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IN THE WORLD of high-performance Thermal Soaring, Roto-Flap is new, challenging, and exciting. A highly effective and practical system of control for the Thermal Soarer, it may provide a basis for developing a new generation of sophisticated Soaring machines yielding unprecedented performance levels.

The boxy Roto-Raven is a quick and easy way to get acquainted with Roto-Flap while amply demonstrating the system's viability and potential.

Roto-Flap offers the following advantages: 1) Ailerons and elevator (or all-moving stab) are eliminated. 2) Camber changes are accomplished by *one* servo operating long, dedicated flaps. 3) Airspeed for precision landings is much slower than in "crow" (flaps down, ailerons up), and the ship still turns very well. 4) The overall hardware count and current drain are reduced. 5) Airframes can be simpler and lighter. 6) No more than a four-channel receiver is needed. 7) Only the most commonly used transmitter controls are needed.

In contrast to conventional use of as many as *four* servos for camber/flap operations, Roto-Flap does it all with *one*. This greatly simplifies installation and operation.

Roto-Flap requires a transmitter with elevon mixing function. In Mode 2, turn and pitch are on the right stick, flaps are on the left. The trim tab reflexes the flaps. Two servos rotate the panels for pitch and turn. Add flaps and you have Roto-Flap. A simple mechanism called the Flap-Mo (flap mover) makes this possible.

A key to the concept's success is the swept rudder post. This generates a pronounced *up*-elevator effect with rudder input. The nose is held up without increasing the incidence of the rotating panels. There is no unusual tendency to stall in a low-speed turn. Further, *down* flap can be smoothly coordinated as part of the turning technique. This is especially helpful in keeping the nose up in a turn.

The panels operate differentially to avoid adverse yaw from, and excessive angle of attack in, the upturned panel.

Once you've built and flown the Roto-Raven, it's time to use your creativity! Help develop the concept and a new breed of sleek and efficient airframes that will tap the Roto-Flap's potential. Let's see some Roto-Eagles, Roto-Condors, Roto-Hawks, and Roto-Falcons! However, Roger-Roto is taken. This slicked-up Two-Meter ship is my next project.

The completed model showing its basic slab-sided fuselage and solid tail feathers. The wings may be built up or made from foam cores (the plan shows both). The long, dedicated flaps are used for camber changes and slow landings.

Roto-Raven

The revolutionary control system used in this model promises a new frontier in Thermal Soaring. Build our author's test bed prototype and find out for yourself how simple Roto-Flap is to install and operate. With its 78-in.-span Selig SD7032 airfoil wing, this flier can soar with the best.

■ Harley Michaelis

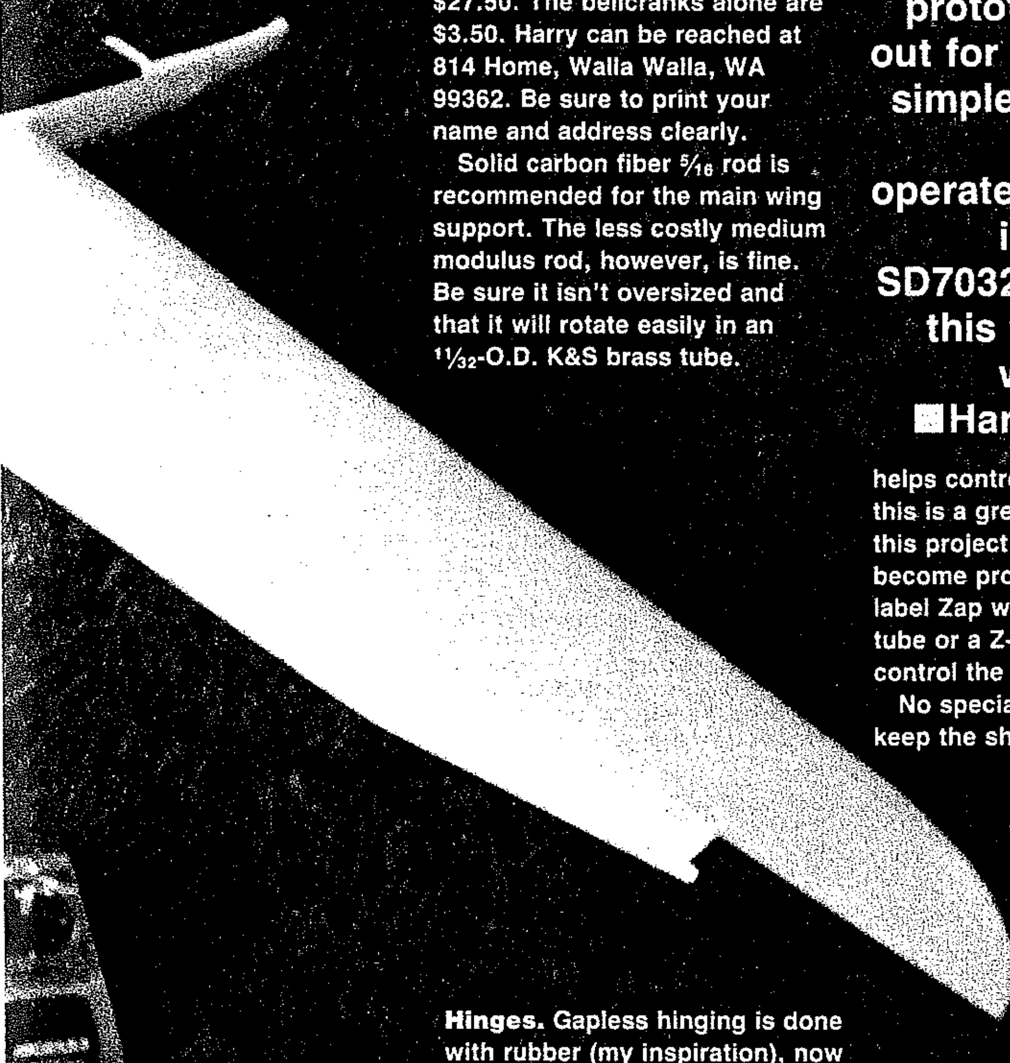
The Roto-Raven employs the new, superior Selig SD7032 thermal airfoil designed for use with flaps.

Construction

All Roto-Raven prototypes built to date have had foam-core wings. However, the plans detail a familiar D-box built-up wing. The computer-generated airfoil plots for the rib outlines for both built-up and foam-core wings are included in the full-size plans. A sidebar at the conclusion of the text explains their use.

