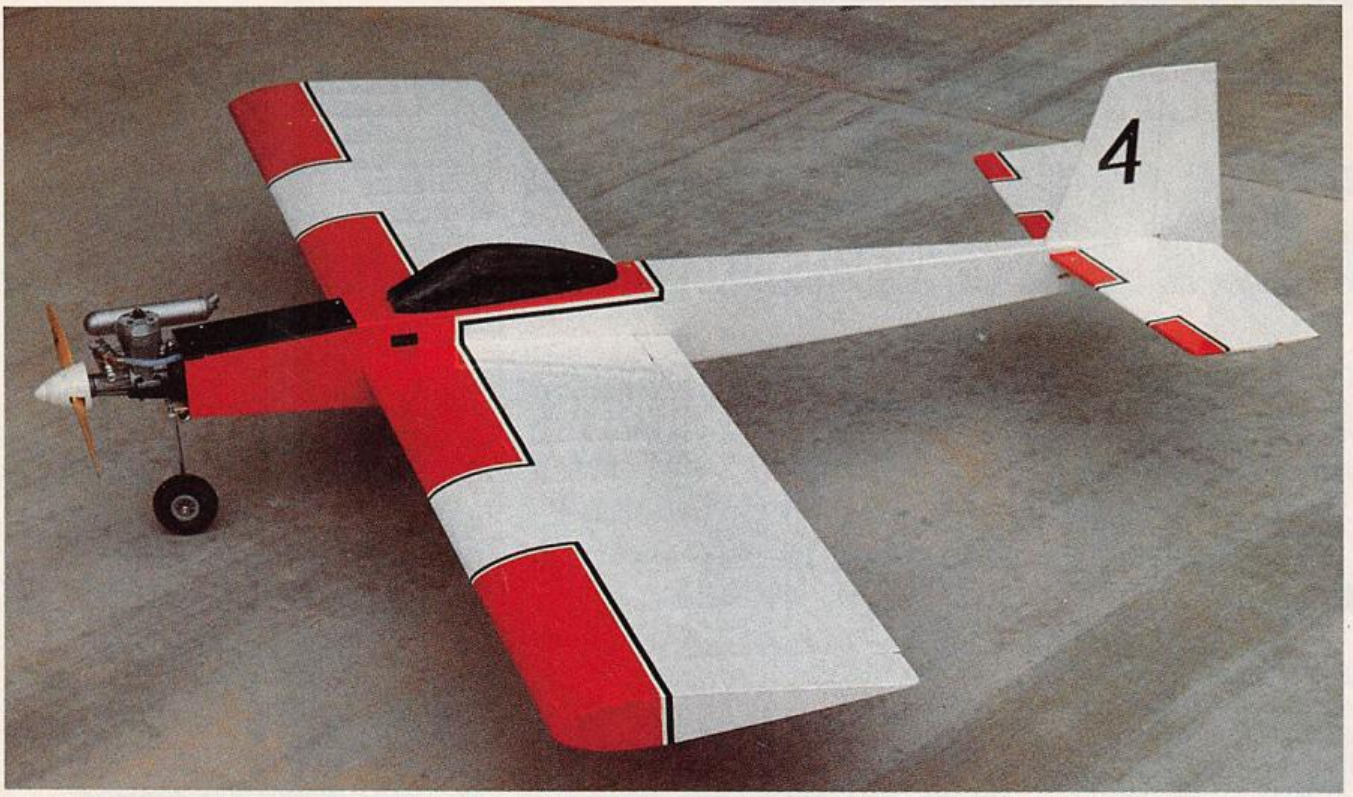
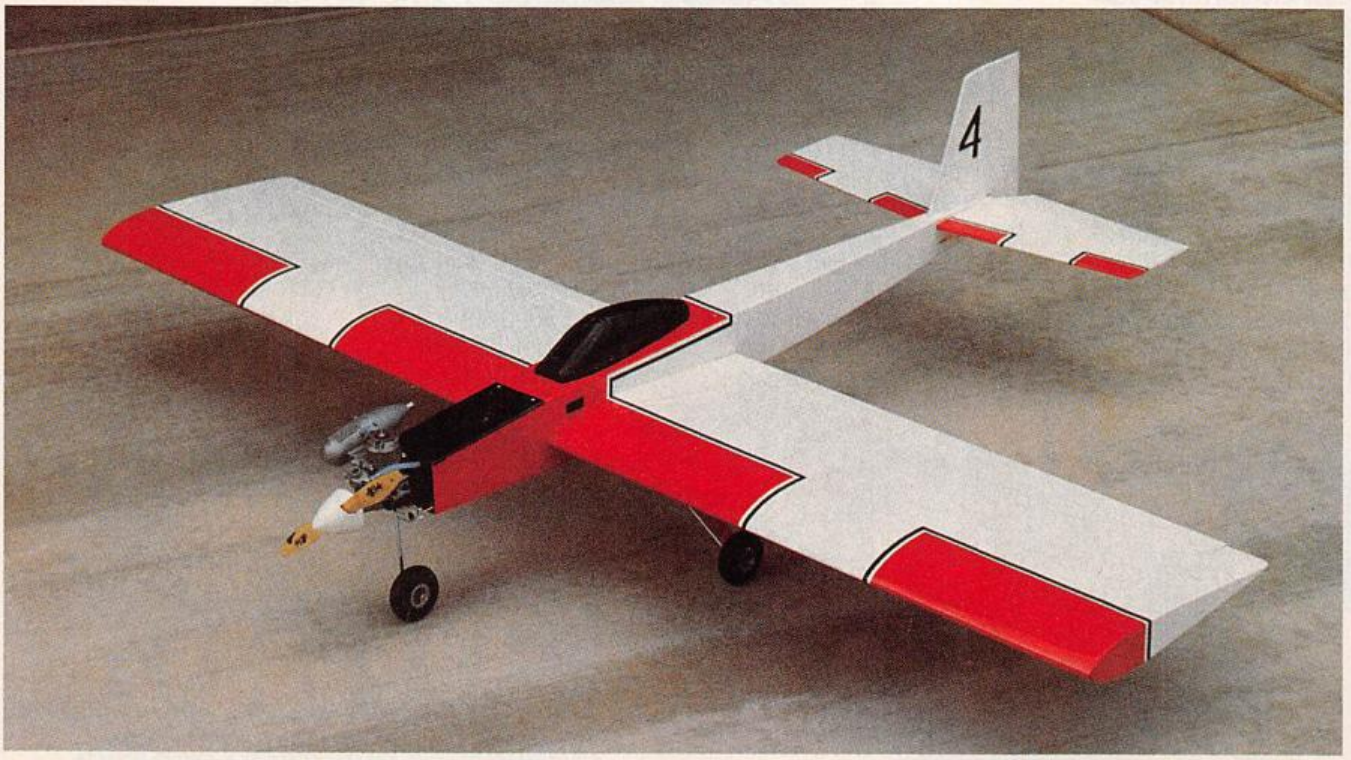


