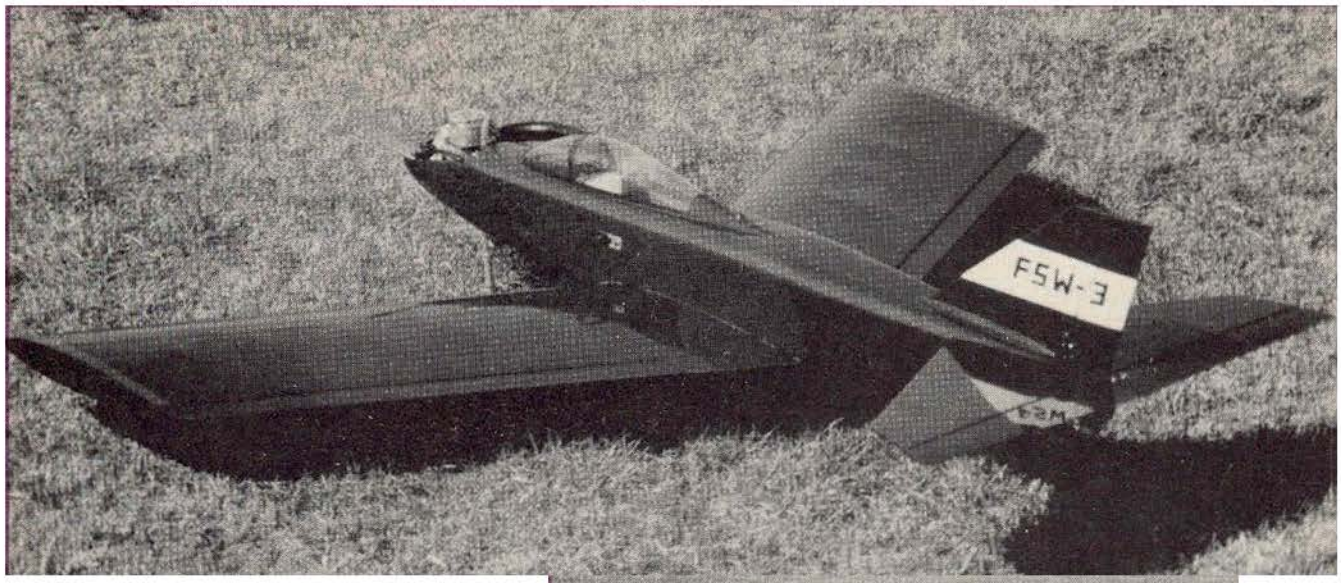



# FSW-3

**We can leave it up to designer Don Sobbe to give us something different. This forward swept wing model will get you all the attention you want and also some great flying.**

**By**
**Don Sobbe**

**Photos by**
**Lynda Sobbe**


***ABOVE: Author explaining why the wing is on backwards. Although it looks sinister, the FSW-3 is both a rocket ship and a pussycat. Don recommends light color and lots of stripes. Dark colors like his, can cause disorientation especially on cloudy days.***

While writing "The Shape Of Models To Come" (see Feb. '86 RCM), I started thinking about building another forward swept wing model in order to learn more about their performance. At the same time, I realized that there were probably a few curious souls who might be interested in flying one of these creatures. Taking my usual scientific and completely analytical approach to this idea, I said to myself, "Hmmm . . . there's nothing on the workbench, it's too cold out to fly and the shop needs another coat of sawdust anyway! . . . why not?"

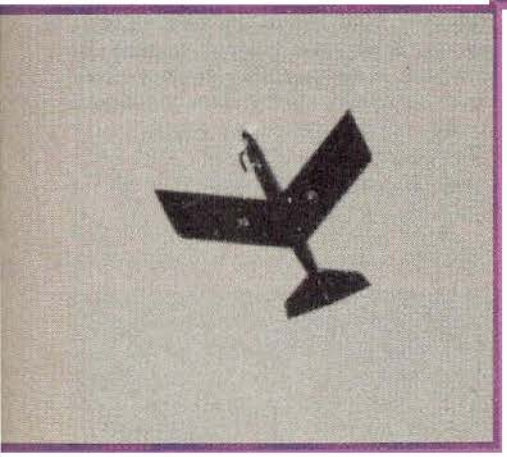
The FSW-3 (forward swept wing, third in a series) was designed as an easily built, 40 powered research platform to study constant chord forward swept wings. I also wanted it to be an acceptable sport model.