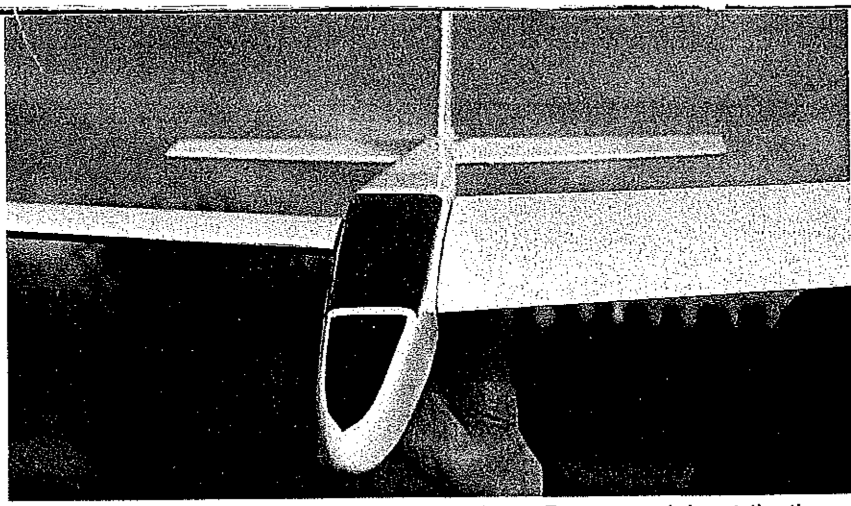
My friend Harry Smith can provide you with some dandy 32-in. foam cores and the special bellcranks required at a cost of $27.50. The bellcranks alone are $3.50. Harry can be reached at 814 Home, Walla Walla, WA 99362. Be sure to print your name and address clearly.

Solid carbon fiber 5⁄16 rod is recommended for the main wing support. The less costly medium modulus rod, however, is fine. Be sure it isn't oversized and that it will rotate easily in an 11⁄32-O.D. K&S brass tube.

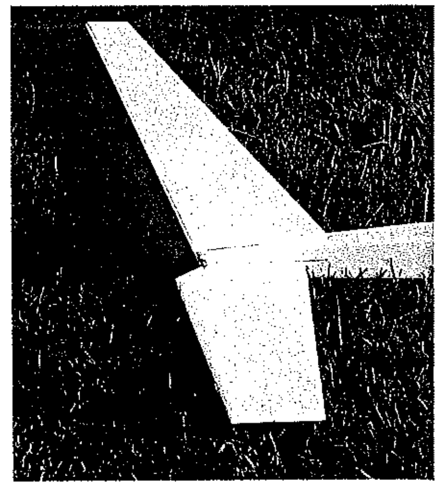


Hinges. Gapless hinging is done with rubber (my inspiration), now packaged by Ace RC as Harley's Hinges, stock #50L317. Surfaces butt fit and pivot at their edges. Flaps easily drop a full 90°. The slight tension from the rubber helps control flutter. Fellows, this is a great way to hinge. Use this project as an opportunity to become proficient at it. Pink-label Zap with the small Teflon tube or a Z-end is needed to control the application.

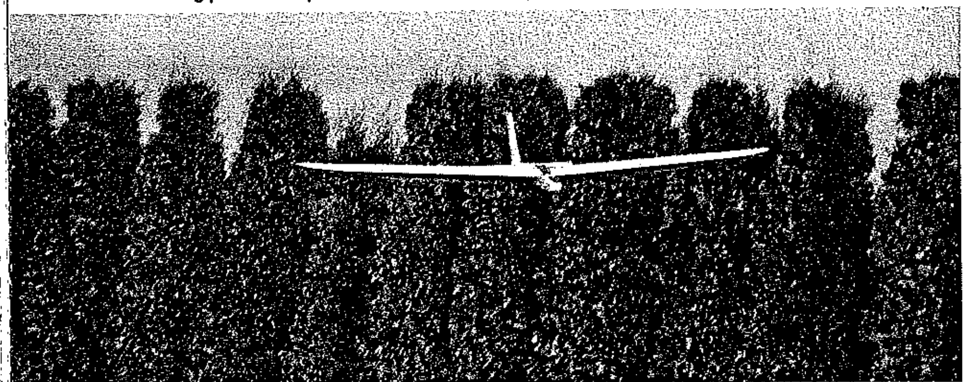
No special effort was made to keep the ship light since it was intended only as a test bed for the Roto-Flap system. The fin and rudder may be quickly built from solid sheet, but use very lightweight stock.



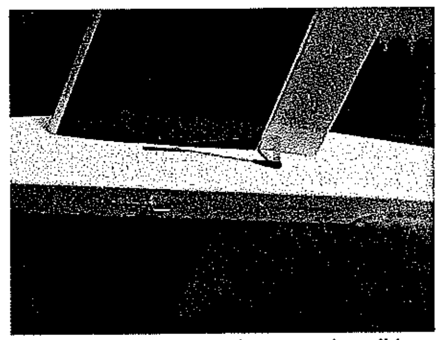
This close-up shows the wings in an exaggerated left turn. Turns are made by rotating the entire wing panel. The panels move differentially, with little *up* movement, to avoid adverse yaw.



The swept rudder post generates an *up* elevator effect that keeps the nose up in turns without increasing the incidence. Since the wing panels also rotate for pitch control, there is no need for traditional elevators.



Roto-Raven in flight. The Roto-Flap system allows fast, easy penetration, along with slow, controlled flight for circling in thermals and precise landing. A transmitter with elevon mixing function is required. Dick Stuart took this and all the preceding color photographs.



Arms that swivel freely in turns also slide fore and aft to operate the flaps. Note the tow hook located at the center-of-gravity.

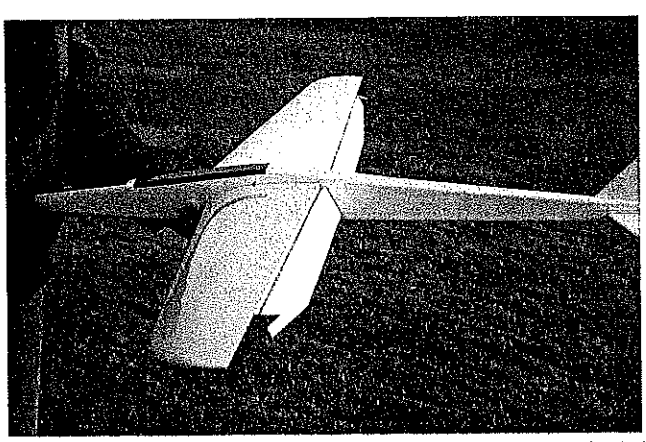
Several of the accompanying photos should clarify the toe-hinging procedure. Make the slots, face around the hinge lines with covering material, then slit and heat seal the raw edges into the slot. Slip in the T-fitting, and attach the hinges with CyA (cyanoacrylate glue). Trim any excess, and finish covering.

