#575

scorpion 60

A BRIEF GLANCE at this year's AMA sanctioned contest calendar is sure to point out a definite trend that began a number of years ago—an increasing number of low pressure competitive events generically thrown together under the heading of "fun-fly." From a pressure standpoint, fun-fly events are to Pattern con-

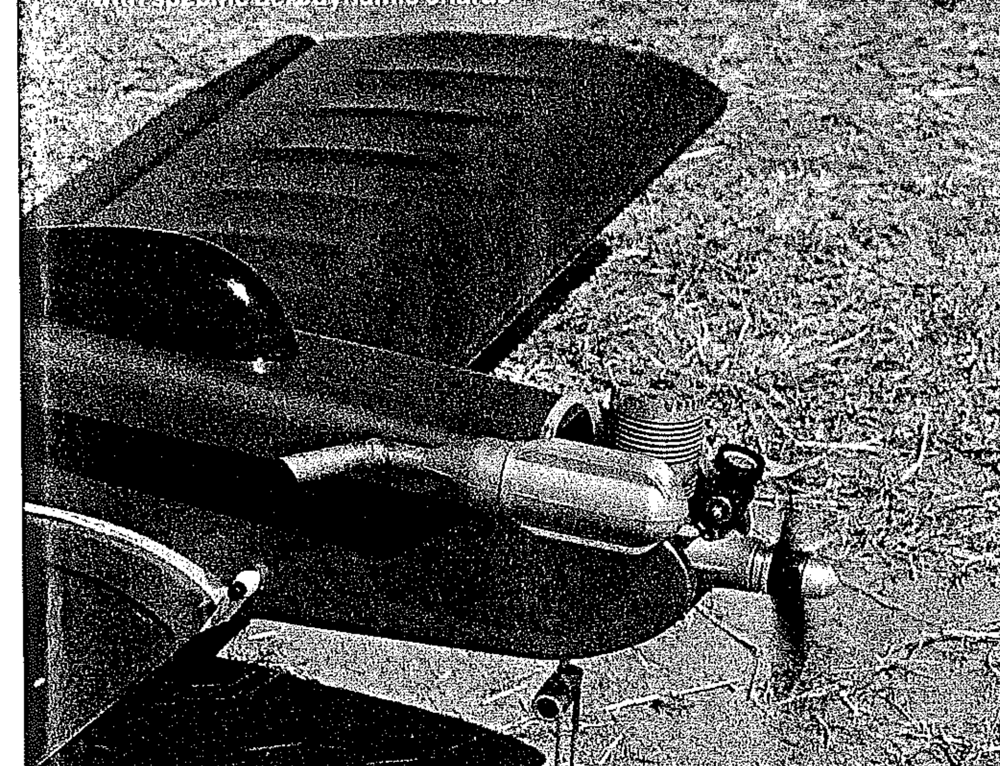
■ Design by Manny Hamilton
Text by Larry Kruse

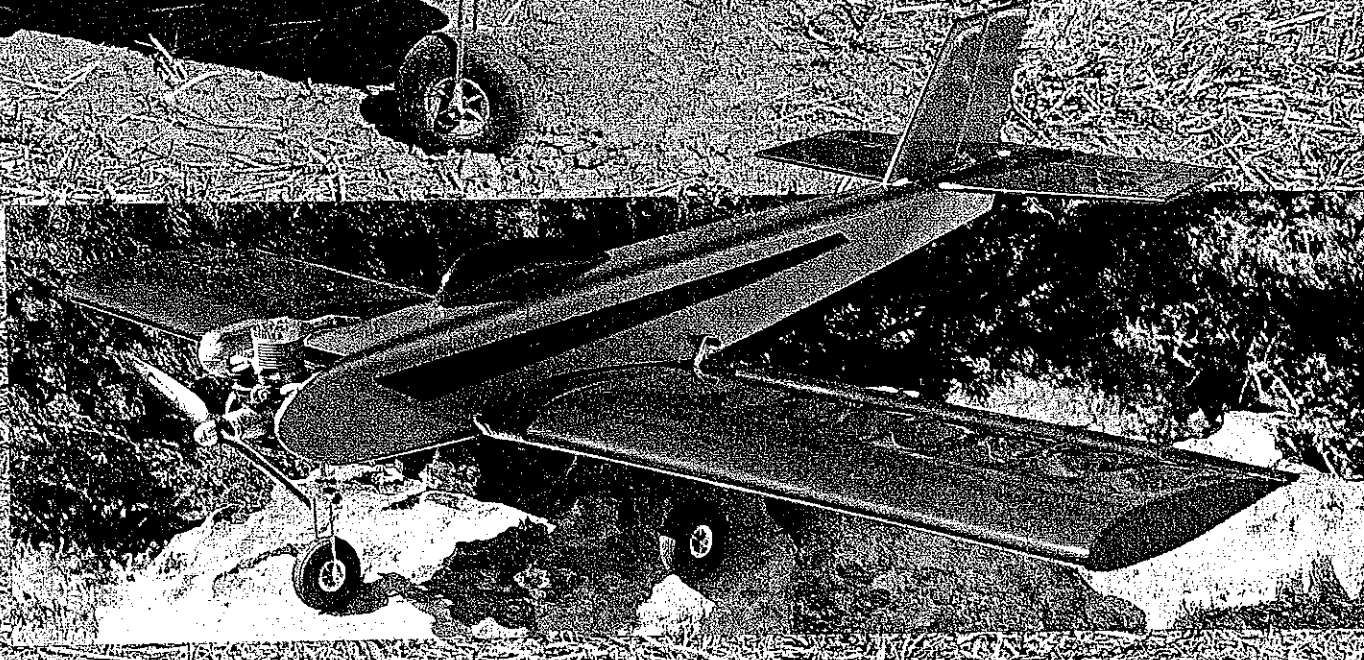
Model Aviation

They're held all over the country, generally low-key, often combined with picnics or refreshments, and called fun fly events. No matter what you call them, though, the objective is to win, and therein lies the most fun of all. Spend the winter on this four-channel model for .60 engines, and see if you can't be the one having the most fun at next year's contest.