After building the wings, I made a discovery. In the above mentioned article I had made the statement that these wings needed to be fully sheeted to make them absolutely resistent to torsion. At the time, I was referring to much larger wings that carried greater loads than this wing. But in this case, when the ribs are mounted at an angle, the wing turns out stiffer than a dead carp. And that's pretty stiff!

Okay, okay. I know this model looks like it would be as stable as a drunken sailor, but, in fact, this wing planform will fly at angles of attack that would have straight wings heading for the ditch. Flying behind the power curve is as easy as falling off your workbench. If you want to crawl under a limbo pole, without worrying about tip stalls, this is the wing to do it with.

Although I don't fully understand why, forward swept wings don't seem to be affected by cross winds as much as straight wings. Other than using the rudder to keep the model headed in a straight line, little to no opposite aileron is necessary during cross wind take-offs and landings --- and, dihedral doesn't seem to have any effect on roll. The model just yaws with rudder application, regardless of the amount of dihedral.

***Overhead, the forward swept wing is a real attention getter.***



To be perfectly honest, there is one aspect of this particular model's performance that you may not like. As I said, the model was designed as a research platform and the stabilizer position will produce some pitch coupling, with rudder deflection, in knife-edge flight. If you absolutely, positively have to have a model that will perform knife-edge flight like a pattern ship, drop the stabilizer down 1" from the position shown on the plan.

The FSW-3 has some other performance capabilities that, besides its appearance, makes it a really different model. We'll discuss those later. But, right now, let's get out the chainsaw and start building!

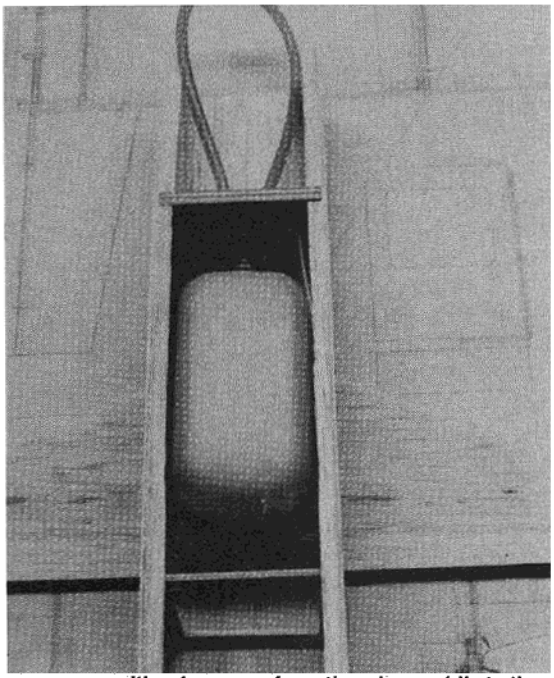
The general construction is almost identical to an Ugly Stick so I'll just touch on the spots where you might need some help.

***RIGHT: This is an easy model to photograph in flight. Just fly up to the camera and stop! Wind is 10 mph. BELOW: Flying the angle of attack and using power to control the sink rate, the FSW-3 makes a short field landing in these pictures. Although easy to fly, the model can be made to handle like a high performance jet fighter.***

**FSW-3**

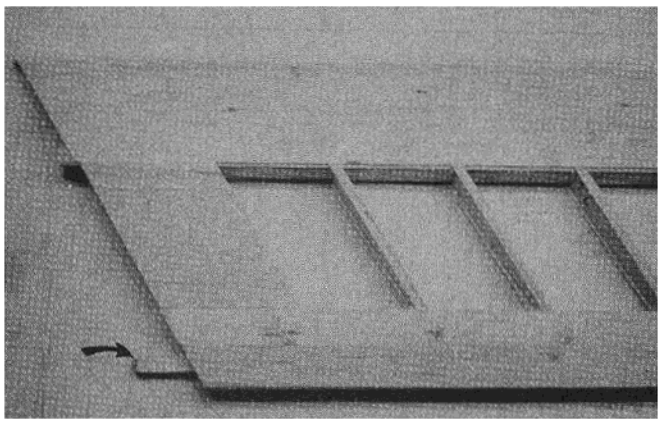
**Designed By:**
Don Sobbe
**TYPE AIRCRAFT**
Sport
**WINGSPAN**
41 Inches
**WING CHORD**
11¾ Inches
**TOTAL WING AREA**
481¾ Sq. In.
**WING LOCATION**
Low Wing
**AIRFOIL**
Symmetrical
9.4% Section
**WING PLANFORM**
Forward-Swept
Constant Chord
**DIHEDRAL EACH TIP**
1/4 Inch
**O.A. FUSELAGE LENGTH**
42½ Inches
**RADIO COMPARTMENT SIZE**
(L) 11¾" x (W) 3" x (H) 2⅝"
**STABILIZER SPAN**
18 Inches
**STABILIZER CHORD (incl. elev.)**
6¼ Inches (Avg.)
**STABILIZER AREA**
112½ Sq. In.
**STAB AIRFOIL SECTION**
Flat
**STABILIZER LOCATION**
Top Of Fuselage
**VERTICAL FIN HEIGHT**
5½ Inches
**VERTICAL FIN WIDTH (incl. rud.)**
6¾ Inches (Avg.)
**REC. ENGINE SIZE**
.40-.45 2-stroke
**FUEL TANK SIZE**
8-10 Oz.
**LANDING GEAR**
Tricycle
**REC. NO. OF CHANNELS**
4
**CONTROL FUNCTIONS**
Rud., Elev., Throt., Ail.
**BASIC MATERIALS USED IN CONSTRUCTION**