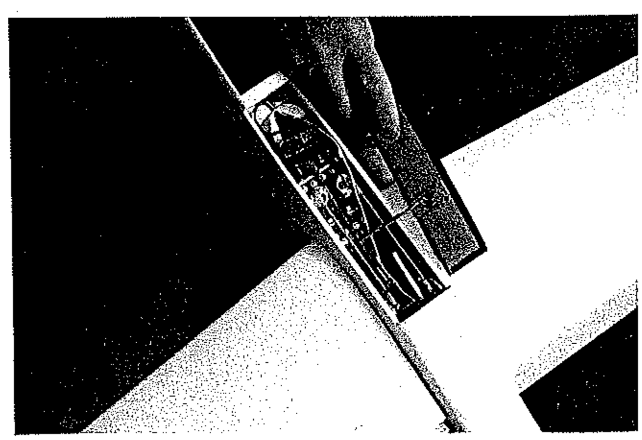
Fuselage. Study this section thoroughly before picking up your tools. The turn and pitch servos can be standard-sized with around 50 oz./in. torque. The up-front rudder servo can be tiny. The flap servo should be squat, with possibilities including the Ace Bantam Midget (which has a quite long arm in the included output arm set), the Airtronics 94831, and the discontinued Airtronics 94461. This simplifies keeping the horizontal slot in the sides in a low position, so that down-rotated bellcranks can clear the slots yet still clear the hatch. A low slot assures ample reinforcement around the main tube. Note these relationships on the plans and in one of the photographs.

Tack two sheets of medium-density ⅛-in. balsa together and cut out the two slab sides for a precisely matched set. The longer leftover scrap pieces are joined together to form the bottom. Mark an accurate centerline down the bottom.

Flap-Mo. This simple mechanism is shown in one of the photos. Swiveling arms fit into a tube soldered across the slider. As the slider moves fore and aft, the flaps are lowered or raised. The unit mounts on the tow hook block shown in another photo.

Slider. Fashion this unit as shown on the plan, but a bit overlength. The final length and the spacing of the end blocks will vary from case to case. You want about ¼-in. of slider motion for reflex and about ¾ in. for

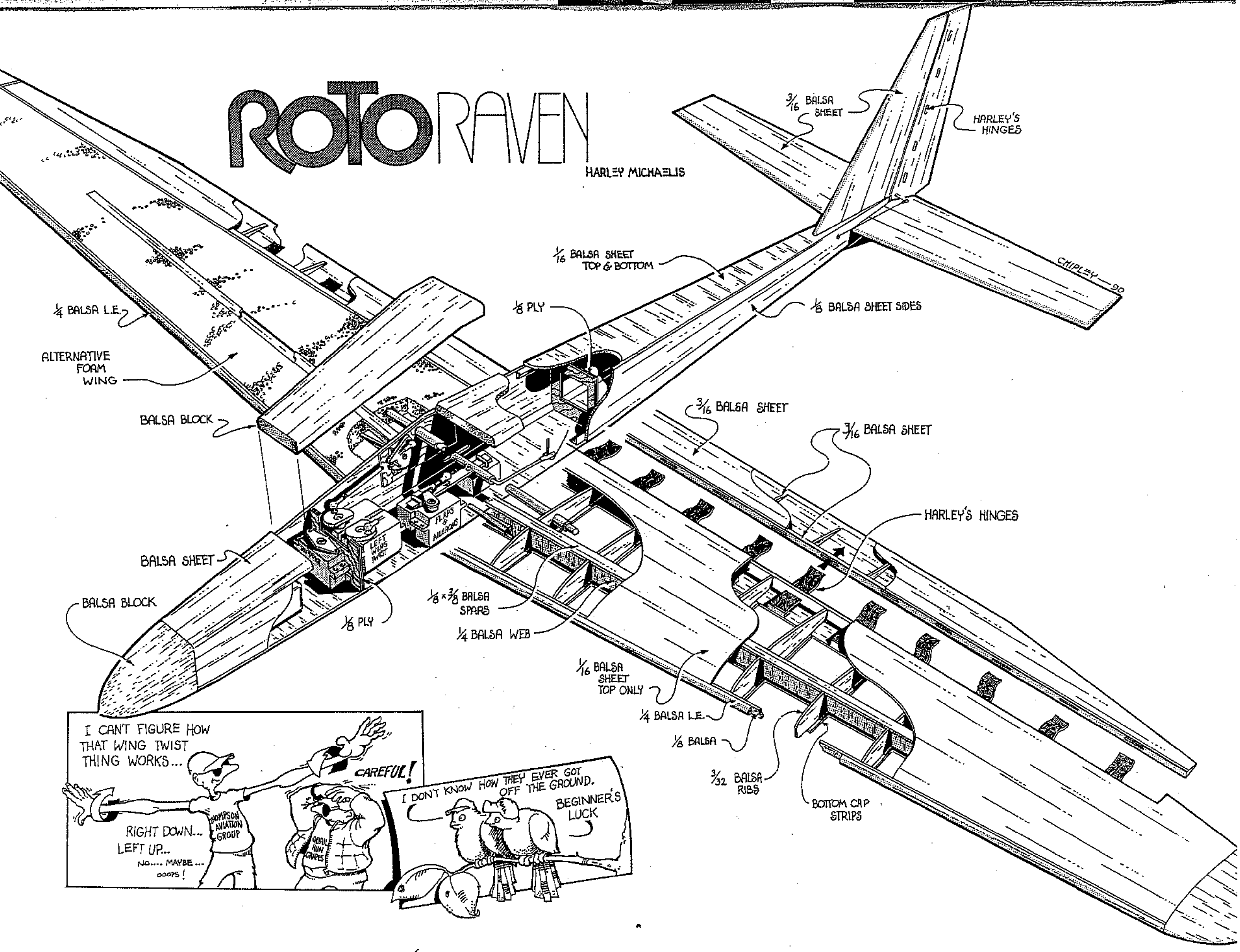


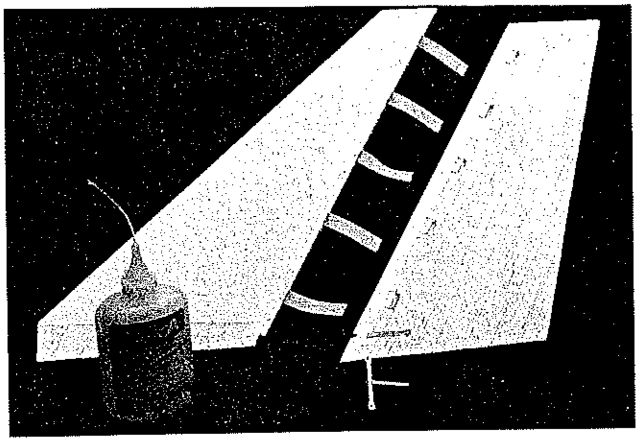


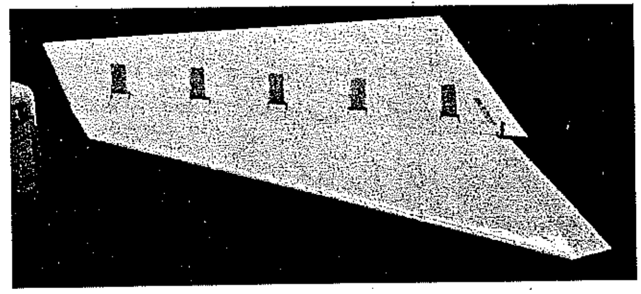
Left: Wing incidence lowers with *down* flap to provide automatic pitch compensation. Rubber Harley's Hinges (Ace RC) provide a butt fit under a small amount of tension to control flutter. Right: The entire Roto-Flap system is compact and will fit nicely in a typical Two-Meter ship.