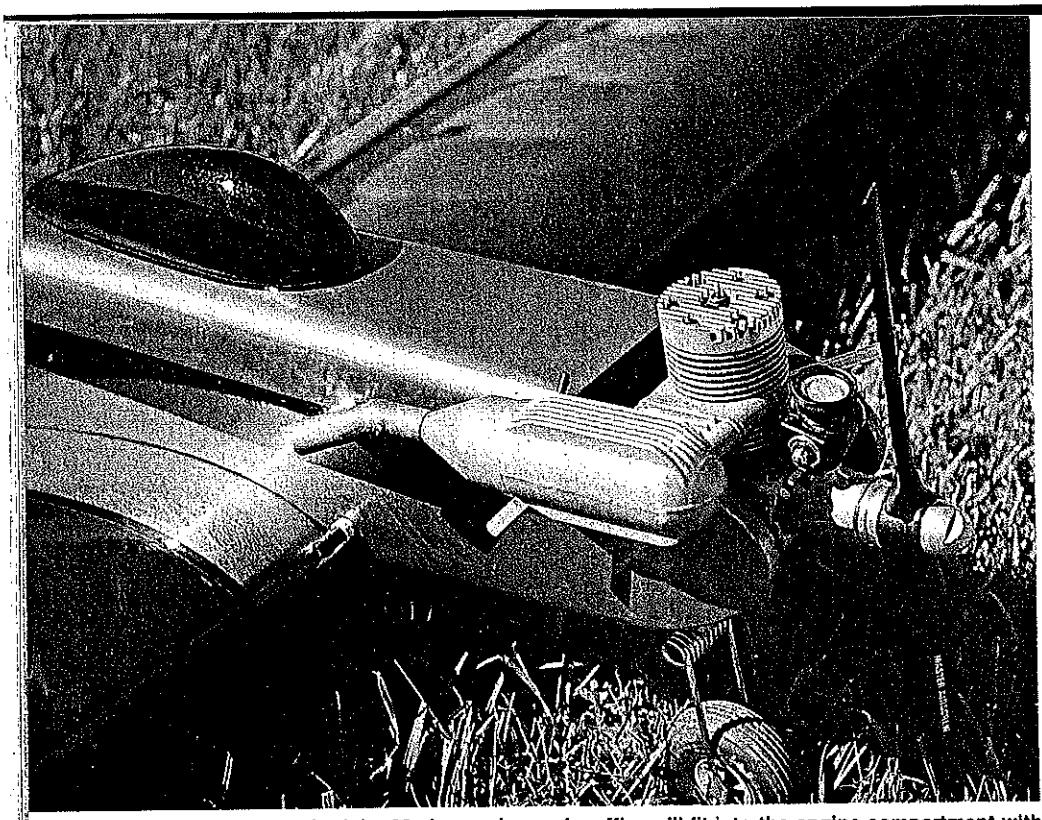
tests as apples are to oranges. However, there is one decided similarity between the two: They both require special types of airplanes. Just as it takes a plane with specific aerodynamic characteristics to perform knife-edge flight or a four-point roll properly, so also do events like the Bomb Drop, Loops-a-lot, Climb and Glide, and Limbo call for a plane with certain characteristics.

Designed and developed over the last five years by Manny Hamilton, the Scorpion fulfills all the right criteria for these fun-fly competitions. It's light, tough,

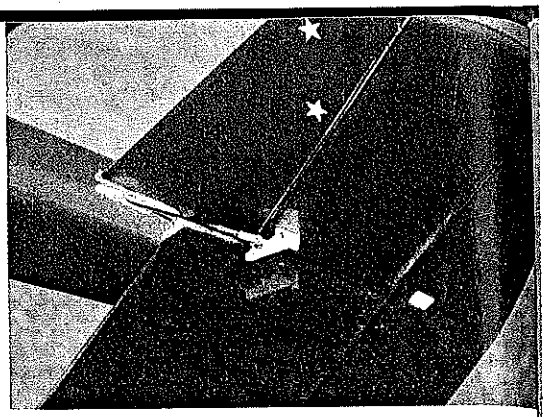




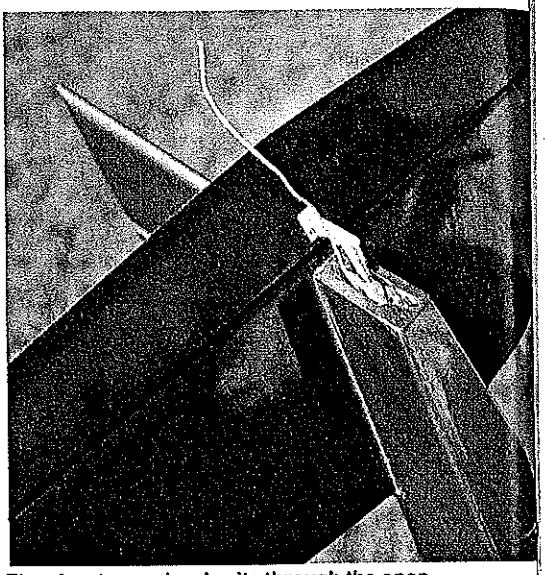
Big picture: With the engine idling our fun fly phenom awaits its turn at another "friendly" contest. Above: Racking up win after win all across the midwest, this model has given its designer, Manny Hamilton, quite a lot to smile about. Below: Although designed especially for the type of flying generally required at fun fly events all across the country, this model also features good looks and a great sport flying disposition.



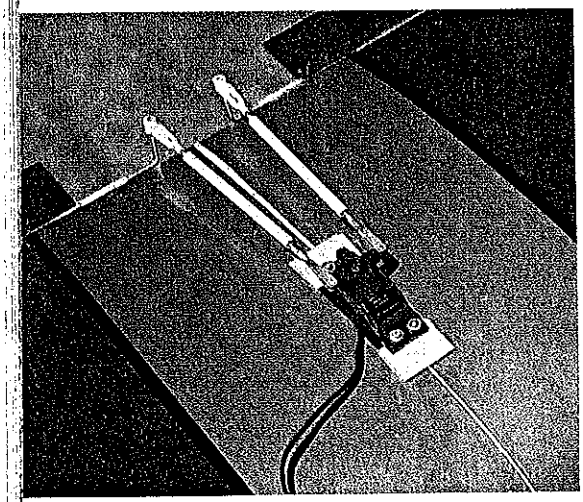
Just about everybody's .60-size engine and muffler will fit into the engine compartment with no need to modify any part of the fuselage. Open compartment makes engine easy to service.



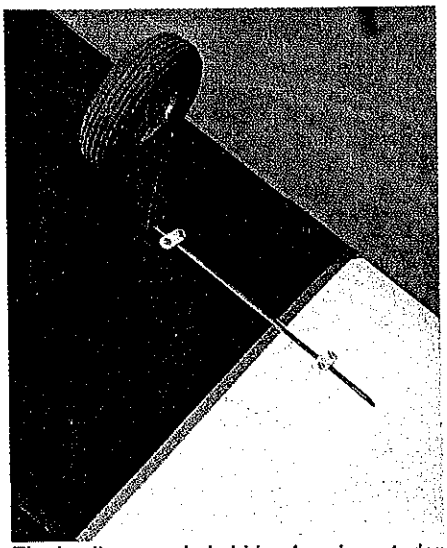
The rudder pushrod exits through the fuselage top block just to the outside of the fin.