| | |
|---|---|
| Fuselage | Balsa, Ply & Lite Ply |
| Wing | Balsa & Spruce |
| Empennage | Balsa |
| **Wt. Ready To Fly** | **64 Oz. (4 Lbs.)** |
| **Wing Loading** | **19.16 Oz./Sq. Ft.** |

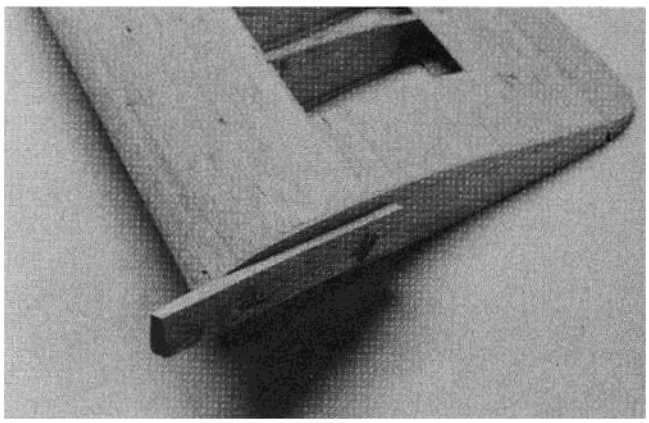


*It's a long way from the wing saddle to the firewall, but by passing a piece of fuel line through from the front and connecting it to the tank, it's easy to pull the fuel tank into position.*

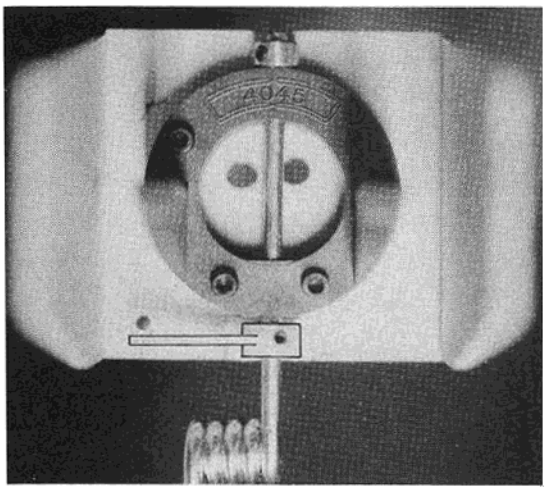
centerline. In order to locate the bulkheads, lay the fuselage sides over the plan and use the extended bulkhead lines and a ruler to mark the bulkhead locations on the sides. Next, glue the 1/2" triangle stock to the sides. (The entire model can be assembled using CA and CA+.) Remove the portion of this stock that extends into the stabilizer saddle and taper the remaining portion, as per the plan view. Make sure that the triangle stock ends flush with the F-1 bulkhead pencil mark. Mark the centerline on all bulkheads. Glue F-2 and F-3 to one side. Make sure they're square to the side. Stand this assembly upside down on the workbench and glue the other side in place. Pin this inverted assembly over the plan view with the forward fuselage flat on the plan. Install F-1, F-4, the bottom 1/4" sheet and aft lite ply bottom sheet. Remove the fuselage from the plan and install the fuel tank supports. Place the fuselage aside and build the wing next.



