

# Sea Dancer

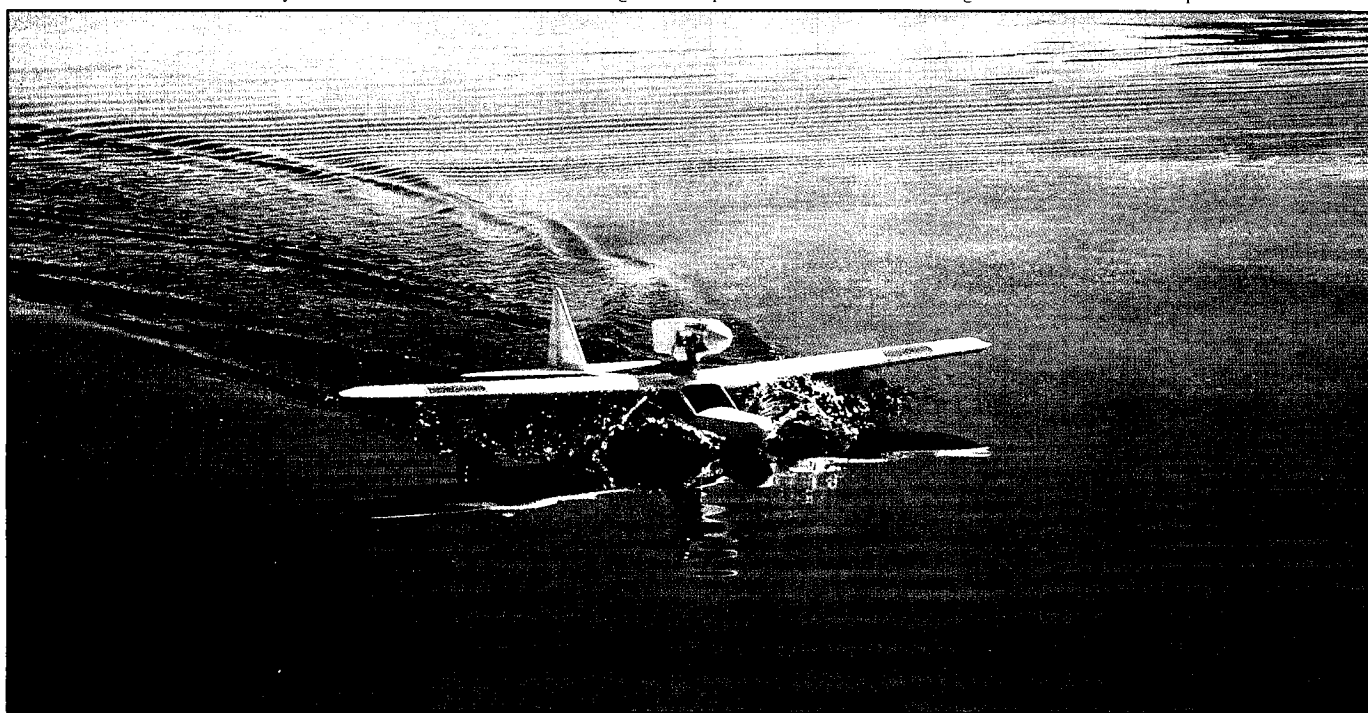
*The Sea Dancer is a step back into time when the big flying boats were the pride of the skies. However, the new version is better than ever. Lightweight construction, balanced aerodynamics, and lots of power make this seaplane of the 90's perform.*

*By Fred L. Reese*

There is something majestic about the old flying boats like the Martin Clippers, the Hughes Giant Flying Boat, the Douglas Dolphin, and the Grumman Widgeon and Goose. Back in the 60's, Don McGovern designed many model seaplanes including the classic Piranha, Mako Monster, and Moray Monster that captured our imagination before there were modern radio control systems. There were also the Berkeley Privateer kits and the Jetco Navigator

with their long lines and graceful curves that dated back into the 50's. These were designs that caught the elegance and grace of the early full-sized flying boats. Thinking about these earlier seaplanes and what set them apart, I designed the Sea Dancer. It needed to be big and it needed a tapered wing and graceful lines to satisfy my need to revisit those earlier times.

I drew the Sea Dancer back in 1990 right after I finished the first Cloud Dancer. I guess I was waxing nostalgic and thinking about possibilities while looking at the Cloud Dancer plans, so I used the



## SEA DANCER

Designed by:

Fred L. Reese

### TYPE AIRCRAFT

Sport Aerobatic Seaplane

### WINGSPAN

72 Inches

### WING CHORD

12 Inches (Avg.)

### TOTAL WING AREA

847 Sq. In.

### WING LOCATION

High Wing

### AIRFOIL

Semi-Symmetrical

### WING PLANFORM

Double Tapered

### DIHEDRAL, EACH TIP

1-1/2" (under each wingtip)

### OVERALL FUSELAGE LENGTH

58-1/2 Inches

### RADIO COMPARTMENT SIZE

(L) 14-1/2" x (W) 6" x (H) 5"

### STABILIZER SPAN

24 Inches

### STABILIZER CHORD (inc. elev.)

8 Inches (Avg.)

### STABILIZER AREA

192 Sq. In.

### STAB AIRFOIL SECTION

Flat

### STABILIZER LOCATION

Top of Fuselage

### VERTICAL FIN HEIGHT

9-1/4 Inches

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

8-1/2 Inches (Avg.)

### REC. ENGINE SIZE

.45-.60 2-stroke; .60-.90 4-stroke

### FUEL TANK SIZE

12-16 Oz.

### LANDING GEAR

None

### REC. NO. OF CHANNELS

4

### CONTROL FUNCTIONS

Rud., Elev., Ail., Throt.

