



By Burnis Fields

# CESSNA 140

1/4 SCALE



At last . . . a scale modeler's dream comes true, Cessna's famous two place light aircraft — for the serious modeler!

**A**t the end of WWII, hundreds of thousands were learning to fly. The G.I. Bill was paying the tab. Dwane Wallace of Cessna Aircraft saw the unlimited potential, and designed the 120/140 series.

Patterned after what was successful in the light-plane market, the 120 came out

racing pilot "Steve" Whittman. This landing gear is very rugged, but springy. It had its good points, but if not used right, it could send you bouncing all over the place.

The 120 sold for \$2,495.00 and the 140 sold for about \$500.00 more. More people could afford to fly their own airplane. These planes were very popular with flying schools and sportsman pilots who just liked to fly.

The Cessna 120/140 is basically an all metal airplane with fabric covered wings. Powered by an 85 hp Continental engine, it could cruise at 105 mph. Stall speed of the 120 was 45 mph, while the 140 with flaps could get down to 40 mph. The 140 could climb at 640 fpm.

The Cessna 140 was pleasing to look at, inexpensive to operate, and above all --- **fun to fly.**

My model is a copy of a Cessna 140 that belongs to F. Bracewell of Dublin, Georgia. My thanks to Mr. Bracewell for his help with information and photographs.

If I have tweaked your interest and perhaps aroused some fond memories, let's build the model of the Cessna 140.

The Cessna 140 model is 1/4 the size of the full size. Material to build it should be available at your local hobby shop.

The model is built from balsa wood and plywood. The wings are in two panels and disconnect quickly for ease in transporting. Three set screws and a quick disconnect on the lower end of the wing struts make them very easy to install and remove. The spar supports at the fuselage are from Sig Mfg. Co. (same as used on the Spacewalker). The quick disconnects are easily made from sheet brass and brass tubing. A piece of 1/16" wire and a spring from a ball point pen form the lock.

The wings and tail are conventional except for the control surfaces. They are crimped plastic (again from Sig), and they are very light. The vertical fin and horizontal stabilizer have laminated 1/32" plywood leading edges.

The fuselage is built on a crutch, much like some of the old Freeflights and U-control models. Build the top half and then, add on the bottom. The landing gear is a modified Bravo gear.

The tail wheel can be either Sig or C.B. The engine can be 2-stroke or 4-stroke. Any good .90 to 120. I used an O.S. 1.08 2-stroke which is more than enough power.

## CONSTRUCTION

### Stabilizer:

Start the stabilizer by first tracing both leading edges from the plans. This is to keep from ruining your plans when you glue the laminations together. Over this tracing you assemble the laminated leading edges. I used seven layers of 1/32" x 1/4" plywood. Apply wax paper or plastic wrap over the plan to keep the glue from sticking to the plan. Stick pins along the inside line on the tracing to form a jig. Apply aliphatic glue to the 1/32" x 1/4" plywood and stack one on top of the other like a sandwich.

## CESSNA MATERIAL LIST

### Wood List

- 1 — sheet 1/8" x 6" x 12" plywood
- 1 — sheet 1/32" x 12" x 48" plywood
- 1 — sheet 1/4" x 12" x 48" plywood
- 1 — sheet 1/16" x 12" x 48" plywood
- 1 — sheet 3/16" x 12" x 24" plywood
- 3 — 1/8" x 3/8" x 36" balsa stab ribs
- 3 — 3/8" sq. x 36" balsa stab and elevator spars
- 5 — 1/8" sq. x 36" balsa stab, sub L.E. elevator and rudder ribs
- 1 — 3/8" x 3/4" x 36" balsa for rudder reinforcement
- 4 — 1/16" x 3" x 36" balsa sheet for covering of stab and vertical fin
- 2 — 1/2" x 1/4" x 48" balsa wing L.E.
- 2 — 1/4" x 1/4" x 48" balsa sub L.E.
- 4 — 1/4" x 1/2" x 48" balsa wing spars
- 4 — 1/4" sq. x 48" spruce rear wing spar
- 2 — 1/4" x 1/2" x 48" balsa rear wing spar
- 12 — 3/32" x 3" x 36" balsa sheet for wing ribs
- 1 — 3/32" x 12" x 24" lite plywood for ribs
- 1 — 3/16" sq. x 36" spruce for wingtip brace
- 16 — 1/8" x 3" x 36" balsa for fuselage sheeting
- 22 — 1/8" x 1/2" x 48" balsa for fuselage, planking and bracing
- 3 — 1/8" x 3/8" x 36" balsa for door frame
- 1 — 3/8" sq. x 36" spruce engine mount
- 2 — 1/2" x 3" x 8" balsa blocks for cowl
- 2 — 1/4" x 1/2" x 36" spruce wing strut
- 2 — 1/2" x 3/8" x 36" spruce wing strut
- 1 — .030" x 17" x 17" clear plastic for windshield and windows

### Hardware Items Needed:

- These may be purchased from Sig Mfg. Co., or your local hobby shop.
- 7 — Sheets of corrugated plastic (5/8" corrugations) Brave kit
  - 1 — Brave Aluminum landing gear RP — BA-257
  - 2 — Tiller Bar Kits #SH-715
  - 1 — Set engine mounts #SH-626
  - 2 — Pkg. 90 degree bellcranks #SH-231 (ailerons and flaps)
  - 1 — Pkg. of 15 Brand XX Hinges #SH-217 (ailerons and rudder)
  - 1 — Pkg. of 6 Brand XX Hinges #SH-216 (elevator)
  - 2 — .030 x 17" x 17" Clear plastic window and windshield
  - 1 — Complete set aluminum wing joining hardware, both spars (Spacewalker)
  - 4 — 4-40 clevis and rods (flaps and ailerons)
  - 1 — CB heavy duty tail wheel assembly
  - 1 — Pair 4 1/2" wheels
  - 2 — 1/4" x 2" hardened bolts
  - 4 — 1/4" nuts
  - 1 — Pkg. of 6 Super Hinge Point hinges
  - 1 — 1/4" sq. x 12" brass tube
  - 1 — 1/16" x 12" brass tube
  - 1 — Pkg. brass hinges (Houseworks #1122)
  - 1 — Replacement chain for a retractable key chain. (Tail wheel, can be found at most hardware stores)
  - 2 — Small Proctor Formica Horns (rudder and elevator)
  - 1 — Du-Bro Universal Switch Mount (radio switch)
  - 1 — 1/16" x 36" music wire (Jury struts)
  - 4 — 2-56 x 1/2" socket head screws (wing struts)
  - 1 — 1/2" tail wheel
  - 15 — Feet of .018 Control cable (Proctor), (elevator and rudder)
  - 1 — Sheet .010 brass
  - 1 — 1/8" x 12" brass tubing

## 1946 CESSNA 140

### Designed By:

Burnis R. Fields, Jr.