The elevator pushrod exits through the opening at the rear of the fuselage. The clevis is easily accessible for setting elevator throw.



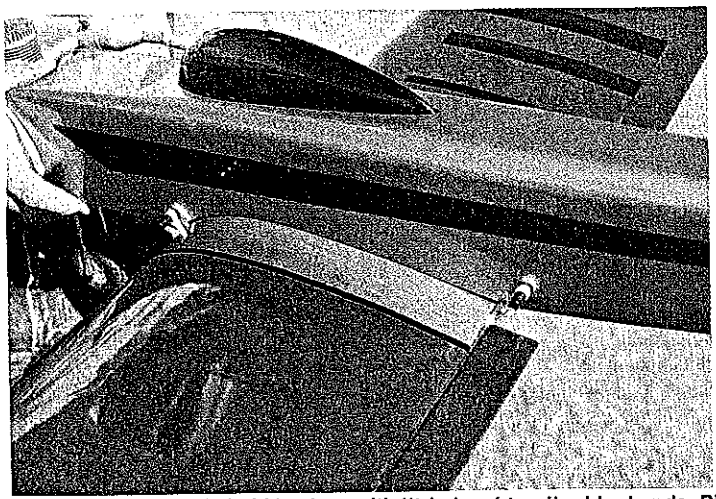
The aileron servo setup is typical of that on many models, but the servo mount shown here is adjustable so that the servo position can be changed to build in the desired amount of "up" differential aileron throw.

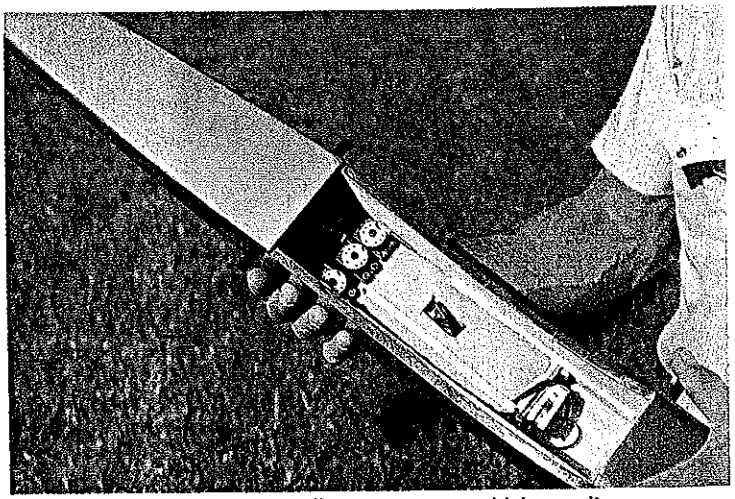


The landing gear is held in place by exterior nylon straps. The solid pine landing gear blocks also offer good torsional resiliency.

and fully aerobatic, yet its semisymmetrical airfoil and dihedral make it inherently stable enough for the novice flier. In a nutshell, the Scorpion has proven itself to be the perfect fun-fly airplane for anyone with a .60 engine and an urge to fly in low-keyed competition. The design has enjoyed considerable regional popularity, with literally dozens having been built in Kansas, Colorado, Oklahoma, Texas, and New Mexico. All have proven successful as sport and fun-fly models.