### C.G. (from L.E.)

4-3/4 Inches (at fuselage)

### ELEVATOR THROWS

1" up / 1" down

### AILERON THROWS

3/8" up / 3/8" down

### RUDDER THROWS

2" left / 2" right

### SIDETHRUST

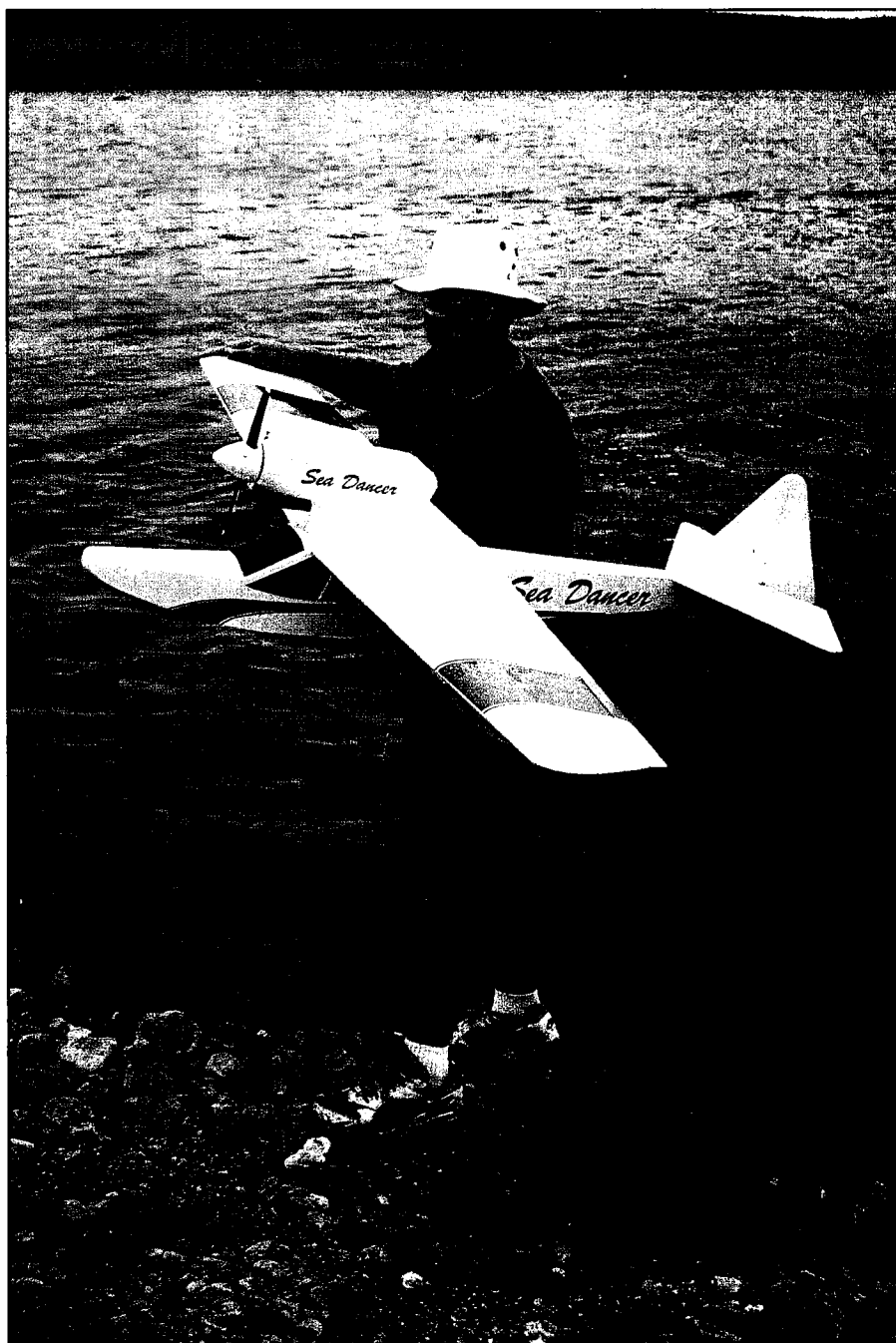
0 Degrees

### DOWNTHRUST/UPTHRUST

0 Degrees

### BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	112 Oz. (7 Lbs.)
Wing Loading	19 Oz./Sq. Ft.



Cloud Dancer wing and tail in the new design. However, I did not build the Sea Dancer until 1995. During those five years a lot of things happened and changed. We moved twice, changed jobs twice, and I got involved with other projects. Early in 1995 the Las Vegas Radio Control Club, of which I am a member, announced a float-fly at Lake Mead in June. That was all I needed. I dug out the original Sea Dancer drawings and put them into my Cad system using computer generated airfoils to get the finished plans.

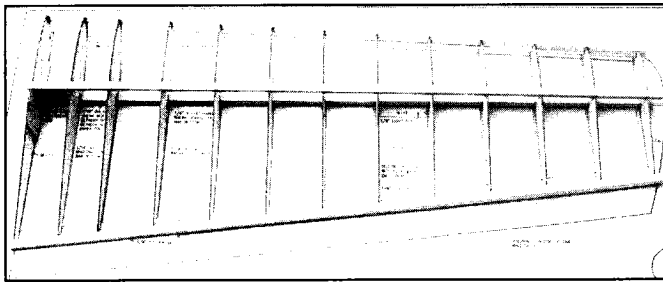
The Sea Dancer has the same shaped rudder and stabilizer as the Cloud Dancer because I liked the distinctive shape, and it worked well. The large, graceful tapered wing gives the model some of the elegance I hoped for. The fuselage is designed to be functional as well as attractive. The rudder sits low enough to work as a water rudder at slow speeds without resorting to a deeper fin. I wanted a V-bottom so the model doesn't slap or skip on the water. It settles smoothly on landings. With the addition of the triangle chine strips, the front hull acts like a tri-hull speed boat. The lift on the water is increased and the spray is deflected downward in the front and away from the prop. The outboard floats are similar to the Sea Master but are deeper and are placed near the center of the wing panels. The volume of the tip floats is great enough to keep the wing from

sinking in a stiff breeze. Being further inboard, the floats do not affect the directional control during take-offs or landings. The Sea Dancer steers on the water like it was on wheels.