ROTO RAVEN

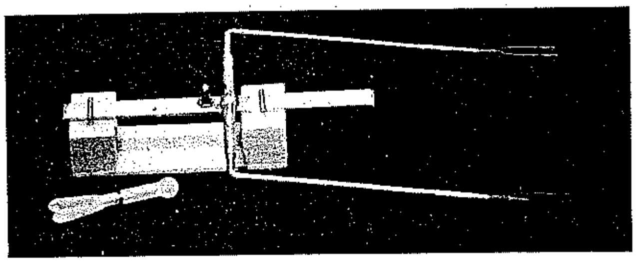
HARLEY MICHAELIS

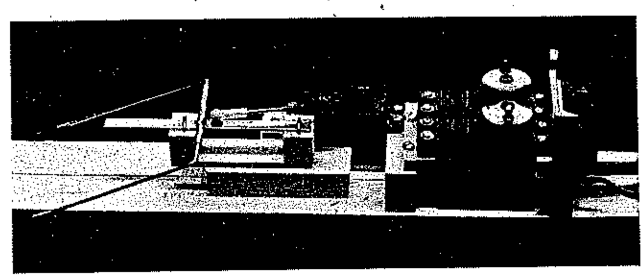




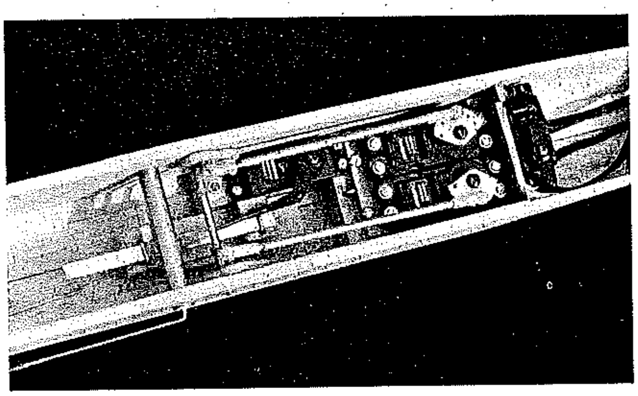


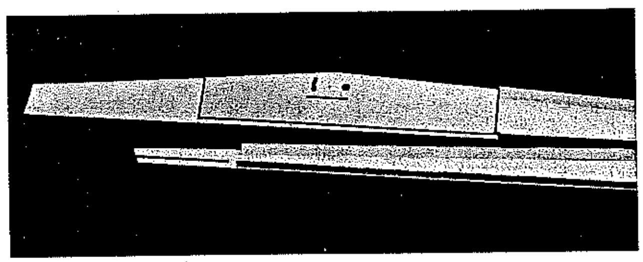
Left: In rubber hinging, a wrap of covering material is sealed around precut slots. The covering is then slit and sealed inward. The inserted hinges are wick joined with thin CyA. Note the T-fitting next to the rudder. Above: The rubber hinges extend through slots cut in the rudder and exit along one side. The end hinges and one in the center are slightly tensioned, and all are secured with a drop of CyA, then trimmed with a slight amount of excess for later removal when necessary. The T-fitting for the control cables can be seen installed.





Left: The Flap-Mo unit with its swiveling arms that link to the flaps. As the slider moves to the left, the flaps go down. When it moves to the right, the flaps reflex. Right: The Flap-Mo, connected to its servo, is shown mounted on the tow hook block behind the pitcheron servos.





Left: Links to the bellcranks are made from all-threaded rod through brass tubing. The small rudder servo is mounted sideways at right. Above: The 1/8-in. balsa slab sides have 1/32 ply doublers inside, extending from former to former. Triangular stock is set back 1/16 in. to support the top and bottom sheeting. The slot visible in the tail section of the left fuselage side is for installing the elevator.

down flap.

The horizontal slot in the slab sides (shown in one of the photos) is at the centerline of the cross tube. The Flap-Mo is shimmed as needed.

Main wing support inlays of 1/8-in. birch ply fit above the horizontal slot. Position them flush with the inside surfaces of the slab sides.

Doublers. Make matching 1/32 ply doublers to fit between the formers and down to 1/8 in. from the slab side bottoms. Make sure they're positioned identically so that the formers will be squared.

Matching holes. Carefully align the slab sides with the inside doublers, and tack them together. Mark the centerlines of the main support rod and the 1/8-in. pivot wire. The wire and drive pins are in the same geometrical plane and a bit below the main tube to better center the drive pins in the root. Check that the bellcrank will clear the slot when rotated downward, and trim it if necessary. The drive pin slot radius is taken from the main tube centerline.

Using a drill press, sharp bits, and wood backing, simultaneously drill matching holes. Make the horizontal slots.

Carve and attach the sub-nose block. Cut out formers F1 and F2. Add the rail on F1, and coat the other side with epoxy so that servo tape sticks well. Install both formers.

Cut out the bottom and top pieces behind F2. Mark them with centerlines, and cut 3/16 slots for the skid and fin. Attach a stabilizer base of light balsa to the bottom piece, then align and attach this piece to the fuselage, joining it at F2.

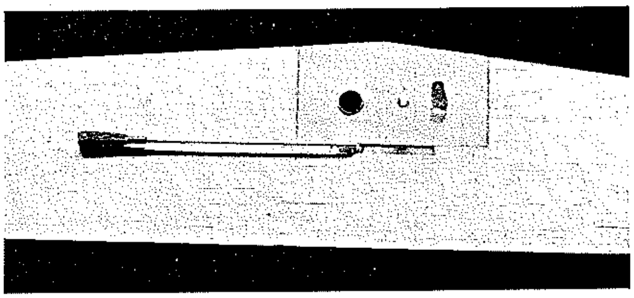
Add triangular stock, recessed 1/16 in., to the slab sides behind F2. Join the sides, making certain that all is flush and even so that the main tube is precisely squared. Add the top and bottom, and trim the triangular stock for the fin. Add the thicker top structure, then fit the hatch and the main nose block.