*3/8" x 3/8" jig (arrow) under wing keeps everything straight during construction. Finished wing is very stiff (see text).*



*After the wing panels are joined, the wing tips tend to get banged around. Pinning some scrap to each tip will save them until construction is complete.*



*Nose gear installation in nylon mount. Steering arm is outlined for clarity.*

## CONSTRUCTION

**Fuselage:**

Note that the top edges of the fuselage sides are not parallel to the

**Wing:**

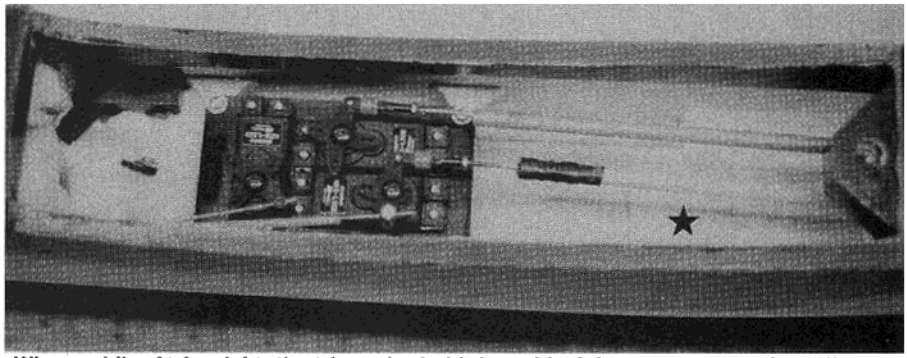
The entire wing is constructed with CA+. Since the ribs are installed at a 30° angle, it is very important that they are all the same length, otherwise, the angle will exaggerate any errors. Only the edges of the ribs will touch the leading and trailing edges. Don't worry about that as the CA+ will create a fillet giving the joint enough strength.

Construct the wing in the following sequence. Pin the bottom spar and the 3/8" x 3/8" jig in place on the plan. The jig is actually a 36" piece of 3/8" x 3/8" balsa. Pin it to the locations shown on the plan. Then lay a straightedge alongside of it and pin the center portion to the plan. This will insure that it is straight. Glue the ribs to the spar. Add the trailing edge, 1/8" shear webs, top spar and leading edge cap. After sheeting, turn the assembly over and again pin it in position on the jig. Install the landing gear block and 1/16" sheeting. Remove the wing from the plan and install the leading edge, wing tip and aileron torque rods. Be certain that they exit the top of the wing at the location shown on the plan since they move at an angle to the fuselage sides and may not have enough clearance if they exit at the wrong location.

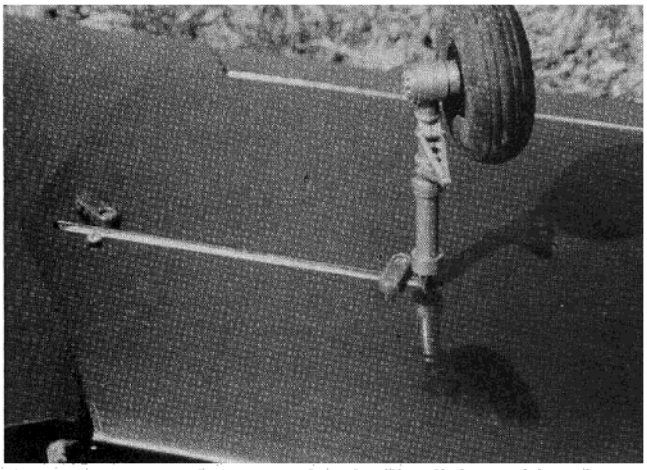
After the wings are assembled and sanded. Lay both panels upside down on the workbench with the 3/8" x 3/8" jig under the root ribs to provide 1/2" dihedral. Join the wings with CA+. The center section may now be fiberglassed.