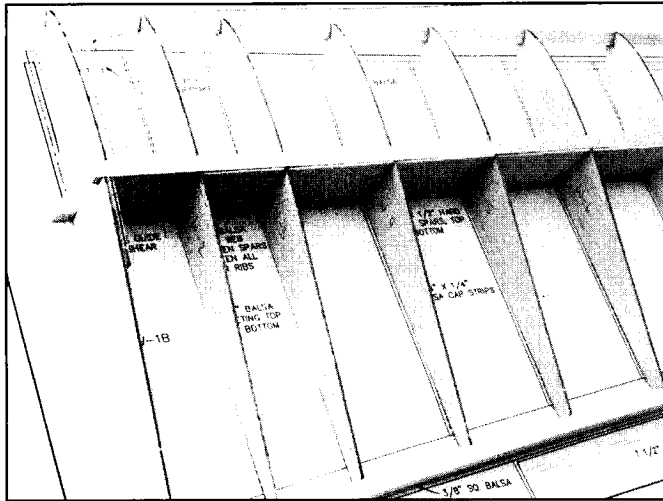
By the time I built the Sea Dancer, I had built three Cloud Dancers in different sizes and had logged hundreds of flights on these models. I knew what worked and where changes should be made. I wanted the Sea Dancer to be fully aerobatic. The force arrangement is much like a low wing model with the thrust line just above the wing. The wing and stabilizer are in line like the Extra and Laser aerobatic aircraft. The mass of the engine pod and tank balance the weight of the fuselage so the roll axis is in line with the wing and stab. Couple this with a very light wing loading and lots of power and it spells performance.

The Sea Dancer is a joy to fly. It is light and the wing is very forgiving, so it can be flown slowly if you wish. It is very predictable and goes exactly where you point it. The Sea Dancer will roll like it is on a string and it will knife-edge forever. The model is big with a full six foot wingspan, so it is easier to fly than some of the smaller seaplanes just because you can see it better.

The Sea Dancer was designed for .60 cu. in. engines. I chose a plain bearing 2-stroke engine for my Sea Dancer because engines



Cover the wing plan with wax paper. Pin down the bottom 3/8" sq. hard balsa spar to the plan. Glue the two parts of W-1 together, then glue W-1 to the spar using the shear web and angle guide to set the angle for the dihedral. Glue on the tip rib and the trailing edge. Glue in the rest of the ribs and add the top spar and leading edge.



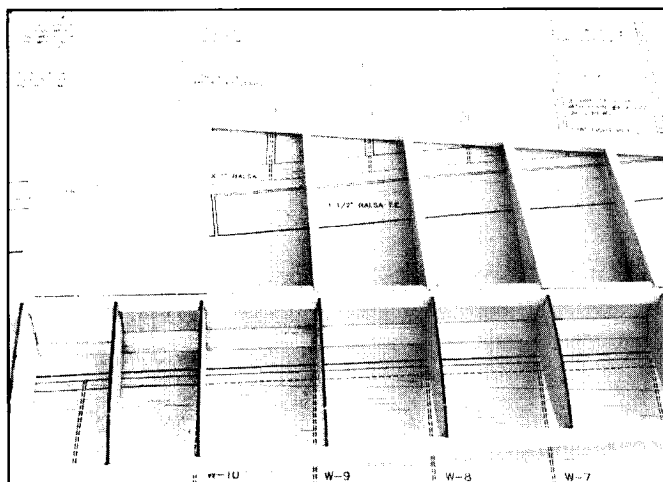
Glue in the 1/16" balsa shear webs between the rest of the ribs.

near the water get wet. Also a K&B .65 or an O.S. FP .60 cost a lot less than the engines with ball bearings, yet will deliver plenty of power for a 7 lb. airplane. A .40 engine would fly the Sea Dancer very nicely and anything larger than a .60 would make it a rocket ship.

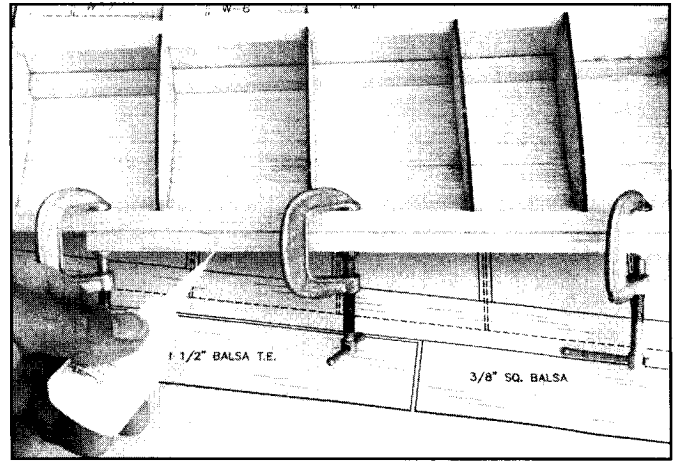
## CONSTRUCTION

### Wing:

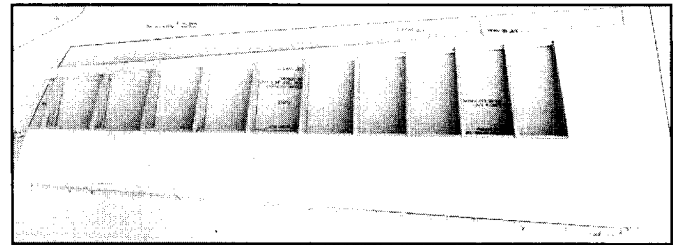
Begin by cutting out all of the ribs. The method that I use to make ribs or other parts from a plan is to first make a photocopy of the ribs from the plan. Since there are two of each rib, I first glue two sheets of balsa together with 3M-77 spray contact cement. A light coat sprayed on one sheet will produce a temporary bond and the two sheets can easily be separated after the parts are cut. Roughly cut out each rib from the photocopy. Spray a light coat of 3M-77 on top of the two sheets of balsa, then place the rib patterns on the balsa to get



Turn the wing over and glue on the 1/16" x 1" trailing edge, center section sheathing, and capstrips cut to the centerline marked on the spar.



