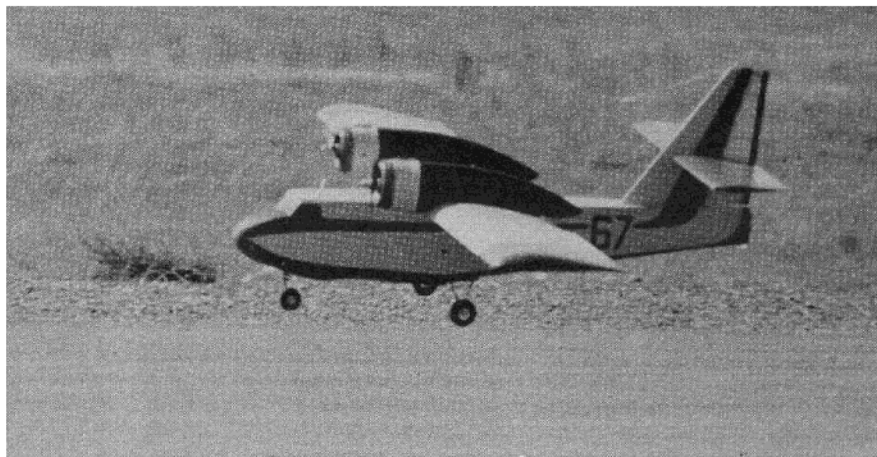




MICTURATOR





The genesis of the Micturator was a conversation held many months ago with Dick Tichenor. "You like to fly off the water. Why don't you work up something like this for a construction article?" With that he tossed a picture of the Canadair water bomber at me. I pointed out that scale models in various sizes of the Canadair had already been done.

Undaunted by my negativism, he charged ahead. "How about a practical amphibian for all those sport fliers out there who have a couple of .19s just sitting on the shelf? Something with a high lift wing with about a 12" chord, perhaps with flaps, etc. . . ." Dick was getting carried away. I had to put a damper on his enthusiasm. "It will probably be too big to fit in my Datsun," I said. I'm not interested in any airplane I can't carry inside my car and still have room for my lady.

The man won't give up. He sent me off with a 3-view and some pictures of the Canadair to think about it.

Well, he had me. Since I had never built or flown a twin, a flying boat, or a flapped airplane, here was a chance to kill three birds with one stone. Besides, the idea of having my model in RCM really stroked my ego.

So we hashed out our principal objectives: (1) A stable airplane that someone like myself (an average builder and flier) would be comfortable with; (2) rugged enough to take a hard landing on the water; (3) can be built with familiar materials and techniques — no exotic stuff; (4) uses supplies that are readily available at the local hobby shop; (5) is easy to convert from land to water flying and vice versa; (6) will fit into a small car.

A sport amphibian designed around a pair of .19s and rigged to be able to scoop up water and dump on the fire.

By Claude Brown

Photos By:
Dick Tichenor, Richard Young
and Bo Liman

After I got going on the project, I added another objective: The capability of picking up water and then, when airborne, releasing it.

So on with the fun of figuring areas, moments, hull design and flotation. Engine installation, and so on. Of course, the biggie with any airplane is the wing. It occurred to me that a wing design better than anything I might come up with already existed. Tichenor had used it with great success on his RCM Funster. It is the Telemaster 40 wing which is available as a kit from Hobby Lobby.

All that was necessary was to reposition a few ribs and to add some structure between the nacelles to take the vibrational and landing loads imposed by the two engines. The Telemaster 40 wing kit costs no more than the material necessary to build the wing from scratch and it saves a lot of time and aggravation. Think of making all those ribs.

Let's get on to how it all came out. With the plans drawn and the RCM prototype built, it was off to Mile Square for photos and the Micturator's first flight. Well, I'm not going to tell you it flew right off the building board. It took several flights before it performed to our expectations.

Then we filled the tank with colored

MICTURATOR

Designed By:

Claude Brown

TYPE AIRCRAFT

Sport Amphibian

WINGSPAN

73 Inches

WING CHORD

11 1/4 Inches

TOTAL WING AREA

840 Sq. In.

WING LOCATION

High Wing

AIRFOIL

Flat Bottom

WING PLANFORM

Constant Chord

DIHEDRAL EACH TIP

5/16 Inch

O.A. FUSELAGE LENGTH

48 Inches

RADIO COMPARTMENT SIZE

(L) 6 1/2" x (W) 5 1/2" x (H) 6"

STABILIZER SPAN

31 Inches

STABILIZER CHORD (incl. elev.)

7 Inches

STABILIZER AREA

210 Sq. In.

STAB. AIRFOIL SECTION

Symmetrical

STABILIZER LOCATION

Fin-Mounted

VERTICAL FIN HEIGHT

12 1/2 Inches

VERTICAL FIN WIDTH (inc. rud.)

7 1/2" Avg.

REC. ENGINE SIZE

(2) .19-.25 Cu. In.

FUEL TANK SIZE

(2) 6 Oz.

LANDING GEAR

Tricycle (removable)

REC. NO. OF CHANNELS

6

CONTROL FUNCTIONS

Rud., Elev., Ail.

Throt., Flaps, Tank Valve

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa, Lite-Ply, Ply

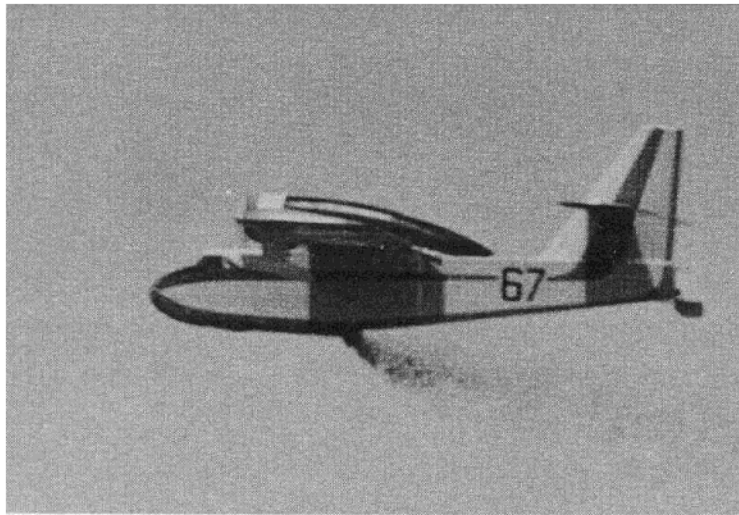
Wing Balsa & Ply

Empennage Balsa, Spruce, Ply

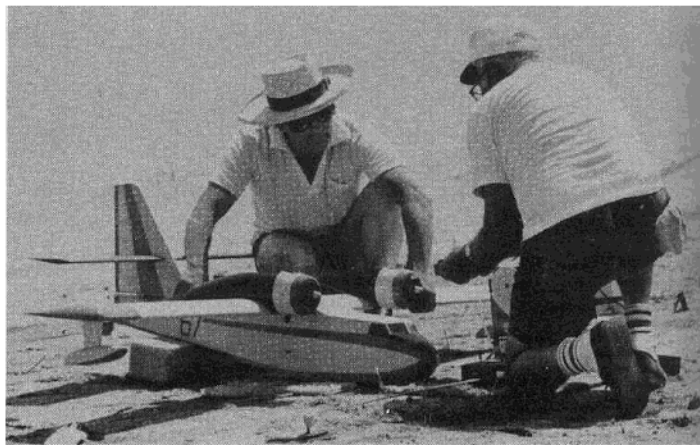
Wt. Ready To Fly 144 Oz. (water)