**Mounting The Wing:**

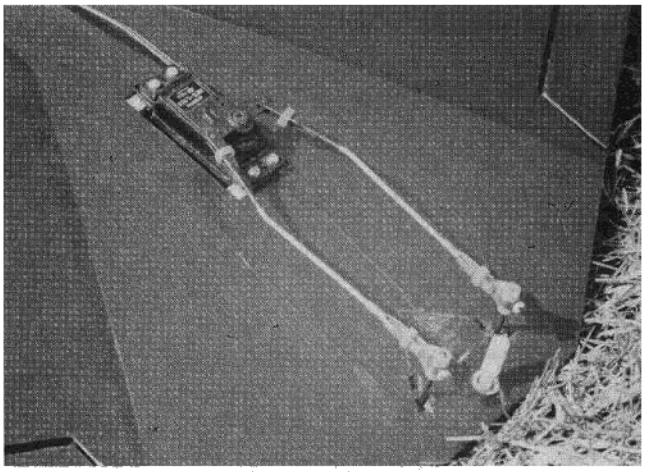
Install the 1/4" dowels and set the incidence at zero, relative to the firewall. A Robart Incidence Meter



*Wing saddle. At far right, the triangular hold-down block is necessary to clear aileron torque rods. Light colored square, to the left of the hold-down block, is the web that ties the top sheeting together (indicated by a star).*



*Storing a forward swept wing is like living with a large boomerang. To save storage space in the shop, Don installed Vortac's new gear locks, which allow him to remove the main gear in seconds without using any tools.*



*Aileron linkage. Due to the large sweep angle, the torque rods pivot at an angle to the centerline. Note single Vortac captive wing bolt. More in text.*

will come in handy for this. Square the wing to the fuselage and positon the 1/2" plywood hold-down block against F-3. Rotate the torque rods back and forth, checking that there is enough clearance. Then, glue in the hold-down block. Drill a 3/16" hole through the wing and hold-down block. Tap the block with a 1/4"-20 tap. Using a drill or round file, enlarge the 1/4" hole in the wing to 3/8" to accept a Vortac captive wing bolt. Bevel the edges of the hole to clear the bevel on the bolt sleeve. Insert the sleeve in the hole and trace around the top with a pencil. Remove the 1/16" sheeting inside the penciled circle and the sleeve will recess flush with the surface. It can now be secured with CA. The excess portion of the sleeve that extends above the top sheeting can be trimmed off with a razor saw.

Don't be concerned about using only one bolt to mount the wing. These bolts are capable of supporting far greater loads than this wing will ever impose on them. I ought to know, I designed them.

**Landing Gear:**

The plan shows a nylon engine mount. Drill a 5/32" hole through the backplate of the mount and install the nose gear as shown. Since the nylon will spread away from the drill as it penetrates the mount, I recommend drilling the hole slightly oversize with a .159" #21 drill. This will result in a finished hole of 5/32".

Forward swept wings tend to be a little unhandy to store at home and this problem can be eased if the landing gear can be taken off for storage. For this reason, I have shown the gear blocks flush mounted with the 1/16" sheeting. (This is so you'll have a tough surface next to the place where the screwdriver slips.) Or, you can install Vortac's gear locks, then you'll be able to remove and install the main gear in a few seconds, and without using any tools!

**Final Assembly:**

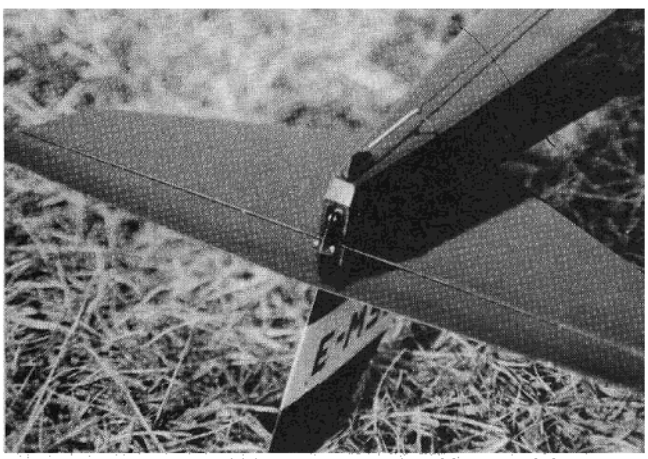
Mount the top front 1/4" sheet on the fuselage. Before mounting the rear 1/4" sheet, bevel the underside as per the plan. This will provide a slot for the stabilizer. Temporarily fit a piece of 1/4" sheet scrap on the stabilizer saddle to check fit this part. After gluing the top rear sheet in place, apply CA + to the web and press it into place so that it bends and makes contact with both of the top sheets. Don't omit this part as it ties the top sheeting together and will prevent the joint from cracking. Fill in the cowl with scrap balsa and carve and sand the fuselage to final shape. Then, remove the 1/4" scrap from the stabilizer slot.

