

Cloud Dancer 40



NOW IN A 40 SIZE, WITH ALL THE FUN AND PERFORMANCE OF ITS BIG BROTHER.

The Cloud Dancer 40 is a little brother to the original Cloud Dancer and the Cloud Dancer 120. The new Cloud Dancer 40 spans 60" and is intended for the popular .40 size engines. The Cloud Dancer 40 is the same size and uses the same power as most of the popular .40 size trainers but is lighter. Flying weight of the Cloud Dancer 40 is only four and a half pounds.

Each spring, when I lived in Wyoming, we would go horseback riding. The horses that we would ride had been out to winter pasture and had not been ridden for at least six months. These horses were fresh and lively. They would run at the touch of a heel and accelerate like they were rocket propelled. These fresh horses were

eager and responsive and fun to ride. The Cloud Dancer reminded me of those Wyoming horses with its instant acceleration, light handling, and responsiveness.

The Cloud Dancer 40 is a scaled-down version of my 74" Cloud Dancer, published in the June '93 issue of RCM (plan #1146) which was the best all around flying air-

By Fred L. Reese

plane I have ever owned. The Cloud Dancer 40 has the same light feel to it that made me like the original. Like when I fly the even larger Cloud Dancer 120 (also scheduled to be published in an upcoming issue of RCM), I find myself doing maneuvers with the Cloud Dancer 40 at lower power, just because it can. The Cloud Dancers all fly very predictably and put the pilot at ease as soon as the plane is in the air. I really have to like the design to have built three of them.

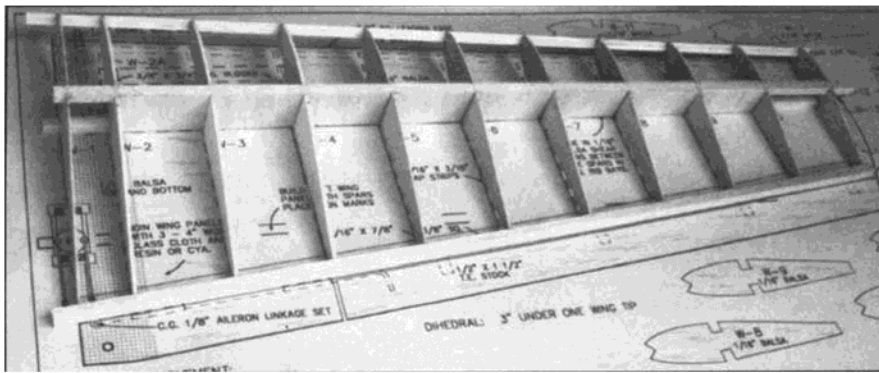
The Cloud Dancer 40 is the size of many .60 size aircraft with a wingspan of 60" and 625 sq. in. of wing area, yet it weighs a pound less than most .40 size models. The resulting wing loading of only 16.5 oz./sq. ft. coupled with a modern high output .40 2-stroke engine or a Surpass 48, Enya 46 or 53, or Saito 45 or 50 4-stroke means there is power to spare in a model that can do anything you ask.

The construction of the Cloud Dancer is more traditional than typical current designs. Lite ply is used where it is advantageous and balsa is used for the rest. The 1/4" sq. balsa truss rear fuselage is much lighter than lite ply or balsa slab sides. 1/16" balsa is used for all of the balsa sheet needed. As used, it is strong enough for all flight loads, but use care in handling on the ground.

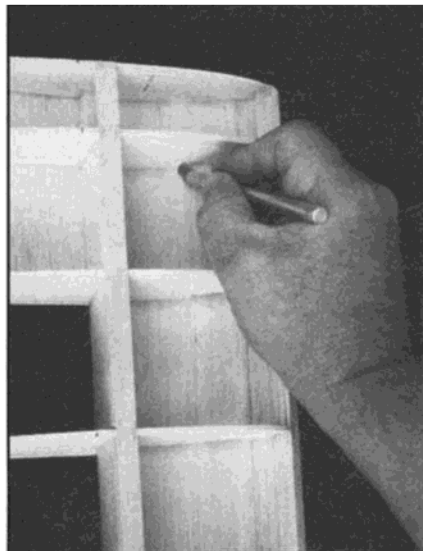
The wing uses special airfoils which I developed for the Cloud Dancers that allow the wing to be built flat on the table, assuring a straight and true wing without resorting to special jiggging. The wing is flat on the bottom from the spar to the trailing edge. All of the camber of the bottom of the wing is forward of the spar. There is no washout, but rather it uses a changing airfoil from root to tip that gives very forgiving stall characteristics. The airfoils are semi-symmetrical with 55% of the thickness above the wing center-



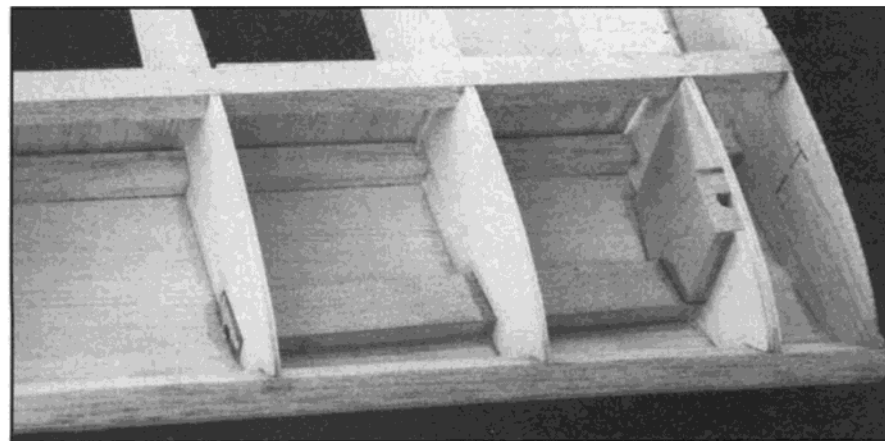
The author, Fred Reese, with his Cloud Dancer 40 at the North Las Vegas flying site.