148 Oz. (land)

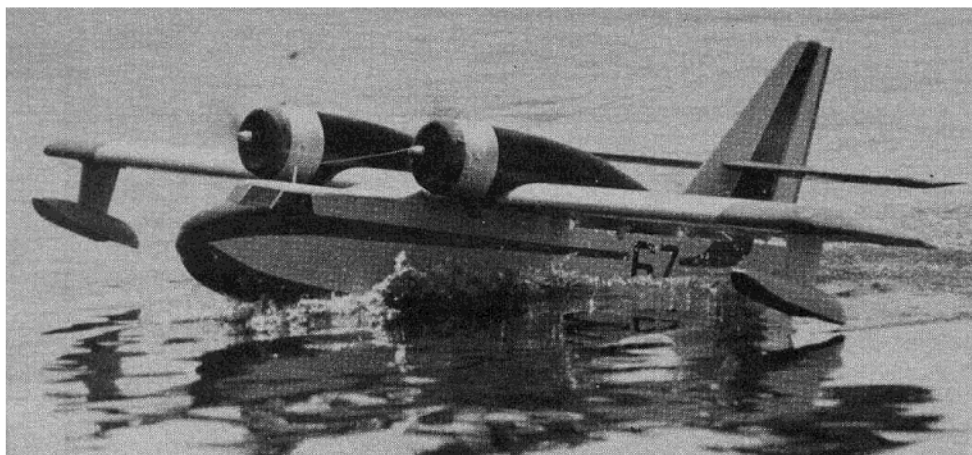
Wing Loading (land) 25 1/2 Oz./Sq. Ft.



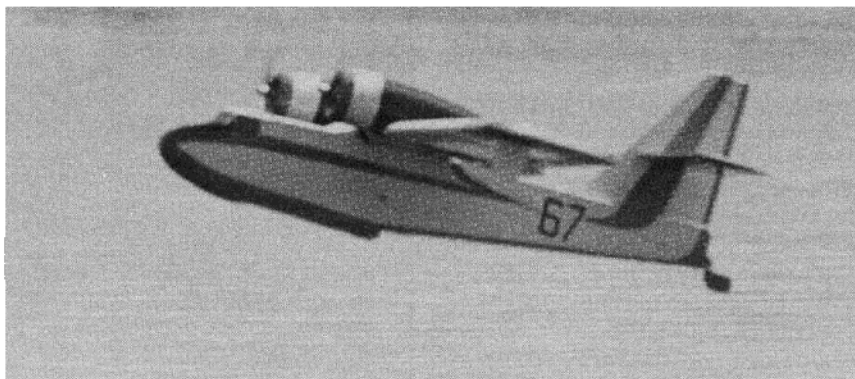
Water bombing run.



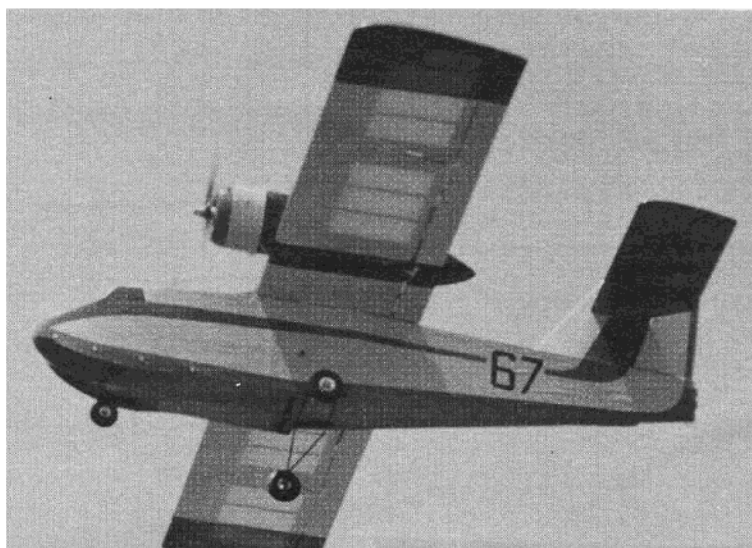
Claude (R) and helper taching engines before flight.



Coming onto the "step."



Climb out. The identification number is the author's age.



water, dropped the flaps about 10° and took off. With nine pounds of airplane and two pounds of water, it took about 200' to lift off. On the second try we made the water drop in close enough for Tichenor to get a picture. Looked great.

The Micturator is fun to fly. It is stable about all three axes and has no bad habits. It's even more fun to fly off the water. Take-offs are a joy to watch and the take-off run seems to be shorter than on land. Several touch and go water pickups have been made. During its thirty or so flights I've asked a number of pilots with various levels of skill to fly it. "Solid," "Grooves," "On rails," are typical comments. So who am I to argue?

CONSTRUCTION

General:

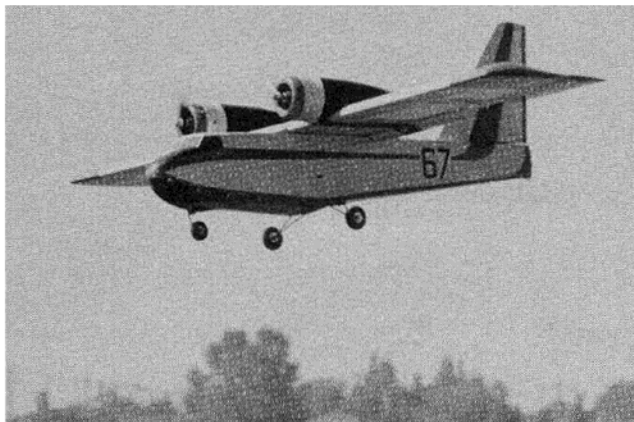
First let's cover the usual caveats: Use a flat building surface; protect the plans with Saran Wrap or waxpaper; and stick everything together with some kind of adhesive.

My RCM prototype was built almost entirely using Carl Goldberg's Jet and Super Jet. Epoxy was used only when more time was needed for parts alignment. Pica's Gluit was used to butt glue sheeting because it sands well.

Since the tail assembly is large, it was designed to be removable for transportation. If size is not a problem for you, glue it on.