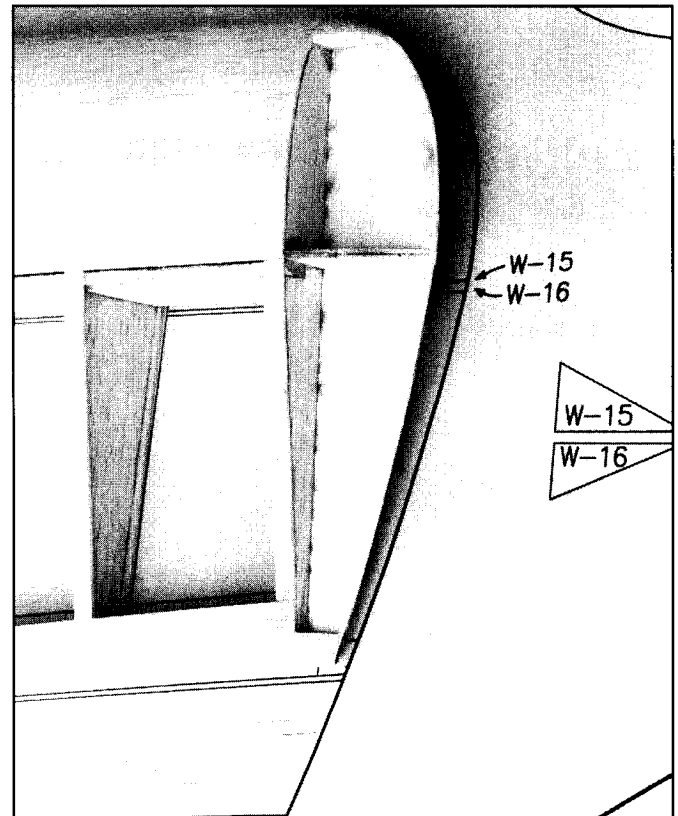
Glue on the bottom front sheathing made from 1/16" x 4" x 36" balsa. Use clamps and a scrap of 3/8" sq. to hold the sheathing to the leading edge while gluing with thin CA. Glue from the inside so as not to glue the clamp strip to the sheathing.



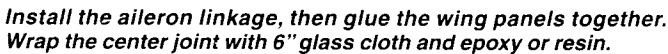
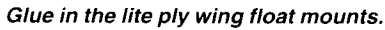
Pin the wing down to the plan again and glue on the top sheathing and capstrips. Use woodworking glue and pins to glue on the forward sheathing.

the most parts per sheet. I then cut out each pair of ribs on my Dremel jig saw close to the lines and finish shaping the ribs to the lines with a sanding block.

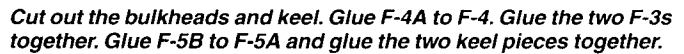
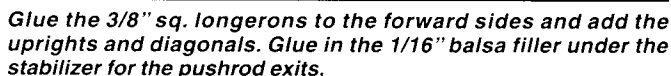
Begin construction by covering the wing plan with wax paper. Pin the bottom wing spar in place on the plan. Choose the hardest 3/8" sq. stock for the wing spars. Glue the lite ply rib halves W-1A



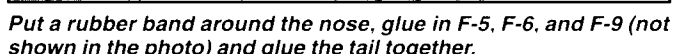
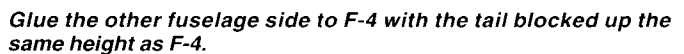
Glue on the wingtips and round the leading edge.

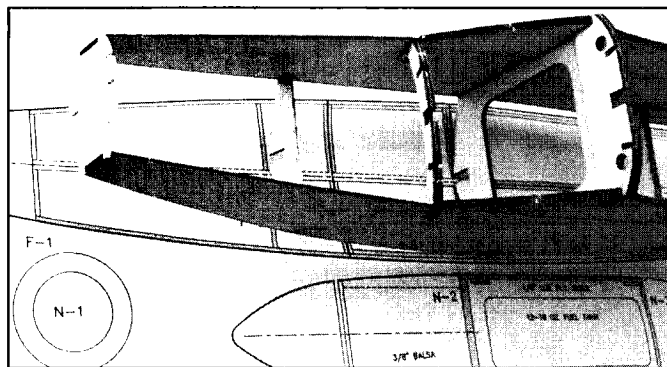


Remove the wing from the plan and turn over to sheet the bottom of the panel. First, glue on the 1/16" x 1" trailing edge sheet. Mark a centerline down the bottom spar. Glue on the center sheeting from

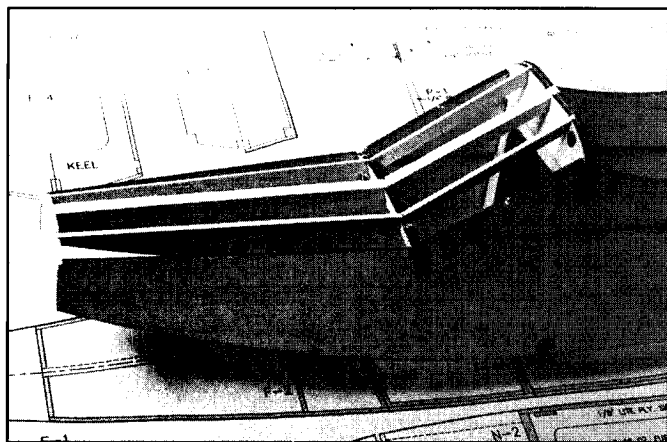


With medium viscosity CA, glue the bottom leading edge sheet to the bottom spar. Turn the wing over and glue the sheet to the ribs





Glue in F-1, F-2, and F-3 while aligning the fuselage with the plan top view.

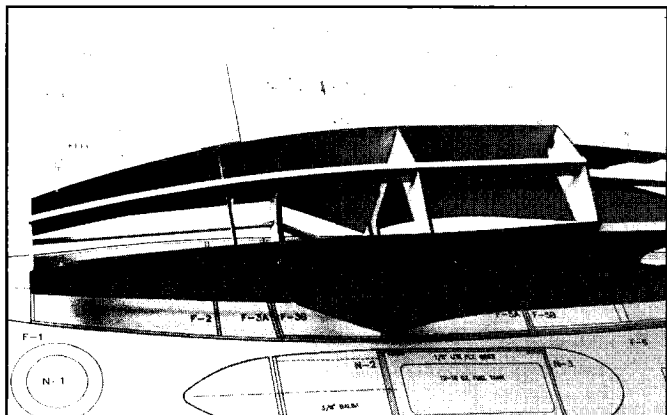


Glue in the top front stringers.

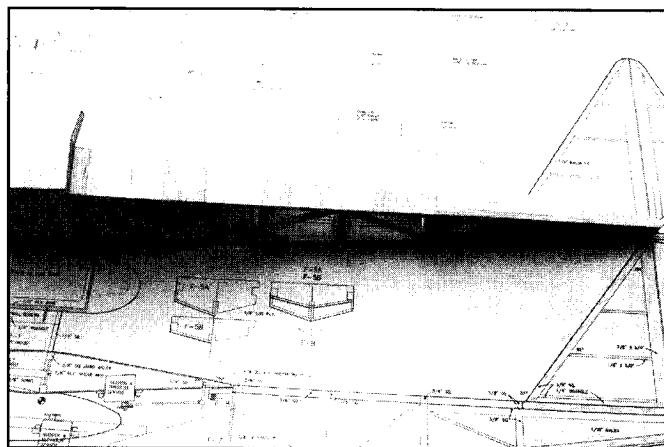
with thin CA. Pin the wing flat to the building board while gluing the sheet to the ribs and start at the middle rib and work alternately to the ends. To glue the sheet to the leading edge, first dampen the sheet on the outside of the bend. Clamp a scrap of 3/8" sq. about a foot long over the sheet to the leading edge in the middle of the wing panel. Wick thin CA from the inside to glue the sheeting to the leading edge. Move the 3/8" sq. and clamps and finish gluing the leading edge sheet to the leading edge.