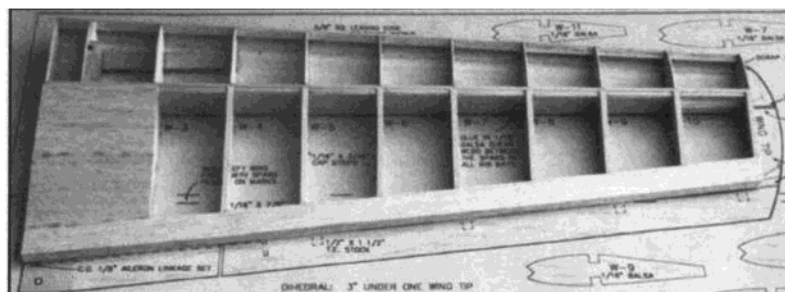
Begin the wing construction by gluing the ribs onto the bottom spar over the plan. Add the leading edge, trailing edge, and top spar. Glue in the 1/16" balsa shear webs.



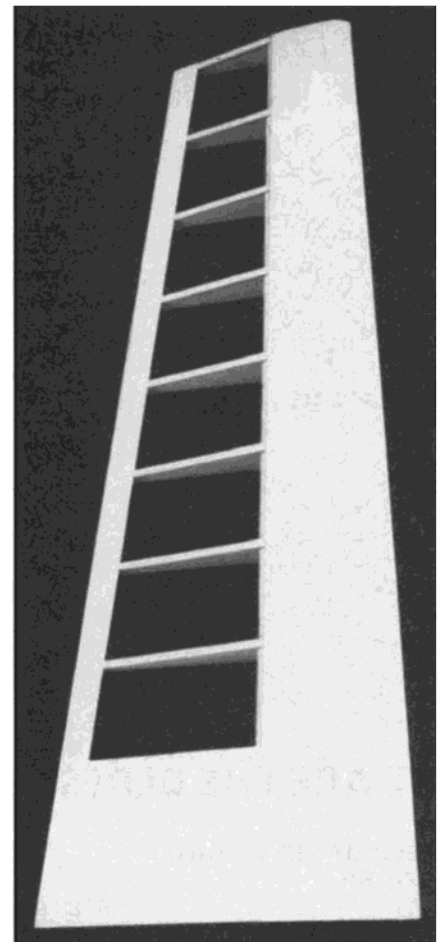
Use an X-Acto knife to locate the position of the landing gear notches in the bottom sheeting.



Cut out the bottom sheeting for the landing gear blocks and glue the landing gear blocks into the wing. Glue in W-2A, the vertical landing gear block, and the trailing edge support.



Glue on the top trailing edge sheeting, center sheeting, and capstrips.



Turn the wing over and glue on the bottom sheeting and capstrips.

line and 45% of the thickness below the centerline. This gives flight performance much like a fully symmetrical wing airfoil.

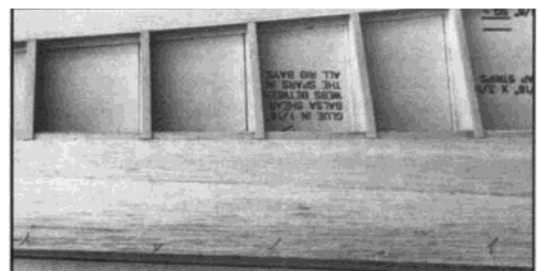
CONSTRUCTION

Choose the wood carefully for building this or any other model. Select only very hard, straight grain wood for the wing spars, the top and bottom fuselage stringers, and the tail group. Lighter wood can be used for the uprights, cross bracing, and diagonals. Choose tough, medium weight wood for all of the 1/16" balsa sheeting, wing, ribs, and fuselage top. Save the very light wood for smaller models.

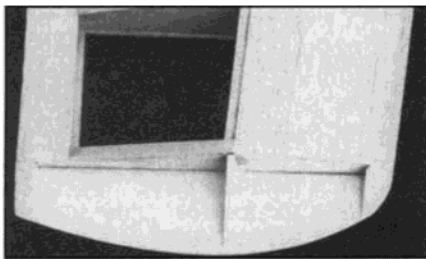
The easiest way I have found to cut parts is to make a copy or photocopy of the parts, then use spray contact cement to glue the copy to the wood, then cut out with a Dremel jig saw. For the wing ribs, spray glue two sheets of wood together, so that both of each ribs are cut at once. Use rubber cement thinner or naphtha to remove any excess adhesive or to remove the paper if

needed. Usually the paper comes off easily if you don't leave it set too long. Cut out all of the parts and the assembly goes quickly.

Start with the wing. Pin the bottom 3/8" sq. balsa spar to the plan over waxed paper and glue W-1 and the tip rib in place. Glue on the 3/8" sq. medium balsa trailing edge and pin down. Glue the remaining ribs in place. Glue on the 3/8" sq. top spar and leading edge. Glue the rib doubler W-2A to rib W-2. Glue in the 1/16" balsa shear webs either between the spars or behind the spars. Turn the wing over on the plan and glue on the 1/16" x 1" bottom trailing edge, 1/16" x 1/4" capstrips, and the center sheeting. Make the top and bottom leading edge sheeting by gluing together five 1/16" x 3" x 30" sheets. Cut the sheets diagonally at 4-3/8" and 2-5/8" at the ends to make four tapered sheets. Glue the bottom L.E. sheet on first with the grain running parallel to the



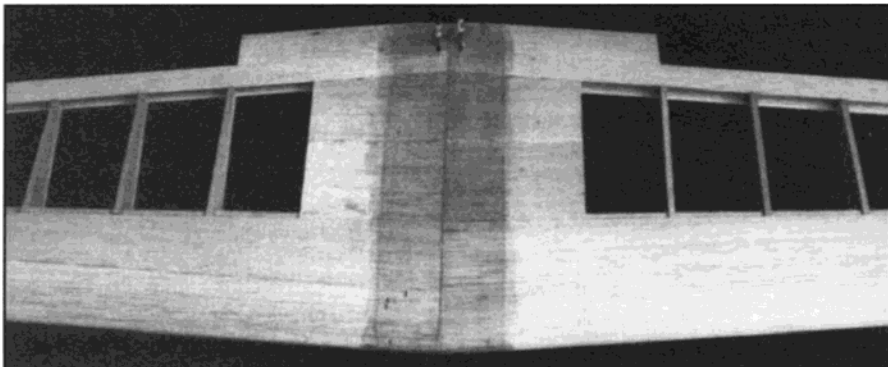
Glue on the top leading edge sheeting with white glue and pins.