You will notice that a continuous hinge pin is used on each movable surface. This makes it easy to remove for covering, cleaning, and — gulp — repair. Also it simplifies hinge alignment. My usual practice is to install hinges as early in construction

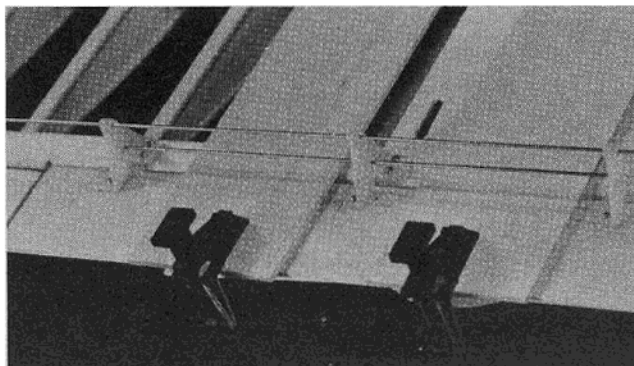
LEFT: Fly by as a land plane. The water pick up and dump ports are just forward of the step.



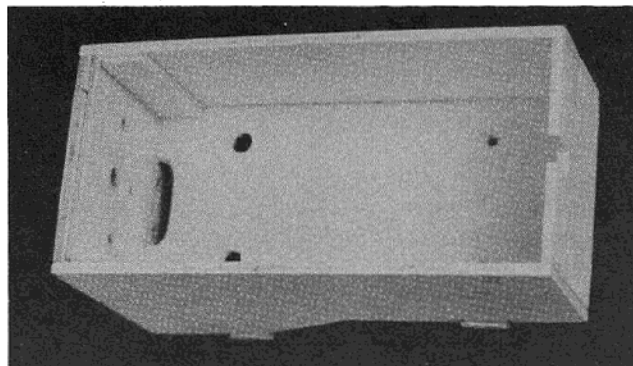
On final.



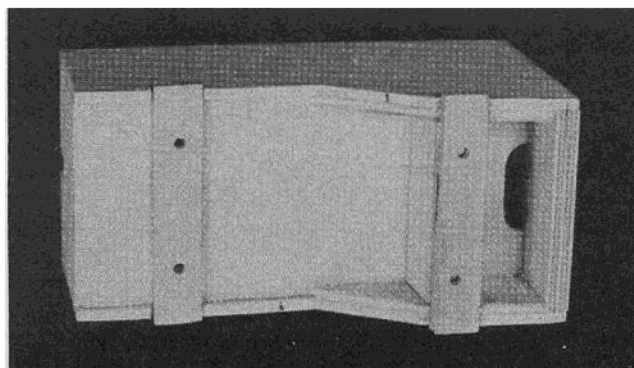
Flap bellcrank and throttle outer torque arm installation. Note blocks between lower spar and ply doubler. These prevent blind nuts from being pushed out.



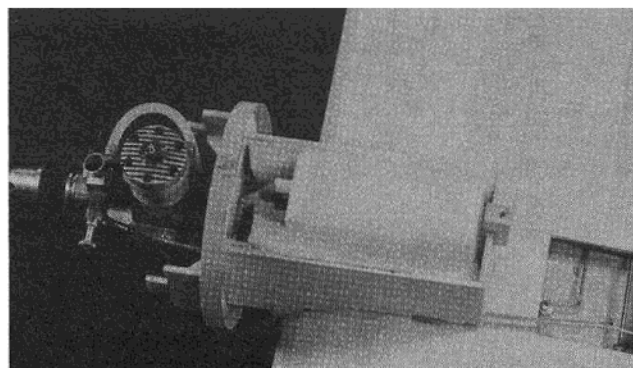
Method for aligning hinges on alternate flap installation.



Engine mount assembly construction — top view.



Engine mount assembly construction — bottom view.



Engine mount assembly mounted on wing with Kraft tank and throttle pushrod in place.

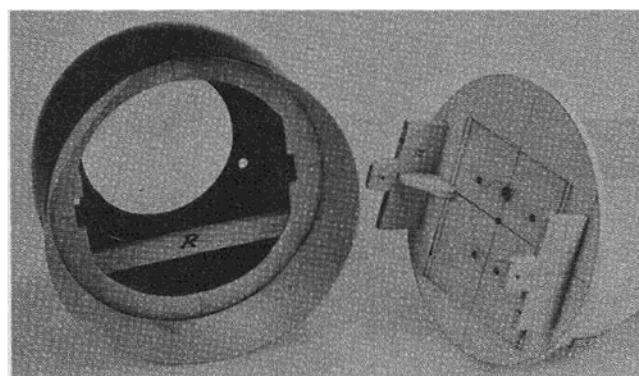
as possible.

The plans show conventional trailing edge flaps (Sect. G-G) and an alternate system with slotted flaps

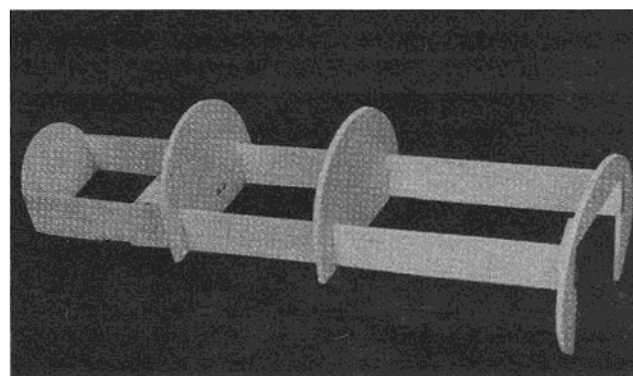
(Sect. V-V) which are hinged below the wing as on the Canadair. In building my airplane, provision was made for switching from one type of

flap to the other. Performance in the air will be discussed later.

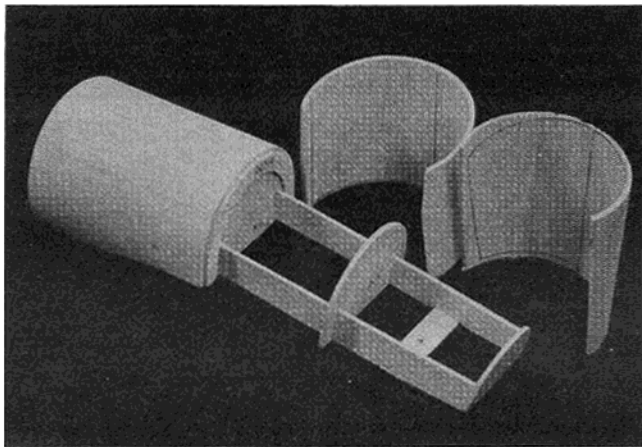
The Micturator was designed to be easy to cover and finish and to provide



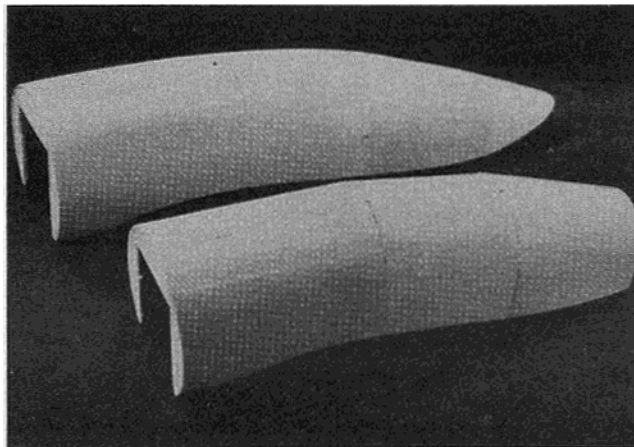
Outer firewall and cowl mounting brackets are shown on the right. Aft end of cowl assembly is shown on the left. The cross member was removed to clear the exhaust system.