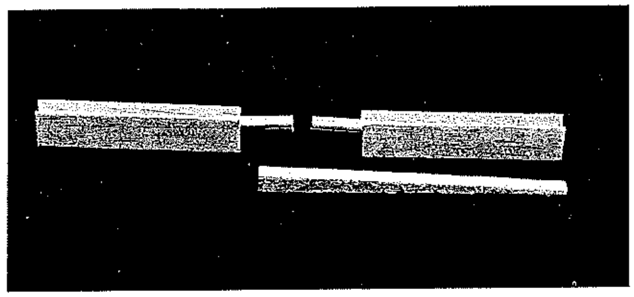
Cover the fuselage. Install the main support tube using CyA, and position it so that the ends extend 1/32 in. for panel clearance.

Contrary to what might be expected, the deflection of the panels needs to be quite large. The bellcrank design allows ample deflection, with servos that normally rotate 45° each way.

There are two ways to mechanically increase the panel rotation: 1) Before assembly, tap a second hole in the bellcranks, perhaps 3/16 in. lower, for the 2-56 ball links. The ball links can then be moved down later if necessary. 2) Blank output wheels can be customized with a larger radius.

Bellcranks. If you have access to a piece of 1/8-in. filled epoxy circuit board, you might try making the bellcranks yourself. Remember, however, that they must match precisely to work correctly. When mounting them, run the 1/8-in. wire partway through, add a thin washer, a bellcrank, two bits of tiny surgical tubing, the other bellcrank, and a second washer.





Left: The right side of the fuselage showing the inlaid ⅛-in. ply used to provide a firm base for the main wing support tube and the bellcrank pivot wire. The Flap-Mo cross tube aligns with the horizontal slot in which the swivel arms move. Right: The wing support tubes fit on a three-degree decline between balsa uprights to provide for wing dihedral. The three-degree wedge is used to achieve an accurate matching fit.

Add the skid and tailpieces. Run a thin wire through the fuselage, allowing gravity to direct it under the main tube. CyA a cable end to the wire, pull it back and out, run it through the T-fitting, and knot it.

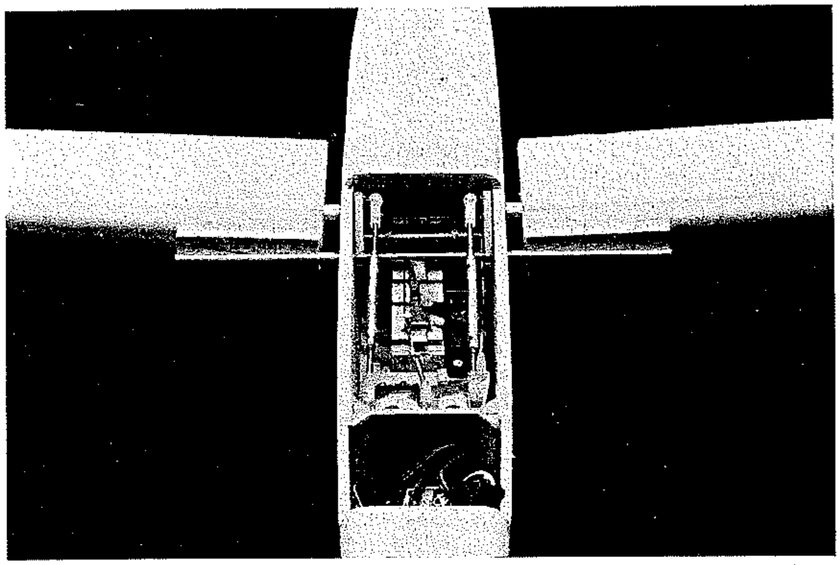
Built-up wing panels. Make the ribs according to the instructions contained in the sidebar and the rib plots included with the full-size plan. Take special care to center the hole for the main tube in the ply R1 ribs, which are then drilled simultaneously to achieve a matched set.

Make the beveled and tapered strips that butt at the hinge line by first cutting the bevel in a 3/16 x ½-in. balsa strip on a table saw or the equivalent. Pin the strip down straight and mark the taper, noting that it changes at rib R7. Cut it a hair oversized, and sand it for a fine fit.

The sequence for the built-up wing construction is as follows: Pin down the bottom sheeting and the one-inch-wide hinge line sheeting strip. Add the bottom spar, then alternately install the ribs and webs from the root outward. Install a 1/32 ply doubler in the first bay. Make the beveled and tapered hinge line strips, and notch them for hinging. Install the front strip, then add the top spar. Attach the sub-leading edge. Cleats are added where the hinges attach.

Install the main tubes and drive pins. Add the top sheeting, leading edge, and cap ribs. Build and cover the flaps, then install the hinges in the same manner as the fin. Build and install the extreme tip. Cover the top of the wing, add the flaps, and cover the bottom. Use opaque covering film to avoid subjecting the hinges to direct sunlight.

While most of the above is routine, a few areas require comment: Holes in the root and R-1 ply ribs as per the templates will build in three degrees of dihedral, with the tube just under the sheeting at the root. Notch the root to receive the tube end. Add a doubler of 1/32 ply, with the grain running fore and aft over the bottom sheeting, behind the spar. To assure matching dihedral, a three-degree wedge (having a ⅜-in. rise in 7 in.) can be made and placed under the angled tube. Be sure the tubes are parallel to the hinge line. Cut a block to fit under the tube, and glue it to the root, tube, and doubler. Reinforce around the tube so that it's well anchored. Add triangular stock wherever the ply doubler meets another part of the structure. Fill in the notch at the root.



The wing cores come in sections, as they are precut at the spar locations. One section is used in incidence and drive pin alignment procedures. Refer to this photo as you review the section of the article that explains the procedure. It really isn't that complicated.

Notches for the rubber hinges are made with a 2 x ⅝-in. strip of #50 sandpaper glued to a small block. I cut my hinges ½ in. wide and 1¾ in. long. The hinges are CyA'd to cleats along the front of the 1-in. strip. When epoxying the cleats in place, be sure to keep the pores open for attaching the rubber with CyA. Using the cleats leaves about ¾ in. of rubber free to stretch in flap reflex. Fish the ends through the little slots in the first two bays.

Loose hinge ends are wicked to the cleats under *very slight* tension. In fact, with ½-in. hinges it's sufficient to have slight tension in the end and center hinges alone, while just taking the slack out of the rest—tension in all the hinges might make it difficult for the servo to reflex the flaps. To anchor the hinges up front, invert the panel and put a small drop of CyA on the slightly stretched loose end. If no tension is to be used on a hinge, simply allow it to go slack before pulling it up against a cleat. Leave on some excess hinge, so that, if replacement should be necessary, it can be slowly pulled off without debonding.