### TYPE AIRCRAFT

1/4 Scale

### WINGSPAN

96 Inches

### WING CHORD

15 1/4 Inches

### TOTAL WING AREA

1400 Sq. In.

### WING LOCATION

Above Cabin

### AIRFOIL

NACA 2142

### WING PLANFORM

Constant Chord

### DIHEDRAL, EACH TIP

1°

### OVERALL FUSELAGE LENGTH

61 1/2 Inches

### RADIO COMPARTMENT SIZE

Ample room under pilot seat

### STABILIZER SPAN

26 1/2 Inches

### STABILIZER CHORD (incl. elev.)

9 1/2 Inches (Avg.)

### STABILIZER AREA

218 Sq. In. (Approx.)

### STAB AIRFOIL SECTION

Streamlined

### STABILIZER LOCATION

Mid-Fuselage

### VERTICAL FIN HEIGHT

14" from Bottom of Fuselage

### VERTICAL FIN WIDTH (incl. rud.)

12 1/2 Inches

### ENGINE SIZE

.90-1.08 2-stroke; .90-1.20 4-stroke

### FUEL TANK SIZE

Sullivan 24 Oz.

### LANDING GEAR

Aluminum

### REC. NO. OF CHANNELS

5

### CONTROL FUNCTIONS

Rud., Elev., Throt., Ail., Flaps

### BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa, Spruce, & Ply
Empennage	Balsa, Spruce & Ply
Wt. Ready To Fly	240 Ozs. (15 Lbs.)
Wing Loading	24.7 Oz./Sq. Ft.

looking something like a Luscombe. This did not hurt Luscombe or Cessna.

The Prototype 120 first flew on June 28, 1945; the 120 and the more deluxe 140 started rolling off the assembly line March, 1946, and 22 a day were being built by August, 1946.

The spring steel landing gear used on the Cessna 120/140 series, was invented by



Photo #1



Photo #2



Photo #3

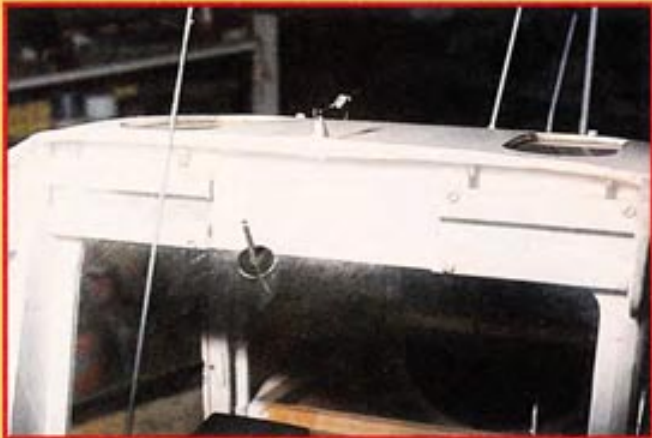


Photo #4

*#1: Radio compartment is under the seat. Here you see 3 servos (elevator, throttle, rudder, from bottom to top). Wrapped in foam is the receiver, and the battery pack is under the AMA placard.*

*#2: Here is a good shot of the elevator and rudder horns. The tailwheel chain is from a retractable key chain.*

*#3: Here you can see the holes for the four wing lock screws at the rear of the windshield; also, the rear spar set screws. The big round holes are for aileron and flap wires. You might notice the dummy antenna.*

*#4: This is a picture of the two front wing spar supports. Notice the four set screws and the eight 4-40 support bolts.*

*#5: This shows the recessed door handle and pin. The vertical slot above the gear is for the lower wing strut fitting.*

*#6: The lower wing strut quick lock can be seen between the lower door and landing gear plate supports. The lock is in the open position.*

*#7: Here you can see the rudder and elevator tiller bars. Notice how short the pushrods are. You can also see the door lock striker and door step.*



Photo #5



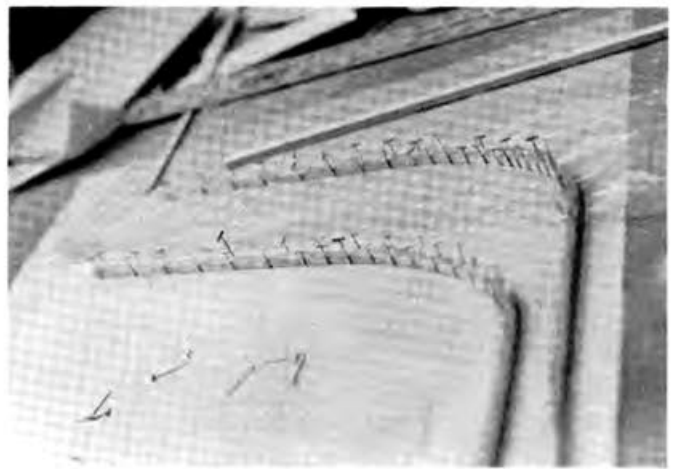
Photo #6



Photo #7



**Cowl and lower fuselage frames.**



**Laminating stabilizer leading edges (1/32" x 1/4" plywood).**

Quickly, before the glue sets, wrap the laminate around the pins and pin in place. Allow to dry. (*Editor's note: A 1/4" ply template could be made to wrap ply strips around.*)

Next, take a 1/8" x 3/8" x 27" spruce strip and glue it to a 3/8" x 3/8" x 27" hard balsa strip. This is the main stabilizer spar. Cover plans with clear plastic wrap and pin down spar with spruce cap toward front. From 1/8" x 3/8" balsa, cut out the stabilizer ribs and glue in place. CA glues will hurry the job. Now comes some fun. Place about six inches of two 1/8" sq. x 20" strips in water and allow to soak for about 15 minutes or so. While the strips are soaking, place pins along inside line of leading edge backing to form a jig (same as you did for the laminated leading edge). The 1/8" sq. x 20" strips can now be bent and pinned in place and glued with CA to front of the ribs. Note: 1/8" scrap balsa is used to shim the 1/8" sq. x 20" up from plan to insure that it is centered on ribs. Allow to dry. Sand ribs to shape, then install 1/16" sheeting with Sig-Ment or aliphatic glue. When dry, turn stab over and pin to building board again. This is to help keep out warps. The leading edge is now shimmed with 1/16" scrap. Repeat the above and when dry, remove from board and sand sheet covering to mate smoothly with 1/8" leading edge backing. Fit and trim

laminated leading edges and glue to leading edge of stab. This completes the stab, except for sanding and shaping the leading edge. Oh — yes! A little Model Magic will fill the cracks.

