center section of the wing. Rough up the flat part of the fiberglass where the new balsa cradle will fit, and attach the balsa with Francis or K & B Fiberglass resin. Epoxy will work, but not nearly as well.

Make a cardboard template for the former which is shown at the trailing edge of the wing, cutting it to fit the contours of the inside of the fuselage. Then make the 1/8 inch plywood former. Be sure to cut a hole in it to let the elevator pushrod through. It's kind of tough to make the hole after the former is in place.

The plans show the mounting for KPS-12 servos. You can use larger ones . . . it's just that those are what I use on my smaller models, and they have ample power to move the surfaces, even those big barn-door ailerons.

Be careful in cutting the slot for the

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stab. Keep it right on the centerline so you have the right incidence setting for the wing in relation to the stab.

To mount the switch, I simply attached it to the fiberglass lip for the canopy, using servo mounting tape. Let the sliding knob protrude slightly through a hole cut in the canopy.

WING

Now here is where all the work takes place. It is the real secret of the speed of the Top Slider. If you have a wire cutter and want to cut out your own cores, the sections are shown for you to cut two center sections and two tips, which are each two feet long, the four of them adding up to the eight foot, two inch span (when you add the one inch shaped balsa tips).

If you don't have a cutter, I've arranged for wing cores to be cut for the Top Slider by my friend Duke Crow. You can get a set by writing him at 264 E. McKinley Ave., Sunnyvale, Cal. 94086. The base price is $15.00 a set, plus a handling and shipping charge which will depend upon what part of the country you live in.

If you have a big flat table, you can put the two wing halves together on it, but I had to use the floor. It is important that the surface be flat; any deviation will be reflected in the wing.

Everyone seems to have their own personal preference for covering wing cores. In my case, I took the two cores for the left wing, epoxied them together, then laid the assembly in the foam blocks which Duke ships them in, skinning first the top surface with the 1/64 inch ply, using Best Test Paper cement for the contact adhesive. Repeat with the right wing.

Note that the trailing edge of the wing extends a 1/4 inch behind the aft line of the foam core; that's to give a real sharp trailing edge. To hold the 1/64 ply together back there, use epoxy. The contact cement doesn't hold the ply together well enough; scrape it away and, using a Hobby Poxy applicator knife, slide it in between the top and bottom skin and work the epoxy in place.

Cut the ailerons out before covering the wing with fiberglass. And this, if you choose to use the closed aileron hinge line as shown on the plans, is the most tedious and demanding job of the whole airplane. Carefully mark the top lines and the bottom lines on the plywood covering where you have to cut through to attach the 1/8 inch hard balsa strips . . . both to the wing and to the aileron. Using a modeling knife, slit through the ply at the top, then the bottom. Using those lines as a guide, slice the foam core at the angle shown, first for the aft edge of the wing, then the leading edge of the aileron.

Sand the foam smooth along the lines, then epoxy the balsa edges in place. Leave a little excess both top and bottom so you can cut and sand the balsa to fit the wing contours smoothly.

The triangular closing strip of balsa is then epoxied (or you can use Titebond here) to the trailing edge of the wing. And here is where the tedious work comes in. You have to shape the top of the aileron, and the bottom of the closing strip of balsa, so that when the aileron is hinged to the wing at the bottom, it will move freely up until the leading edge butts against the slanted trailing edge of the wing. The curved upper surface of the front of the aileron has to fit the lower curve of the closing strip, with just enough clearance for easy movement. When the hinges are inlaid and epoxied in place, you'll have a smooth wing surface for the entire chord, with virtually no break at the aileron hinge line, even when up or down aileron is commanded. It's a lot of work, but you'll be glad you did it. Even if it doesn't add a lot of speed, it looks fast!

Now you have two wings, with ailerons, ready for joining and fiberglassing. To join them, I used three full-depth 1/8 inch plywood joiners, with just enough dihedral to keep the wing from having a drooping appearance in the air.

When the center section has been epoxied together, and all surfaces lightly sanded smooth (the plywood doesn't need much) it's time to fiberglass. Start at the center section with the five inch strip of 8 oz. cloth, then lay the 15 inch strip of 4 oz. over that, and then cover the entire wing with a layer of 4 oz. over that, and then cover the entire wing with a layer of 4 oz. cloth.

And now the elbow grease comes into play! Sand the fiberglass resin in the first layer smooth, add another coat, sand, another, sand, and another, and sand. And if it isn't glass smooth by then, add a couple of more coats and sand some more. Using very fine grit, wet-sand for the last coats, and then, when you think it looks just right, use some Simoniz paste wax to bring out the best in it.

The aileron servo fits into a cutout in the wing, with small screws holding it in place. The guard rails are epoxied in place, and then the aileron horns mounted. Epoxy the brass tubing to the wing, and then put a small strip of fiberglass over the tubing and extending about one inch fore and aft for added strength.

Note that the aileron horns slant aft, and the attachment to the servo of the pushrods is at the 45° hole locations. This is to yield differential aileron movement . . . more up than down, to prevent adverse yaw in turns.

FLYING

For your first flight, I'd suggest you pick a day when the wind is neither light nor strong . . . say around 10-12 mph. Check the CG. If anything, it's better for it to be too far forward than too far aft. Aileron travel should be about 20° up and 10° down, and the elevators about 15° for both. Give it a good heave. It won't start to fly if you don't. And heave it straight ahead, or down the hill. Not up.

After you've flown it a bit, you can begin experimenting with ballast for the wind conditions on your own particular hill. It's better to fly with too little ballast than to have too much. In the latter case you'll have to mush to stay up, and that slows you down. You can always put the nose down if you are a bit light. Ballast is added at the CG. I use lead strips, held in place by the nylon bolts through the bottom of the fuselage.

In very light air, the Top Slider seems to fly better with the CG just slightly forward of the position shown. In moderate or strong winds it handles best with the CG as drawn. To be sure, check this out with your own model.

And here's an interesting feature of the Eppler wing section. You can slow the model down and fly at a fairly high angle of attack in light air, and then you can put the nose down, pick up speed, and it will come right back up and maintain altitude at a much faster speed. Learn to use this feature; it really helps when racing in light winds.

The big ailerons don't have to move very far to make the model bank. Thus, they don't create a lot of additional drag during turns. Keep the nose down, turn smoothly, and you'll come out of the turn almost as fast as you entered it. Don't pull too much up elevator . . . you'll mush and slow down.

So build yourself a Top Slider, practice, and come on out for some slope races. They're great sport! ●