Construction. Two of the most surprising

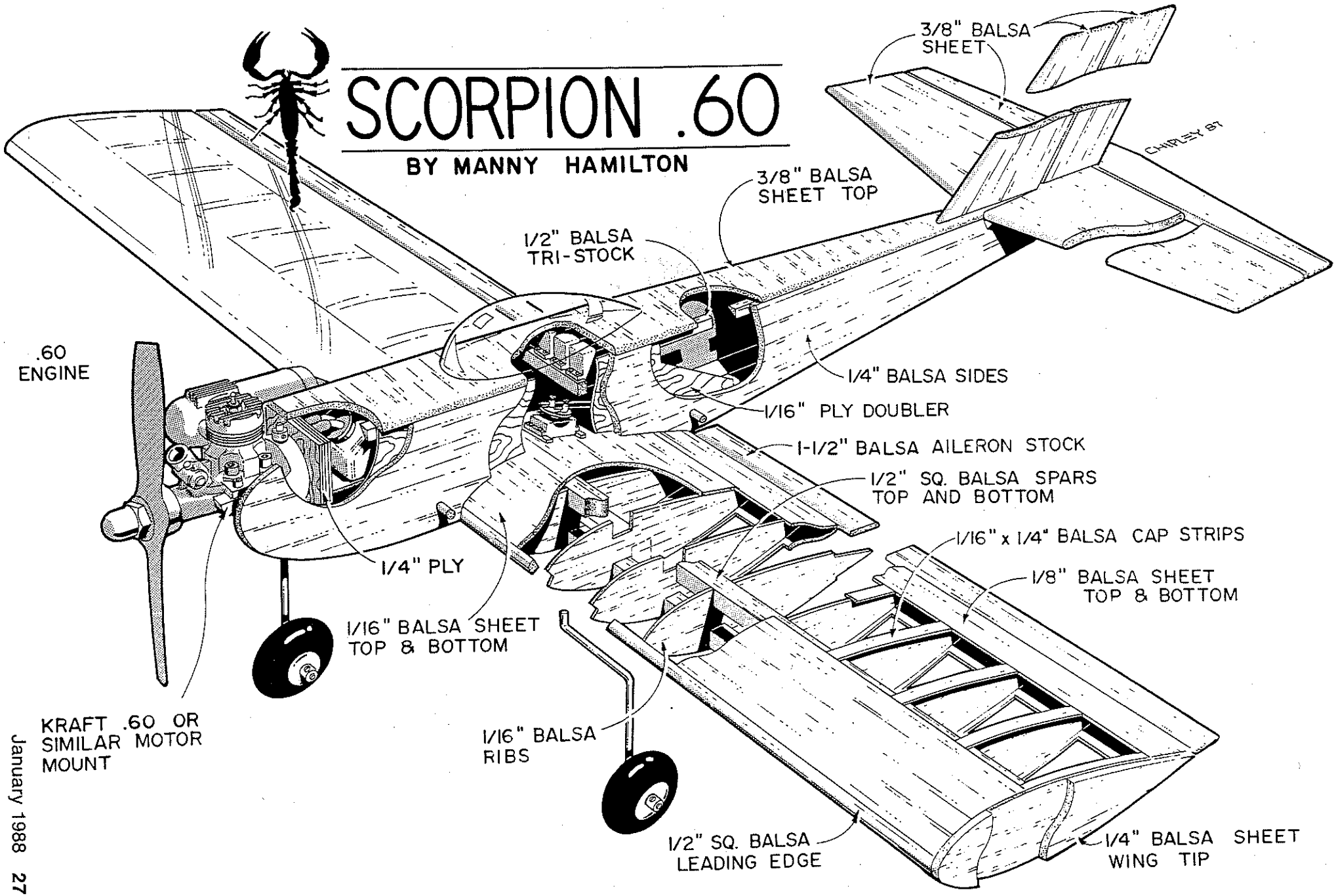




Left: The wing is held in place with "tried-and-true" rubberbands. Right: The Scorpion has a generous radio compartment which permits any four-channel radio to be installed. The "formerless" fuselage allows the radio gear to be moved virtually anywhere to achieve the required CG.

SCORPION .60

BY MANNY HAMILTON



facets of the Scorpion are its simplicity and its ease of construction. The first thing you'll notice in looking at the plans is the absence of any formers in the fuselage! Other than the ¼-in. plywood firewall, there are no interior fuselage members. Obviously, this means that installing radio gear and hooking up control rods could not be easier.

If you assumed that the omission of the formers has compromised fuselage strength in the Scorpion, you'd be wrong. You'll never build a stronger fuselage, or one more resistant to damage from pilot error. This unusual strength is due chiefly to the use of full-depth ply doublers from the wing area forward and to the fuselage-length triangular stock, which provides a greater than normal gluing surface between the various pieces.

Wing. Because the wing must be used to help align the stabilizer and rudder during fuselage construction, it should be built first.

A great deal of time can be conserved by pre-kitting the wing before starting to put the pieces together. Begin by stack-sawing the ribs and cutting out the pine landing gear block. The slot for the landing gear wire can be dadoed on a table saw to a depth of ⅛ in., or it can be carefully carved by hand using an X-Acto narrow, concave blade. At the same time, select and prepare all of the necessary ½-in. stock for the leading edge and spars and the 2-in.-wide strips of ⅛-in. balsa which will comprise the wing trailing edge cap strips.

Once all of the components are prepared, begin forming up the right wing panel by gluing a ½-in.-sq. piece of spar stock to the right front side of the pine landing gear block. To ensure accuracy, mark the exact center of the landing gear block, place the slotted side of the block down, and pin the spar alongside it, with both lying flat on the building board. Allow this assembly to dry, then position it over the plan as indicated.

Pin down the bottom trailing edge piece for the right wing panel, and shim up the spar/landing gear block ¼ in. along its length. Fit and glue a tip rib and a center rib over the spar and the trailing edge piece, then do the same with the rest of the ribs. Once the ribs are set in place, add the top spar and the top trailing edge piece. The ½-in.-sq. leading edge is next. Note that both the leading edge pieces and the spars will require a slight beveling on the ends that butt against each other at the center-section location.

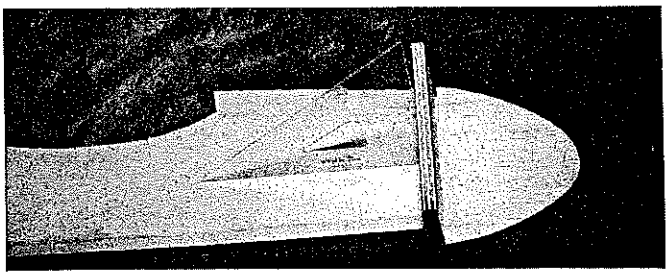
Remove the right panel from the building board and construct the left panel in the same fashion as the right. It will be necessary to block up the right panel during this phase of construction. As before, install the spars, ribs, leading and trailing edge pieces in sequence. Strive for a good, close fit at all the butt joints of the wing halves, and use epoxy.

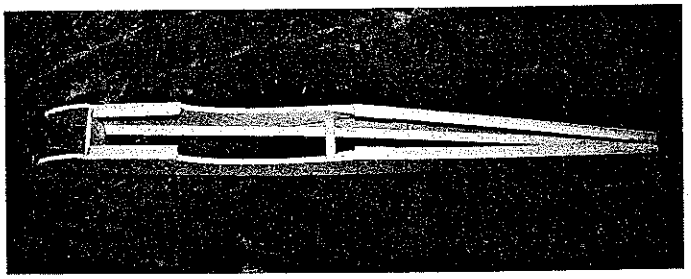
Plank the entire wing leading edge with 1/16 sheeting. Wet the top of the sheeting so it will conform to the curvature of the ribs. After installing the landing gear support blocks, plank the center section and cut out a hole for the aileron servo. Complete the basic wing by adding the ¼ x 1/16-in. rib cap strips and the ¼-in.-sheet tip plates. Sand the wing to shape, rounding the leading edge as shown on the plans.

Drill a 5/32-in. hole in each of the gear support blocks, drilling from the slotted side of the landing gear block. Fit the servo into the cutout and mount it on short strips of 1/16 plywood glued to the sheeting. Bevel the front of the aileron stock for hinge clearance and cut both ailerons to length. Keep the ailerons at stock thickness, but chamfer the leading edge to a 'V' shape. Drill both ailerons for the required torque rods, and epoxy the rods in place.

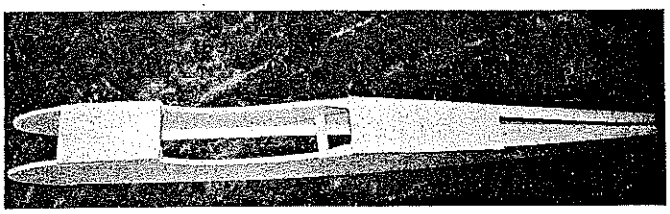
Final sanding and preparation for covering can be done on both the wing and ailerons before the hinges are installed.