#### **Wing Construction:**

We have two reasons for building the wings at this time: #1 — lots of people hate to build wings. #2 — We need the wings and stabilizer to build the fuselage. Okay, let's get started.

1. Build up the rear spar. One piece 1/4" x 1/2" x 48" hard balsa with two 1/4" sq. x 48" spruce strips glued top and bottom. Install 1/4" x 1/2" x 4 1/2" plywood. Insert in root of spar. Taper rear spar at tip.

2. Cut out all the ribs from 3/32" sheet balsa, with the exception of the root rib, R2-B and R3-B which are 3/32" lite ply.

3. Pin down to plans the 1/4" x 1/2" balsa lower spar.

4. Cut three or four — 3/8" x 3/4" x 1 1/2" balsa blocks and pin to plan under rear spar. This forms a jig to hold the whole mess straight.

5. Slip all the ribs on the rear spar and set in place on blocks and lower front spar. Position the ribs and glue in place. **Do not glue R4 and R5 yet.**

6. Install upper 1/4" x 1/2" balsa spar.

7. Install sub leading edge.

8. Trace wingtips off the plan onto

tracing paper. (This will save your plans.)

9. Put clear plastic wrap on top of tracing and push pins in along the inside edge of the wingtip. This forms a jig for building the tips.

10. I set up my Dremel saw and cut fourteen 1/32" x 1/4" x 48" plywood strips.

11. Cut the strips a little on the long side for wingtips.

12. Using aliphatic resin glue such as Sig Bond, glue seven strips together like a sandwich and pin down tightly around the jig you formed on the wingtip tracing. Make sure the strips are held together tightly. Lots of pins do nicely. Allow to dry.

13. Block up lower front spar 15/16" from table at the point where the wingtip joins. Cut spars to length and taper upper side of lower spar, and the lower side of upper spar so that, when they are brought together, they will be 1/4" thick.

14. Now, glue in R4 and R5.

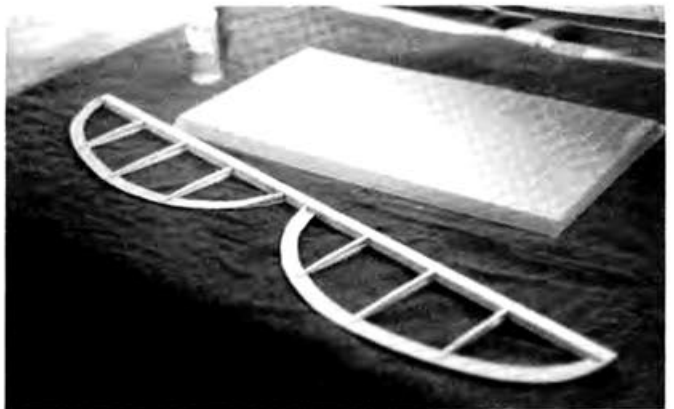
15. Cut a strip of soft 3/32" x 3/4" x 19-5/16" balsa and glue to the curved end of ribs at the flap location. CA is a big help here, also. Trim and sand to match the upper and lower edge of ribs.

16. Cut and glue on the 3/32" x 1" x 19 1/2" top balsa sheet at the flaps.

17. Now we start the aileron cutout. Cut to fit and glue in 3/32" x 1/4" strip in place in the V cutout. Now cut and glue in the



**Stabilizer with 1/8 sq. sub-leading edge in place.**



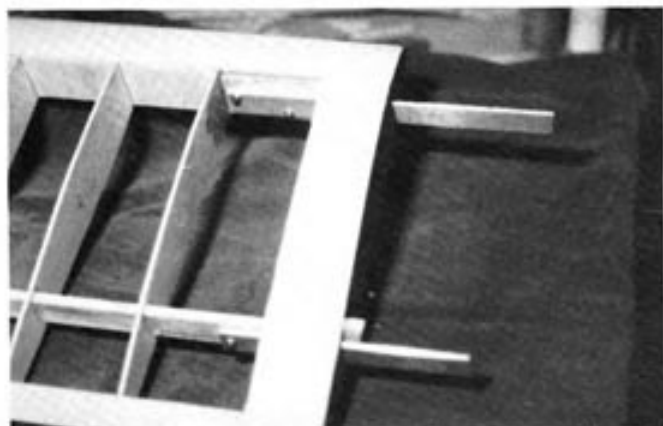
**Elevators and ribbed plastic covering.**



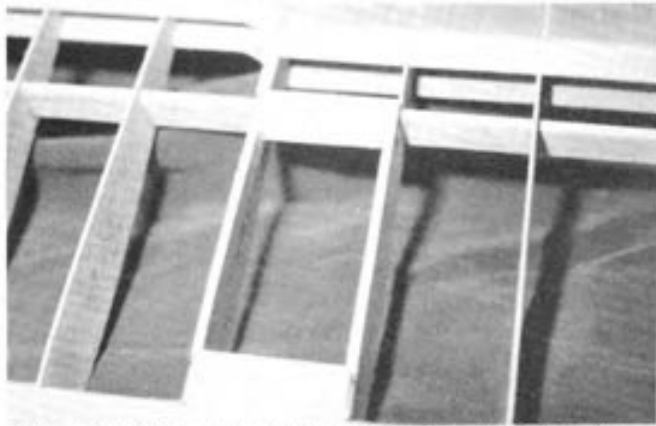
*Elevator with most of ribbed plastic installed.*



*Stabilizer and elevators complete and ready to cover. Balsa sheeted stabilizer is covered with silkspan.*



*In-board end of left wing. Aluminum bars support wing at fuselage and make wing installation very easy.*



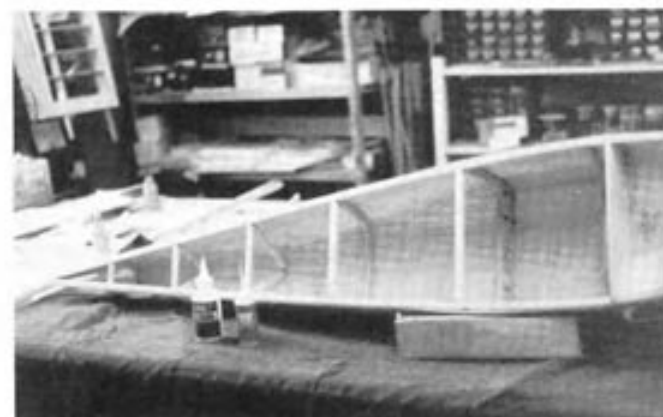
*Wing strut attachment points are boxed for added strength.*