With the wing pinned to the building board, right side up, glue on the top 1/16" trailing edge, center sheeting, and capstrips. To glue on the top leading edge sheet, squeeze a bead of Titebond or other wood-working glue along the tops of the ribs and the 3/8" sq. leading edge. Apply a bead of medium CA to the spar and press the sheet in place on the spar. Using lots of pins, starting at the middle rib, pin the sheet down to the ribs and the leading edge and allow the glue to dry.

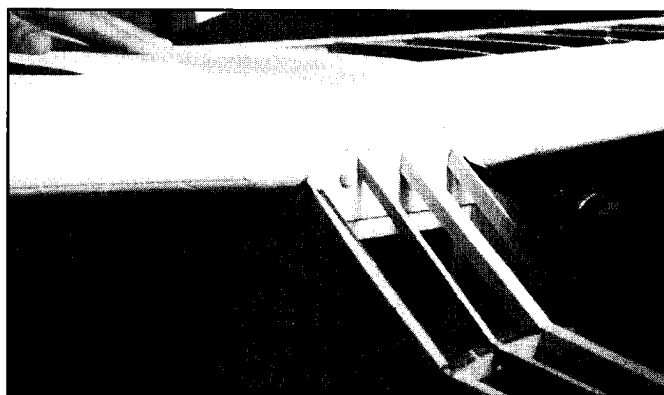
Glue on the wingtip and tip supports and some scrap 3/8" sq. at the leading and trailing edge. Glue in the plywood float supports. Sand the leading edge to match the plan. Cut the aileron stock into the root, aileron, and tip sections. Fit the 1/8" Goldberg aileron linkage into the root section and glue to the wing panel. Glue the tip section in place and finish shaping the wingtips. See the front of the



Glue in the front and rear keels and bevel sand for the bottom sheeting.



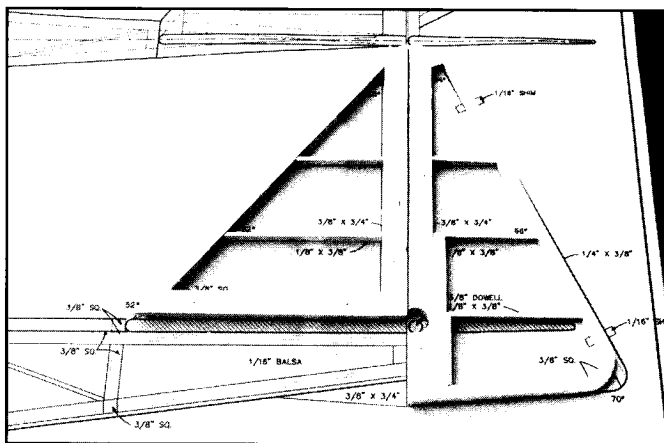
Glue on the front and rear bottom sheeting. Use lite ply for the front and balsa for the rear.



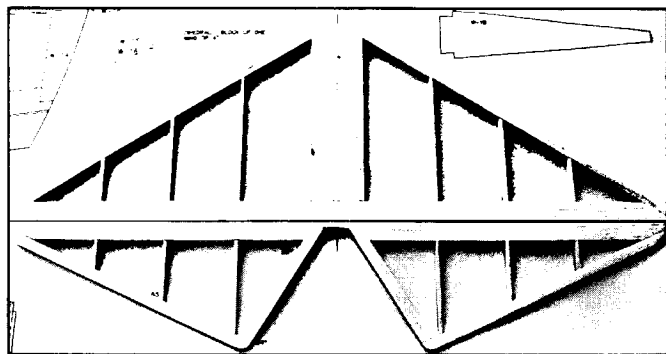
Fit the saddle to the wing and drill the wing dowel holes in the wing using the holes in F-4 as a guide.

aileron section and cut the hinge slots and fit the hinges but do not glue the hinges in place until the wing is covered. Build the second wing panel using the same construction sequence.

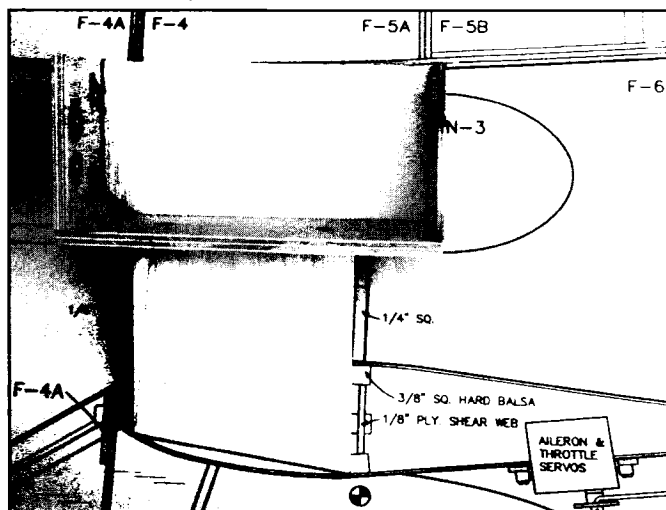
Before joining the two wing panels, sand off the excess sheeting at the root along the top edge, including the notch at W-1A. Leave the bottom center sheeting even with W-1B all the way to the leading edge. When the wing is joined, there must be a full 1/4" slot between the two W-1A half ribs for the engine pylon to slide into. If the slot is less than 1/4" or the pylon does not fit easily, glue a 1/16" balsa spacer between the two W-1Bs. Sand the spacer until the 1/4" plywood engine pylon will just fit. Glue the two wing panels together with medium CA. The resulting dihedral should be about 3" under one wingtip, with the other wing panel flat on the table. The strength of the wing center section is the 6" wide band of heavy (8 oz.) fiberglass cloth wrapped around the wing and secured with epoxy, resin, or CA.