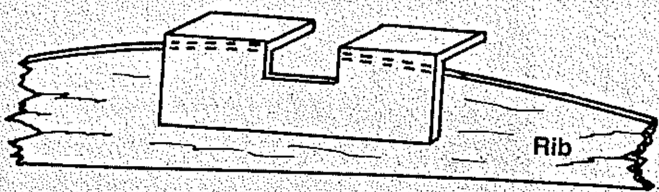
Wing incidence. Cut a strip approximately 2 x 10 in. from 1/16 balsa sheet. Angle the top at three degrees. Trim it to fit just under the main tube. Apply masking tape, and draw a series of three-degree parallel lines. Position the incidence template plot over the tape a bit lower than the wing panel, with its chord line parallel to the above lines.

Drive pin alignment. Cut two pieces of 1/16 ply or hard balsa about 2½ in. long, and jam them snugly between the spars from the root rib outward. Mount the wing panels. Run a 5½-in. piece of ⅛-in. wire through the slots in the bellcranks. With the radio on, square up the output wheels. Adjust the pushrods so that the bellcranks are identically upright and the wire is perfectly squared. Position the jammed-in ply pieces so that they contact the squared-up wire perfectly. Tack glue them to the spars. Carefully remove the wing panels. Fill in behind the ply pieces with epoxy and a balsa wedge to firmly secure them.

Cut two 2¼-in.-long pieces of ⅛-in.-I.D. brass tubing. Rough up the outsides. Remount the panels and the wire. Slip the tubes on the wire to clear the fuselage sides by about 1/16 in.

Using the incidence template as a visual reference, set one panel at three degrees. Tack glue the drive pin tube to its ply upright. Eyeball the other panel to the same incidence, and tack that tube in place. Remove the panels. Glue blocking with epoxy

Making Roto-Raven Ribs From the Selig SD7032 Plot Patterns



Note: These instructions relate to the rib plots which are provided with the full-size plans reproductions (these plots are not shown with the reduced plan printed in the magazine, as the lines are too thin for successful reproduction at small size).

Find a copy machine that reproduces a 10-in. line accurately. Make several copies to cut up. The plots are slightly overlength, leaving about 1/32 thickness for feathering into the wing trailing edge line on the plan. Bevel the inside leading edges of the ribs to about 1/64 in. to match the angle of the leading edge. Use epoxy or slow-setting CyA for assembly, and hold the panel flat so that the trailing edge comes out straight.

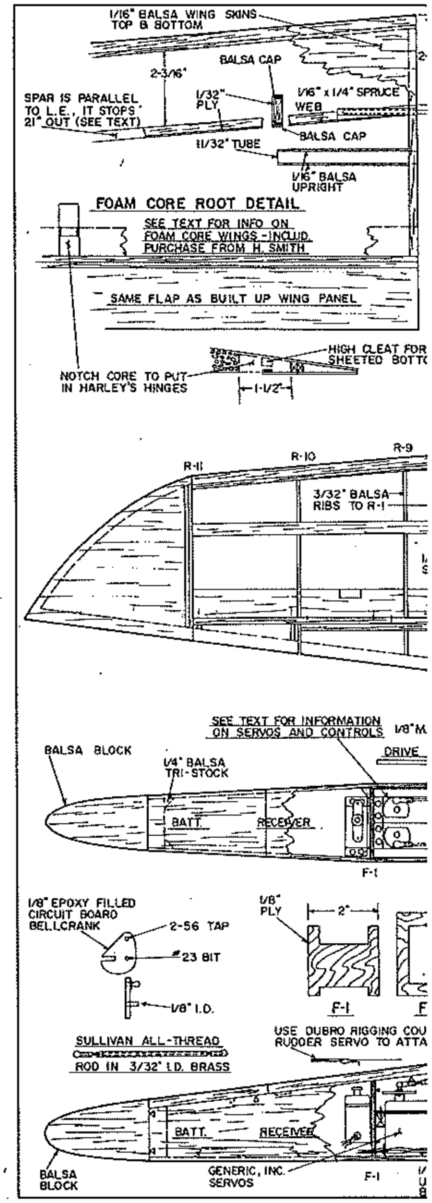
The wing leading edge is made up of a 1/8-in. sub-leading edge and the main 1/4-in. leading edge. The rib noses butt against the inside of the sub-leading edge. HL signifies the hinge line. The extension at line 14 defines the rear of the bottom spar.

Note on the root rib pattern that the top spar cants forward slightly so that the two spar segments are more closely parallel. Vertical shear webs with right angle cuts fit better with this arrangement. Because of the taper change at R7, the spars must break there in order to remain on line 14 (see the plans). For foam-core wings, use the root, R7, and R11 rib patterns. Since the spar doesn't extend beyond the main section and runs parallel to the leading edge, the cut for it is easy to make on a table saw or the equivalent. Also, because the spar originates at a different point, it's possible to more easily align and attach the drive pin. The core can end 3/16 in. forward of the hinge line, as it becomes too thin and distorted in the flap area to be useful.

Cut out the balsa ribs by first rubber cementing a pattern on 3/32 sheeting. Pin or tack glue a stack together; double the numbers if making duplicates. Make a nick at line 14. Saw the ribs a little wide, then sand them to the pattern rib line.

The root ribs can be made from 1/4-in. hard balsa, or from two laminated 1/8-in.-thick sheets. The R1 ribs are made from 3/32 aircraft ply. All other ribs are cut from 3/32 balsa sheet. Make four extra R11 ribs if hollow wing tips are contemplated. Before separating the ply ribs, carefully drill an 11/32 main tube hole as shown on the rib plot set plan. After cutting and final sanding, carefully separate the stacks and number the individual ribs.

A simple guide for making spar notches can be filed from a square aluminum extrusion (see the attached sketch). Accurate notches can be easily cut out with an X-Acto saw and knife using this jig.



above and below the tubes and even with the sheeting. Cap the end of the tubes.

To make the drive pins, cut two pieces of wire to length. Round one end of each and file notches, as shown on the plan. Attach a wing panel, and run a drive pin into the tube. Slip on the collar and tighten the setscrew, which together keep the wing panels in place. These collars are critical. Make sure they're tight. Rotate the drive pin for easy access to the setscrew. With the wing tube jammed to the fuselage and the collar to the bellcrank, wick CyA between the tube and wire from both ends. Repeat for the other panel. Trim the roots so that they're parallel to the fuselage sides with about 1/32-in. clearance.