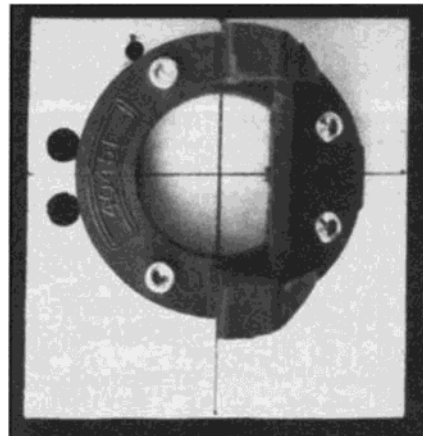
Glue on the lite ply wingtips and braces.



Slot the center section trailing edge for the aileron linkage and glue the linkage into the trailing edge.



Build the other wing panel over the plan by placing the spar over the marks and build the panel like the first, but with the ribs going the other way. Glue on the center section trailing edge and aileron linkage. Glue the two halves together, then wrap the center with fiberglass cloth and resin, epoxy, or CA.

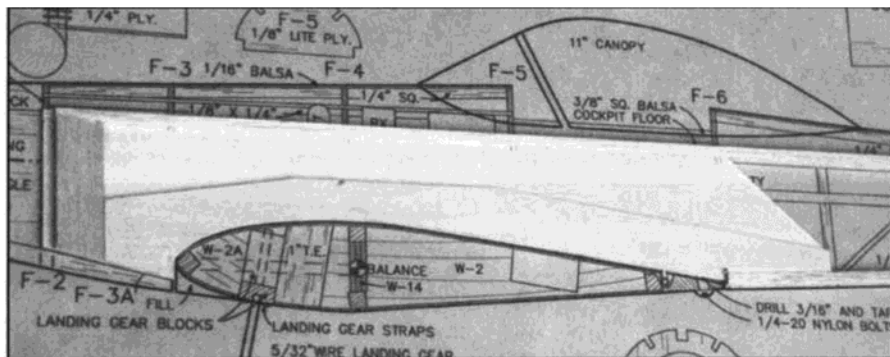


Drill and mount the engine to the fire wall. Install the blind nuts for the engine mount in the fire wall. An O.S.-48 Surpass 4-stroke engine was used on the prototype mounted on a Dave Brown long mount. Drill the fire wall for the fuel lines and throttle linkage.

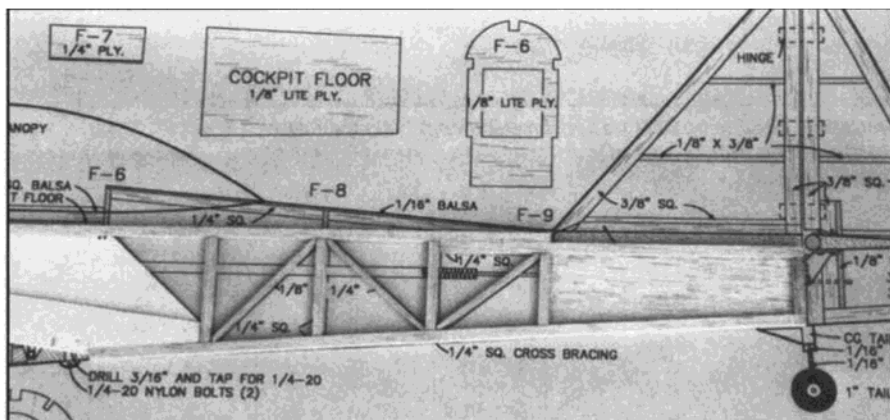
leading edge so that it will curve around the ribs easier. Glue on the bottom capstrips and the bottom center sheeting. Use the point of an X-Acto knife to locate slot in the sheeting for the landing gear, using the notches in the ribs. Cut the slot in the sheeting for the gear block and glue the landing gear block in place. Glue W-2A onto the outboard side of W-2, then glue the vertical landing gear support for the vertical block. Drill down through the vertical block and the L.G. block with a 5/32" drill. Pin the wing back down over the plan. Glue on all of the top wing sheeting and capstrips. Glue on the center section 1/2" x 1-1/2" trailing edge and aileron linkage. Build the other wing panel over the same plan, but pin down the bottom spar over the marks for the left wing panel shown on the plan. Place the ribs over the marks on the plan, but facing the other way. After completing the second wing panel, glue on the wingtips. Shape the leading edge. Cut away the W-1 ribs between the spars for the W-14 wing joiner. Glue the wing joiner into one wing panel, then glue the two wing panels together while blocking up one wingtip 3". Wrap the center joint with 6" wide fiberglass cloth and secure with resin, epoxy, or CA.

Pin the second lite ply fuselage side over the first. Build the second side on the first, so that it comes out exactly the same, but reversed, one right and one left.

Bolt the engine mount to F-2, the fire

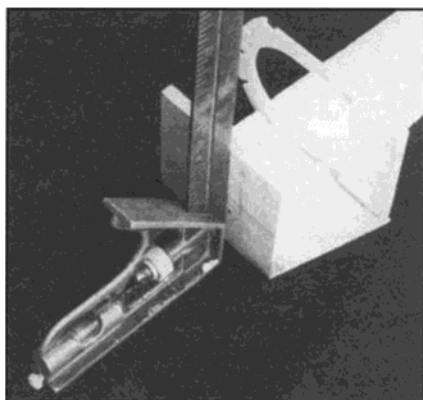


Cover the plan with waxed paper, then pin one of the lite ply fuselage sides over the plan. Glue on the 1-1/2" trailing edge stock, leaving 1/4" for the fire wall. Glue on the wing saddle doubler and mark the positions of the bulkheads. Glue on the top and bottom 1/4" sq. longerons.

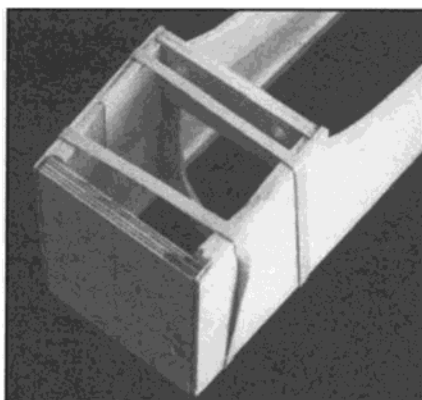


Cover the fuselage side view on the plan with waxed paper. Lay one of the lite ply fuselage sides over the plan and pin in place. Mark the position of the doubler and glue the doubler and 1-1/2" trailing edge stock in place, leaving 1/4" ahead of the trailing edge stock for the fire wall. Mark the positions of the bulkheads on the side. Glue on the top and bottom 1/4" sq. stringers to the fuselage sides and pin down to the plan while adding the uprights and diagonals. Flip the side over and lay a piece of waxed paper over the side.