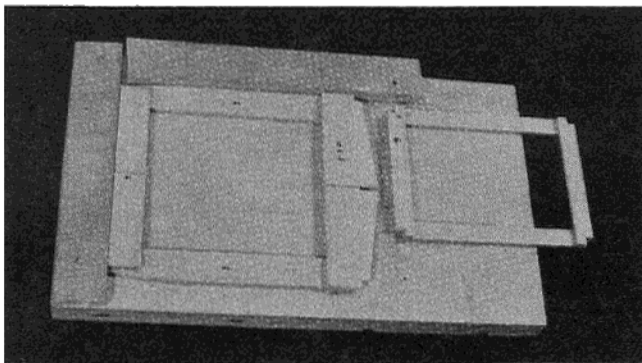
Basic nacelle framework.



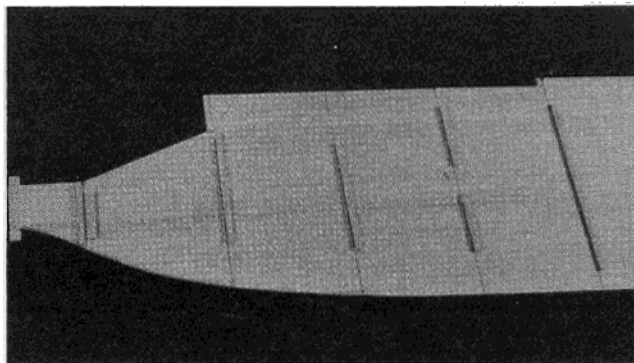
Nacelles partially covered.



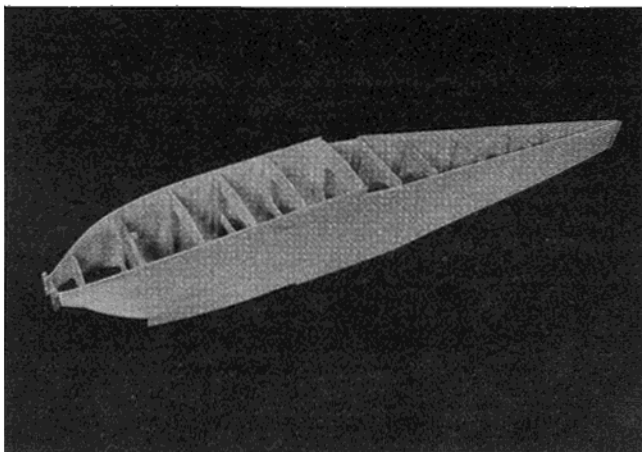
Completed nacelles ready to attach to wing.



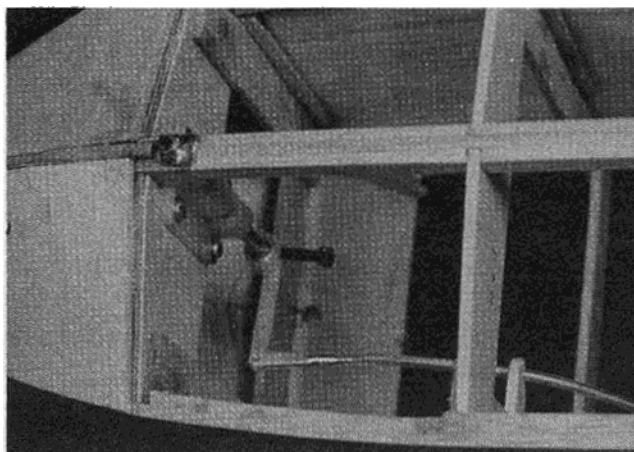
Simple fixture used in building fuselage formers.



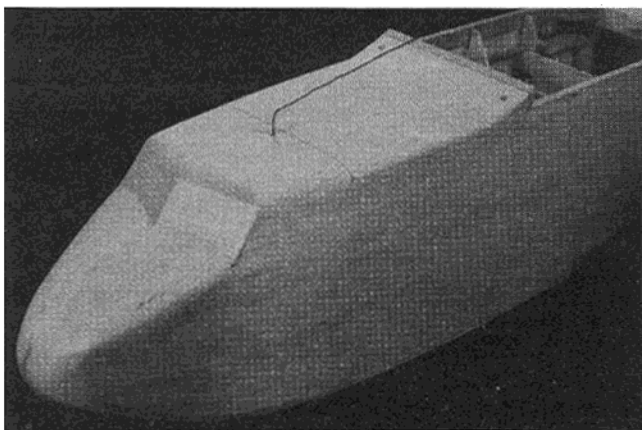
Right side of fuselage showing locating strips. Note clamping tab and cleat at forward end.



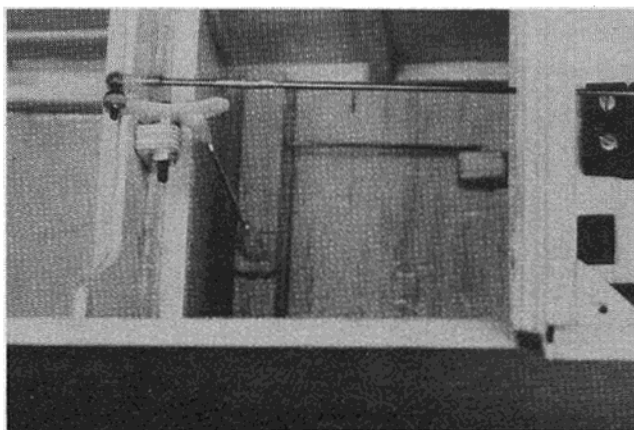
Fuselage with all formers in place.



Detail of nose gear mounting.



Forward end of fuselage sanded to contour.



Looking down into the water tank showing clapper valve and actuating linkage.

easy access to radio, controls, fuel tanks, etc.