MYSTIK

A SUPER MID-SIZED, MID-WING SPORT FLIER
FOR .25-.32 ENGINES

By Paul F. Denson



Introduction

Probably the most copied airplane that has ever been designed is Phil Kraft's Das Ugly Stik which was published in Grid Leaks Magazine in 1966. You can look through the advertisements and find replicas from a Little Bitty Stik to a Great Big Humongous Stik, A Pretty Stik, a Sweet Stik, and even a fragrant Joss Stik. They have every size engine from a Cox .02 Pee Wee to a three cu. in. Quadra.

We have built a number of these planes, in the .20 to .40 bracket, ourselves and have enjoyed building as well as flying them, they all have an excellently designed beginning.

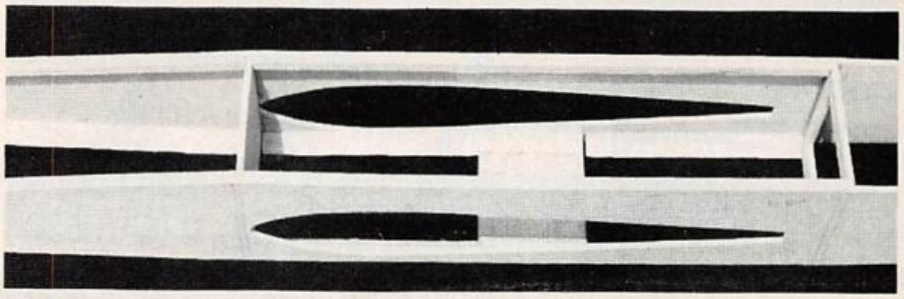
Mystik is an acronym for mid-wing stik. We started with Mistik, MI for "mid" but we just didn't like the way the word went together. Even though the "MY" might indicate that this is our personal stik, doing this article should indicate that we want to share it with you. So Mystik it is.

If Mystik looks something like an Ugly Stik you are right, it was designed that way, but like all the others it is a bit different. We were kind of tired of having a high wing configuration so we thought of putting the wing on the bottom, or is it, turn the fuselage upside down and stick the empennage on what is now the top.

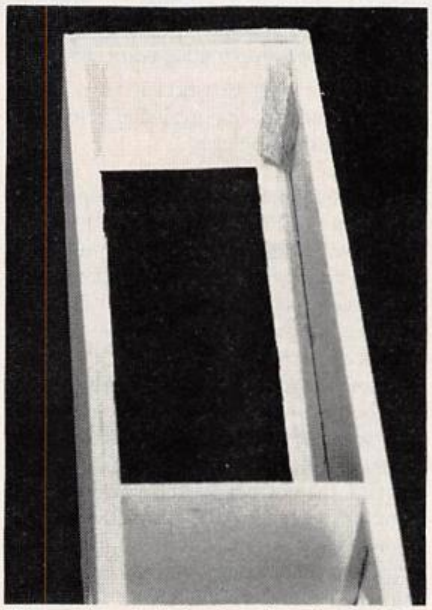
We are not into taildraggers, our planes must have trike gear. That brings up one of our pet abhorrances (we too have a Thesarus), planes with landing gear on the wings. The wing lays there propped up at a dismal angle with the wheels and the ailerons on the floor. The fuselage has a nose wheel and will not lay flat in the back of the station wagon, it cants itself up on a stab tip and the wheel.

We insist that the main landing gear, along with the nose gear, be on the fuselage.

In case you haven't discovered it yet, this is a one piece airplane. Once you put the servos in the plane, run the pushrods, and install the aileron torque rods, the wing is in place and cannot be removed. We have a small hatchback automobile and all the planes we have designed with a 54" wing will fit in the car with the wing in place. Oh yes! Fitting in the car was another of the design criterion.



Make cut-outs for wing in each side before assembly. Sand and trim so the wing will pass through. Tape the two halves together and sand the edges. This will assure the wing will be straight and level.