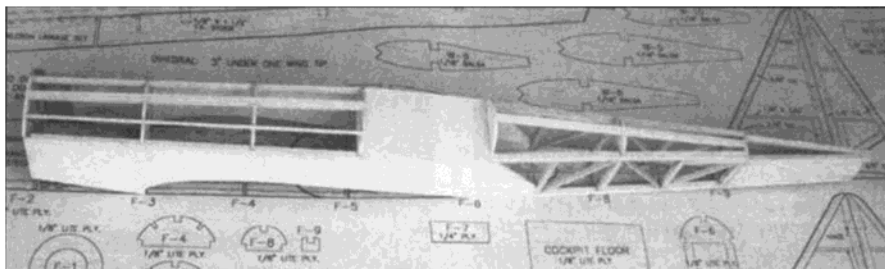
Glue on the stab mount, and the 1/16" sheet balsa under the stab mount for the pushrod exits, then glue in the uprights and diagonals. The stringers should be selected wood that is very hard and straight grained. Turn the fuselage side over and lay waxed paper over the side. Build the second fuselage side over the first side.



Glue the fire wall and F-3 with F-3A to one of the fuselage sides, using a square to keep them 90° to the sides.



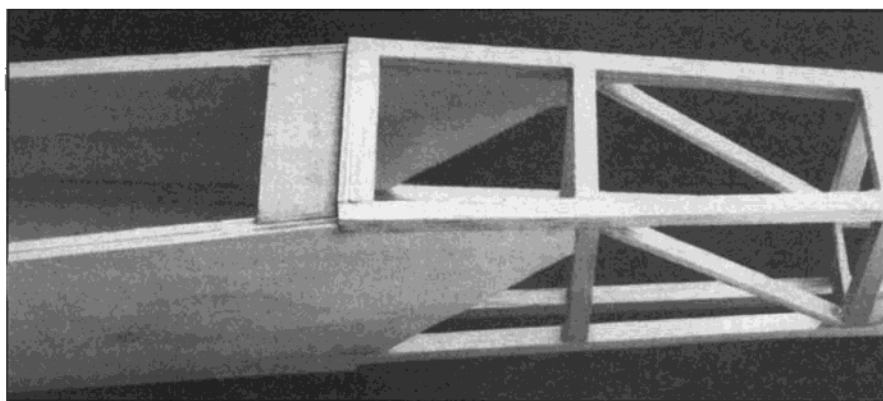
Epoxy on the other side with the nose out over the workbench to keep the two top stringers aligned.



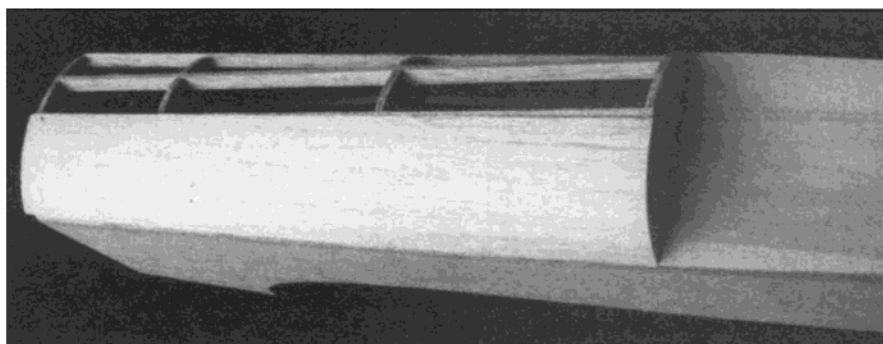
Pull the tail together and hold with pins or rubber bands. Glue in the rear bulkhead, F-6. All of the fuselage side curvature should be in the cockpit area. The fuselage is straight from F-7 back. Glue on the cockpit floor and F-5, the instrument panel, keeping the rear sides straight. Glue on F-2A over the fire wall and add F-4. Glue in the three top front stringers. Glue in F-8 and the top rear stringer.

wall, and install the blind nuts. Glue the bulkhead doubler, F-3A to F-3, and drill the two 1/4" diameter wing dowel holes. Glue F-2 and F-3 to one of the fuselage sides using a square to keep them 90° to the side. Be sure F-3A is forward of F-3. Glue on the other fuselage side, then rubber band and

pin the sides together at the tail. With the fuselage upright over the top view, glue in F-6, the cockpit floor, and F-5. The fuselage sides should be straight from F-6 to the tail, all of the curve is between F-5 and F-6. Bevel the sides on the inside of the tail and glue together so the fuselage is 3/8" wide at



Glue in F-7 and the bottom 1/4" sq. crosspieces.



Glue on the top front 1/16" balsa sheeting.

MATERIAL LIST

- 10 — 1/16" x 3" x 36" Balsa
- 4 — 1/16" x 1" x 36" Balsa
- 11 — 3/8" Sq. Hard Balsa
- 6 — 1/4" Sq. Hard Balsa
- 4 — 1/16" x 1/4" x 36" Balsa
- 2 — 1/8" x 1/4" Balsa
- 1 — 1/8" x 3/8" Balsa
- 1 — 3/8" x 3" x 12" Balsa
- 1 — 5/8" x 3" x 4-1/2" Balsa
- 2 — 1/2" x 1-1/2" T.E. Stock
- 1 — 1" T.E. Stock x 12"
- 1 — 1/2" Triangle Stock x 6"
- 1 — 1/4" Dowel x 10"
- 1 — 3/8" Dowel x 4"
- 1 — 1/8" Lite Ply 12" x 48"
- 1 — 1/4" Aircraft Ply 2-1/2" x 5"
- 1 — 3/8" x 3/4" Slotted 5/32" x 15" Hardwood L.G. Block
- 1 — 1/16" x 18" Piano Wire
- 1 — 5/32" x 36" Piano Wire
- 2 — 12" Threaded Pushrods And Clevis
- 2 — 6" Threaded Pushrods And Clevis
- 1 — Set C.G. 1/8" Aileron Linkage
- 2 — 1/4-20 x 1" Nylon Bolts
- 2 — Large Control Horns
- 1 — Set Ace R/C Throttle Linkage
- 15 — Regular Klett Hinges
- 1 — C.G. Tail Wheel Bracket
- 1 — 11" Sig WW II Canopy Or Ace R/C
- 1 — 2" Wms. Bros.
- Sportsman Pilot Figure
- 1 — Pair 2-1/2" Sullivan Lite Wheels
- 1 — 1" Tail Wheel
- 1 — 2-1/2" Spinner
- 1 — .40 Engine Mount
- 1 — 6-8 Oz. Sullivan SS Fuel Tank