Wing:

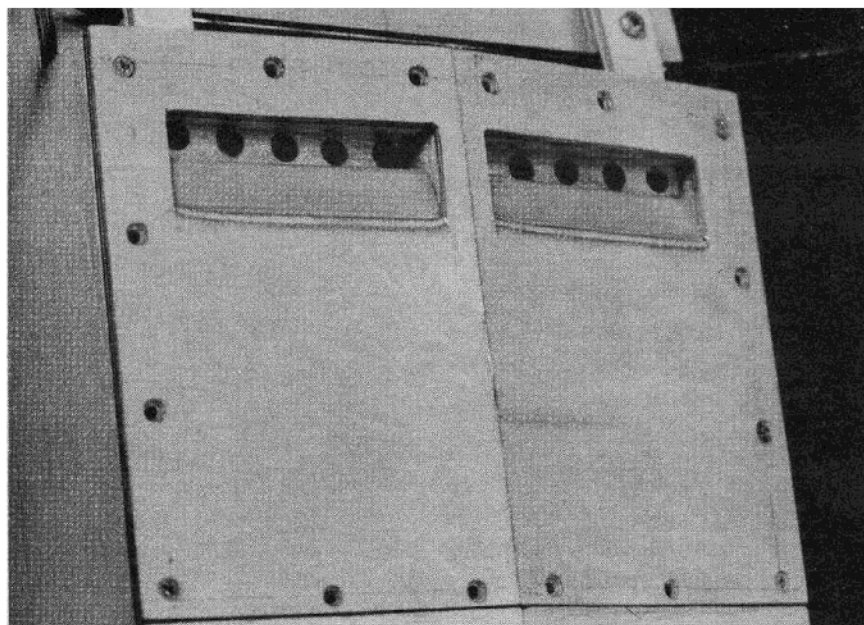
1. Make and identify all the ribs and shear webs.

2. Align the lower trailing edge sheeting in place over plans and glue the 1/4" x 5/16" sub T.E. to it. Pin the flap and aileron stock in position and mark hinge locations.

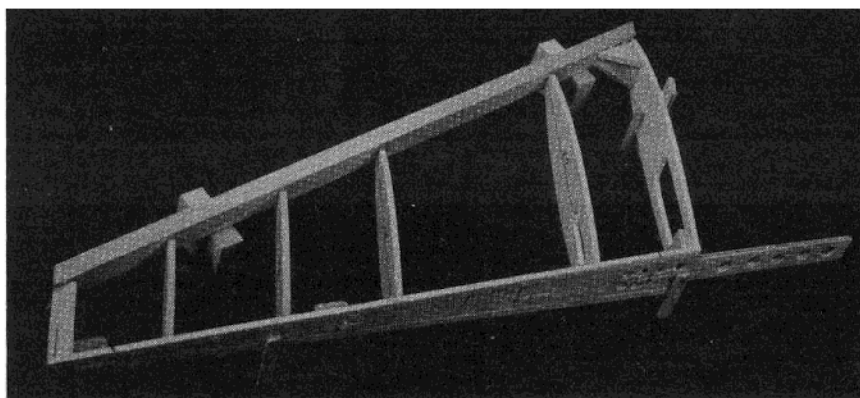
3. Cut hinge slots. See sections F-F and G-G for vertical location. Bevel ailerons and flaps as shown. Glue hinges in place and pin.

4. Trim the lower leading edge sheeting to width and pin over plans. Edge glue the 3/8" x 3/4" L.E. to sheet. Glue the 1/8" x 1/2" spruce L.E. doubler to the L.E. and lower sheeting.

5. Using several ribs as spacers, repin the trailing edge sheeting in



Tank bottom and water port. Port was revised to slots to dump water faster.



Set up for constructing and truing fin.

place. Fit and glue all the lower surface sheeting and rib capstrips.

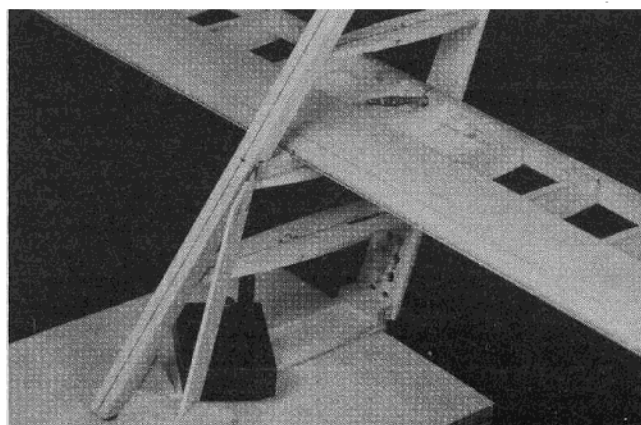
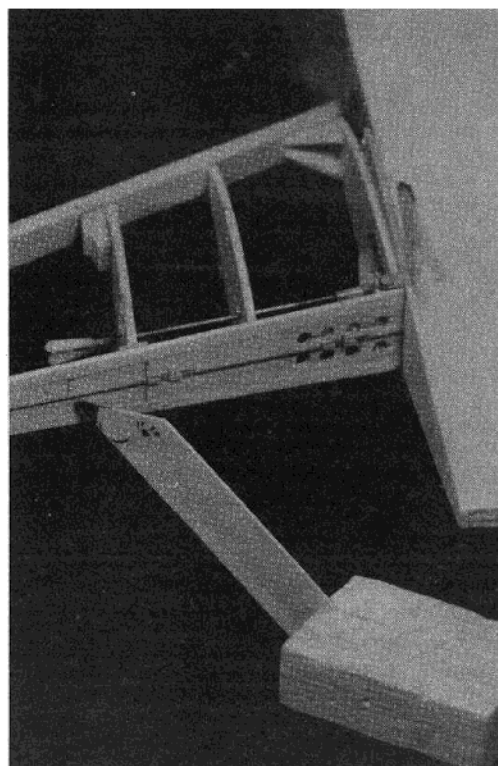
6. Place the 3/8" x 1/2" lower spar and the 1/4" square stringers in position using W-1, W-6 and W-14 for location. Glue spar and stringers to lower sheeting.

7. Push upper spar and stringer in place.

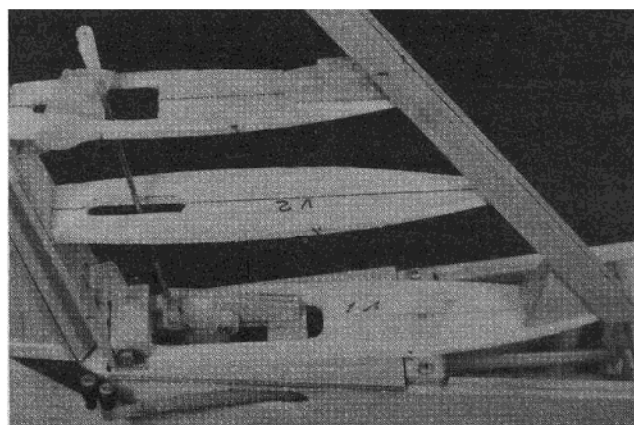
8. Set angle of W-1 with template

and glue in position. Glue 1/8" shear web to W-1 and front of spars. Position W-2 against shear web and glue. Using the shear webs as spacers. Position and glue in the rest of the ribs and webs. Leave out the rear web between W-4 and W-5 for now. Glue

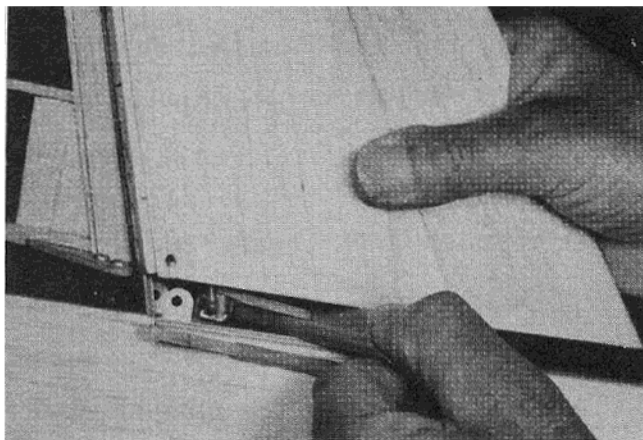
RIGHT: Aligning the fin on the fuselage.