*Laminated wing tip is braced with spruce (in case you stand your Cessna on the wing tip while servicing model).*



*Complete wing with aileron and flaps. Hinges are made up to look scale.*



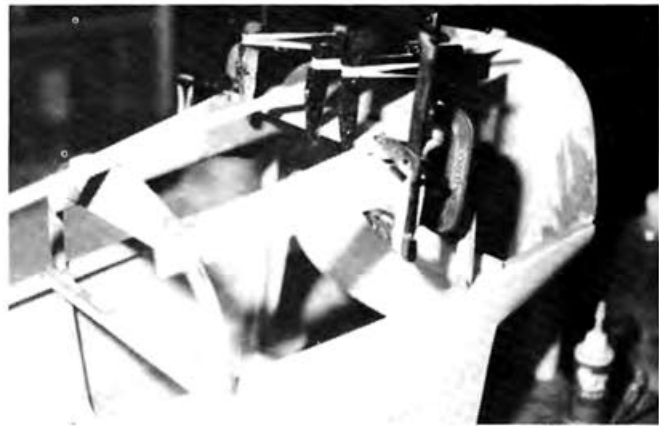
*Bottom side of fuselage top. Top half is built on a crutch, planked and sheathed as the curves dictate.*



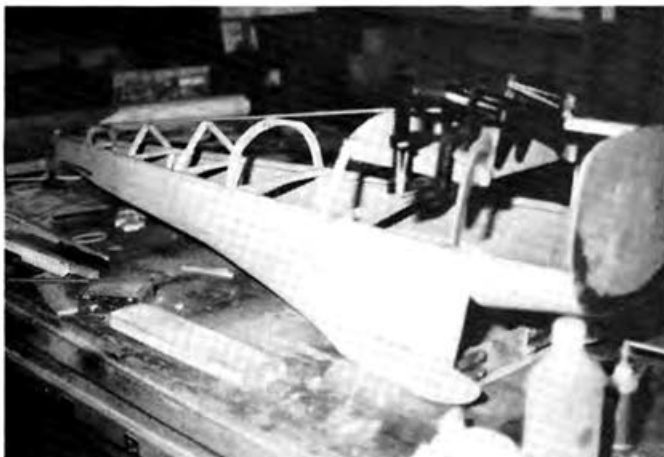
*Aluminum channels fastened to plywood frames support the wings. Set screws hold wing to fuselage.*



*Complete top half of fuselage. Wings and tail should have already been fitted and aligned.*



*Installing plywood plate for landing gear. Use slow epoxy glue.*



*Framework for the bottom of fuselage. The triangle frames are there to support the first plank and help keep the proper shape.*



*Complete tail installed. Controls are pull-pull cables. Elevator cables are inside vertical fin.*

3/32" x 1" balsa strip in the other side of the V cutout. Sand top edge of 3/32" strip to mate the top edge of ribs.

18. Cut and glue on 3/32" x 1" top sheeting at the aileron cutout. Be sure this sheet is glued to the ribs and the 3/32" sheet in the V cutout. This forms a socket for the aileron.

19. Install the curved gusset at R3-B where flap and aileron come together.

20. Trim and fit laminated wingtip. **Note:** laminated tip must be shimmed at the sub-leading edge. This tapered wedge brings the tip out even with the leading edge when it is installed.

21. Cut 20 spar webs from 3/32" x 3" C-grain sheet balsa. This is enough for both wings. Trim and install to the back side of front spars with the grain of the wood vertical. Omit the first two bays at the inboard end and the last bay at the tip. Allow to dry.

22. Remove from the board and install the lower sheeting at the aileron and flap. Cut and glue in plywood parts for wing strut supports. Use plenty of epoxy glue.

23. Install wingtip braces.

24. This is as far as we go until the top half of the fuselage is constructed.

25. Repeat above for the other wing.

#### **Fuselage Construction:**

1. Cement (3) — 1/8" x 3" x 24" sheets of balsa together to form a 9" wide sheet.

Cut 1/8" x 3" x 9" sheets and glue them to the 1/8" x 9" x 24" at 90 degrees to form cross grained 1/4" sheet. This is used to cut B1 instrument panel, E1 and E2, F1 and F2, and the rear cowl frame.

2. Using the fuselage keel plan, fold plan back and mate it to edge of your building board. Cover the plan with clear plastic wrap. Splice together (2) — 3/8" sq. x 48" strips for the keel. Use a 12 to 1 splice. Cut to length and fasten to the plan. Take the leftover 3/8" sq. and splice to another 3/8" sq. x 48" keel side. Cut to length.

3. Cut and fit the 3/8" sq. strips that fit at each former location. This makes the keel. The keel should extend past the edge of the building board. The firewall is mounted here and squared.

4. Cut and install the top half of the two plywood frames. Notice the angle of the C-frame. I added a piece of 3/32" plywood the height of the top of these frames and to the shape of the top of the frames. Install to the back of the frames with epoxy glue.

On the frame and between the aluminum channels, I glued in a piece of 1/16" plywood. This dresses up the frame which can be seen through the windshield.

There is a drawing of the cabin frame stiffeners and 1/16" fill-in for the front of the forward cabin frame. I put this in mainly to hide the joint in the frame.

5. From the laminated sheet of balsa, cut



*Control horns are formica. Tailwheel springs and chain hook to rudder horn.*

B1, E1, E2, F1, and F2. Parts are cut with the wood grain running at 45 degrees. This makes a very strong and light frame. Install E-1 and F-1 to the keel.

6. Cut G1 and G2 from 1/8" balsa. The tail wheel assembly fastens to this one. Install G1 at its location on the keel.

7. Install 1/8" x 1/2" x 48" strip at the top center of the frames. This reaches from the G1 frame to about 1" ahead of C2. This holds everything in alignment.

8. Splice enough 1/8" x 3" x 48" to reach the full length of the fuselage. I used a

center the keel. This leaves room to glue on the lower sheets later.

9. Glue on these to the lower side sheets. Trim to line up with the top of the fuselage. Let the sheets extend 1" past the firewall. Now we have the frames hemmed in.

10. From Sig Mfg. Co., obtain a complete set of wing joining hardware that is used on the Spacewalker. We use this to mount the wings to the fuselage. It is very solid and simple. This is the point where they must be installed. Once the top half of the fuselage is planked, you cannot get to it.