Make the rudder and fin over the plan. Use the Mini Miter Box from the Cloud Dancer .40 article in the August '95 RCM. The Mini Miter Box is available from Ace R/C for \$3.98, Part No. 60K246.



**Build the stabilizer and elevators over the plan, then join the elevators with a piece of 3/8" dowel. Fit the hinges, but do not glue, then sand the tail parts.**



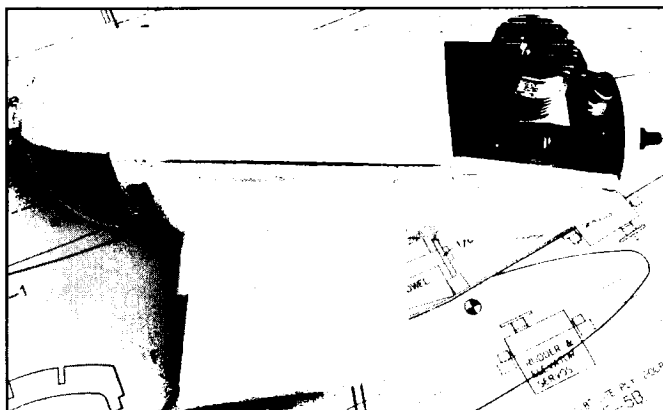
**Build the engine pod from 1/4" plywood and lite ply. The base is epoxied to the pylon and secured with drywall screws. Install the blind nuts and drill the fuel line and pushrod holes in the fire wall. Glue on the lite ply sides.**

### Fuselage:

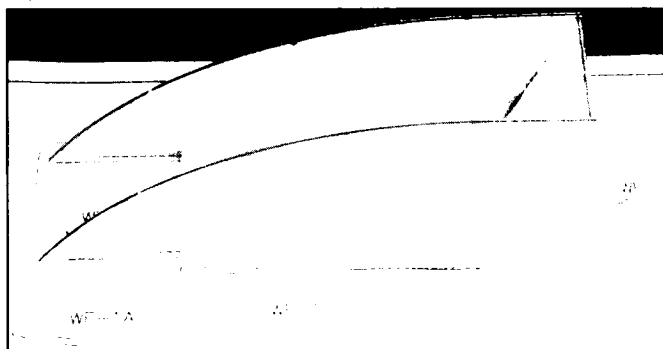
Begin the fuselage construction by cutting out the lite ply forward sides, doublers, bulkheads, and keel. I use the same process as described for the wing ribs to cut out these parts. Glue or epoxy the top fuselage side doublers to the forward sides. Be sure to make a right and a left side. Pin the right hand side to the plan, the doubler will be on top. Cut and glue in place the top and bottom 3/8" sq. longerons and stabilizer mount. Choose hard balsa for the longerons. Fit and glue in place the 3/8" sq. verticals, the 1/8" x 3/8" diagonals, and the 1/16" balsa filler under the stabilizer. The first side is done. To make the second side, remove the first side from the plan and turn over. Lay a piece of wax paper over the side. Build the second side right over the first. The two sides will be back to back. Pin the second forward side over the first, the doubler will be on top again. Build the rear fuselage structure, pinning the longerons to the finished first side.

Glue F-4A to F-4 and drill the two 3/8" wing dowel holes. Glue F-4 to the first fuselage side using a square to keep it perpendicular to the side. Make a spacer the same height as F-4 is wide and place over the tail of the first side. Glue the second side to F-4 using the spacer at the tail to keep the two sides parallel. Also use the square at the tail to keep the two sides aligned.

Place a rubber band around the two sides at the front and at the tail. Use enough pressure at the front to keep the sides parallel at F-4 and not break those glue joints. Carefully sand the tail joint between the sides so the total thickness of the tail post is 3/8". Glue F-6 between the sides and glue the sides together at the tail. Glue F-5B to F-5A, glue the two F-9s together, drill for the NyRods and glue in place. Lay the fuselage over the plan top view, upside down. Glue in the forward bulkhead by first slipping F-2 and the F-3s in place, but don't glue yet. Glue in F-1 using the square to align the fuselage to the plan. Then glue in F-2 and the doubled F-3. Glue in the doubled



**Fit the hatch, glue on the cowl blocks and spinner ring, and shape to the spinner. Add the triangle stock around the pylon joint and build the tail cone from 3/32" balsa. Cover before epoxying the pylon into the wing.**



**Build the wing floats from lite ply. The floats are secured to the wing with #4 SM screws.**

lite ply keel. Glue in the lite ply chine doublers between F-1 and F-5. Glue in the top and bottom rear 3/8" sq. cross braces. Glue on the bottom rear 3/8" sq. keel and F-8. Glue in the 3/8" sq. top front, center stringer, and two 1/8" x 3/8" side stringer. Glue in the rear wing mount, F-7.

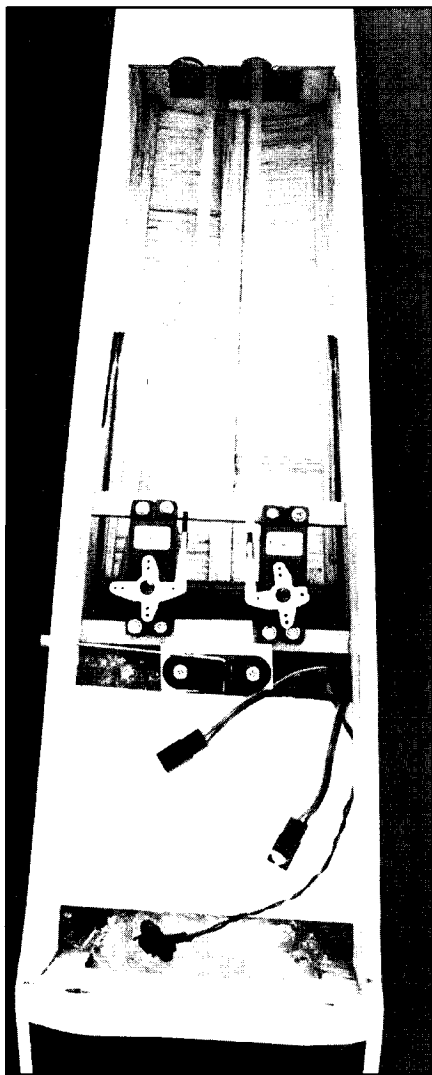
Glue on the bottom front sheeting after block sanding the sides and keel down to the bulkheads. I used 1/8" balsa for the bottom front, but I would recommend using lite ply or 1/16" hard plywood, or cover the balsa with medium weight glass cloth and resin. Cover the bottom rear with 1/8" balsa, v'ed back to F-8, then flat to the tail. Don't glue on the triangle chine strips until just before covering to keep them from being damaged during construction.