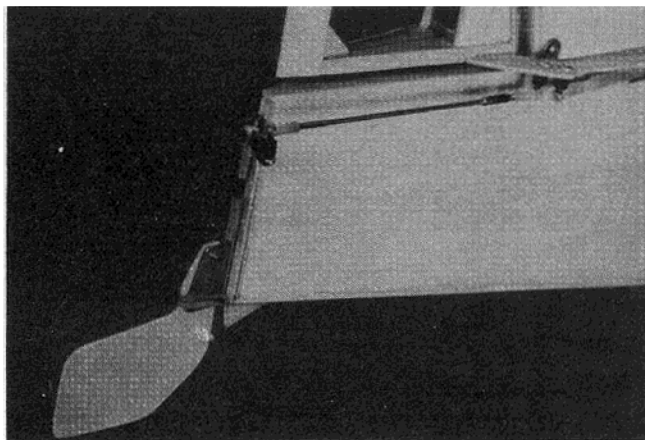
Checking incidence of stabilizer.



Elevator and rudder controls.



Disconnecting elevator control to allow removal of tail assembly.



Water rudder installation.

ribs to lower sheeting and capstrips.

9. Glue W-16 to stringers and lower sheeting.

10. Trim out the leading edge and leading edge doubler to fit W-15. Do not glue W-15 in at this time.

11. Glue 1/8" ply pieces between W-13 and W-14. Glue 1/4" square between W-1 and W-2. Glue balsa blocks at wing dowels and hold down screw locations.

12. Sand the sub T.E. to rib contour. Protect ribs with masking tape. Glue on upper T.E. sheeting and the 3/32" ply between W-1 and W-2.

13. Fit and glue the upper leading edge sheeting.

14. Install the flap, aileron and throttle controls.

15. Fit and glue upper sheeting in center section.

16. Glue in the locators and bellcrank plates for flap and aileron. Note — the purpose of the ramp on the aileron bellcrank plate is to enable the aileron pushrod to be inserted into the bellcrank after the wing is covered.

17. Remove panel from building board. Shape leading edge to contour. Use a template to make it uniform. Glue on the wing tip blocks and carve

to shape.

18. Trim upper leading edge sheeting to clear W-15. You can glue W-15 in place now or wait until after wing is covered.

19. Subsequent wing operations are to be performed during or after building the engine mount assembly and nacelle fairing.

20. With W-15 pushed into position, attach engine mount assembly to it with (2) 4-40 x 1/2" long screws. True up mount for 0° side thrust. Drill 1/8" holes through upper spar using rear mounting plate as guide.

21. Glue W-17 in position on lower surface of upper spar using screws through engine mount assembly for clamping. Block blind nuts with 1/8" balsa so they can't be pushed out.

22. Glue rear shear web in place.

23. Align and join wing panels with epoxy.

24. Make cutout in rib W-1 for the wing joiner. Epoxy joiner to upper and lower spars. Reinforce wing joint with glass or nylon tape per plans.

25. Mount aileron, flap and throttle servos as shown. Hook up controls and check operation and travel.

26. After fuselage is complete, drill

and insert wing dowels. Drill for hold-down screws.

Engine Mount Assembly:

1. Saw and sand two sets of components. Care taken at this time in making parts dimensionally accurate and square will pay off in assembly.

2. Drill holes in 1/4" ply firewall. Set 4-40 blind nuts.

3. Clamp up sides, firewall, floor and end plate with sides inverted. Check fit and squareness of firewall.

4. Soak all joint surfaces with Jet. Reassemble and glue with Jet. Glue in doublers and shear plate.

5. Locate and glue 1/8" ply mounting plates. Pin forward mounting plate as shown. Drill 1/8" holes in mounting plates.

6. Perform operation 20-22 on wing panel.

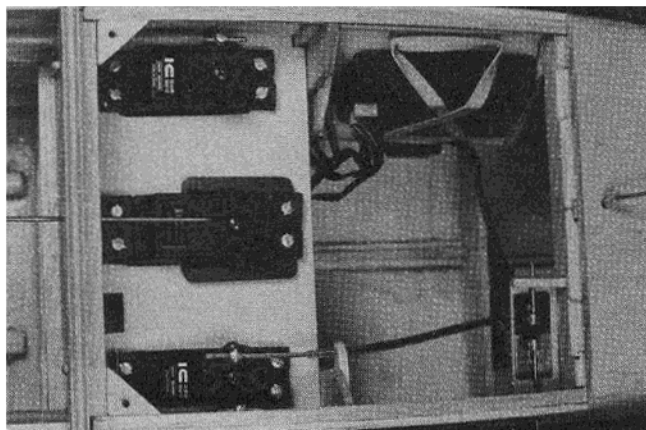
7. Glue on outer firewall and cowl mounting brackets. Glue 1/4" ply block to end plate.

8. Coat with resin, inside and out.

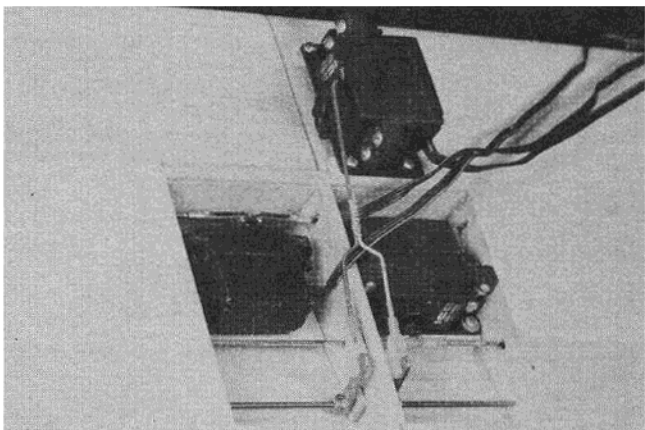
9. After nacelle fairing is completed, glue on seal ring and balsa fairing.

Nacelle Fairing:

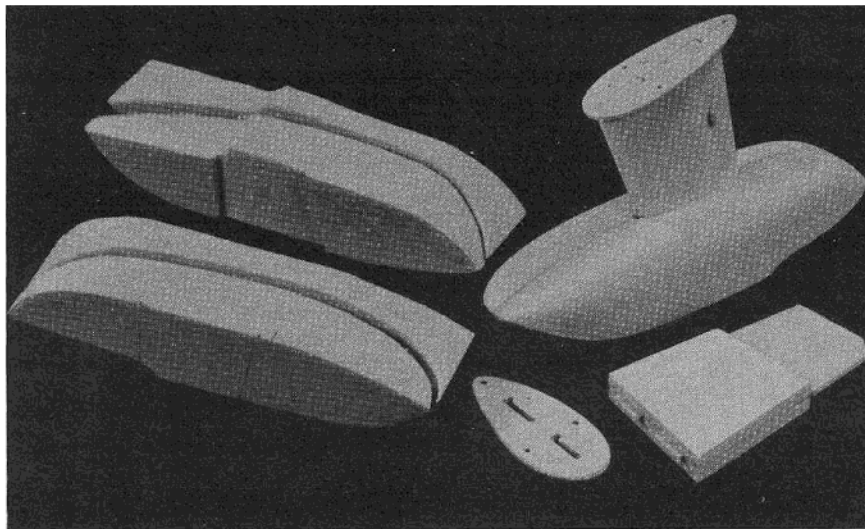
1. Make components N-1 through



Receiver and servo installation in fuselage.