The stabilizer should be mounted with zero incidence. After it is glued in place, remove the portion of F-4 above the line shown on the plan. This will provide the clearance for the tail horn. The wing/fuselage fairing can be built up from scrap or carved from sheet stock.

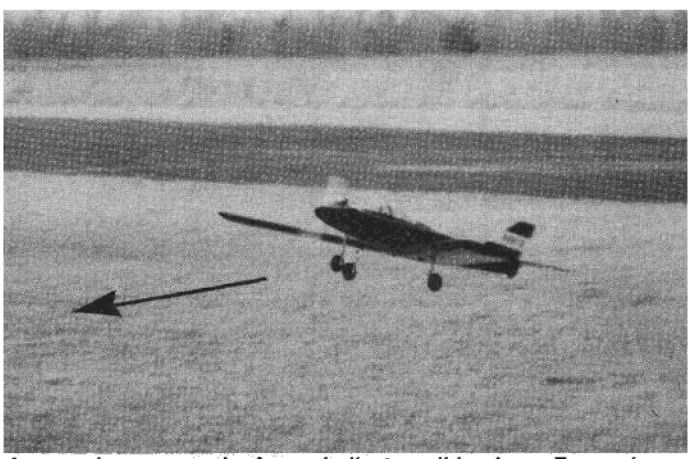
**Radio:**

The plan shows the recommended servo locations. Your model will probably come out slightly tail heavy, so mount the servos as far forward as is practical.

Set the elevator throw at 5/16" up and 5/16" down, measured at the centerline. Forward swept wings tend to be pitch sensitive. Trust me, 5/16" is enough throw to do anything. Because



*Shot of tail horn and skid. Elevator pushrod has straight run to servo, accessible from either end.*



*A very slow approach. Arrow indicates glide slope. Forward swept wing also allows this model to fly very fast.*

the wing is sensitive to small elevator movements, without being squirrly, be certain that there is **no slop** in the elevator linkage. Of course if you have a dual rate radio and want to do four foot diameter loops, set the high rate at 3/4" up and 3/4" down.

Set the aileron throw at 1/4" up and 3/16" down. Set the rudder throw at 3/8" to 1/2" each way.

**Finish:**

The model shown in the photos was MonoKoted. The wing loading is quite low so use whatever finishing method you prefer.

**Weight And Balance:**

The finished model should weigh about 64 oz., without fuel. For the initial flights, balance the model at the location shown on the plan. The rear limit of the C.G. range is 1/4" aft of the C.G. shown on the plan. At that location the model will be pitch sensitive at full throttle, so be careful. The forward C.G. limit is 1/2" ahead of the C.G. shown in the plan. At that location the model will tend to mush out and lose airspeed during Hi-G turns. I don't recommend it.

Although not critical, I would suggest that you balance the wings. This will improve any model's handling in looping maneuvers. To do this, tie some string around the prop shaft and tail skid. Invert the assembled model and hang it from the ceiling. Add weight to the light wing until the model hangs in a wings-level attitude.

**Flying:**

If balanced where shown, the FSW-3 will handle as well as any sport model and has no bad habits. With a hot engine up front, it's both a rocket ship and a pussycat. The forward swept wing is highly resistent to stalling and spinning, making this one of the safest sport models I've flown. In fact, the only way I was ever able to get anything resembling a spin was to use an extraordinary amount of elevator and rudder with opposite aileron; not recommended.

With the throttle closed, and a high angle of attack, you'll find that this wing can develop some very stable and high sink rates. It's like having an automatic flap. This can be a blessing when you're forced to make a dead stick landing way out in the boondocks. Since stalling isn't a problem, simply feed in some up elevator and the FSW-3 will come down like it's on a parachute. But, as long as the glide speed is kept up, the model will maintain a flat glide and normal landings are very easy.

Since the wing is capable of flying at high angles of attack, slow approaches with short ground rolls are safe and easy to do. Before turning final, slow the model down and start pulling the nose up to slow the sink rate. As the nose rises, add about 1/4 throttle. From this point on you will be looking at the bottom of the airplane until it touches down. Don't be afraid to use power during an approach at high angles of attack. Power is what will control the model's sink rate. This is called flying the angle of attack. It's a lot of fun and easy to learn (see "Let's Talk about Landings," Dec. '84 RCM).

With dual rates, it's quite easy to do continuous Lomchevoks. How about five or six at a time!

The FSW-3 can do a few other interesting maneuvers, but I'll let you have the fun of discovering them yourself. Welcome to the future. □

**From RCModeler Feb. 1987**