The REAPER

By Brian Chas

After looking at the stack of w in the corner for nearly a ye admit I'm a pack rat), I dec to try something a little different. I look the flying wings on the market and looked at my 1/2A C/L combat planes a came to me. I grabbed the remains of a s wing out of the corner and started cu and gluing. First I cut the leading edge of the center rib bay and added a radio t and firewall. Second, I had to have elevator so I added twin tail booms like C/L, but decided to raise the tail 3" to the elevator out of the wing wash since was so short coupled. Third, I ad landing gear, engine, radio, etc., and w ready to go flying. (It took longer tha sounds.)

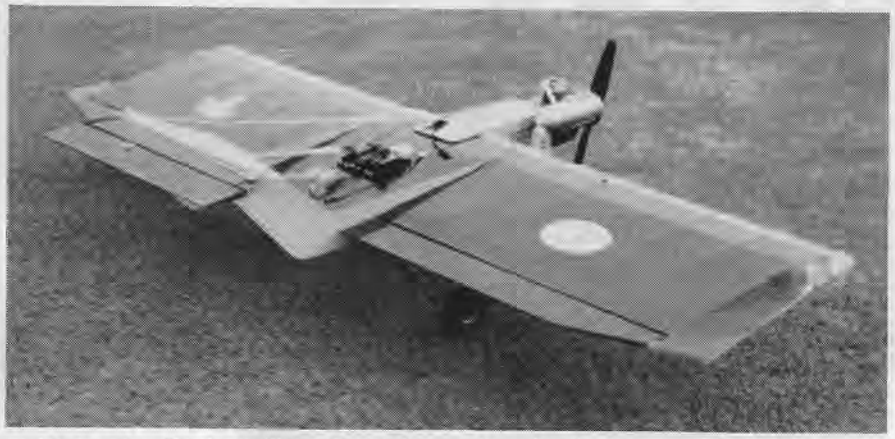
The next morning I snuck out to the fi before anyone showed up so as not to m a fool of myself if this didn't work. I start and tuned the engine. I put the plane on t runway for some taxiing to check grou stability, but as I gave the plane about throttle, the thing leaped off the ground a was airborne and climbing out steepl After the shock wore off, I gave it a li down trim and it was flying surprisingl well. I did some loops, rolls, hard tur etc., then decided it was time to land. throttled back and the plane slowed into nice glide and landed nice and level. I h been terrorizing the sky ever since.

The first plane was a bit heavy because the cut and add process. Due to combat fatalities, I built a second prototype and added twin rudders. The rudders were not effective so they were removed. By the third and final prototype, the rudders were left off, the booms were built as a fin, and the servos were moved back to help the balance. I was able to decrease the weight by 1½ pounds, even with the landing gear installed.

ABOUT THE AUTHOR

Brian Chase is 31 and tries to stay active in both R/C planes and cars. He has been flying R/C planes for about six years and enjoys the hobby and the people involved. He lives in Theodore, Alabama, and belongs to the Azalea City Model Aeronautics Club, located in Mobile, Alabama.

REAPER
Designed by:
Brian Chase
TYPE AIRCRAFT
Sport-Combat
WINGSPAN
50-1/2 Inches
WING CHORD
12-1/4 Inches
TOTAL WING AREA
618 Sq. In.
WING LOCATION
Mid-Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
0
OVERALL FUSELAGE LENGTH
12 Inches
RADIO COMPARTMENT SIZE
(L) 12" x (W) 2-7/8" x (H) 2-1/2"
STABILIZER SPAN
14 Inches
STABILIZER CHORD (inc. elev.)
5 Inches
STABILIZER AREA
70 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Vertical Fins
VERTICAL FIN HEIGHT
3 (x 2) Inches
VERTICAL FIN WIDTH (inc. rud.)
2-1/2 (x 2) Inches
REC. ENGINE SIZE
.20-.25 2-stroke
FUEL TANK SIZE
4 Oz.
LANDING GEAR
Tricycle (optional)
REC. NO. OF CHANNELS
3-4
CONTROL FUNCTIONS
Elev., Throt., Ail., Steerable Nosegear
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage . . . . . .Balsa, Ply (Door Skin)
Wing . . . . . .Balsa, Bass, Ply
Empennage . . . . . .Balsa
Wt. Ready To Fly . . . . . .48-56 Ozs.
(3 Lbs. to 3 Lbs. 8 Oz.)
Wing Loading . . . . .11.2-13.0 Oz./Sq. Ft.