Servo installation in wing. Note yoke from throttle servo to inner torque arms.



Tip float construction.

N-5.

2. Cover the nacelle area of the wing with waxed paper. Attach engine mount assembly to wing with 4-40 screws.

3. Cover backside of outer firewall with waxed paper and clamp N-2 in position. Cover sides with waxed paper and clamp N-1 in position. Slip N-3 and N-4 into slots in N-1. Put 1/8" x 3/4" cross piece in position. Clamp N-5 in place. Glue all joints with Jet. Glue N-2A in place.

4. Drill 1/8" hole through cross piece and into wing. Insert 1/8" dowel.

5. Select medium to soft 1/8" balsa for nacelle sheeting. Match flexibility as closely as possible. I didn't and it was **trouble**. Edge glue and trim to flat patterns shown.

6. Soak in water and preform radius. I wrapped the sheeting around a 28 oz. Skippy Peanut Butter jar, taped it in place and set it aside to dry. This worked out just about right for me.

7. Glue forward section to N-2 and N-3. Sand flush at each end. Glue N-3A in place. Trim forward edge of mid-section sheeting for a good fit. Glue in place and sand flush with N-4. Glue on N-4A. Fit and glue rear section.

8. Trim bottom of fairing to match wing contour.

9. Glue on soft balsa tail block.

10. Sand sheeting and tail block to a smooth contour.

11. Fit 1/8" ply doubler forward of N-3. Drill and tap block on engine mount assembly for hold-down screw.

Cowling:

1. Remove base from a 2 liter pop bottle by directing your heat gun at the center. Cut out the center. Clean

the cowl ring gluing area with acetone and sand with 220 paper. Clean again.

2. Make the cowl ring and fit to base.

3. Set the ring on several 3/16" thick blocks. Press cowling over ring and glue with a generous application of Jet. Apply Jet to backside of joint also.

4. Make cowl flap to the flat pattern. Push down into contact with ring and glue in place with Super Jet.

5. Drill holes for attaching screws. Tap holes in mounting brackets.

6. Trim to clear your engine and exhaust system.

7. My first attempt at painting the cowls was not a success. Fuel caused the paint to lift. Then someone told me the secret. Thoroughly clean the plastic with Acetone, then sand with 220 paper and finally flame treat with a propane torch. Go easy because too much heat will shrink the plastic. The cowls were painted with Formula U. First a coat of white, then yellow and

finally the red trim. So far the paint is hanging in there very well.

Fuselage (hull to you purists):

1. Make all formers. A simple fixture will make the assembly of the built up formers easier and more accurate. Drill 1/8" through F-5A, B and C for locating dowels. Glue F-5B and C together. Do not glue to F-5A.

2. After butt gluing sufficient 1/8" sheet, cut out the sides. Add about 1/8" to the lower edge forward of the step. Leave a tab forward of F-1 for clamping.

3. Mark former locations on left and right sides and glue on 1/8" square locating strips as shown.

4. Make the saw cuts at the bend line. Wet this area and make the bends. Block in position and let dry. Later, soak the area with Jet.

5. Glue F-4, F-5A, F-6 and F-7 to right side. Be sure each former is flush with top of fuselage.

6. Place upside down over plans and glue on left side. I added a temporary "X" brace between formers 5 and 6 to hold the structure square and solid while subsequent work was performed.

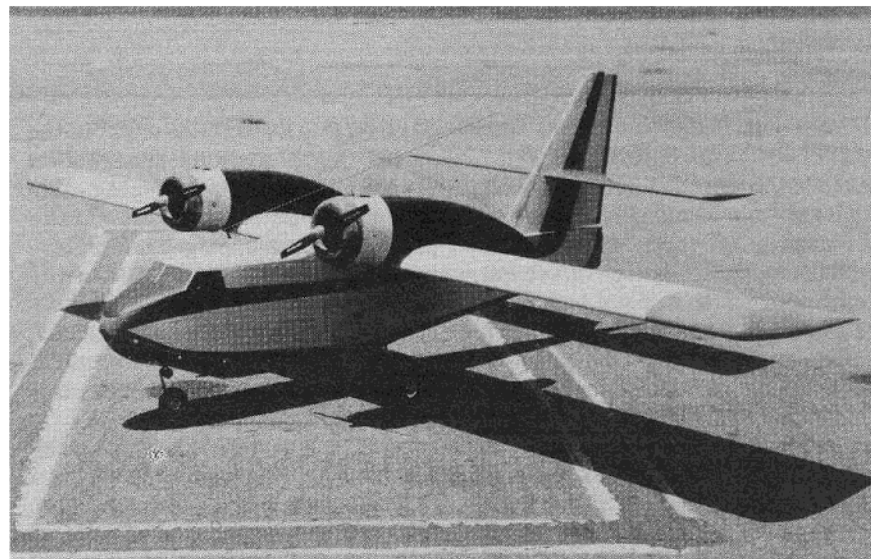
7. Align fuselage sides at aft end and glue. Glue in water rudder mounting. Fit and glue F-7 through F-12.

8. Add landing gear doublers and 1/4" ply plate. Glue in 3/16" square stringers aft of plate. Glue on 3/32" sheeting back to F-10.

9. Pull sides together at nose and slip F-3, F-2 and F-1 in place. True up with centerline and glue.

10. Glue in K-1, keel, 3/16" corner stringers and all doublers. Block sand to bottom angle from F-5 forward.

11. Insert 3/16" tubing through keel



and nose gear fitting.

12. Plank bottom with 1/8" balsa from F-5 forward. Locate planking joints at former location. Now you can take fuselage off the building board. Sit back with a cup of coffee and admire your work.

13. Ready to work topside? Reinforce all bottom planking joints from the inside with Jet. Glue doubler between F-1 and F-2. 3/16" square stringers can go into hatch area and from F-7 back, glue in wing saddle doublers D-3, and 3/32" x 14" capstrips. Glue wing hold-down blocks flush with capstrips.

14. Now is a good time to put in the servos, Gold'N-Rods and rudder idler. Hook up the nose gear steering cable and tie it down securely. Make provision for securing your battery pack between F-1 and F-2 and the receiver between F-3 and F-4.

15. Add nose block, windshield, forward decking and cockpit top. Sand to shape and be sure to protect receiver and servos from dust.