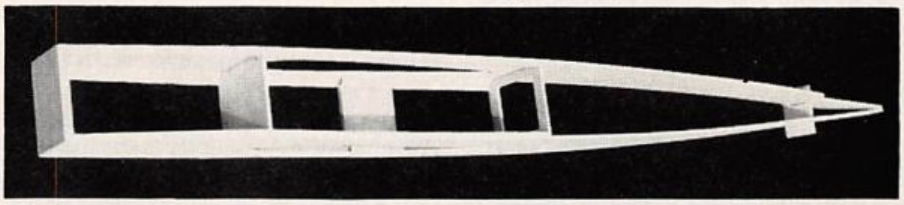


Triangular stock is placed on both sides and the bottom of the firewall, as well as alongside the fuselage on the bottom.

We have been using Romney Buckolt's design parameters, as published in the January, 1981 issue of RCM by Ken Willard, for many years. We have found, over and over, that a plane constructed with these specifications **will fly,** so we used them to design the Mystik.

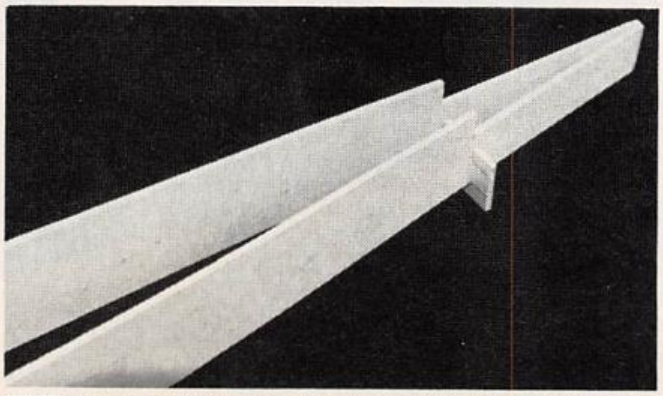
Here are some of the features we incorporated. The fuselage is exactly 36" long, a length of 6" x 36" lite ply will make the fuselage sides and bottom. If you start with a 6" x 48" slab of lite ply, you will have enough wood for the formers and the hatch covers. The wingspan is 54", the wing chord is 11" giving an aspect ratio of just under 5:1 which is just about right for a sport plane.

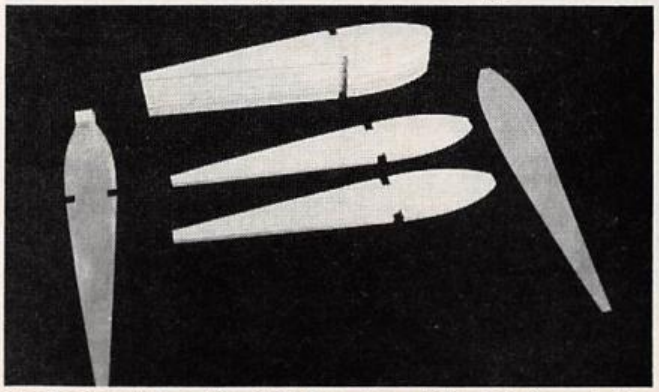
A piece of MonoKote cut from a roll will reach from the side of the fuselage to the wingtip without splicing. The rib design is such that the bottom is straight enough so the wing may be constructed flat on your workbench without any jigs or spacers. Pin the trailing edge bottom sheet to the plans, pin the bottom spar in place and start inserting wing ribs. The fuselage is a box, pin down one side, erect the formers and firewall, and add the other side — just that simple.



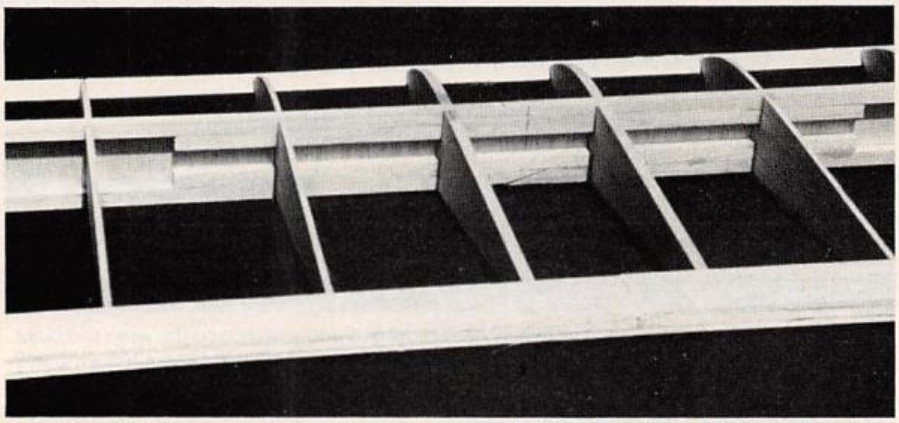
Place the fuselage over the top view on the plans. Slide the tail jig forward until the two halves touch at the tail. Check with a tri-square to see that the empennage end is directly over the meeting point on the plans.

Everything is made from standard cut balsa, spruce, and ply. All the hardware, engine mount, and landing gear is available

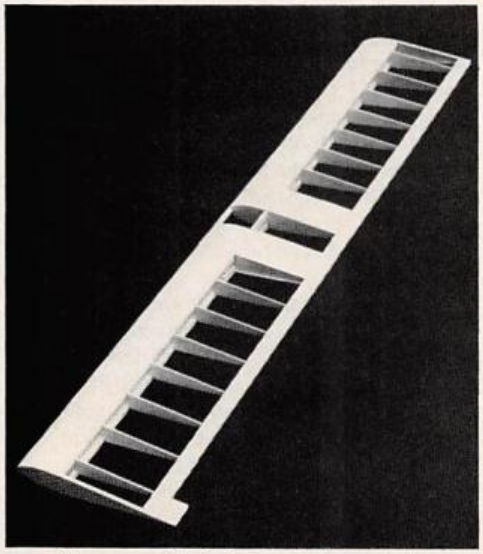




LEFT: Close-up of the tail jig in place. RIGHT: All wing ribs are cut using the template on the right. Two pins which stick through the template keep it from sliding while cutting. The template for cutting the spar notches is on the left.