the tail to match the rudder. Glue in the rear wing mount, F-7. Glue on F-2A and F-4 and add the top 1/4" sq. stringer and the two 1/8" x 1/4" stringers. Glue on F-8 and F-9, and the top rear 1/4" sq. stringer. Glue in the bottom 1/4" sq. crosspieces. Glue two pieces of 1/16" x 3" x 16" together to make a 6" sheet. Glue this to the top front of the fuselage with the seam centered on the top stringer. Bend the sheet over the top and glue in place, then trim along the side seam. Do the same over the top rear.

Fit the wing to the saddle and drill the two 1/4" diameter wing mount dowel holes into the wing through the holes in F-3. Epoxy the dowels into the wing back to the shear web. Drill one of the two 3/16" diameter holes for the rear hold-down bolts through the wing and F-7 and tap for the 1/4-20 nylon bolt. With the one bolt installed, drill and tap the other hole. Remove the bolts and apply thin CA glue into the holes in F-7 to harden the wood. Allow the CA to fully cure, then re-tap to clean out the threads. Drill the holes in the wing out to 1/4" and CA these holes too.

When cutting the angled cuts for the rudder and elevator, I suggest making the little miter box included with the plans. It will cut all of the angles needed for this model and cut them accurately. The cut angles are called out on the drawing. Build the tail group from very hard 3/8" sq. balsa. For the trailing edges of the rudder and elevators use

NAME
CLOUD DANCER 40

Designed by:
Fred Reese

TYPE AIRCRAFT

Sport Pattern

WINGSPAN

60 Inches

WING CHORD

10.5 Inches (Avg.)

TOTAL WING AREA

625 Sq. Inches

WING LOCATION

Low Wing

AIRFOIL

Semi-Symmetrical

WING PLANFORM

Double Taper

DIHEDRAL, EACH TIP

1.5 Inches

OVERALL FUSELAGE LENGTH

46.75 Inches

RADIO COMPARTMENT SIZE

(L) 12" x (W) 2.75" x (H) 3"

STABILIZER SPAN

21 Inches

STABILIZER CHORD (inc. elev.)

6.25 Inches (Avg.)

STABILIZER AREA

121 Sq. Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

6.625 Inches

VERTICAL FIN WIDTH (inc. rud.)

6.25 Inches (Avg.)

REC. ENGINE SIZE

.40-.53 2-stroke or 4-stroke

FUEL TANK SIZE

6-8 Oz.

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa & Lite Ply

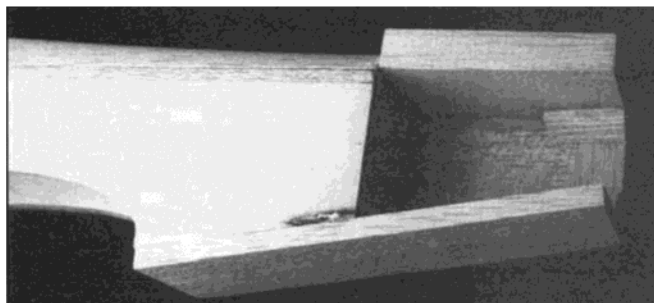
Wing Balsa & Lite Ply

Empennage Balsa

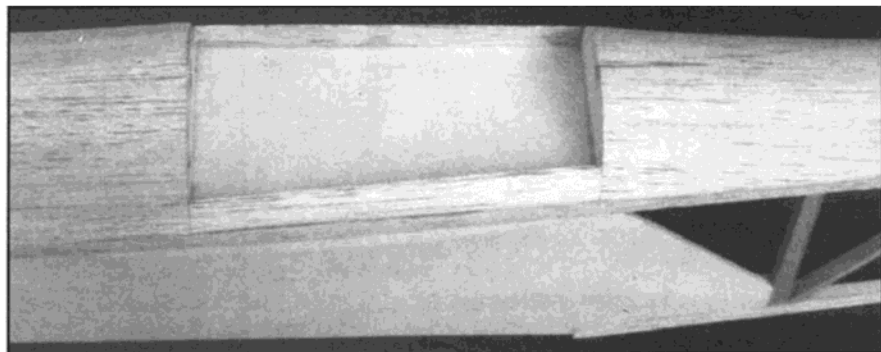
Wt. Ready To Fly 72 Ozs. (4.5 Lbs.)

Wing Loading 16.5 Oz./Sq. Ft.

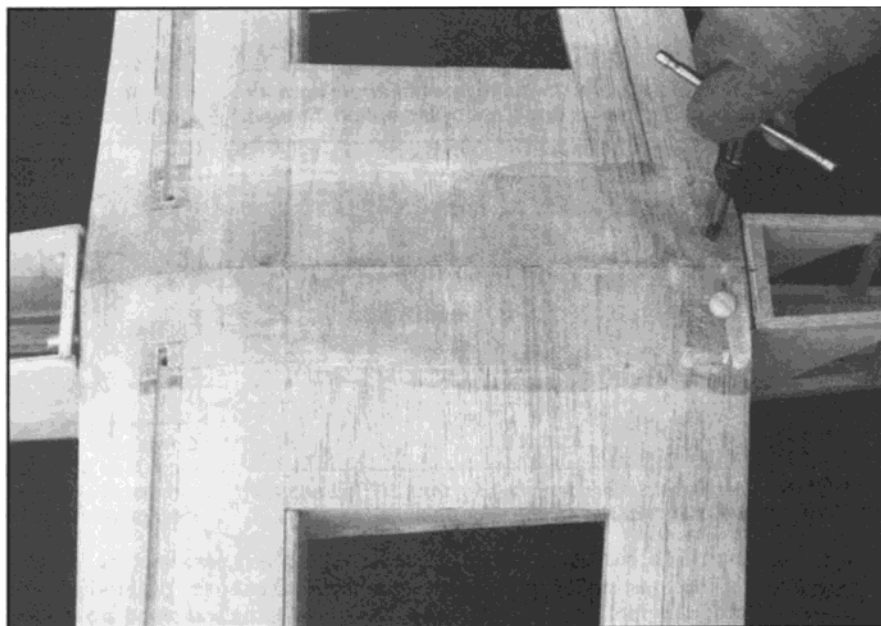
1/4" x 3/8" wood and shim up 1/16" during construction. This leaves a lot less wood to plane off later when shaping. Carefully fit the end joints and glue together so the joints are filled and tight. Join the elevator halves with 3/8" dowel. Sand the leading edges of