Fit the wing saddle of the fuselage to the wing by sliding 100 grit sandpaper between the wing and saddle, sanding the saddle. Align the wing to the fuselage and tape in place. Drill through the two holes in F-4 with a 3/8" drill through the wing leading edge. Remove the wing and glue the two 3/8" wing hold-down dowels into the wing. Round the front ends of the dowels. Place the wing back into the fuselage, realign, and drill the first of two 3/16" holes through the wing trailing edge and F-7. Tap the hole through the wing and F-7 with a 1/4-20 tap and run in a 1/4-20 x 1" nylon bolt. Drill and tap the second bolt hole.

Enlarge the holes in the wing to 1/4" and seal the holes with thin CA. Also seal the tapped holes in F-7 with thin CA and partially re-tap. The threaded holes should be slightly snug to the bolts so they



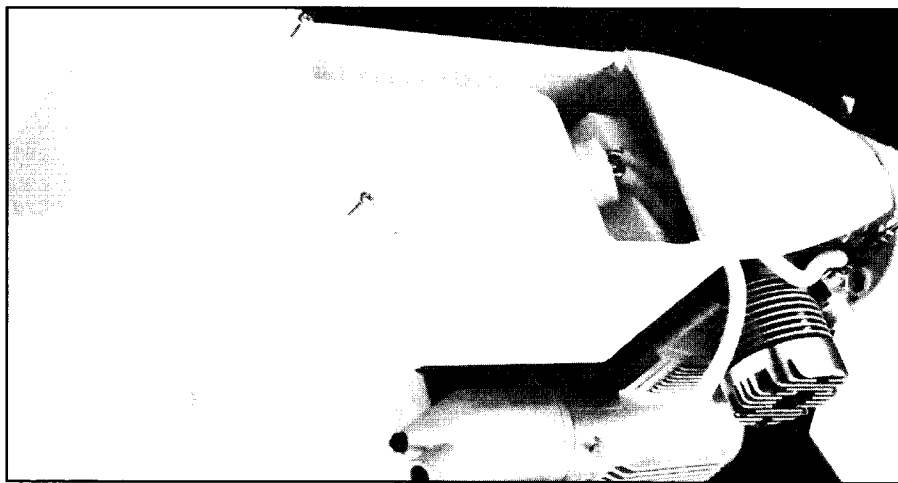
**Cover and decorate the parts before final assembly. Cut away the covering before gluing.**



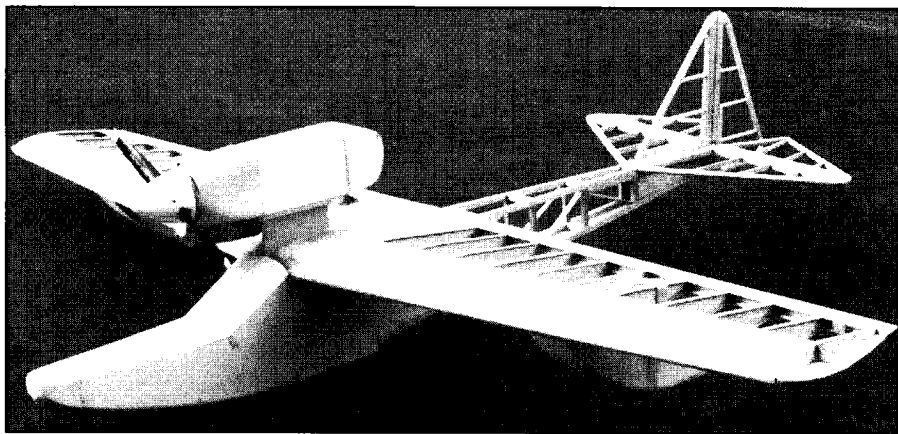
*There is plenty of room for the two servos, receiver, and battery in the fuselage. The finished fuselage, tail, and radio weighed only two and a half pounds. Fill the forward fuselage with bubble pack for emergency floatation.*

cannot vibrate out in flight.

Cover the top front deck and windshield of the fuselage with medium hard 1/16" balsa. With the wing in place, glue W-19 to the wing behind F-4. Use a 3" x 5" card spacer between F-4 and W-19 to allow for the covering. Fill the space behind W-19 with scrap balsa or filler. This fillet is very



*The engine pod is kept as low as possible so muffler just clears the wing. There is easy access to the fuel tank, fuel lines and throttle linkage. The engine pylon and pod is very solid.*



*The completed bare bones. Very strong but light structure. The six foot wing has almost 850 sq. in. of area and the finished weight of the airplane is seven pounds. Wing loading is only 19 oz./sq. ft.*

important to keep water out of the fuselage. Cut away the 1/4" slot for the engine pylon.

#### **Tail Group:**

Lay wax paper over the rudder plan, then build the fin first from 3/8" sq. balsa and 1/8" x 3/8" balsa. Use the Mini Miter Box published in the Cloud Dancer 40 article in the August '95 issue of *RCM* to cut the special angles called out on the plan. The Mini Miter Box is available with all parts die-cut to size from Ace R/C for \$3.98. This little tool makes it much easier to get squared angle cuts and tight fitting joints from the 3/8" sq. stock. Build the rudder,

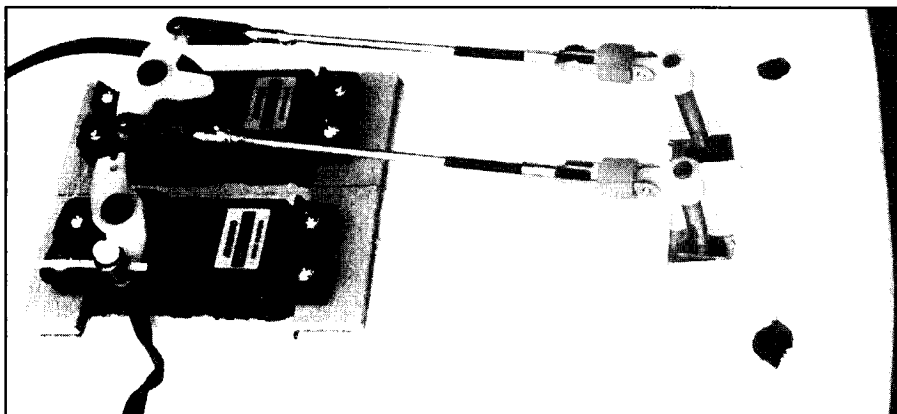
stabilizer, and elevators using the same techniques used in making the fin. The trailing edges of the rudder and elevators are 1/4" x 3/8" and must be shimmed up 1/16" to center them to the ribs. This reduces the amount of wood to be removed when shaping. Fit the hinges and sand the elevator and rudder to a tapered cross section.