Pencil mark is the center of the wing. Spruce spar doublers are shown. Webbing is on the front surface of the spars. Note trailing edge sandwiched between trailing edge sheeting.



The completed sheeted wing. The center section is left unsheeted as this is the location for some of the radio gear. The wingtips will be added later. One aileron tip is left off in order to insert the wing in the fuselage.

at most local hobby shops. We have included a complete list of everything necessary to build the plane, so you may use this as a shopping list and to check the materials on hand in your workshop.

CONSTRUCTION

We started by kitting the plane, then constructed the wing first because it is necessary to have the wing available before you can finish the fuselage.

Wing:

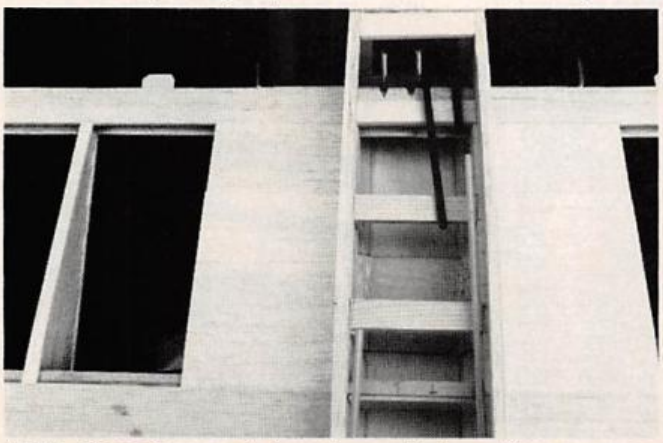
Cut the four pieces of trailing edge sheeting from 3/32" x 3" sheeting. Diagonal splice two of the pieces, then cut to the full length of the wing. Diagonal splice two of the spruce spars and cut them to full span length. Cut spar doublers to length and glue in place to cover the splice.

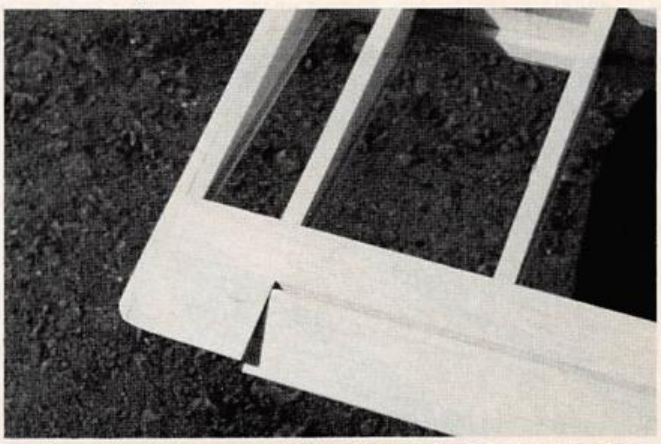
Using the tool pictured on the plans, cut the trailing edge spar to width, remember, you want the widest part of the tapered stock. Splice and cut this piece to length then cut the notches for the rear end of the wing ribs using the other tool pictured on the plans. Using thick CA, cement the trailing edge spar to the bottom trailing edge sheeting. We used Satellite City's UFO both thick and thin for 100% of the construction of this plane.

Insert all the wing ribs, be sure the two center ribs are cut from 3/16" sheeting, and glue in place. Add the spliced top spar with doubler and glue it in place. The leading edge is made from 3/8" square balsa stock, the two pieces are spliced and cut to length. When added to the wing, the leading edge is in the shape of a diamond.

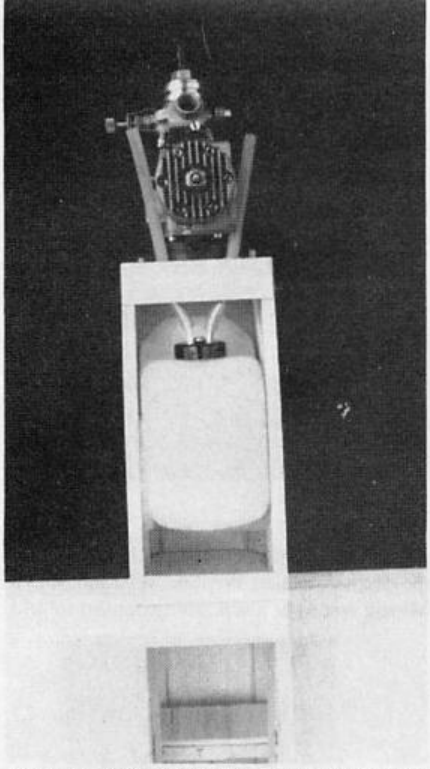
Cut-outs using the tool previously mentioned, are made halfway through the diamond so they will fit the leading edge of each of the ribs. Push the leading edge on all ribs, making sure there is an overhang on

MYSTIK
Designed By:
Paul F. Denson
TYPE AIRCRAFT
Sport Mid-Wing
WINGSPAN
54 Inches
WING CHORD
11 Inches
TOTAL WING AREA
594 Sq. In.
WING LOCATION
Mid-Wing
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
None
OVERALL FUSELAGE LENGTH
40 Inches
RADIO COMPARTMENT SIZE
(L) 10" x (W) 2" x (H) 2¾"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (incl. elev.)
5¼ Inches (Avg.)
STABILIZER AREA
105 Sq. Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6 Inches
VERTICAL FIN WIDTH (incl. rud.)
5¼ Inches (Avg.)
ENGINE SIZE
.25-.32 2-stroke; .40-.45 4-stroke
FUEL TANK SIZE
6-8 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.,
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Ply, Lite Ply, & Balsa
Wing ..... Spruce, Lite Ply, & Balsa
Empennage ..... Balsa & Spruce
Wt. Ready To Fly ..... 64 Ozs. (4 Lbs.)
Wing Loading ..... 15½ Oz./Sq. Ft.