Glue on the bottom cowl block, then the side and top cowl block. Add the trailing edge and triangle stock to fill the corners of the cowl at the front.



Glue on the top rear 1/16" balsa sheeting and the 1/4" x 3/8" cockpit sides.



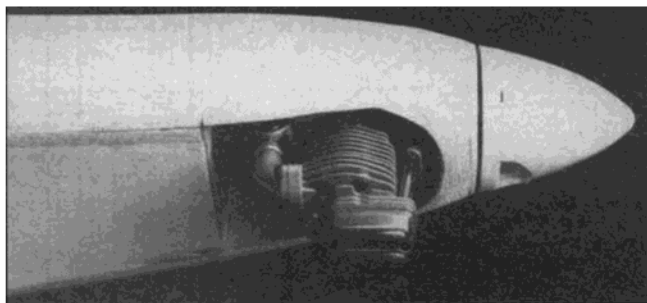
Fit the wing into the fuselage and drill the two 1/4" holes through F-3 into the wing and epoxy in the wing mount dowels. Drill and tap the trailing edge and F-7 for the two 1/4-20 nylon bolts. Drill and install one at a time.

the tail parts round and taper the rudder and elevators as shown on the plan.

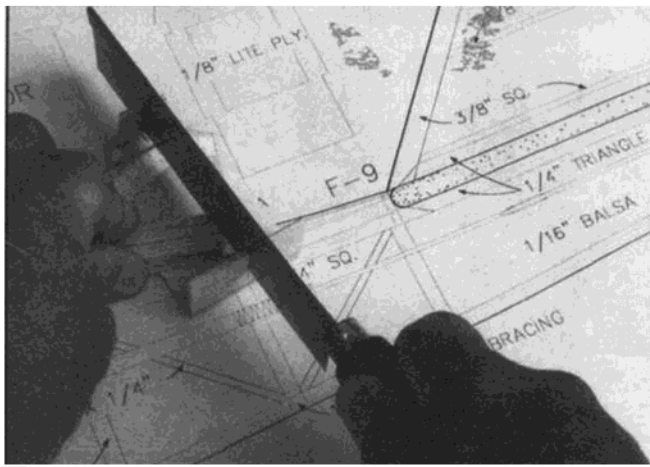
Bolt the engine to the engine mount and bolt to the fire wall. True up the fuselage bottom surface and glue on the bottom block. Glue on the cowl side and top. Glue in the trailing edge stock and triangle stock filler blocks. True the front of the cowl to the spinner, leaving a 1/4" gap behind the back of the spinner. Fit and glue in place the spinner ring, F-1, centered on the spinner. There should now be a 1/8" gap behind the spinner. Carve and sand the cowl to the spinner.

With modern film coverings, every little bump in the finish will show up so it is

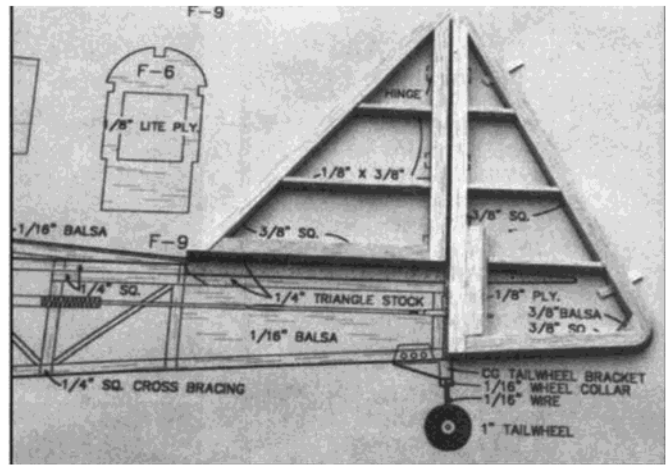
important to spend some time in preparing the surface for covering. First clean off the workbench of all tools and things that will dent the surface. Lay down a sheet of foam rubber over the bench to protect the model while you are working. Go over the entire surface and fill any dents or holes with Model Magic Filler or vinyl spackle. Block sand the entire model with 150 grit and then 220 grit sandpaper to level and smooth the surface, especially the ends of the capstrips on the wing ribs. Clean up the area and sand with 400 grit paper. Before covering each part, vacuum the entire part and wipe it down with a painter's tack rag. This process



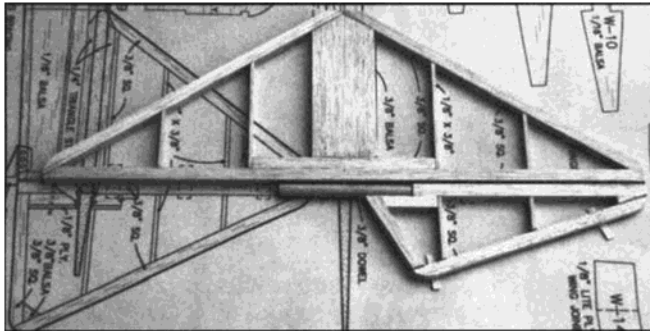
Mount the engine and trim off the cowl blocks 1/4" behind the spinner backplate. Glue on F-1, the spinner ring, and carve the cowl blocks to the spinner.



