

Designer John Goodyear shown with his latest Skorpion.



SKORPION

Try this Skorpion to improve your two channel skills. You will find it's an ideal, go anywhere, fun machine.

By John Goodyear

An Aerobatic, 2 Ch. Slope Soarer from the United Kingdom

Introduction

Skorpio represents the end product of twelve months design and development work undertaken in an attempt to produce a simple, efficient, two channel aerobatic slope soarer, capable of handling the worst possible

combination of wind/lift conditions experienced in the U.K. That means being able to operate in winds varying from nothing up to 45 mph --- such diverse weather occurring with irksome regularity on the top of the Pennine range of hills at 2500 ft. in northern England.

This has been largely accomplished, thanks to the low wing loading and clean lines. Clearly, though, Skorpion is at a significant disadvantage in really calm conditions when everyone

else is flying their 120" plus high aspect ratio soarers. At least it's capable of scraping along, even under these conditions, however, which is more than can be said for a lot of other "kippers."

Other highly desirable characteristics exhibited by Skorpion are the use of inexpensive, readily available building materials, high maneuverability, and aggressive styling.

If you're still reading you might already be tempted. So, providing you can handle an aileron model, send off your money and acquire a plan, buy the wood, and start building. This is how it all goes together.

CONSTRUCTION

Fuselage:

Simplicity in building was one of the criteria laid down when designing Skorpion and the fuselage is a classic example of this.

For strength, laminated 1/32" ply and 1/8" medium balsa sheet sides are used. Don't omit the lightening holes in the ply, and don't be tempted to enlarge them or alter their position. As drawn, the ply supplies maximum reinforcement at positions of critical stress.

Once you have the sides cut out, give the ply a good rub down with fine grade sandpaper prior to gluing. This will remove any residual mould laquer which always appears to be present on plywood nowadays. Further, as an aid to later cutting, mark out the positions of both the wing and the hatch on the outer sides of both balsa members.

For gluing I would earnestly recommend the use of semi-flexible adhesive. This allows bending of each laminated side when the nose and tail are pulled together later on. Do not use epoxy or conventional white wood glues because all you will succeed in doing is building in stress. I personally use a water based adhesive marketed in the U.K. as "Copydex." No doubt an equivalent is available in the U.S.

One final point of caution. I know it's been said before, with monotonous regularity, but do not build two left or right hand sides, will you? The net result of errors of this nature is bad temper and/or an unusual looking fuselage, and/or a decision to build two models at the same time! You have been warned.

The formers for the fuselage are basically ply/balsa/ply sandwiches. I have used composite formers involving this technique in some five models now, all with considerable success. In other words, they have survived when the remainder of the airframe didn't! Note that F2 uses two laminations of ply on one side to take the loads imposed by the central wing

locating dowel. Don't be tempted to omit this.

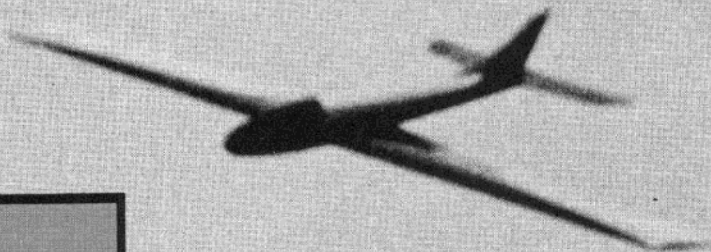
When all the components are prepared, assembly of the fuselage is simplicity itself. Start by installing F2, working over the plan or in a jig, and ensure that everything is lined up dead square. After this joint has thoroughly set, pull in the front and rear ends and glue F1 and F3 in position. Leave everything to set really well at this stage and busy

yourself cutting out a set of wing ribs, or cut two foam cores and apply the veneer skins.

You should now possess a nice straight fuselage and can accordingly install the triangular section longerons, notching where necessary to assist bending. Note that the lower longerons only runs to the rear of F3. When dry, sand flush and glue on the top and bottom decking. While this little lot is drying you can cut out the

congratulate yourself, because you're on your way to your own Skorpion.

To finish all the heavy work on the fuselage, cut out the wing seating/fairing sections using the previously marked lines. Save the fairing for use on the wings and install the 1/4" balsa tripler. The hatch can also be removed and finished off with appropriate retainers and a catch. Finally, cut the locating slots for the fin and elevator, making sure that



SKORPION

Designed By:

John Goodyear

TYPE AIRCRAFT

Slope Soarer

WINGSPAN

54 Inches

WING CHORD

9" Root — 7½" Tip

TOTAL WING AREA

445½ Sq. In.