CONSTRUCTION

I use a 2x4 that I cut with a radial arm saw for a wing jig. The blade of the saw leaves a groove just the right size for the ribs and tail boom. Space your cuts at 3-1/16" on center and 1" deep. The jig is not necessary, but makes building a lot easier. After cutting the ribs and tail booms, place them in the jig and add the main spars. Pull the bottom spar against the jig and hold in place with a rubber band to keep everything square. Glue the top spar and front edge of the bottom spar. When the glue is dry, slide the wing forward a little and glue the bottom spar completely. Now, lift the wing out and put the front of the ribs in the jig with just the leading edge sticking out. Install the 3/8" x 3/8" leading edge and glue in place. This will help square the wing.

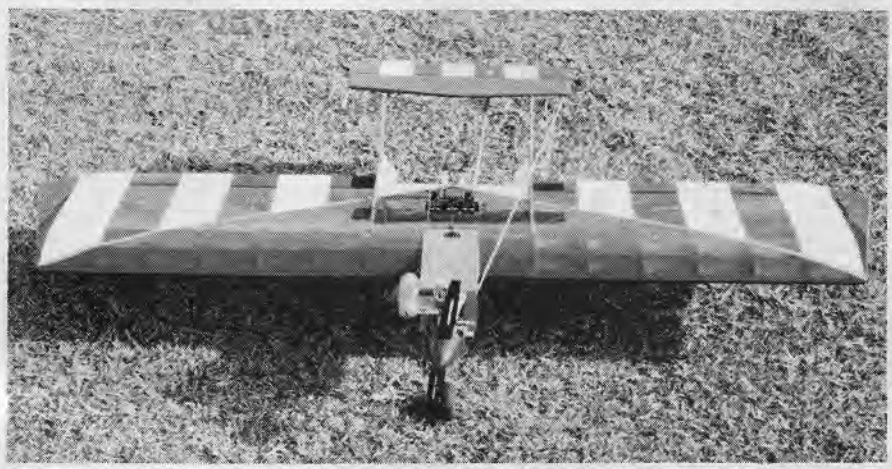
Now, put the wing back in the jig and glue the 3/16" sq. mid-spar in place. Cut 3/32" notches in the trailing edge stock to match the ribs. Fit the trailing edge to the back of the wing and glue in place. Sheet over the trailing edge top and bottom with 3/32" balsa. When adding the trailing edge to the center section, be sure that it measures the same as the space at the spar, keeping everything square. Now add the stiffeners to the centerline of the tail booms, and we are ready for the aileron torque rods.

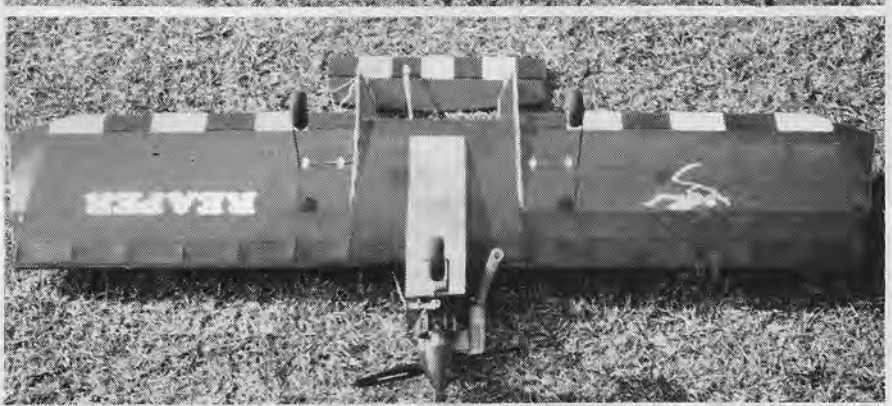
Drill a 1/8" hole in each tail boom and notch the tail boom stiffener for the tork rods. Glue a 1/16" plank to the bottom of the wing, letting it hang over the trailng edge 1/2". Install the torque rods and shim until they are centered on the trailing edge, now epoxy in place with about 1" between the rod ends. When the epoxy is dry, cap the rods then move on to the next step.

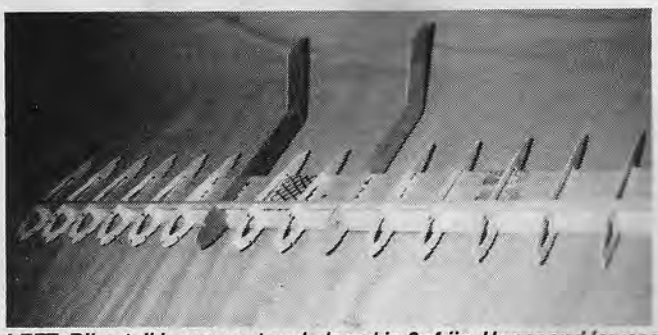
Cut out the center section leading edge and mid spar, and check fuselage sides for fit. Now, epoxy the fuselage sides to the inside of the center section and clamp in place with clothespins. When the epoxy is dry, glue the bottom of the fuselage with triangular braces in the corners. For the stabilizer supports, cut four pieces of clothespins (tapered end forward), two for each tail boom. Now glue one on both sides of each tail boom, then drill three holes in each tail boom and glue the dowels in. Drill three equally spaced holes in the top of each tail boom and glue dowels in the holes. Cut the stab out and drill holes to match the dowels in the top of the tail booms. Be sure the tail booms are equally spaced at the top, bottom, and at the main spar. Now glue the stab in place.