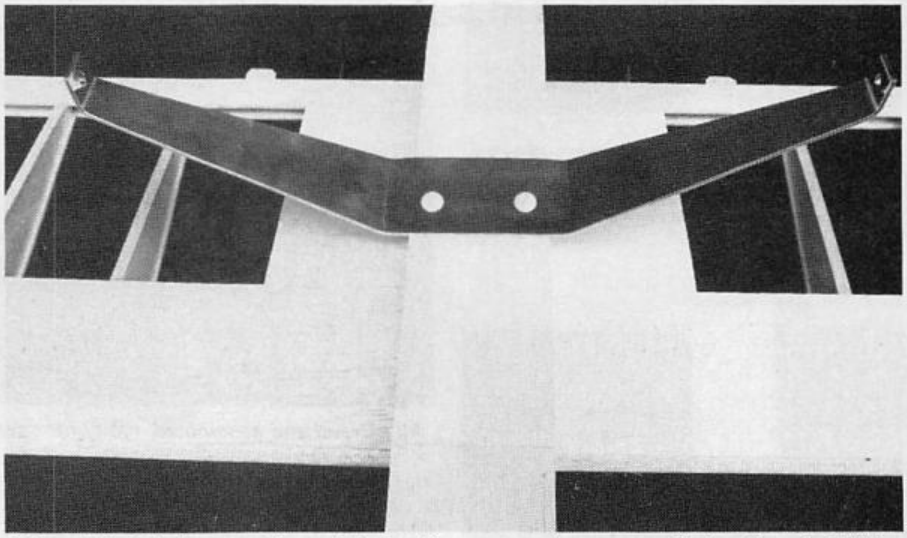




LEFT: Aileron torque rods have been added as well as spruce servo mounting strips. The spruce strip just forward of the rear fuselage sheeting is an anchor block for the radio compartment hatch. RIGHT: Wingtip showing added aileron, wingtip, and vertical grain webbing.



Tank shown is a 6 oz. Du-Bro tank; there is room enough in the compartment for an 8 oz. tank. The forward hatch cover has a lip that hooks under the strip at the firewall, and anchors to the block just forward of the wing.



Nylon 1/4"-20 bolts pass through the landing gear and are screwed into a threaded 1/4" ply landing gear anchor block. The sheeting on the bottom of the tank compartment and under the landing gear is 1/8" lite ply.

both the top and bottom to take the leading edge sheeting. Glue in place with thin UFO. Later you may fillet with thick UFO.

Add the top trailing edge sheeting. This sheeting does not have to be spliced, trim to width and length and apply. Leave the space between the two 3/16" center ribs uncovered. Add top 3/32" x 1/4" capstrips.

Remove the wing from the plans and invert. Cut the webbing to width and length and cement in place forward of the spars. We ran a bead of thick UFO on each of the spars, sprayed the webbing with Kick-It, and put the webbing in place. Instantly it was stuck there, clamps were not necessary. Webbing used to be a chore we hated, now, using UFO it's fun.

Add the top and bottom leading edge sheeting and finish the capstrips. Hold the wingtips until later. You will notice in the pictures of the wing during construction, there is a piece of aileron stock glued to one tip, we had to remove the other one when we inserted the wing into the fuselage. Set the wing aside for now, it will be finished later.

Fuselage:

Cut the fuselage sides from lite ply. We traced the outline of the wingtip rib on the fuselage side or you may use the middle wing rib outline on the plans. Cut out this area very carefully, then clamp the two sides together and file and sand the opening until you can slide the wing through with no binding. Sand the outside edges together, this keeps the wing horizontal when inserted in the fuselage.

Mark the location of the firewall and both formers on one fuse side and transfer these markings to the other side. Add the 1/8" x 1/4" fuse side doublers to the top front of the sides. Add the 1/4" triangular stock to the bottom and to the top, aft of the wing location. Leave spaces for the formers and the landing gear anchor block. Pin the right side of the fuselage to the plans and erect the firewall and both formers. F-1 and F-2 differ only by the opening in the center of F-2.

Check to make sure the formers are vertical to the fuse side. Glue in place, when firm, add the left side of the fuselage. Remove the fuselage from the side view of the plans and erect it over the top view and weight or pin in place. Make the tail jig which is shown on the plans. Slide it under the fuselage with the sides in the cut-outs and as you slide it forward, the empennage ends of the fuse sides will come together. When they touch, check with a square to insure they are directly over the meeting point on the plans, then glue them together.

Turn the fuselage over and add the 1/4" ply landing gear anchor block and double it with 1/4" triangle stock. Put the 1/4" triangular stock around the bottom and sides of the firewall. Add the bottom sheeting in three pieces. Forward and under the wing are 1/8" ply and from the wing to the empennage is 1/8" balsa. We put the UFO on the fuselage sides, spray Kick-It to the bottom panels and put them in place. Instant stick. Trim and sand the panel edges.