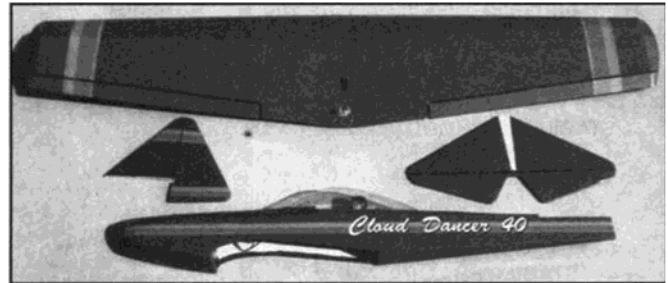
RCM Mini Miter Box being used to make special angle cuts for stabilizer and rudder. Degrees of angle are called out on the plan.



Build the fin and rudder over the plan the same as the stabilizer and elevators.



Build the stabilizer and elevators over the plan from 3/8" sq. and 1/8" x 3/8" ribs. Use 1/4" x 3/8" for the trailing edge shimmed up 1/16".



Cover all of the parts separately and trim away any covering where there is to be a glue joint. Add any decorative trim. Hinge all of the moveable surfaces. Finish the cockpit interior and paint the pilot, then glue on the canopy with RC-56 or Zap's new Formula 560.

will take some time to do, but it is the most important time of the construction in how the finished model appears. I chose UltraCote for the covering because of the way it sticks down and does not bubble up over the sheeted areas. UltraCote also works well for trim as it does not bubble when ironing down over the base covering.

It is especially important to thoroughly fuelproof the inside of the model. I sprayed in three heavy coats of Perfect Paint clear before installing the fuel tank or servos. I used epoxy to fuelproof the engine compartment.

Apply the trim colors to the parts of the model before final assembly.

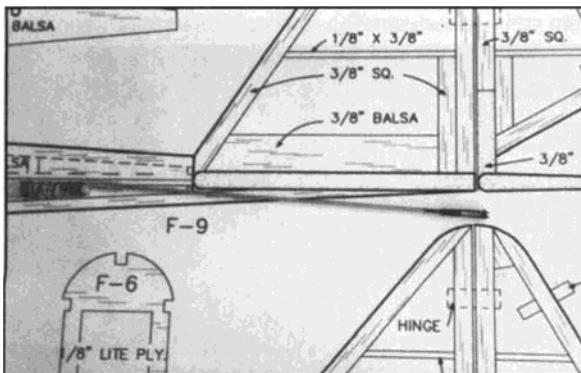
Install the servo rails and mount the servos. Make the 1/4" sq. balsa pushrods according to the plan. Lay the pushrods over the top view plan drawing to make the angle bends of the pushrod exiting the fuselage.

The fuselage is very narrow at the rear and care must be taken so the pushrods do not bind. Foam padding was taped around the fuel tank so that it could not touch any wood to prevent foaming.

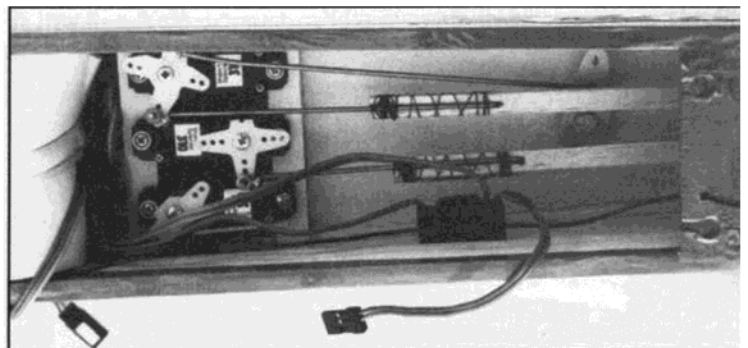
Epoxy the aileron and elevator hinges in place. Cut away the covering on the stabilizer for the fuselage joint and the fin joint on the top of the stabilizer. Glue the fin to the stabilizer. Epoxy the stabilizer and fin onto the fuselage. Install the tail wheel assembly and hinge the rudder. Adjust the elevator and rudder pushrods to end as shown on the plan and attach the control horns to the pushrods. With the pushrods attached, drill and mount the control horns. Before making final attachment to the servos, make sure there is no binding or stiffness in the control linkages. They should work freely and not cause any bending of the wooden pushrod through

their arc of travel. Spend as much time as is needed to get the controls working right.

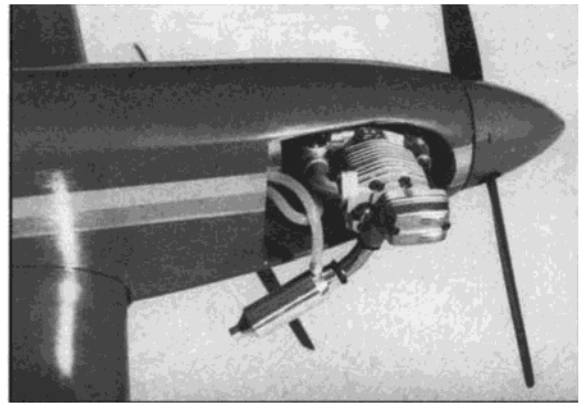
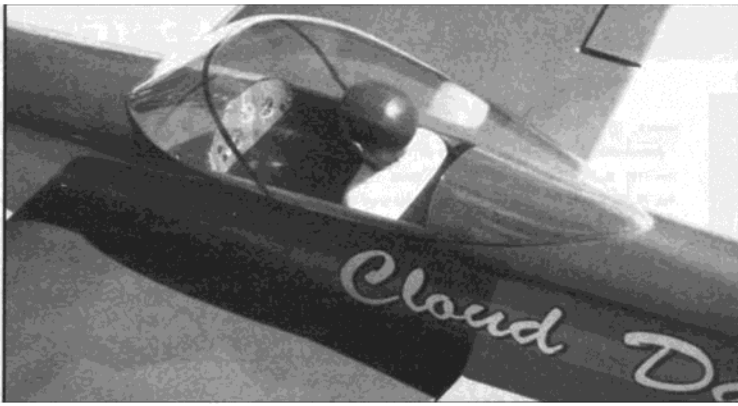
I bought the Ace RC wheel pants for the Cloud Dancer 40. The wheel pants are white ABS plastic and look great and could be used without painting. These wheel pants are not expensive, compared to fiberglass wheel pant sets, but I prefer the fiberglass wheel pants. So, I thought, why not use the plastic wheel pant shells for fiberglass molds. Polyester resin would attack the plastic, but epoxy would work. I used two layers of heavy cloth in the outboard halves and two layers with carbon fiber between the layers on the inside. Apply at least three coats of paste wax to the inside of the plastic shells followed by a brushed-in coat of PVA mold release. Use slow curing epoxy such as Pacer's 30-minute Z-Poxy. Mix about 1/2 oz. of epoxy and brush a coat into each



Make the pushrods per the plan and lay them over the top view to make the bend at the rear.