16. Glue F-5B and L to F-5A. Make hatch.

17. Glue in 1/8" ply plate at F-11 and 3/32" bell crank plate. Sheet top with 3/32" cross-grain balsa.

18. After the fin has been aligned, complete the bottom sheeting.

19. Cover the bottom of the fuselage with K & B 3/4 oz. glass cloth and resin. If you are going to paint the fuselage, cover it completely with glass.

20. Make up the tank bottom, cover, and clapper. Complete the inside of the tank including the windows. Resin the inside of the tank.

21. Epoxy the tank bottom in place. Hook up the valve controls. Water test. Tank should hold about one quart.

22. Align the wing on the fuselage. Drill and tap hold-down blocks.

23. After all finishing is complete, install the spray rails with sheet metal screws.

Tail Assembly:

1. Make up elevator horn assembly. Take special care with the solder joint. The life of your airplane depends on it. Proof test the joint by subjecting it to an 80-100 in.-oz. torque load.

2. Install hinges in stabilizer and elevator spars. Fit elevator horn assembly to stabilizer. Be sure its centerline coincides with hinge centerline.

3. Build the stabilizer and elevator as shown on the plans.

4. Cut out fin and rudder ribs.

5. Build the fin spar as shown or use the alternate. Make rudder spar. Mark rib locations on spars.

6. Install hinges in spars and pin.

7. Clamp fin spar to F-12 in fuselage with two screws through the holes provided. Lay fuselage on its side on building board. Shim if necessary so that wing saddle is square with board and fuselage centerline is parallel to board. Adjust fin spar until its centerline is parallel to board. Glue rails to F-12 do not glue spar to F-12 or rails.

8. While spar is clamped, align V1-A and V1-B with fuselage centerline and clamp in position. Drill 1/8" hole through V1-A, V1-B and 1/8" ply plate in fuselage. Glue V1-B to V1-A and V1-A to spar. Fit and glue 1/4" ply block in corner. Drill and tap fuselage plate for hold-down screws. Remove spar rib assembly from fuselage. Glue 1/8" alignment dowel in fuselage.

9. Tack glue balsa legs to ends of spar and V-1. Sand legs until centerlines of spar and V-1 are parallel to board. Block 3/8" square leading edge parallel to board and glue to V-1. Glue V-8 in place. Glue in gussets. Check to be sure fin is true.

10. Glue V-2, V-3, V-5 V-6 and V-7 in place. Set V-4 aside. Mark stabilizer centerline on fin spar and leading edge parallel to V-1. Slip stabilizer in place. Fit and glue lower locator block. Align stabilizer square with fin and glue in place. Glue in V-4. Fit and glue upper locator block.

11. Make and fit control link between elevator horn and bell crank. Make sure there is no interference and that elevator can travel 3/4" up and down.

12. Sheet the fin on both sides. Drill and tap for rear attach screws. Shape leading edge.

13. Build rudder.

Landing Gear:

1. Make up the 1/4" ply straps.

2. Bend the forward main gear strut and clamp it to fuselage. Bend and fit rear strut. Wire wrap the joint and solder. Solder washers in place.

3. Make the nose gear from scratch or modify an existing gear. File flat for steering arm set screw. A Goldberg adjustable axle makes it easy to set the ground attitude of the airplane.

Tip Floats:

Make up the components and assemble per the plan. Coat the floats with epoxy or polyurethane. If you substitute bead foam, apply a layer of glass cloth and epoxy.

Water Rudder:

Make parts and assemble per plan. Use a light rubber band since the rudder is supposed to kick up if it hits anything. If your water flying site has a weed problem, I suggest you add the tab shown by dotted lines.

Nose Gear Plug:

Use when flying off of water. Hold in place with steering arm.

Final Assembly:

Check all components for completeness then assemble the airplane. Lower the tail assembly into position until the bottom of the fin is about 3/8" above the fuselage. Push the elevator to full up. Reach in with the elevator ball link tool and position the control link socket over the ball on the bell crank. Snap onto ball. Install the four hold down screws. Never fly without them. To remove the tail, use the opposite end of the tool to unsnap the ball joint.

Finishing:

I used yellow World-Tex to cover the wing, fuselage, fin, rudder and tip floats. The stabilizer and elevator were covered with red MonoKote for torsional rigidity and lightness. The World-Tex was sealed with clear Formula U for protection from fuel and dirt. Red Formula U was used for trim. The nacelle fairings were painted with black Formula U.

I found that, by following the instructions, the application of World-Tex was a joy. Compound curves such as the nose and wing tips were easy. When finished the covering looked great.

C.G. Location:

When rigged for land flying, the C.G. should be located as shown on the plans. With the landing gear removed and the tip floats, water rudder, and nose gear plug in place, you'll find that the C.G. has moved back about 1/4". This has caused us no problem in flying off the water, but if you are uneasy, add 2 or 3 oz. in the nose. A full tank of water will move the C.G. forward a little, but, again, no problem.

Flying:

Do a thorough pre-flight check. Clevises and ball joints tight? All screws tight? Controls travel the correct direction and amount? C.G.

correct? Props balanced? Range check good? Okay fuel up, fire up, sync the engines and taxi out to the runway.

With flaps up and the elevator at neutral you should get lift off at about 200'. If not, gently rotate and make a gradual climb out and turn. Gain some altitude, trim it out, then play around a little. You will notice that the "Micturator" has a positive but slow roll rate. Turns are solid with no adverse yaw. Throttle back to 1/2 and try the flaps. After the initial ballooning, it will settle out with little or no change in elevator trim.

When you land, fly it onto the runway with some power. Now drop the flaps 10°-15° and take off. Try some partial and full flap landings.

Our prototype has about an equal number of flights with each type of flap. In each case roll control is positive with full flaps. I'm happy with both although I prefer the alternate (slotted) flaps because of the increased sink rate. However, they do require more power for a smooth flair and touchdown.

With throttle at idle, flaps up and full up elevator, the Micturator just gently mushes straight ahead.

We have made five landings with one engine out. Two were on purpose. No problem. If you are ever caught out over the boonies with a dead engine, keep the flaps up and use enough rudder to fly straight home with the good engine at full throttle. When you get to the field, cut the power and land wherever it is safe, just as you would on any dead stick landing.

Ready to fly off the water? Okay, remove the main gear, replace the nose gear with the plug and attach the tip floats and water rudder. Water handling is good, just hold full up elevator while taxiing.

Deploy the flaps 10°-15°. Start the take-off run by slowly advancing the throttle while holding full up elevator. As the speed increases, gradually reduce up elevator. When the plane comes onto the step hold just enough up elevator to keep the nose slightly up. If the plane isn't airborne in about 150', give it a little more up and off it will come.

When landing, keep the power up and fly it onto the water.

Now for some water bombing. As you start the take-off run, open the valve for 2-4 seconds. Other than a longer run and slower climb out, it will be just like any other take-off. When you are ready for your water bombing run, get the Micturator between

yourself and the sun. Reduce power, drop the flaps part way and open the valve. What a sight! Spectacular! That's what this airplane is all about. □

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