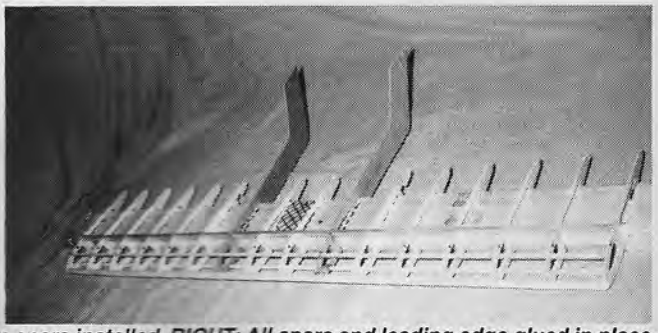
Cut and install the fire wall. Install the fire wall with 1/8" down and 1/8" right thrust. Epoxy the fire wall in place with 1/4" triangle stock at the sides and the bottom of the fuselage.

Now let's add the landing gear blocks and servo rails. Draw a line from the top of the main spar to the trailing edge on the outside of each tail boom top and bottom; these are

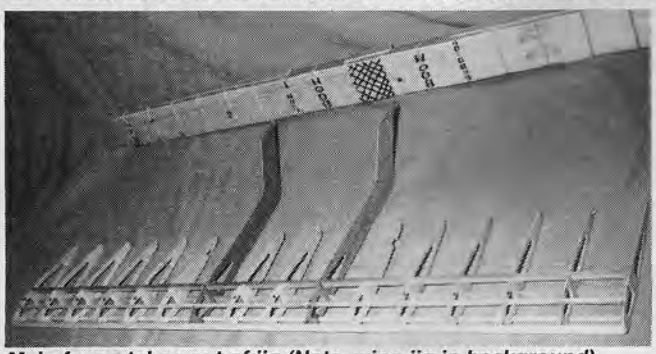




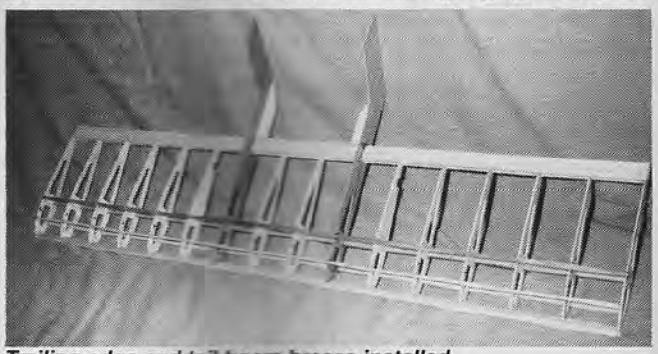




LEFT: Ribs, tail booms cut and placed in 2x4 jig. Upper and lower main spars installed. RIGHT: All spars and leading edge glued in place.



Main frame taken out of jig (Note: wing jig in background).