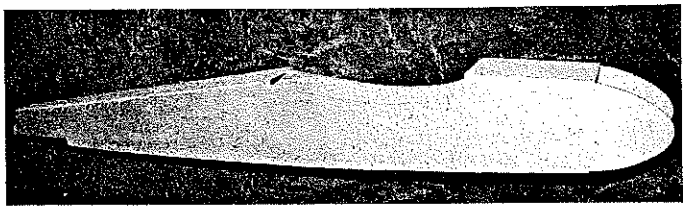
Although no Scorpions built to date have experienced any center-section wing failure, a builder feeling uneasy about the lack of multiple gussets in the center section may soothe his nerves with a bit of glass cloth. The optional method involves wrapping a two-inch-wide strip of fiberglass around the



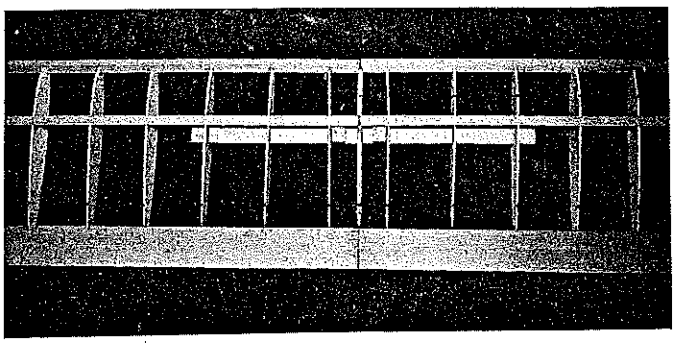


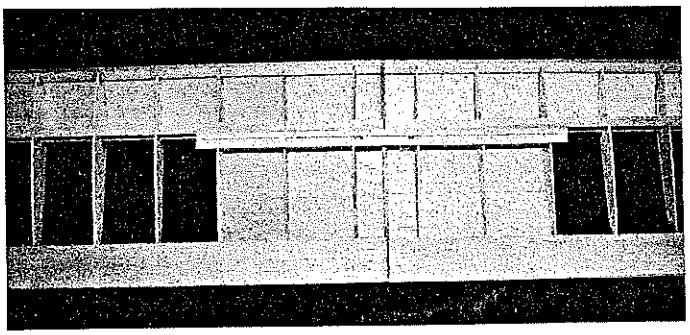
Left: The ¼-in. firewall must be installed squarely in place at a 0°-0° setting. A small triangle works well as an aid. Right: The fuselage begins to take shape with the addition of the ply doublers, triangular stock, and temporary spacer. The spacer is removed for control installation.



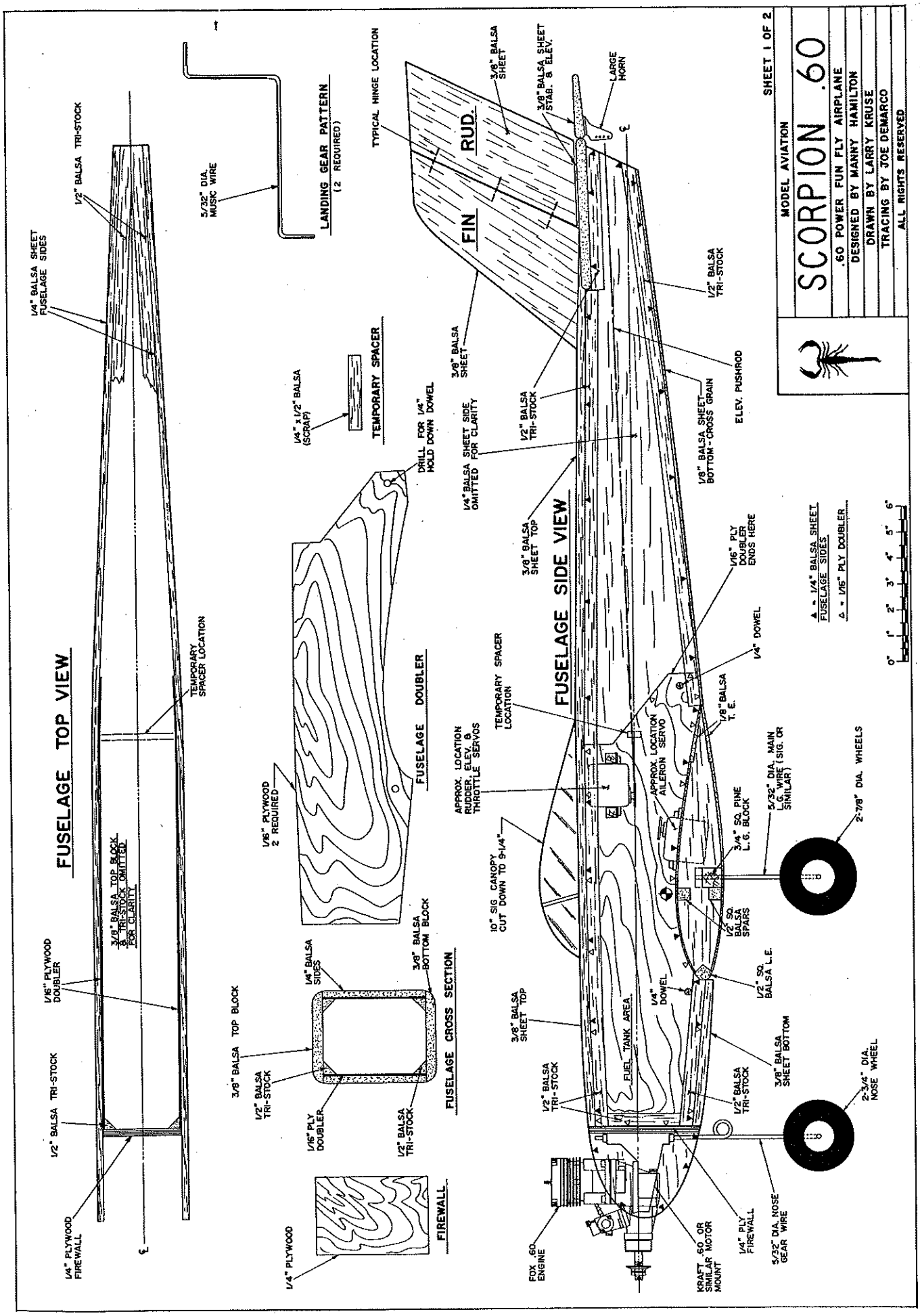


Left: The bottom nose block and part of the ⅛-in. cross-grain bottom sheeting in place. Right: Adding the top block begins to give the fuselage a semi-finished look. The ample wood thicknesses allow for a nicely rounded shape to be given to the fuselage by carving and sanding.