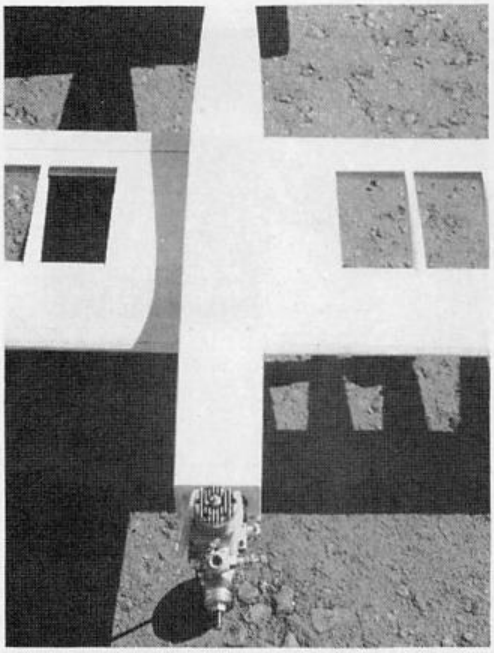
Place the fuselage on your workbench and see if the wing will pass through, if so, pat yourself on the back, you deserve it. Add the two hatch cover lock downs and the two 3/16" ply anchors for the hatch cover screws. Insert the two pieces of 1/8" ply in the notch for the empennage.

Add the engine mount to the firewall and drill the holes for the fuel tubing, throttle servo, and nose wheel servo pushrods. Slide the wing into the fuselage and tack in place.

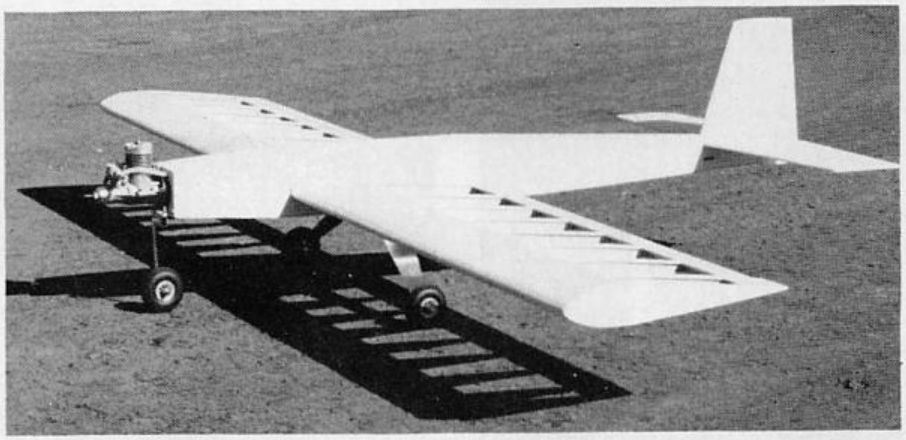
MATERIALS LIST

- 3 — 3/32" x 3" Balsa, Wing Ribs
- 4 — 1/4" x 1/4" Spruce, Wing Spars & Doublers
- 2 — 3/8" x 3/8" Balsa, Leading edge
- 2 — 1/4" x 1" Balsa, Trailing edge
- 2 — 3/8" x 1¼" Balsa, Ailerons
- 1 — 3/32" x 3" Balsa, Webbing
- 4 — 3/32" x 3" Balsa, L.E. Sheeting
- 1 — 3/32" x 3" Balsa, Center Sheeting
- 1 — 1/8" x 6" x 48" Ply, Fuse sides, Bottom & Hatch Covers
- 1 — 1/8" x 1/4" Balsa, Fuse Doublers
- 1 — 1/4" Tri Balsa, Fuse Doublers
- 1 — 1/4" A/C Ply, Wing Anchor
- 2 — 3/16" x 3" Balsa, Empennage
- 1 — 3/16" x 3" Balsa, Wingtips
- 1 — Engine Mount (Hayes)
- 1 — Nose Gear and Axle (Goldberg)
- 2 — Rudder and Elevator Horns (Goldberg)
- 4 — Threaded Couplers
- 3 — 5/32" Wheel Collars (Du-Bro)
- 3 — 2¼" Wheels (Du-Bro)
- 1 — 6 oz. Fuel Tank (Du-Bro or Kraft)
- 1 — Landing Gear (B.J. Custom or Great Planes L3U)
- 4 — 4-40 Blind Mounting Nuts (Sig)
- 1 — Pushrod Cable (Gold-N-Rod) pkg.
- 1 — Aileron Torque Rods (Goldberg) pkg.
- 4 — Snap Links
- 1 — Fuel Tubing
- 1 — Hinges (Sig)
- 2 — MonoKote (roll)
- 1 — Trim MonoKote (sheet)

Items listed by (manufacturer) may be substituted. Radio and engine necessary.



Both of the top hatch covers are in place and screwed down.



All sanded and assembled, ready for covering.

Run the pushrod housings checking the pictures to see our location of the servos. The run of these housings is pretty much standard except for the elevator pushrod housing, which must be squeezed between an aileron torque rod and the rudder pushrod. Actually it passes over the rudder servo wheel.

Insert the hardwood servo mounts. Cut, trim, and sand the two hatch covers, add the tongues, and drill for the hold-down screws.

Put your servos in place, we found it very nice to have all four servos in the fuselage and not have to run an extension cord for the aileron servo which is usually in the wing.

We thought adding the aileron torque rods would be a problem but were surprised how easy they went in. First, remove the plastic sleeve from the torque rods and put them in your salvage box, then replace them with the same diameter brass tubing which has been thoroughly cleaned and sanded with very coarse sandpaper. Bend the metal torque rods to shape.