WING LOCATION

Low Wing

AIRFOIL

Eppler 374

WING PLANFORM

Swept Leading Edge

DIHEDRAL EACH TIP

1/2 Inch

O.A. FUSELAGE LENGTH

33 Inches

RADIO COMPARTMENT SIZE

(L) 7" x (W) 1½" x (H) 2"

STABILIZER SPAN

15 Inches

STABILIZER CHORD

3¾ Inches (Avg.)

STABILIZER AREA

56 Sq. In.

STAB AIRFOIL SECTION

Fiat

STABILIZER LOCATION

Mid-Fuselage

VERTICAL FIN HEIGHT

6¾ Inches

VERTICAL FIN WIDTH (incl. rud.)

5½ Inches (Avg.)

REC. ENGINE SIZE

NA

FUEL TANK SIZE

NA

LANDING GEAR

NA

REC. NO. OF CHANNELS

2

CONTROL FUNCTIONS

Aileron & Elevator

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa & Ply
Wing Foam & Veneer
Empennage Balsa & Spruce
Wt. Ready To Fly 35 Oz.
Wing Loading 11.3 Oz./Sq. Ft.

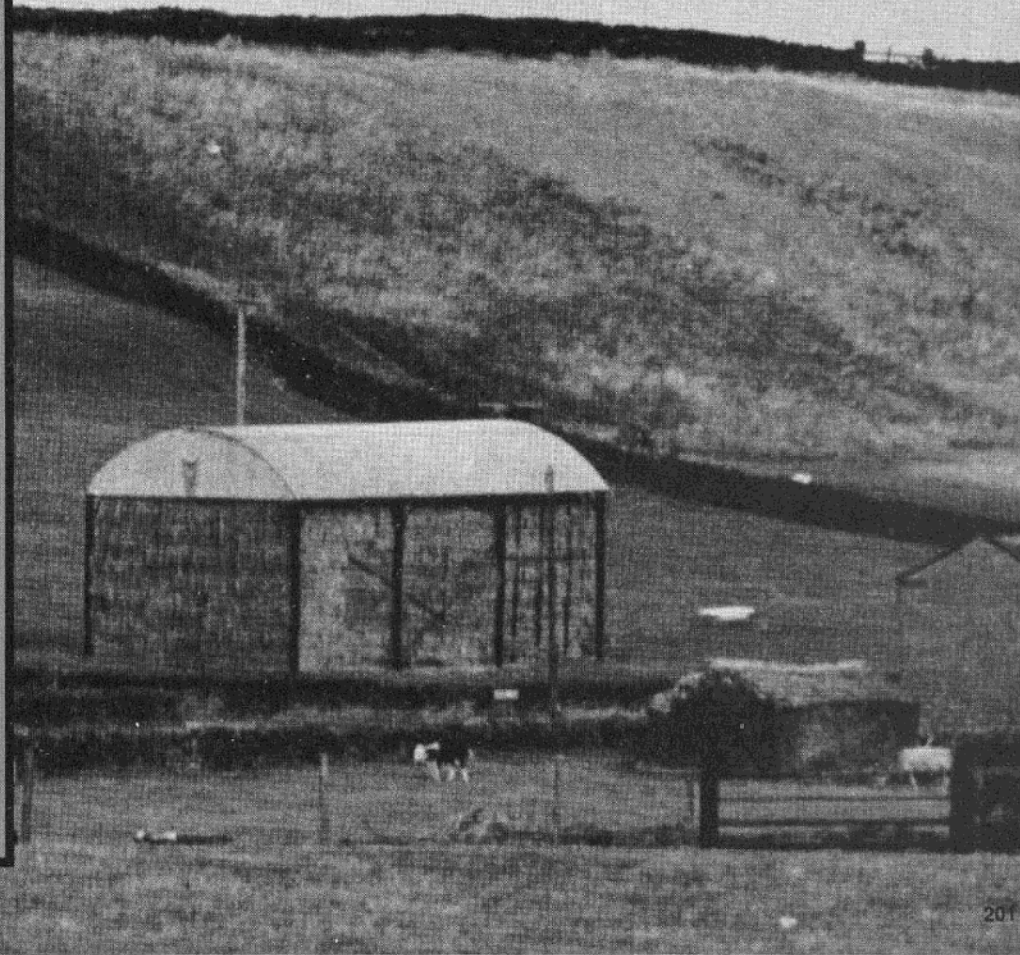
remainder of the wing ribs you should have done before! Assuming you have already done this, don't be lazy but laminate the nose block from balsa and ply and pop in place.