Install the servos, pushrods, and switch. Note the wire pushrod from the rudder servo to the arm from the pilot's head. Wms. Bros. moveable Sportsman pilot figure used and installed according to the directions.



Left: Williams Bros. 2" pilot with moveable head hooked up to the rudder servo under Sig 11" WW II canopy. Right: O.S.-48 Suprass 4-stroke engine used in prototype. Engines from .40 to .50 cu. in. are recommended. APC 11 x 6 propeller used.

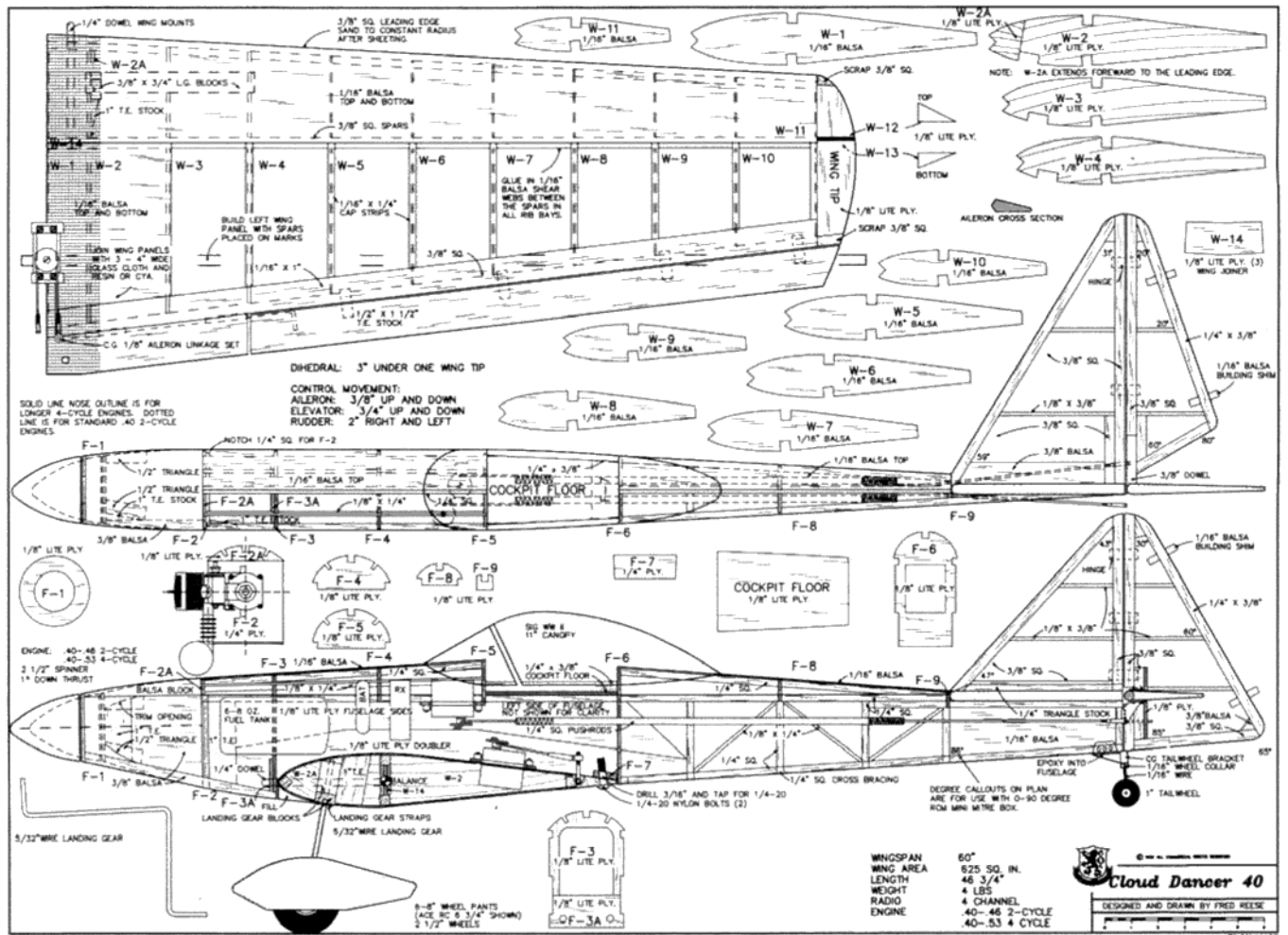
shell mold. Push a layer of heavy glass cloth into the epoxy and brush it down smooth. Brush in the remaining resin over the axle area of the inside halves and apply a 1/2" x 4" piece of carbon fiber, centered on the axle area. Brush another coat of epoxy over the cloth in the mold and brush in the second layer of cloth. Use any remaining epoxy to wet any dry areas of cloth. Lightly warm each shell with a heat gun or hair dryer and brush out the resin. Allow to cure and pop the parts out of the molds. Trim off the excess cloth, cut out the wheel openings, and sand the edges flat. Join the two pairs with masking tape and cover the entire seam with tape. Brush the seam on the inside with

epoxy and apply a 1" strip of glass cloth over the seam on the inside. The result is a pair of strong, light wheel pants that look great and can be repaired or even replaced if needed. The original plastic wheel pants can be used over and over as molds.

Flying:

It seems that with each new ship I learn something new, or something I take for granted jumps up and bites me. This time it was fuel foaming. The first flights ended abruptly with the engine quitting right after take-off. Fortunately, the airplane flew fine while I made a quick circle and landed dead stick. After some head scratching, changing fuel and checking the plug, I

came to the conclusion that the fuel was foaming. I opened up the inside of F-3 a little and made sure there was foam all the way around the tank where it passed through F-3 and the problem was solved. After that, the engine ran and idled reliably and I was able to relax and enjoy the Cloud Dancer. Now I am just flying it for fun as my regular Sunday flier which was my intention all along, and I hope you enjoy yours as much as I do mine.



FULL SIZE PLANS AVAILABLE - SEE PAGE 201

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