Drill a hole in the fuselage, at the trailing edge of the wing, the same diameter as the brass tubing. Insert the threaded end of the torque rod through the hole and up into the fuselage. Slide the brass tubing into the fuselage the distance as measured on the plans, and tack in place in the center of the trailing edge of the wing. Run a neat bead of UFO along both sides of the brass tubing, hit with Kick-It. Inside the fuselage, add a couple of beads of UFO to double the holding power of the glue.

Add the aileron tips to the ends of the wing, cement in place. Cut the ailerons to length. Cement the hinges in the wing with thin UFO, we used Sig Easy Hinges, made for use with CA. Cut the slots for the hinges in the ailerons then cut the angles on the leading edges. Drill the hole for the torque rod and cut away the inner end to clear the brass rod. Add the 3/16'' sheet balsa wing tips, sand to match the wing.

We used a Goldberg nose gear strut and axle. The BJ's landing gear was mounted using two 1/4''-20 nylon bolts. Note, it sticks out past the fuselage sides about 3/8'', we felt that a full 3'' wide fuselage was not necessary. All the landing gear we checked were for 3'' fuselages. A Great Planes L3U will also work.

Empennage:

The whole empennage is fabricated from 3/16'' balsa. Cut to shape and cement pieces together. The two halves of the elevator are held together with a piece of 3/16'' dowel.

Using two scraps of 3/16'' balsa, construct a false fin and stab, see drawing on plans. Fit blocks of scrap into the sides of the jig, tack glue in place, trim and sand to the contours of the fuselage. Later these blocks may be covered and inserted to fair out the fuselage where the vertical fin and stabilizer meet. Add the control horns and run the inner pushrods.

Finishing Touches:

There are three locations where the battery will fit when checking/setting the Center of Gravity. In case the plane is tail heavy, the battery may be located behind the fuel tank. A hole will have to be cut in F-1 for the passage of the wires.

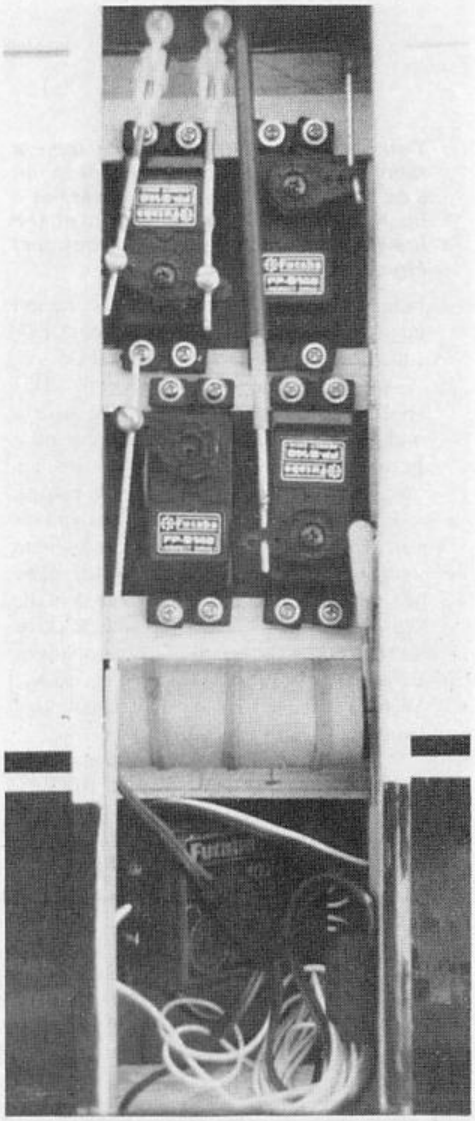
The battery may also be located below the receiver in the compartment made by the first third of the wing. Or in the case of a nose heavy condition, the battery may be located between the wing spars and the front servo mount. As you can see from the pictures, this is where we located the flight pack battery.

Covering:

We covered our Mystik with Dark Red and White MonoKote using Black Trim Sheet for the numerals on the fin and stripes on the wing and empennage. In addition, we held the ailerons and elevator to full up and covered the hinge gaps with strips of MonoKote to help prevent flutter which may happen when the hinge gap is too large.