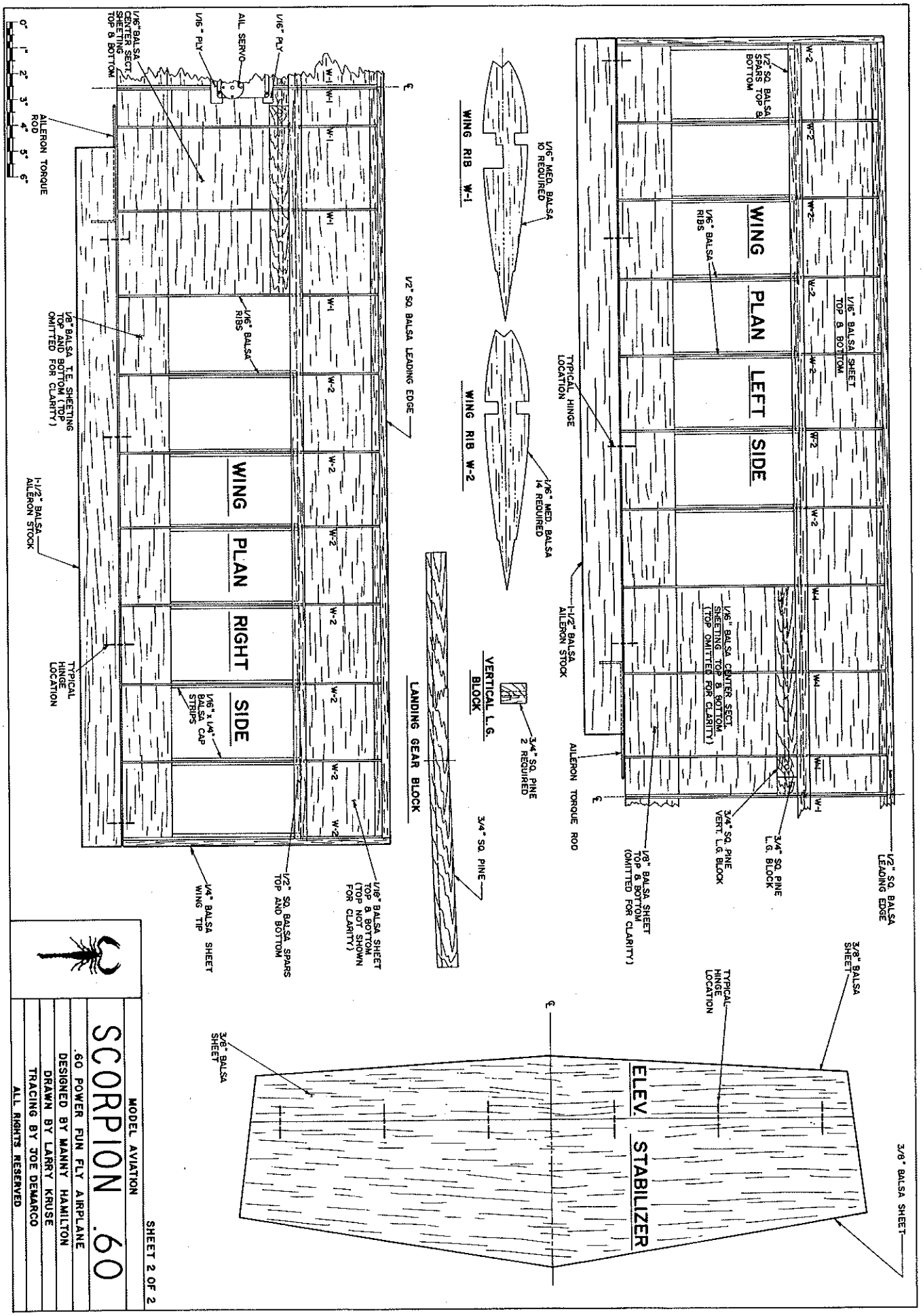




Left: The basic wing structure with the pine landing gear block installed. Note the small vertical landing gear blocks inside the center rib bays. Right: With the top sheeting on, the wing begins to gain torsional strength. Adding the bottom sheeting and cap strips completes the process.


SHEET 1 OF 2
MODEL AVIATION
SCORPION .60
.60 POWER FUN FLY AIRPLANE
DESIGNED BY MANNY HAMILTON
DRAWN BY LARRY KRUSE
TRACING BY JOE DEMARCO
ALL RIGHTS RESERVED
FUSELAGE TOP VIEW
FUSELAGE SIDE VIEW
FUSELAGE CROSS SECTION
FUSELAGE DOUBLER
FIREWALL
TEMPORARY SPACER
LANDING GEAR PATTERN
(2 REQUIRED)
FIN
RUD.
1/2" BALSA TRI-STOCK
1/4" BALSA SHEET FUSELAGE SIDES
1/16" PLYWOOD DOUBLER
3/8" BALSA TOP BLOCK & TRI-STOCK OMITTED FOR CLARITY
TEMPORARY SPACER LOCATION
1/4" PLYWOOD FIREWALL
5/32" DIA. MUSIC WIRE
TYPICAL HINGE LOCATION
3/8" BALSA SHEET
3/8" BALSA SHEET STAB. & ELEV.
LARGE HORN
1/2" BALSA TRI-STOCK
ELEV. PUSHROD
1/8" BALSA SHEET BOTTOM - CROSS GRAIN
1/4" BALSA SHEET SIDE FOR CLARITY
1/4" BALSA OMITTED
3/8" BALSA SHEET TOP
1/4" x 1/2" BALSA (SCRAP)
DRILL FOR 1/4" HOLD DOWN DOWEL
1/16" PLYWOOD 2 REQUIRED
APPROX. LOCATION RUDDER, ELEV. & THROTTLE SERVOS
TEMPORARY SPACER LOCATION
10" SIG CANOPY CUT DOWN TO 9-1/4"
APPROX. LOCATION AILERON SERVO
1/16" PLY DOUBLER ENDS HERE
1/4" DOWEL
1/8" BALSA T. E.
3/4" SQ. PINE L.G. BLOCK
5/32" DIA. MAIN L.G. WIRE (SIG. OR SIMILAR)
2-7/8" DIA. WHEELS
1/2" SQ. BALSA SPARS
1/2" SQ. BALSA L.E.
FUEL TANK AREA
3/8" BALSA SHEET BOTTOM
2-3/4" DIA. NOSE WHEEL
3/8" BALSA TOP BLOCK
1/4" BALSA SIDES
3/8" BALSA BOTTOM BLOCK
1/2" BALSA TRI-STOCK
1/16" PLY DOUBLER
FOX .60 ENGINE
KRAFT .60 OR SIMILAR MOUNT
1/4" PLY FIREWALL
5/32" DIA. NOSE GEAR WIRE
▲ = 1/4" BALSA SHEET FUSELAGE SIDES
△ = 1/16" PLY DOUBLER
0" 1" 2" 3" 4" 5" 6"

Full-Size Plans Available . . . See Page 186



center joint of the wing.