The base and fire wall of the engine pod are made from 1/4" aircraft plywood and held together with epoxy and drywall screws. The sides, top, and rear are lite ply and the tail cone is made from 3/32" balsa. Glue 3/4" triangle stock to reinforce the base to pylon joint. Bolt in the engine, fit the cowl blocks and shape them to the spinner. Cover the wing and engine pod before epoxying the pylon into the slot in the wing.

Build the wing floats from lite ply and 1/8" balsa. The floats are mounted to the wing with four #4 x 1/2" SM screws into the plywood plates in the wing.

Before covering the fuselage, spray the inside with clear varathane varnish to seal all of the wood including the rear structure. Water will get there! Cover and decorate all of the parts of the model before final assembly and be sure to seal all corners and seams. Test the hull in the bathtub to be sure it doesn't leak.

Buy a piece of 2" foam rubber, large enough to protect the fuselage during final



*Aileron and throttle servos are mounted in the wing. Ace R/C flexible nylon throttle linkage snakes up through the wing into the engine pod. The nylon linkage works freely and can't rust.*



assembly and equipment installation and later at the lake while starting during handling and transportation. Install the radio as shown on the plan and fill the forward fuselage with bubble pack or Styrofoam for floatation insurance. Stuff happens, heavy sinks and Murphy's Law tries to prevail on the water. Ask me how I know! Place some thin foam rubber or bubble pack around the fuel tank to prevent foaming. There is enough clearance for a 12" propeller, but an 11" prop does not suck in the water as did the 12" prop. Pick the pitch to suit your engine. I run an 11 x 8 APC propeller on my FP 60. Before flying, tape the seam across the top where the wing fits against F-4. This is where my model took on water. Also seal around the wing saddle and F-7 with foam tape to keep out the water from spray. Seal the receiver and battery pack in baggies. Be sure to remove the baggies as soon as you are through flying and be sure all of the wiring and switch is dry to prevent corrosion of the connectors and switch. If there is any water in the hull, open up the servos and allow to dry. If there is any water present in the baggies, open up the receiver and set in the sun to thoroughly dry. Check the hull periodically to make sure it is not taking on water, especially after the first flight. Water moves to the back of the fuselage, creating a tail heavy situation. I did that, not good. Couldn't figure out why the airplane just fell out of the sky after it had been flying so well until the post mortem revealed several ounces of water back in the tail section of the fuselage.

### **Flying:**

The first flights were at the June float-fly and it pointed out all the things that were wrong. The 12" prop took on a lot of spray. The forward hull needed chine strips (not installed yet) to prevent some of the spray. The fuselage-wing seam leaked badly and tail heavy aircraft don't fly well. Actually the first flight went well. I ripped the Sea Dancer off the water with full power and a lot of up-elevator and it flew. It really flew well. Several of the club members flew it during the maiden flight, as everything really felt right. The engine quit on the second, third, and fourth flight soon after take-off which caused me to switch focus from other things. With each take-off, the hull took on more water which I did not notice. The engine ran better on the fifth flight but quit as a friend throttled back to land. Without power the Sea Dancer nosed up a little, then without warning it stalled and spun into the lake from about thirty feet up. There was some damage and everything was wet so I went home.

The following week, Rudy Taube and I went back to the lake to try again. With the chine strips installed and an 11" prop, the take-off problems were solved. The engine ran right and we got in several good flights. The Sea Dancer flew great and we took turns flying it. Then it stalled and spun in again on a landing approach. Water was still getting in, causing the tail heavy situation. This time at home I added the fillet behind F-4 on the wing and sealed it with 3-M clear tape for the following flights and that solved the water leak problem.

During subsequent flights, the Sea Dancer made long smooth take-offs, shot touch and go's, flew by low and slow and so pretty, made gentle landings, and made me happy that I had reminisced and built this flight of fancy called the Sea Dancer.

### **Material List**

- 10 — 1/16" x 3" x 36" Balsa
- 4 — 1/16" x 4" x 36" Balsa
- 4 — 1/16" x 1" x 36" Balsa
- 6 — 1/16" x 1/4" x 36" Balsa
- 2 — 1/8" x 3" x 36" Balsa
- 20 — 3/8" sq. x 36" Balsa
- 3 — 1/8" x 3/8" x 36" Balsa
- 1 — 3/8" x 3" x 36" Balsa
- 1 — 3" x 4" x 2" Balsa block
- 1 — 1/4" x 6" x 12" Aircraft plywood
- 3 — 1/8" x 12" x 24" Lite ply
- 1 — 3/8" x 18" Dowel
- 1 — 3/4" x 12" Balsa triangle stock
- 1 — 3/32" x 3" x 24" Balsa
- 2 — 1/2" x 1-1/2" x 36" Tapered trailing edge
- 1 — 3/8" x 36" Balsa triangle stock

### **Hardware**

- 1 — 1/8" Aileron linkage set  
(Carl Goldberg)
- 2 — Long control horns
- 1 — Throttle cable set (Ace R/C)
- 2 — NyRod pushrods and ends
- 17 — Medium nylon hinges
- 2 — 1/16" Aileron pushrods and clevis  
(Carl Goldberg)
- 1 — SS-12 or SS-16 Fuel tank (Sullivan)
- 2 — #6 x 1" Drywall screws
- 4 — #6 Tee nuts
- 4 — #6 x 3/4" Bolts
- 2 — 1/4"-20 x 1" RH nylon bolts
- 2 — #4 x 1/2" SM screws
- 1 — Engine mount to fit engine used