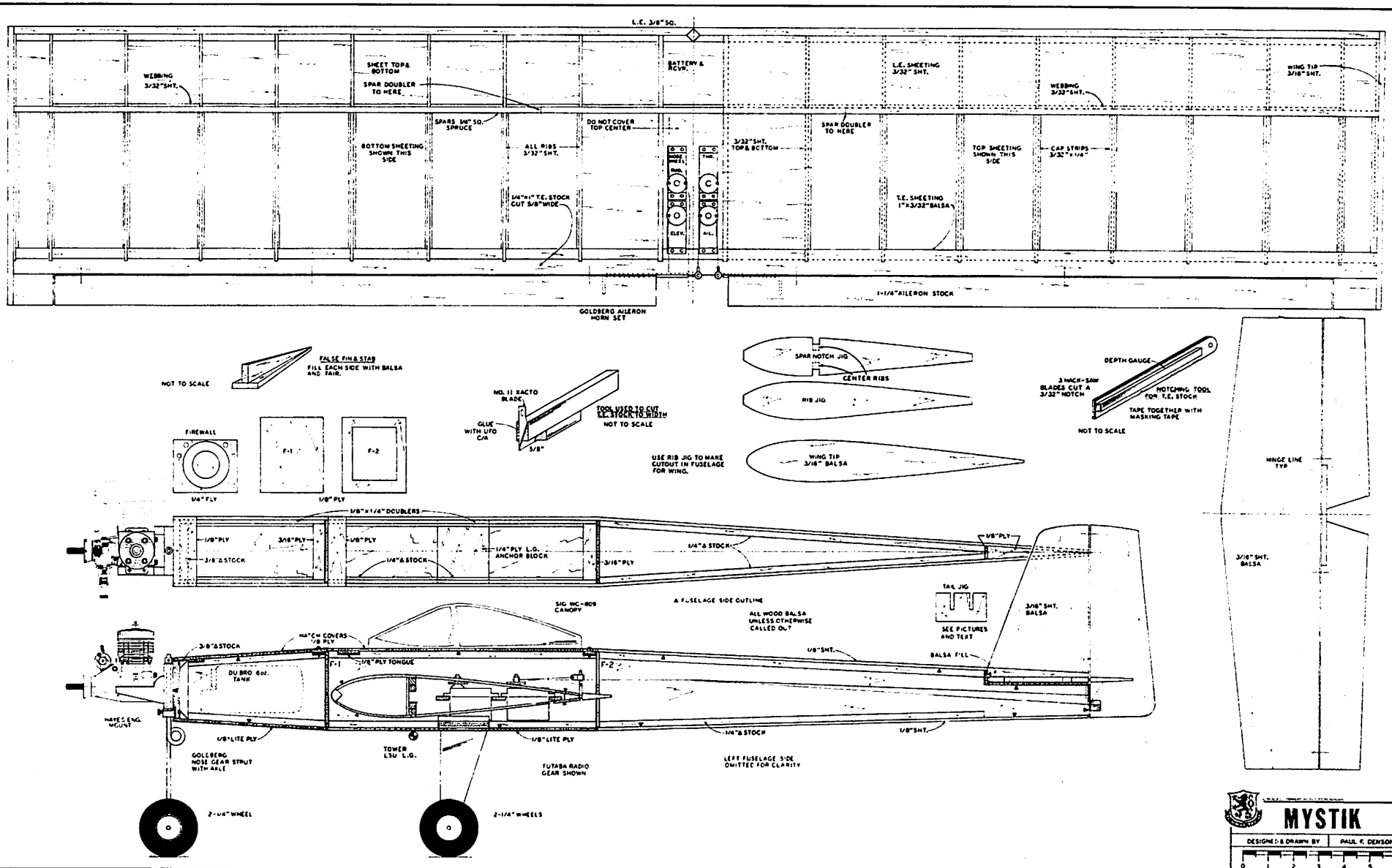
Flying:

We have tried the Mystik with four different engines, all the way from an O.S. .25 Schneurle to one of the new O.S. .32 F ABC. In-between we flew with a K&B .28 Sportster and a Royal .28. We found all these engines to be adequate, a .20 would not be sufficient to fly the plane and obtain the desired results. We have no doubt that a Mystik would be a screaming demon should



Servo location. Aileron servo at upper left, the elevator servo upper right, the throttle servo lower left, and rudder and nose wheel servo lower right. Note the extra length of the outer pushrod cover so there will be no moving contact between the inner pushrod and the servos which it passes.

FULL SIZE PLANS AVAILABLE SEE PAGE 239



MYSTIK

DESIGNED & DRAWN BY	PAUL K. DENSON

0 1 2 3 4 5 6

PLAN NO. 1120

you decide to put a .40 2-stroke up front.

If you want to use a 4-stroke then by all means do so, but, you are going to have to move the firewall back somewhat in order to get the plane to balance where called out on the plans. Even with the light 2-stroke engines we used, it was necessary to add a small bit of weight under the stab.

The first flight was not the normal knee-shaker, we felt this plane was going to be fine, you know sometimes when you build a plane you just know how it is going to fly. Normally, when a model looks like an airplane, it will fly like an airplane. The Mystik doesn't look like any full scale airplane but, it really does fly.

The first flight was with the K&B .28 Sportster. We fueled up, hit the spinner with the starter and are surprised as usual at the lack of noise that issues forth from the Sportster muffler. We taxiied out to the runway, turned and pushed the throttle stick to the limit, gave a bit of right rudder to counteract torque. Mystik hugs the runway like she is in love with it, when flying speed is attained a bit of up elevator causes her to jump into the air.

We circled the field a couple of times checking the trim then gained a bit of altitude and made the decisions which determined whether high or low rate will be used on the ailerons and elevator.

Next, we put the plane through all the maneuvers in our book and were very much satisfied. Particularly with the inverted flying, practically no elevator control was necessary to keep the plane horizontal. Landing was a breeze, we only needed half of the runway and after the feather light landing, the plane stuck to the runway like it was glued there.

As the mounting holes are the same, we tried the second flight with the O.S. .32 F ABC engine. Our new Futaba PCM transmitter has ATL (adjustable throttle limiter) so a tweak with the accompanying plastic screwdriver adjusts the play in the throttle servo pushrod making engine changes a cinch.

The second flight was even better than the first, things happened faster and with seemingly much more power. A friend who had joined us out on the flight line insisted upon his turn and knowing that he had much more skill and a quicker reaction time, we wanted to see what the plane could really do. He really did it to Mystik, we were not really worried that he would lose the plane, our worry was, would it hold up to the wracking he was putting it through. Our worries were groundless, it came out of the torture test with flying colors.

Apparently, the built in mid-wing seems to be stronger than either the high wing or the low wing. There are no worries that the mechanical attachment devices will hold up to implied stresses.

Conclusion:

Should you be looking for a neat .25-.30 sport plane you need look no further. Give the Mystik a trial and we are sure that you will feel as we do, the thrill you get from flying this plane will last a lifetime. □