Trial mount the landing gear with the hold-down straps, and set the assembly aside until the fuselage is completed.

Fuselage. Cut out the fuselage sides from straight-grained ¼-in. balsa. Stack-saw them to ensure two identical sides, making sure that each side has about the same resistance to bending. Measure and mark the position of the ¼-in. ply firewall on each side. Be very accurate in this task in order to maintain the 0°-0° thrust line.

Cut out the two 1/16 ply doublers, making sure you build a right side and a left side, and align each along the firewall line you marked earlier. Again, this task is critical to keeping the thrust line where it's supposed to be. Use five-minute epoxy to install the doublers, and let them set up before proceeding. Using white glue or Sig Bond, glue the ½-in. triangular stock in place. Where the 1/16 ply doubler ends, you have a choice of cutting the ½-in. stock for a neater assembly or of simply "bridging" it across the gap. The chief purpose of the triangular stock is to provide a gluing surface for the ⅜-in. top and bottom blocks and the ⅛-in. bottom sheeting, so longitudinal strength is not important.

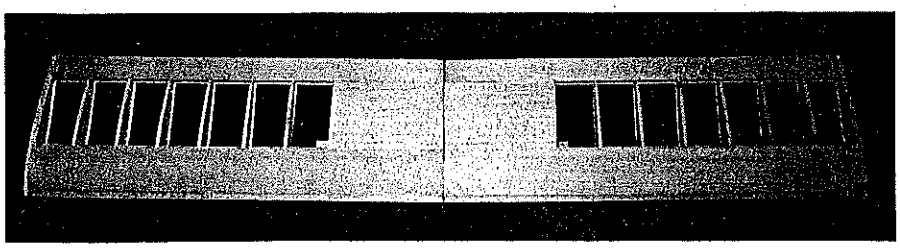
Drill the ¼-in. firewall as required for the engine mount you have selected, and install blind nuts on the back side. Lay one fuselage side flat on the building board and epoxy the firewall to it. Use a right triangle or a small carpenter's square for accuracy. When the first side is cured, epoxy the firewall to the other side. Block up the first side to maintain squareness and the thrust line.

Since there are no formers, you will need to temporarily install a piece of ¼-in. scrap balsa, the same depth as the fuselage, just behind the wing cutout area. Let the desired final appearance for your fuselage determine the width of your temporary former. If a tapered, streamlined fuselage is wanted, make the temporary former 2½- to 2⅝-in. wide. If on the other hand you want the fuselage to parallel the wing trailing edge and then taper back to the tail, a 2⅞-in. width is appropriate for the former. In either case, merely tack-glue it in position so it can be easily removed later.

Now pull the tail together. Trim the triangular stock on both sides of the tail to get a vertical gluing surface. Leave at least a ⅝-in. gap at the rear in order to give room for the elevator pushrod to exit. Glue the tail area well. A glue such as Super Jet works nicely here and sets up almost immediately so that you can plank the bottom of the fuselage, from the rear of the wing cutout on back, with cross-grained ⅛-in. balsa.

Glue the ⅜-in. fuselage top in place. It's a good idea to wet the upper surface, then let it set for a few moments. It will curve nicely to meet the slight curve of the top of the fuselage. Once the fuselage top is dry, pop out the temporary spacer. Drill holes for the wing hold-down dowels, but don't install them until the fuselage is covered.

Glue the bottom nose block in place, and round the fuselage to a pleasing shape. Because of the wood thickness and the triangular stock, the nose area and fuselage top can be rounded quite a bit. The bottom surface aft of the wing, however, should only be rounded slightly for best results.



The completed wing ready for sanding. The small amount of dihedral (determined by the landing gear block) adds stability for those slow maneuvers like limbos and touch-and-goes.

Carve and sand the fin and rudder and the stabilizer and elevator to an airfoil shape, then slot all mating surfaces for the necessary hinges. Test fit the stabilizer to its mount, and strap on the wing temporarily to see if everything lines up. Sand the stab mount as needed to get everything squared up. Be careful not to change the stab incidence in the process, though. Slot the fuselage top where the fin attaches, and square it with the wing and stab.

Finishing and covering. Fill all pits, dents, dings, and hangar rash with spackling compound, and sand everything one more time in preparation for covering. A coat of Balsa-Rite will help the MonoKote stick a little better, and a coat of clear Hobby Poxy brushed around the engine mount area and inside the tank compartment will provide adequate fuel-proofing. Cover the components separately and install hinges. Remove the covering on the stab where it joins the fuselage. Glue the stab assembly and the fin assembly to the fuselage. Again, take special pains to keep everything square.

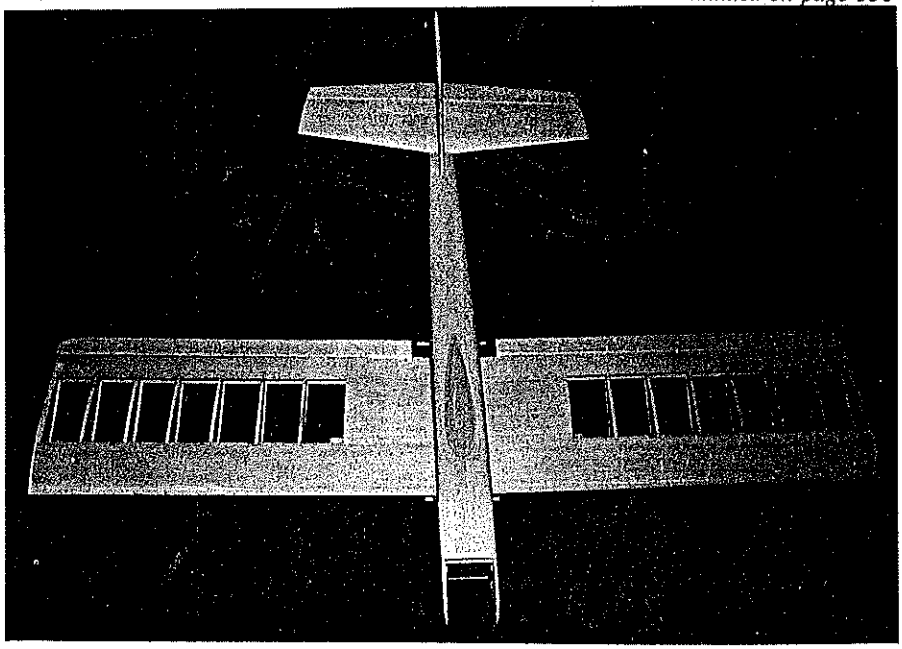
The canopy can be attached as shown or moved backward or forward on the fuselage to give the Scorpion a different look. RC-56 glue is the suggested adhesive. A shallow groove in the fuselage top will help keep the canopy in place, or a Sig Epox-o-lite fillet may be used to fair the canopy smoothly into the fuselage top block and provide additional attaching surface.