Foam-core panels. Since foam slabs are manufactured in 96-in. lengths, 32-in. cores can be cut to yield three sets from one slab. The extreme tips can be made 1 in. longer for the 78-in. span. Of course, if you have a good stock of foam-core blanks, simply cut them to 33-in. lengths.

On the Selig SD7032 airfoil, the foam cores were cut to terminate 3/16 in. forward of the hinge line. Since too little material was left to make flaps, they were built up traditionally.

For easiest drive pin alignment, the spar is positioned a bit farther forward than on the built-up wing. Because the 5/32-in. cut runs parallel to the leading edge, it is easily made with a table saw or the equivalent. Make matching slots for the main tube assemblies parallel to the hinge line.

Cut a wedge at three degrees (3/8-in. rise in 7 in.) from 3/8-in. balsa (see photos). Trim the wedge where it's 3/32 in. high at its low edge, which is the outboard point of the 4-in. tube. From harder, 1/16 balsa, cut 3¾-in. uprights to fit between the bottom and top sheeting. Place the wedge under a tube, and tack on the two well-squared uprights in sequence. Bury the tubes in epoxy and balsa, then glue the units to the core.

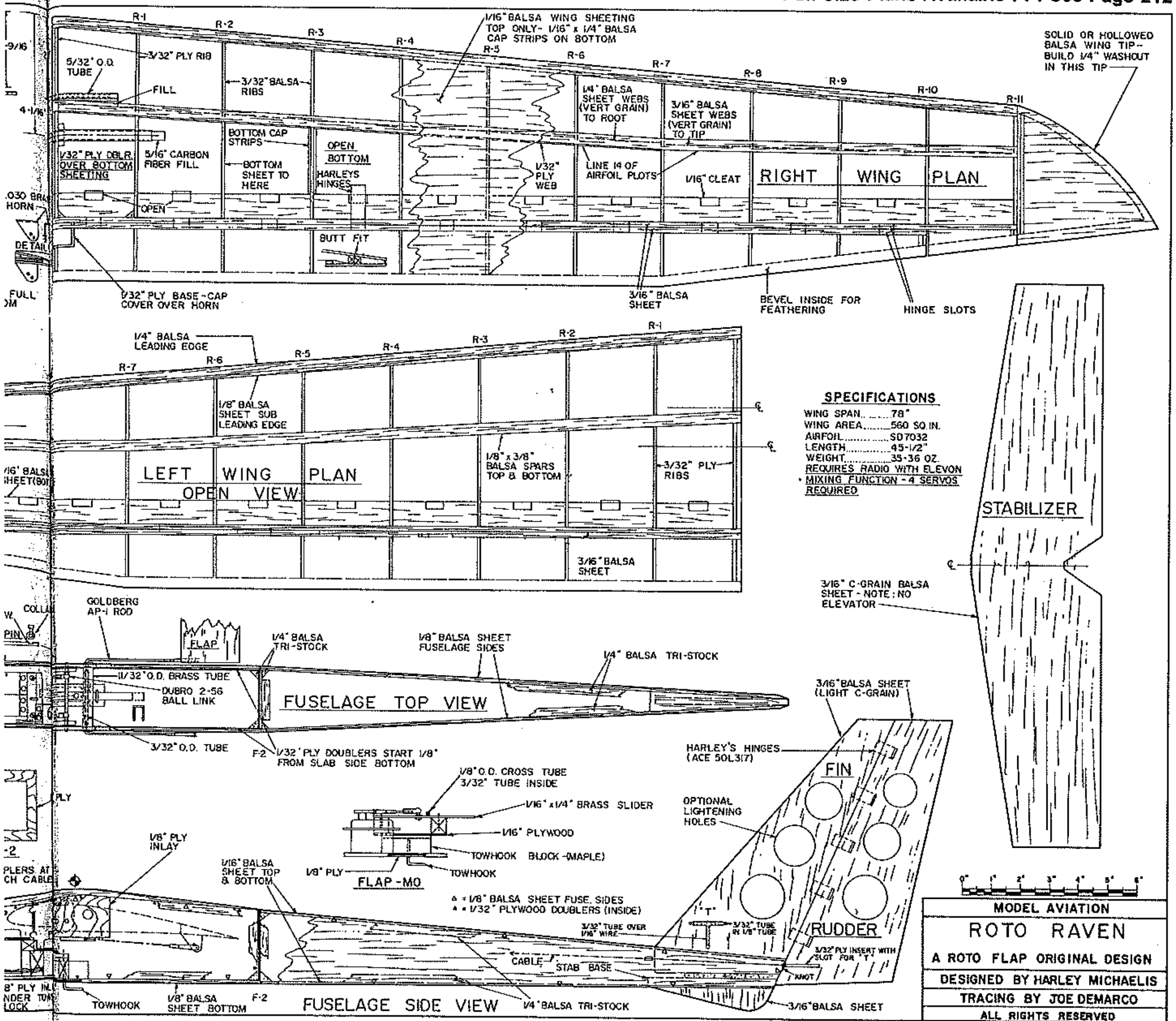
The dihedral and alignment procedures (again, refer to the photos for clarification) are similar to those described for the built-up wing panels, but using the rear core sections. The drive pin brass tubes are separated from the spar by wedges.

The spars are constructed separately, using 1/4 x 1/16 spruce and 1/4-in. shear webs. Due to the lack of parallelism between upper and lower segments of the airfoil, the spar assemblies can be made a little under the indicated height, then shaped to the core contours with soft balsa. A long strip of 1/32 ply is placed on one face of the assembly.

After the drive pins are well anchored, install the spar and the front section of the core. Add the 1/4-in. root ribs, and fill around the tubes with epoxy.

Prepare the 3/16 hinge line strips to match the core height and slope along the hinge line so that they fit between the skins. Cut ½ x 1½-in. notches in the cores where the

Full-Size Plans Available . . . See Page 212



rubber hinges are located.

Easy skinning. The thick green-label UFO and Hot Shot accelerator from Satellite City make skinning to foam exceedingly quick and easy. Try this simple technique: Prepare the skins, and spray them with Hot Shot. Avoid spraying the core material.

Apply a bead of UFO to the core perimeter and any wood edging (leading, trailing edge, end cap, etc.). Also apply the UFO chordwise at two- to three-in. intervals. There is no need to rush, as the thick UFO sets very slowly.

With a core bed flat on the workbench, lay the skin in it. Press the core to it with the other bed. The UFO fires in seconds and the skin is on for good. Washout will be faithfully preserved. No weighting; no waiting! Repeat the process for the other side.

The top and bottom cores can be fully or partially sheeted. Skin the underside so that there's at least ¼ in. of overhang all around. If doing partial sheeting, use a 1-in.-wide strip of $\frac{1}{16}$ balsa along the hinge line in the same manner as on the built-up wing.