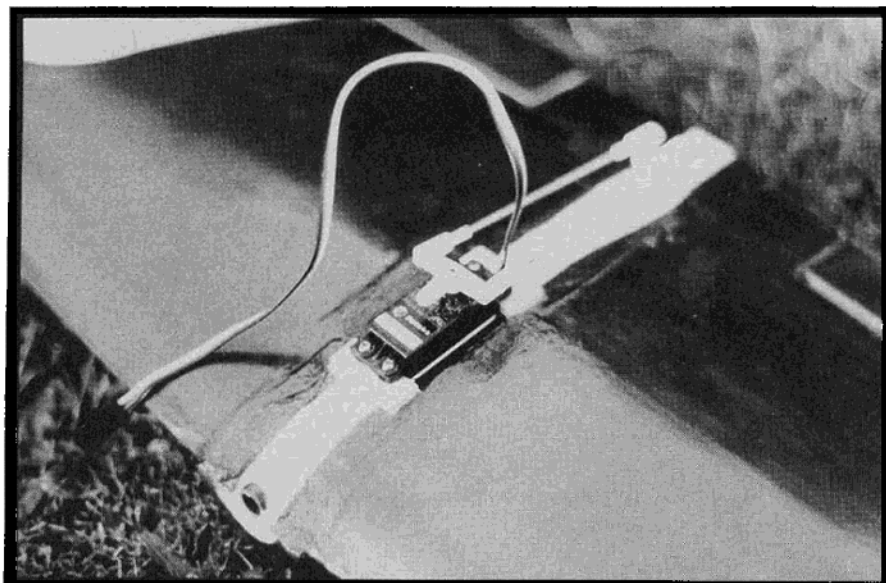
Now it's make-a-mess moment, so time things correctly so as not to incur the wrath of the domestic authorities. Dig out the razor plane and convert your glued hulk of balsa bits to a smooth, contoured fuselage. Once this has been accomplished you can

they are square to each other and the fuselage.

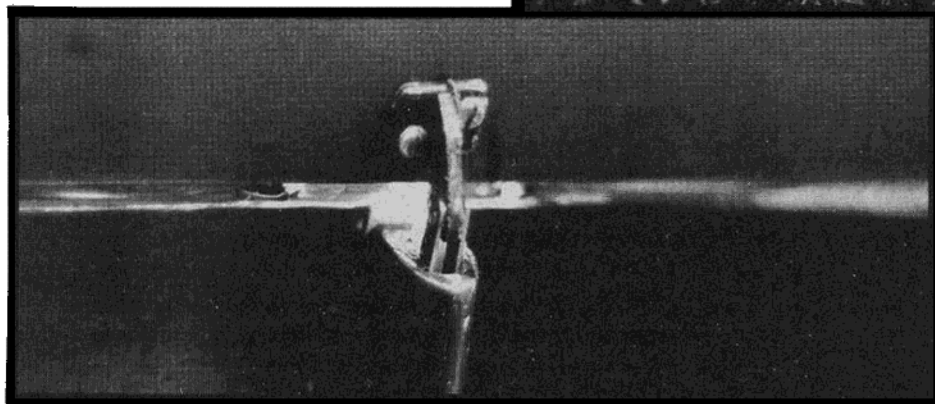
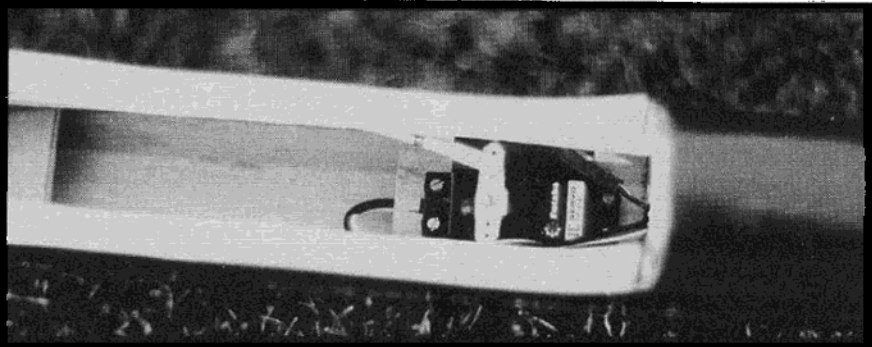
Wing Construction:

Wing construction is next on the agenda. I must confess to being a foam veneer addict, mainly because it's a quick, cheap, and easy method (I'm also lazy). For those of you who prefer this technique, root and tip sections are shown on the plan so you only have to cut two templates from ply and get the cutting wire hooked up.





ABOVE: Aileron servo mounting. RIGHT: With only one servo in fuselage, there is no space problem. BELOW: Elevator pushrod exits out tail of fuselage.



The plans also provide full details of a built-up wing for the balsa carvers amongst you. I would suggest the following assembly procedure. Construct each wing separately, omitting the center section reinforcement until later. Start by pinning down the bottom spruce spars and the false trailing edge, the latter being supported on scrap wood to ensure accuracy. Build over the plan to avoid misalignment.