Engine and radio. Bolt on the engine mount, and install the engine and nose gear. Drill holes in the firewall for the throttle cable, the nose gear pushrod, and fuel lines. Du-Bro cable is recommended for the throttle, and Sullivan flex rods work well for the steerable nose wheel. The tank can be of your choice, but it should be wedged in with foam to reduce fuel foaming from engine vibration. Make sure the tank stays as level as you can get it while packing in the foam.

Install the radio gear of your choice. There is ample room in the fuselage for any contemporary gear setup. Plywood servo trays glued to ¼-in.-sq. balsa rails give a neat, professional look to the radio compartment. Such an arrangement also permits you to slide the servos, battery pack, and receiver back and forth to achieve the necessary balance point. Try to arrive at the balance point without having to add weight to the nose. If that's not possible, *do not hesitate* to add weight to reach the balance point.

In all probability, the foregoing problem

Continued on page 136



Assembled for the camera and ready to cover. A generous planform and a light but sturdy structure are the keys to this model's contest success. An iron-on film finish is recommended.

Letters to the Editor

Continued from page 12

trim). Two weeks later I made three more flights, experimenting with flaps on this outing. The aircraft flies beautifully.

All of these flights were made at the Maule Airport, birthplace of the original full-scale aircraft.

Bob McCann
Jackson, MI

His Son Writes

My son, Chris, 14 years old, is in the process of learning to fly remote control airplanes. He started flying in April 1987 and has not perfected landing as yet. Enclosed is a journal entry written at school expressing his feeling concerning his new hobby.

Joe H. Helms
Monroe, NC

Following is the enclosure, written by Chris Helms:

My favorite possession is an airplane. I can fly it at times when hate has overcome me or when I'm depressed it makes my spirits soar. If I'm lonely I work on it and the boredom goes away. If I'm awake and cannot go to sleep I think about it flying and drift off to sleep. I think I would be lost without a plane. If one crashes I feel like I've lost a friend. I can't explain the joy that it gives me when I make a successful flight I cheer softly to myself and fly off into the night. It's not an easy thing you see to fly a plane and be like me.

Safety/Preston

Continued from page 20

the glue. Apparently he did not see the October 1985 Safety column that contained excerpts from an article in a medical journal that concluded that prolonged use of CyA glue definitely can produce an asthmatic condition in some people. I sent a copy of that column to the letter writer and, if anyone else would like to receive a copy, please enclose an SASE with your request.

John Preston, 2812 Northampton St., N.W., Washington, DC 20015.

Scorpion/Hamilton

Continued from page 31

will not occur, since none of the many Scorpions constructed so far have turned out tail-heavy. But it's best to be prepared to correct the situation if it *should* develop, since there are few things (excluding the federal budget) that are more out of control than a tail-heavy airplane.

At the flight line. Assuming you have constructed the Scorpion in an accurate and true fashion by avoiding all warps and misalignments, it will fly off the board. As with any ship, double-check the incidence angles of the stabilizer and wing to make sure they conform to those shown on the plans. Novice fliers will want to set up their systems as follows:

Rudder throw—one inch right and left
Elevator range—⅜ in. up and down
Aileron range—⅜ in. up, ¼ in. down

More advanced fliers wanting a fully aerobatic plane should use the following guidelines:

Rudder throw—1½ in. right and left
Elevator range—1¼ in. up and down

Continued on page 138

Aileron range—¾ in. up, ⅝ in. down

To whet your appetite for this season's fun-fly competition, here are the stats for the Scorpion at nine recent fun-fly contests:

18 first-place awards
16 second-place awards
12 third-place awards

If that isn't impressive enough, the Scorpion was flown exclusively by the 1985 high point winner of the High Plains Radio Control Association (Kansas, Oklahoma, Texas, New Mexico, and Colorado).

As the name implies, a fun-fly is intended to be just that: flown for fun. At the same time, if participants didn't care about winning, no one would keep score. With some practice and a little self-confidence, you can find yourself right up among the leaders of your next fun-fly—and the Scorpion can help you get there.

Radio Technique/Myers

Continued from page 34

(RC12 through RC34).

2) **Do not, under any circumstances, crystal-swap an old AM set to a new low-band channel.** Don't fly with anyone who has done so who insists that he "knows how to do it right"— unless that person can show you, *on a spectrum analyzer*, that he knows what he is talking about.

3) If you suffer interference, spread out. Make use of Owen Black's Pacific plan (see my column in the May 1987 issue)—or something equivalent—to set up flight lines that minimize possible interference combinations.

IT'S ALL UP TO YOU!

George M. Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.

Premiered/Berman

Continued from page 44

well, the plane climbs straight up until the engine cuts out after 10 seconds. Now the plane levels out and becomes a glider. If airborne the full time (two minutes being optimal), the plane gives the fuse its chance. The rubberband is zapped, the stabilator pops up, and the cruiser DTs (dethermalizes). In the ideal course of things, the ship now descends gently, sometimes with a porpoising motion, and lands not too far away. That is, if the Nebraska winds behave—which they didn't, mostly. Retrieval became a matter of a strenuous cross-country trek, which many resourceful Free Flighters eased by saddling up on motorbikes and ATVs. Few midair worries in this contest!

For the Cunningham family, anyway, ½A Gas is challenging enough to have bridged the generation gap. Vic Sr., AMA No. 984, won the Nats in 1957. Vic Jr. repeated the feat in 1968 at Olathe, KS with a plane of his own design. Now grandson Jeff is showing every sign of being primed for the same distinction. Guess some of us have to be shown that planes can fly without radio stuffing!

Another stellar Nats event was the Wednesday night banquet which was held in a huge hall at the Lincoln fairgrounds. Guest speaker was Burt Rutan, who is as unconventional as the canards he designs. Perhaps 400 modelers and wives listened to his spellbinding account of the perils of the Voyager. Burt left no doubt in anyone's mind that, despite its successful conclusion, brother Dick and copilot Jeana Yeager were definitely at risk during their historic flight. For one thing, the Voyager had never been flown at full takeoff weight prior to the record attempt. Second, some fuel leakage resulted from the wing tips scraping during the takeoff roll. Equally serious was crew discomfort, the result of a tossing motion