11. Drill four 7/64" holes as shown in each of the four channels. Be careful not to drill into the inside of the channel as the bars may not slip into the channel.

12. Drill and tap two holes for 4-40 screws in the top of the long channels and one hole tapped 4-40 in the short channels. These screws lock the wings to the fuselage.

13. Position the two long channels on one of the long bars. They should set flush with the bottom of C2 and C3 as shown on the plans and even with the outside edge of C2 and C3. When they are right, clamp and drill holes through C2 and C3 and fasten with 4-40 screws and blind nuts. It will be necessary to shim the top of the channel to make the bars slide easily when the wings are installed and removed.

14. Take one of the wings and saw out the R1-A rib behind the front spars and in front of the rear spar. This is to make it easier to install the support bars.

15. Cut a piece of 1/4" plywood to fit between the two front spars and the butt rib and R2. Cut and fit a piece of 1/8" plywood to fit behind the front spars from top to bottom and from the root rib and R2. Epoxy these two pieces together, but **not** to the wing.

16. Cut slots in the butt rib and R1-A for rear bar. Cut slot in butt rib for the front bar. Be careful; we are about to set the angle of incidence and dihedral. Don't be afraid to take your time here, to check and recheck.

17. Slip the plywood assembly between the front spar and slip the front bar in place. Slip the rear bar in the slots at the rear spar.

18. Slip the front bar into the channel on C frame and block up the wing. Fuselage should be sitting flat on the table. Set 1 degree dihedral in the wing.

19. Slip the rear channel onto the rear bar and position as shown on the plan. Set 1 degree positive incidence. Check that the dihedral did not change. Lock the bars in both channels with the set screws. Recheck your angles again. Now drill the bars and spars as shown on the plan. Fasten with 4-40 screws and blind nuts.

20. Now, go back and recheck. Everything okay? Now do the other wing.

21. You can fit the stabilizer at this time. All the angles are much easier to set before the bottom of the fuselage is added.

#### **Back To The Wings Now:**

1. Replace the R1-A rib. Sand the sub-leading edge and glue on the upper and lower leading edge sheeting. When dry, sand sheets to mate at front of sub-leading

edge and install leading edge. The outboard end will have to be slotted to accept the wingtip. Using a plane, sanding block with 80 grit sandpaper and a template, finish the leading edge.

2. Put the 3/32" sheeting on the two inboard ribs.

3. Cut and shape flap spar as shown and cut flap ribs. Pin the spar to the plan and glue on the ribs. I used 1/16" plywood at the rear of the flaps and aileron to support the plastic skin. The skin is obtained from Sig Mfg. Co. They use it on the Brave elevators.

4. The ribbed plastic is cut to size and glued to the frame with medium CA glue. It will have to be joined at one of the corrugations to make it match and help to hide the joint.

5. Ailerons are made the same way, but the spar is a different size and shape.

6. One-quarter scale Robart hinge points are used on the flaps, and Brand XX Hinges from Sig are put together, three on a common wire, to form a piano hinge. This is used on the ailerons.

#### **Back To The Fuselage:**

1. Install the instrument panel.

2. Using 1/8" x 1/2" x 48" balsa strips, finish planking the top of the fuselage. Starting at the top center strip, put three strips on each side. Trim at the rear to match the side sheets. It will also be necessary to bevel the edges in some places to get a good fit.

3. Install a 1/8" x 3" sheet on each side and trim to match the top strips. This sheet should extend forward of the firewall.

4. Install the cabin sides to top of frames. Make sure they are 1/8" below wing.

5. Install two more strips on each side. Trim to match side sheet.

6. Glue two 1/8" x 1/2" strips from the side sheets up, and trim to match side sheet.

7. Put on three more 1/8" x 1/2" strips on each side at the top. You will have to wet the last strip.

8. Fill in what is left with scrap sticks.

9. Cut slots for the wing bars. Now, if you did like me, you forgot to cut holes for the six set screws. Happy hunting!

10. Fill in the sides between cabin sides and the 3" sheets. Cut sides at the front post for the windshield. Obtain measurements from the plan and cut carefully.

11. Wet the sheets at the front and wrap down on the firewall and instrument panel. Fill in the rest with 1/8" sheet balsa.

12. Cut and fit a 1/8" C-grain balsa doubler inside the front of the cabin, between the C frame and the instrument panel. This helps to stiffen the front post of the cabin.

13. Slip the wing fairing ribs onto the aluminum support bars and install the wings onto the fuselage. Set the wings out from the fuselage so that the wingspan is correctly centered and straight (90 degrees to thrust line, looking down on the model). Pin the ribs to the wing root rib and make sure they are centered for the 3/32" sheet balsa covering. Install the 1/4" thick blocks

between the fuselage and fairing rib. Allow to dry. Remove the wings and fit the 3/32" sheet balsa covering. Be careful of the shape of the top sheeting where it joins the top of the fuselage. This has a lot to do with the scale looks of the plane. Sand so that the wings mate perfectly.

14. The fuselage is now removed from the building board and we start the bottom half.

15. Cut out 1/8" at the rear of the keel to receive the 1/8" plywood tail wheel mount. To make it easy, I used a regular C.B. tail wheel assembly. Install the two spring leaves on the mount with the two screws and nuts provided. Glue the nuts to the mount. Epoxy the assembly in the notch at the rear of the fuselage. Allow to dry.



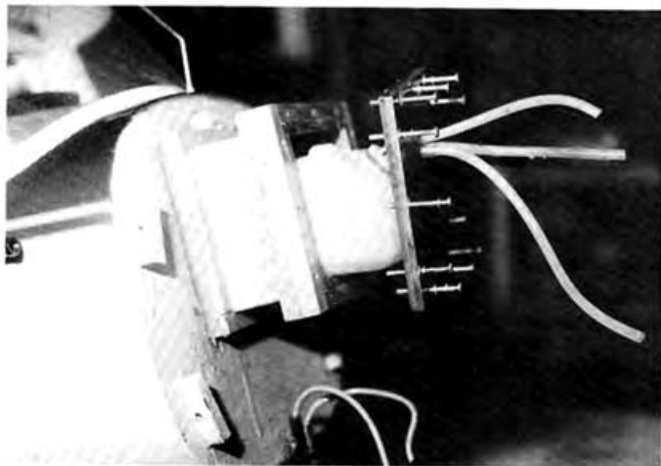
**Complete fuselage bottom and the beginnings of balsa cowl. Cowl is easy to build and very light.**