The ribs can then be glued in place both longitudinal members and the top spars added. Complete the assembly by adding the leading edge.

When both wing halves are ready, join together incorporating the center

section reinforcement spars and the ply brace. Complete by fitting the two 1/2" sub-ribs at back and front ends.

Install the aileron linkages at this stage and ensure that everything moves freely but without slop. This is one thing you must not foul up if you want things to work correctly. The partial wing sheeting can now be added along with the capstrips. Don't omit these latter items even if they are a pain to fit. They provide enhanced rigidity to the wing and prevent torsional loads causing twisting and wing failure via the resultant fatigue mechanism.

Sand the leading and false trailing edge to shape and attach the tips and

aileron blanks, hinging the latter via your favorite method. Final sanding can then be undertaken.

Now you are ready to do a bit of juggling to locate the position and angle of the wing retaining dowel. This is best accomplished by mating the wings with the fuselage and marking through the locating hole in F2. This will give you the correct position and a card template prepared from the plan will provide the correct angle at which to drill. The actual retention of the dowel is via a somewhat unusual technique, but one that I have found to work very well in practice. A 1/4" i.d. brass or plastic tube is firmly glued into the wing to act as a housing. Using a 1/4" hard balsa dowel in conjunction with this encourages the balsa to fracture on a not so good landing and prevents the wings becoming damaged themselves.

To finish the wings off, reinforce the center section with 3" wide fiberglass

cloth and resin. Use this reinforcement whatever wing construction method you have employed. Once reinforced, the wings can be completed by adding the fairing, which hopefully won't have found its way into the trash can by now.

Tail Section:

Returning now to the fuselage, prepare the rudder and elevator from sheet balsa, noting that the rudder has a spruce trailing edge for strength. Install with the wings in place as an aid to alignment.

All that remains now is to install the ply plate holding the rear wing retention nut in place and you are now ready to install the electronic bits and pieces.

Radio Installation:

This is clearly a matter of personal preference although the plan shows suggested servo mounting positions, and control runs. Whatever combination of systems you decide to use, do aim for really free moving surfaces. There is hardly anything worse than binding or stiffness when it comes to running down receiver batteries and/or wearing out servo gears. It also obviously affects flight performance adversely.

Finishing:

Any type or combination of finishes can be used. The original used ordinary film which has proven to be perfectly acceptable.

You can go mad if you want with color schemes since Skorpion is essentially a fun machine. Just ensure that you endeavor to apply contrasting top and bottom surfaces to aid orientation. (Quartered black and white underneath shows up extremely well.) Try also to avoid color schemes used by other local fliers. This will stop you flying someone else's model while yours is plummeting earthwards at terminal velocity out of vision.

Trimming and Flying:

If you have gotten this far, everything else is easy. Check first the C.G. Skorpion is quite forgiving in terms of location, but for the first few flights keep to the front half of the range shown. Given that you haven't fitted lead tail surfaces, the C.G. should be about right with a standard 500 mAh receiver pack right up in the nose. If it isn't, add weight until it is, and err on the side of caution initially. It's very easy to remove weight later to liven performance up, but somewhat unpleasant to find yourself with an overlively airframe at a few hundred feet during a maiden flight.

Set the control throws up as shown on the plan and go out and test the thing. It's amazing how often you find "up" is in reality "down," despite the countless checks you thought you had made.

Flights from the slope should present no difficulty. You will find Skorpion capable of all two channel

maneuvers in all but the lightest of air, and able to do a bit of ridge drifting in virtually nothing.

The quality of aerobatics will, of course, depend on whose fingers are on the sticks. The following will, however, perhaps give you some idea of what is achievable.

First of all loops. With the control throws set up as specified, these can be made very tight indeed and very fast. Conversely, providing you keep the speed up, they can be made to take up vast areas of space.

Inverted flight is readily accomplished. You should be able to cruise around like this all day if the mood takes you. Skorpion rolls rapidly at high speed, so fast, in fact, that you can forget about nudging a bit of down in half way round. The slower you fly the more ragged and barrelly the rolls become, as you would anticipate. Full

control is retained, however, at all speeds.

The stall is very gentle; you would have to be very clumsy to get into trouble with Skorpion.

Now for the critical bit; landing. Due to the light wing loading and the air cushion effect created by the wing position, soft, gentle, returns to terra firma should be achievable. Do be aware though that Skorpion doesn't drop out of the air like a brick once you leave slope lift. She will hang about at altitude a lot longer than you might expect so be prepared for an overshoot on your first approach.

Practice makes perfect, as ever, and you should find Skorpion a useful model to improve your two channel skills as well as being an ideal, go anywhere, fun machine.

Build one and enjoy yourself. Good flying. □