If full sheeting is used on the bottom, cut through the bottom skin to make access holes 1¼ in. long, leaving ½ in. of skin at the hinge line before adding the top sheeting. Sheet the top, then install thicker hinge anchor cleats. A tweezers made from a ½ x 2½-in. piece of .030 aluminum is a handy tool with which to grab hinge ends.

Flaps. Cut the bottom to shape, and bevel the rear edge to $\frac{1}{64}$ in. This is easily done on a Dremel table saw with the blade tilted; practice on scrap. Add the hinge line strip, avoiding glue at the notches. Cut out and install the ribs. Make matching brass horns, and install them between layers of $\frac{1}{32}$ ply. Add balsa fill overhead, and then install the top sheeting.

The extreme tips can be solid or hollow. A solid tip could be shaped and a cutout made for a rib or two. If a hollow tip is preferred, cut the bottom to size, add a ¼-in.-thick rib or two laminated ⅛-in. ribs, then cut the top oversize and wick it in place. Be sure to include a bit of washout in either type of tip.

With the flaps pivoted as shown, the area distribution is about 40-60%. The subject of distribution around the pivot point in relation to servo power and overall area seems to warrant broad investigation. With 50 oz./in. servos, the 40-60 split produced normal operation in typical launch and thermal procedures. Such things as snap rolls during a high-speed zoom or dive may be another story.

Flight preparation

Initially, adjust the travel pots for maxi-

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:y/Preston

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ted, and I had to apply power. No ıded short, into the rocks and tall 'hich hid the plane. I couldn't hear e, but I didn't see any dust rising lying, so I figured that I got away

iced that I was going to have to runway to retrieve my plane. I o be sure that no one was landing, › cross, when suddenly my plane to the air and did the darndest ver- I have ever seen! I couldn't be- it I was seeing, but reacted franti- rying to gain control and stop the ıtions of the plane. I had zero con- it stalled out, went into a big loop, the bottom of the arc (I got lucky). : I *did* see the dust and parts fly, : eternal optimist said, 'It's repair-

vhat caused the plane to come to :ake off on its own? At least two irst, I couldn't see or hear the en- it was running—even though I had le trim clear back for cutoff. ıd, I violated one of the basic rules /ing: Always turn off the receiver [had assumed the engine wasn't and since I had the only radio on 's, it seemed safe to turn off the ɜr. Wrong! Something—or some other radio—swamped mine and sent the plane flying again, out of control. Fortunately it crashed without hurting anyone.''

The message is clear. *Always* turn off your receiver *first!* And remember: ''The flight ain't over till it's over!''

The second ''switch-sequence incident'' was described by Gene Martin in the Wiregrass RC Club newsletter (edited by Harvey Yoder). The incident occurred while Gene was competing in a club fun fly.

''My Big Stick 40 had landed in the grass beyond the runway and was suddenly possessed by the urge to run amok. It came back across the runway, roared past me as I tried futilely to control it, and narrowly missed several people before destroying itself against the tailgate of a pickup truck. I have never felt as helpless in all my life.

''After a lot of good-natured kidding from everyone present, I started examining the plane to try to find out what had happened. Everyone agreed that I had lost radio contact with the model—but why?

''I have the radio out, and it is going to be checked, but I think the problem boils down to pilot error. How in the world can I say that? Simple. I honestly believe, in reviewing what happened, that after the plane landed I assumed the engine was dead and turned the transmitter off. No big deal unless you have a PCM radio with a fail-safe.

''My five-channel Futaba PCM is factory programmed to pull the throttle back to about one-eighth of full if the plane loses its signal in the air. That's great; but if the plane is idling on the ground, guess what? It suddenly accelerates to one-eighth throttle.

''Everything happened so fast that I am not 100% sure if the transmitter was on or off. However, when we got to the truck where the plane had crashed, the transmitter was off. So I am pretty sure that I am the culprit. PCM radios with fail-safe are great, but please remember that if you lose the signal in the air or on the ground, the throttle is going to move.''

Wind penetration: ''The wind penetration of the F-86 had to give it That statement appeared i port of the April 1990 Tc test. The statement conce second-place aircraft, whi lett F-86F Sabres.

At a recent Scale cont bumped into a good frie whom I hadn't seen in qui reads this column and sug thing controversial goin downwind-turn myth?

So, correct me if you There is no such thing as ɡ penetration when it come or full-scale flight perfor: ing sentence in this segı fully counterclockwise.)

Use plenty of rudder throw at first, and *be sure* you flip the switch to couple it to the right stick. If the nose comes up too much with rudder input, reduce the deflection so that it just stays level in a turn. For lazy, hands-off thermaling, a bit of rudder trim will keep the plane level.

The balance point shown, along with three degrees or so of incidence, should produce nearly normal level flight and liberal self-recovery from a hands-off dive. Since there's no elevator, wing incidence is adjusted by the pushrods for level glide. Hand glide the model, making throw adjustments until it handles to your satisfaction, just as you would for ailerons and elevator. Get the feel of things before towing.

Towing. The tow hook position shown on the plan provides a very steep climb. You may want to locate it farther forward in the beginning. Tow and fly without flaps initially. When you get enough altitude, do the hands-off dive test. If the airplane "balloons" too much, balance farther back and retrim down at the leading edge. You want just a bit of hands-off dive recovery for best handling and performance.

Check the flap effect at a safe altitude. If the ship dives, take out some of the pitch compensation. If it still wants to stall with pitch compensation maximized, reduce the flap travel, increase the "elevator" travel, or push the "elevator" stick forward as needed. If you have a transmitter with an elevator preset trim switch, you could adjust it for some "down elevator" with full-down flaps.

Flap manipulation with turn and pitch may be used to fly a Roto-Flap ship. If your transmitter has stick assemblies with horizontal cylinders, manipulate the flaps during launch and turn with your thumb on the cylinder. In turning, you can input a bit of down flap to help keep the nose up rather than increasing the wing incidence, which would risk a stall at lower speeds.

The Roto-Flap control system can open up a whole new world of Soaring challenges. Give it a try!

Nats General/Mankowski

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and Radio Control National Championships were held on this site, some of the managers and directors for these categories came early to ensure that a variety of surface and site preparations would take place in a timely fashion.

The Event Directors for the 1990 National Model Airplane Championships should be congratulated one and all for being able to assemble on site extremely good official crews. The '90 Nats was one of the smoothest-running events in recent memory, perhaps even the smoothest-run Nats of all time!

There are many forces at work when we think of a Nats as being a good one or not. The local community enthusiasm expressed in its smiles, its welcomes, the advertising and the banners and signs hung all over the towns of Vincennes and Lawrenceville seemed to put all the arriving con-