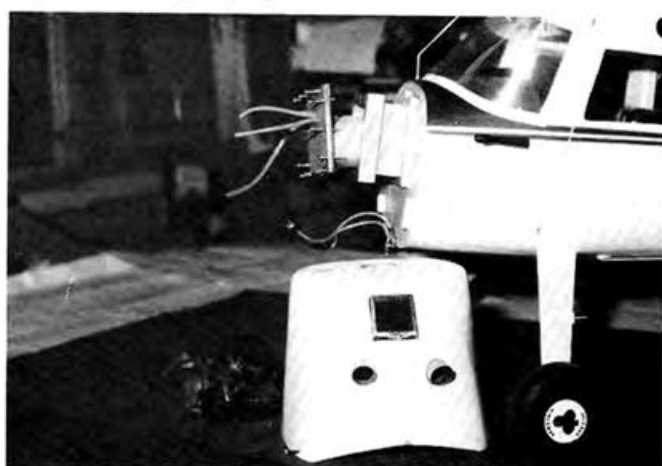
**Top view of nose shows cowl and support blocks, fuel fill probe, and general layout. O.S. 1.08 2-stroke engine.**



**Looking at the bottom of the nose, you can see the extension wires for the glow plug. That's a mini-alligator clip and an old glow plug.**



**LEFT: Tank is accessible through front of box mount which is not glued to the main firewall until correct prop to main firewall distance is decided. A 24 oz. slant tank is shown. Note the throttle pushrod and glow plug extension at bottom. Fast threads and machine screws hold the cowl to the blocks. RIGHT: This shows what can be done with an old lawn chair. Make exhaust stacks. The one on the right slips under the muffler. The air cleaner is black screen and supplies air to the cylinder head.**



16. Install bottom formers.

17. Cut and install the two 1/4" plywood landing gear support mounts between frames C and D. Use slow drying epoxy glue.

18. Cut the 1/4" plywood landing gear mount and install with plenty of epoxy glue.

19. When this assembly is dry, install a Sig Brave landing gear with three 8-32 screws and blind nuts. Sig will be happy to sell you this gear. Drill a new 1/4" hole between the wheel pant holes and cut off the bottom of the strut. The struts are just a little bit too long.

20. Now we go back to planking. The entire bottom is planked with 1/8" x 1/2" strips. Start as before with a 1/8" x 1/2" strip down the center and alternate bottom strips and side strips so that the proper contour will be maintained at the tapered ends of each strip. Carefully fit the strips around the landing gear.

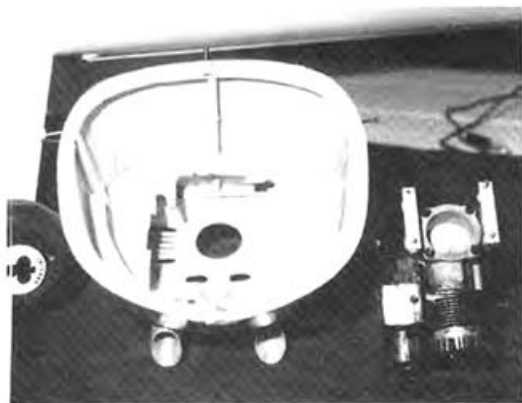
21. Using a 2 1/2" x 11" sanding block (no pad) with #80 grit sandpaper, you sand until the surface is smooth and the ridges are gone. If you fitted your planks well, this should not take long.

22. Looking pretty good? Okay, let's

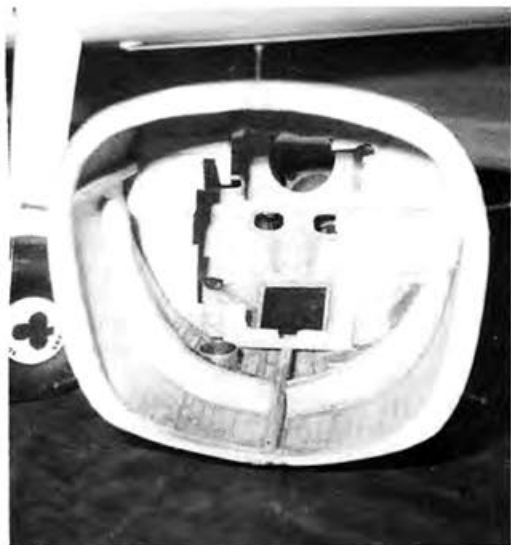
start with the sanding sealer. (Dope and talcum powder works well.) Put on a coat and let dry. Sand with 220 grit sandpaper on a block. Do two or three coats. Now, here is something I'll bet you have not done in a long time. Cover the entire fuselage and tail feathers with medium silkspan. Cut your shapes, lay it in place and spray with water. (A windex bottle works great!) Dope it down right through water and all. Now give the whole thing three more coats of sanding sealer. Sand between each coat. Now it's ready for the final finish!

23. The engine mount is a box made from





**Note that the Tatone muffler fits up tight against the engine. Air goes into the cowl through the four holes in the front of the cowl, and through the air cleaner screen. The cowl is all balsa. The grille is sheet plastic. Notice the baffle inside the cowl; this baffle makes the engine run much cooler by forcing the air around the engine.**



**As it says on the hubcap, this is really "Something Special." See the planking in the bottom of the cowl? That is the only compound curve on the airplane.**

3/16" plywood as shown on the plans and epoxy glued together. The top of the box reaches back to the instrument panel and serves as a tank mount. The other three sides reach just through the firewall. Epoxy four 3/8" sq. spruce blocks around the front of the box to support the 3/16" plywood engine mount. Cut the 3/16" mount to fit the front of the box and drill holes for bolts that hold the mount to the box. The mount is

bolted on to give access to the fuel tank. Mark centerlines on the mount and mount your engine, being sure that it is properly centered. Slip the entire unit through the firewall and align it to the centerline and the depth of the cowl. The prop should clear the front of the cowl about 1/8". If everything is straight, epoxy the box into the firewall and add the 3/8" sq. spruce blocks around the joint to make it strong.

24. While you are playing in the epoxy, glue in 3/8" gussets inside the firewall. These will strengthen the firewall to the fuselage skin. Put one about every inch.

#### **Elevators:**

1. Cut to length the 3/8" sq. x 26 1/2" stabilizer spar.

2. Cover the plan with plastic wrap and pin down the spar.

3. Cut the 1/32" plywood trailing edge and shim up from the plan to the center of the spar. Shims are 5/32" thick.

4. Glue a piece of 3/16" x 1/2" balsa to the trailing edge at spar to form end and center ribs. Cement 1/8" sq. balsa sticks to the spar and trailing edge to form ribs.

5. When dry, turn the elevator over and repeat step #4.

6. When the assembly is dry, cut the corrugated covering to shape and glue to one side of the elevator. CA glue is perfect for this.

7. Cut corrugated plastic for other side.

**Make sure the corrugations match top and bottom.** Glue in place with CA glue.

8. I used cable controls on both elevator and rudder. You can use a pushrod if you prefer. I installed a small Proctor formica control horn in the center of the elevators. Pushrod installation will require a nylon control horn bolted to one side of the elevator.

#### **Rudder:**

1. The rudder is built like the elevators. Use 3/8" sq. balsa for the spar. Add the 3/8" x 3/4" balsa doubler to the back of the spar. Notice the cutout for the elevator spar.

2. Cut the 1/32" plywood trailing edge and shim up from the plan the same as the elevators. Balsa fillers are added at the top of the rudder, the same as for the elevator. Add the 1/8" sq. balsa ribs. When dry, repeat on the other side.

3. Cut and fit corrugated plastic covering to both sides, again making sure they match left and right.

4. Cut a slot in the bottom of the rudder and epoxy in a small Proctor formica control horn.

5. If you used cables on the elevators, you will have to hollow out the rudder to clear the elevator horn.

#### **Vertical Fin:**

1. The vertical fin is built the same as the stabilizer.

2. Trace off the leading edge on another piece of paper. This is to save the plan.

3. Laminate the leading edge the same as before.

4. Lay down the 3/8" sq. spar and the spar doubler.

5. Lay down the 3/8" lower rib.
6. Wet the 1/8" sq. sub-leading edge and pin in place on the plan. (Remember to shim it 1/8" above the plan.)
7. Install the 1/8" x 3/8" ribs.
8. Remove from the plan and sand the ribs to an airfoil shape.
9. Cover the fin on both sides with 1/16" sheet balsa. You may want to glue and sand the sheets before you glue it to the fin.
10. Sand the front of the fin flat and install the laminated leading edge. Note: The leading edge extends down into the fuselage.

frames, and bottom opening formers. Cut out the bottom section of the rear frame to form the air hole.

6. At this point, it is a good idea to sheet the top of the cowl as this part is straight and it helps to stop twist as the bottom planks are worked into place.

7. When all planks are in place, the cowl can be rough sanded.

8. Glue two 1 1/2" x 3" x 8" balsa blocks together to form a block 1 1/2" x 6" x 8" for the front of the cowl.

9. Position the cowl front on the block and draw around it. Find the centerline and drill 1 1/2" hole for the crankshaft.

10. Cut block to outline and tack glue it to the front of the cowl. Carve to proper

shape as shown on the plans.

11. Mark around on the inside front block at the front former.

12. Pop the block off the cowl and carve out the inside. This saves weight and makes room for little things like cylinders and carburetor. Cut to 1/8"-1/4" thick.

13. Re-glue the block to the cowl and mark and cut the four air holes and the air cleaner hole.

14. Frame the inside of the air cleaner hole with pieces of 1/8" sheet as shown on the plan.

15. The cowl can now be finish sanded and covered with silkspan as is the fuselage and tail feathers.

16. The exhaust stacks are cut from

bottom can be cut from 1/4" sheet balsa.

3. Cut from 1/4" sheet the two lower angle frames that form the air hole at the bottom rear of the cowl, and the two center frames that give the lower cowl its shape. This is the only compound curve on the fuselage.

4. Fasten the rear frame to your building board and with a square, center the 1/16" plywood front piece on the four pieces like a table. Be sure it is square and not twisted.

5. When the frame is set and dry, start to plank. Begin at the sides, using 1/8" x 3/8" strips. Work back and forth from one side to the other to help keep the cowl from being warped. When you have about four strips on each side, add the center

tubing obtained from a lawn chair. I am using an O.S. BxI 1.08 2-stroke engine with a Tatone Muffler and the stack lines up perfectly. The pipe in the cowl sets just below the muffler to allow the cowl to be slipped on and off.

17. Hold the cowl in place on the firewall and mark around the inside on the firewall.

18. Remove the cowl and epoxy glue five 3/8" x 1" spruce blocks to the firewall so that the cowl will slip over them snug.

19. Tape the cowl in place and drill five 1/8" holes, 3/16" forward of the rear of the cowl. Drill through both the cowl and blocks.

20. Remove cowl and install 4-40

**continued on page 60**

threaded inserts. If you cannot get threaded inserts, use blind nuts. Use 4-40 x1" screws to hold the cowl to the firewall.

21. The grille is made from 1/16" aluminum tubing. It is easy to form and a 36" piece is plenty. Bend to shape and cut to length and use Sig CA Plus to glue it to the cowl. Make sure the bars are the right length before you glue them. They are hard to correct after they are on.

22. The cowl should be sealed inside to keep fuel from soaking into the wood. Thinned epoxy does a real good job. Your cowl should be complete and ready for color paint.

23. Trace patterns for the side and top windows. Put into position on the fuselage and mark and cut out the holes. Go carefully, a slip of the knife and a lot of work goes down the drain. Sand smooth. (I waited until the model was painted to install the windows.)

#### Operating Doors:

Now is the time for a big decision. Do you want to go to the trouble of cutting doors, making hinges and scale door locks? If you don't want to do this, frame up a hatch in the bottom of the fuselage big enough to get to your radio. Put the hatch just back of the landing gear.

Now, for you brave and hardy souls who must do the whole thing --- here is how I did it.

1. Trace the door from the plan and carefully place it on the fuselage side. This must be done carefully so the front of the door lines up with the back of frame "C."

When you are satisfied with the location, slip a piece of carbon paper under the pattern and trace onto the fuselage side. Don't forget to repeat the process on the other side.

Using a new and a very sharp #11 blade, carefully cut out the door. Cut from the corners and you are less likely to cut an extra door.

Carefully, remove the door from the fuselage. At this point, the wood can be easily broken.

Cut lengths of 1/8" x 3/8" hard balsa for the door frame. To get the exact fuselage curve, I held the strips in place in the fuselage side and marked the curve on the strips. The curve must be right for the door to fit properly. Frame all the way around the door and window. Leave space around the window for the glass.

Frame the door hole at the top, back, and bottom.

2. The door hinges are made using Houseworks #1122 hinges (used in doll house building). From .010 sheet brass, cut two pieces 5/16" x 1 1/4". Lay out holes as shown on the plans. These holes are for the small pins that simulate the rivets and hold the top hinge to the door. Drill with a .080 drill.

Solder one brass hinge strap to each of two hinges. This makes the top hinges. The



*Here is the front end all together, along with the scale prop. The prop is finished with automobile chrome bumper paint; it takes a long time to dry. The dunce cap spinner is molded plastic. Cowl mount screws are counter sunk, socket head screws.*

bottom hinges are used as is.

Measure back from the front of the front cabin support 13/16". This is the position of the top hinge pin. Temporarily fasten hinge, (strap to the rear), hold the door in place with the hinge closed. Mark location of the hinge butt on the front support. Remove the door and hinge from fuselage and carefully cut a hole for the hinge butt to recess into. This depth is to the center of the hinge pin. Do not cut all the way through.

Pin both hinges in place on the door and try the fit. You will have to round out the front door frame so that the door will swing without dragging on the front door frame. Smooth?

Okay, now, we will think door lock.

#### Door Locks:

1. The door lock is made from 1/4" brass tubing and 1/16" brass tubing. Lay out one of the lock plates on the square tube and drill the two .080 holes in the brass. Cut the plate from the tube. I used a fine blade on my Dremel saw, file smooth. Now, do it again for the other side.

Take the 1/16" brass tube and mark a length to fit inside the square brass tube. Do not cut it off. To the center of this length, solder another piece of 1/16" brass tube. This looks like a "T" and is the lock bolt. Now that the solder has cooled, cut the short piece from the tube and file until it slips inside the square tube. Cut the tube that forms the bolt to a total length of 5/8".

Cut a "T" pin to 5/8" and push it through the lock and the bolt. Make sure the head of the "T" pin is down. Turn the "T" pin parallel to the lock and solder the top end. The bolt should work smoothly in the lock. Use another piece of a pin for the lock pivot.

Carefully, cut the hole in the door for the lock. Mark and drill the hole in the door

frame to fit the bolt. Slip the lock assembly into the door. It will be necessary to groove the inside of the door for the pivot pin. The lock fits flush with the outside of the door. Glue the pivot pin in place. Be very careful not to get glue in the lock. Install the spring over the "T" pin and glue on the 1/8" balsa spring stop. Set the stop so that the bolt will come back even with the door frame. Check lock for smoothness of operation. (Note: I used the springs from an old throttle over-ride set — Du-Bro DU-120.)

Mark and drill hole in the door jamb for the plastic tube striker. Make sure the door fits flush with the door locked. Install a piece of scrap 1/8" sq. balsa to the door jamb at the lock for a door stop. If you have done everything right, the door will swing smoothly to the wing strut, and the lock will work smoothly.

Now, isn't that great? Do the whole thing over for the other side. Make two strut locks as detailed on plans. Be sure you make one right and one left.

#### **Wing Struts:**

1. The wing struts are made from spruce. The front strut is 1/4" x 5/8" and the rear strut is 1/4" x 3/8". Notice the 1/16" plywood cap on the outboard ends. These hold the 2-56 x 1/2" bolts at the wing.

Cut the struts to the length and shape shown on the plans.

Protect your plans with plastic wrap and epoxy the lower ends together. When dry, remove from the plans and cut the slot for lower brass fitting. Install the fitting in the slot with epoxy and wrap the joint with fiberglass cloth and epoxy.

Epoxy the 1/16" plywood caps to the outboard end of the strut. Check the strut for proper length. Wrap the ends with cloth and epoxy glue. Allow to dry.

Drill the hole for the 2-56 x 1/2" socket head screws. Now, drill the spruce for the head of the screw. **Do not drill into the plywood!** The screw head is hidden by the spruce. Sand entire strut to a streamlined shape.

With the wing installed and locked to the fuselage, slip the lower fitting through the slot you have cut in the fuselage at the back of the "C" frame, and bolt the outboard ends to the wing. With the lower end of the strut touching the fuselage, drill a 3/32" hole through the hole in the fitting and former "C." This hole is for the strut lock.

Slip the lower end of the strut lock into the hole and put a #2 sheet metal screw through the third hole in the plate and former "C." Pull out the lock and turn away from the hole and the strut is free. Turn the lock back over the hole and push it in, and the strut is locked. I tried bolts, but it took too much work to get to them.

Bend the jury struts from 1/16" music wire and bind with copper wire and solder. Put the strut in place and bind to the struts with #8 sewing thread. Cement 1/16" x 3/16" balsa to the wire to make it look scale. The balsa is sanded streamline.

Paint with three or four coats of sanding sealer. Sand with #220 sandpaper after

coat. The struts are now ready for final 1.

#### **ring:**

covered the fuselage, stabilizer, and tail fin with medium silkspan. That ties the wood grain together and provides a smooth surface that can be easily made to look like metal. Three coats of sanding sealer after one coat of clear is a good foundation for your color dope. My plane is white with Jade Metallic Green trim. The Cessna 140 did not have a lot of trim.

The wings are covered with Sig Koverall. This is very strong and easily filled. I used Sig Stix-it to fasten the covering to the frame. A 1/4" wide band of glue around the edge of the surface is plenty to hold the fabric in place. For a quick surface fill, I used one coat of clear low shrink dope and two coats of sanding sealer. Sand lightly with #220 sandpaper. Go easy over the ribs and edges, you could cut through. Put on just enough color to give the finish you want, Cessna came off the assembly line in plain aluminum and the fuselage trim and numbers, usually on the rudder and bottom left and upper right wing (top of the number toward the leading edge). Maybe there is one at the local airport you can copy. This makes for great documentation.

#### **Flying:**

Now comes the part we have all waited for. Flying! Make sure the model is balanced. To not do this can really mess up your day.

When you are sure the engine is running right and the radio is moving the surfaces in the right direction, it is time to taxi. You know --- taxiing is what you do to get to the downwind end of the runway. Now, doesn't that handle nice? One more control check. Everything okay? Turn the model into the wind and add power. Ooooo — that's pretty! The model will roll straight down the runway and the tail will come up quickly. Almost no rudder correction is needed. When you know the beautiful Cessna has flying speed — tweak a little back stick and — Wow! The prototype flew without any trim change. The controls are quite responsive. Elevator is quick; you might try low rate for landing. Three point landings are a thing of beauty. Just get close to the ground and rotate to the three point position, and watch it settle in.

The full size 140 was not designed to do aerobatics. It was designed to be fun to fly and to go from point A to point B at a low cost.

The model will do that, plus, I have looped, rolled, snapped, and flown it inverted. It is no Extra 230, but it is fun to fly. In the air, it looks just like the real thing. Most anyone with tail dragger experience can handle it. Mine will take off, hands off.

The flaps are quite effective. They can be used for take off and landing. To set up for landing, slow the model down and lower the flaps. It will slow up some more and has no great tendency to pitch up or down. I do not retrim the model.

Congratulations, and happy landings! □