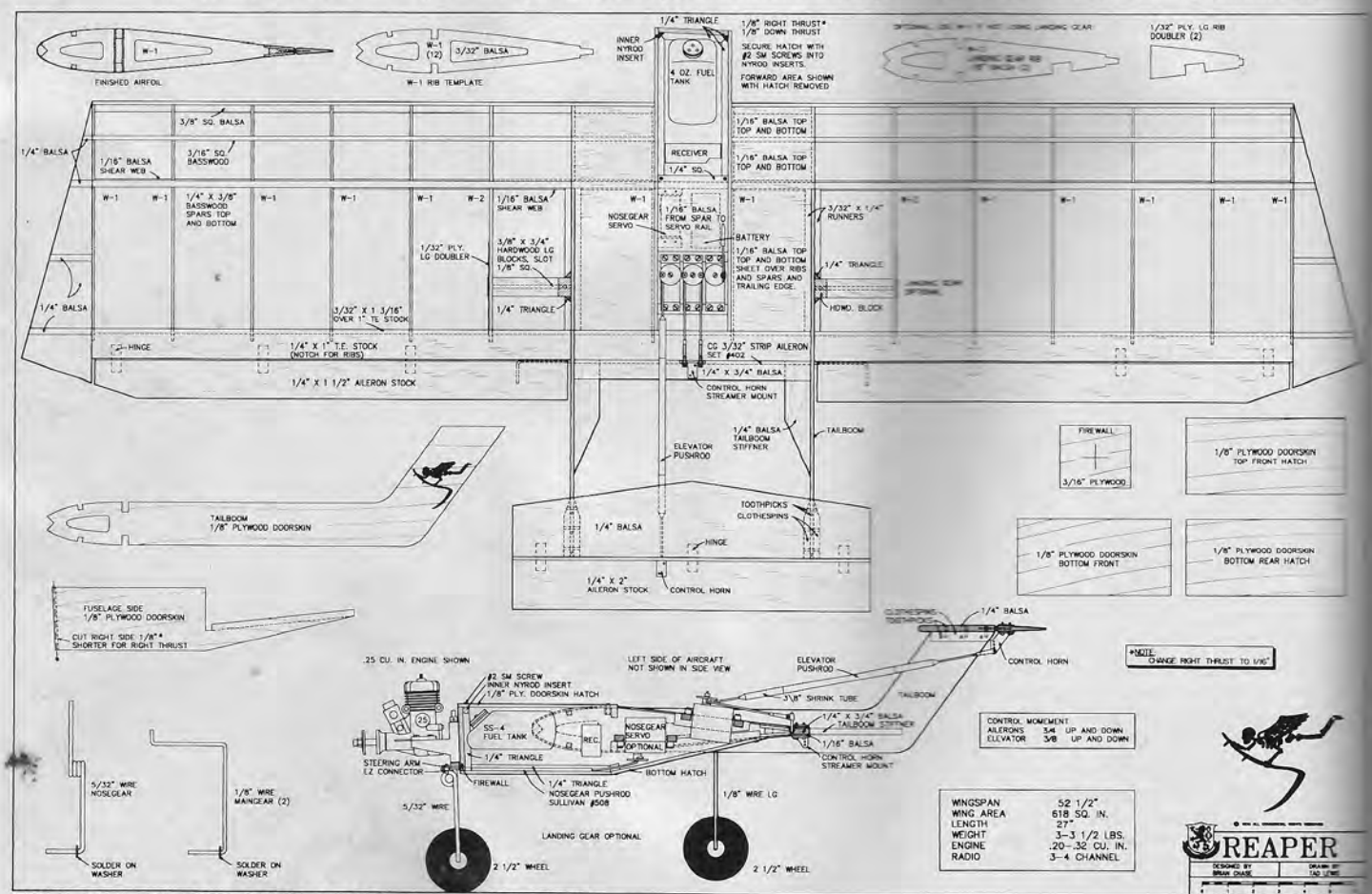


Trailing edge and tail boom braces installed.

to align the landing gear blocks. Glue the main block in place. Cut the upright block so it comes even with the top of the wing, and glue in place.

Install the 3/32'' x 1/4'' balsa strips from the main spar to the trailing edge on each side, top and bottom of the tail booms. These are to glue the center planking to, and for attaching the covering. Cut 1/4'' triangle stock to fit against each side of the upright landing gear blocks, and epoxy in place. Cut and install the 1/16'' lite ply doubler on the landing gear rib. Glue the upper servo rails in place with the top of the rail 1/16'' above the rib. With the servo rails in place, notch a 1/8'' balsa doubler to fit the servo rails and glue it to the inside of the rib. Turn the plane over and glue a servo rail to the top of the lower spar, and a second rail mounted on a block and glued to the side of the rib with the proper space for the servo. The lower mount is for the steering servo, so it is optional.

Install the 1/16'' shear webs to both sides of the spar in the center section, but leave the center bay open. Plank the center section with 1/16'' balsa. Cut and install the



FULL SIZE PLANS AVAILABLE — SEE PAGE 227

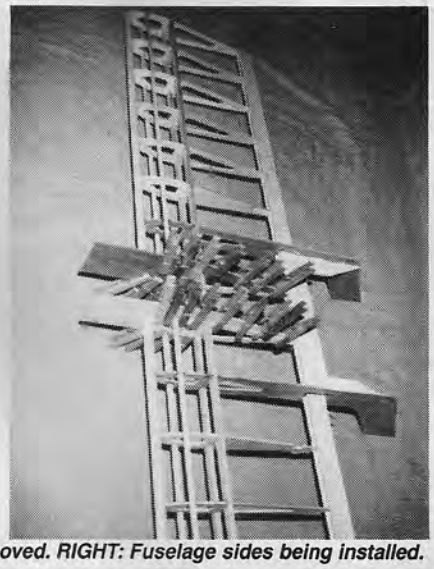
BILL OF MATERIALS

1 — 1/8" doorskin - fuselage, tailbooms
1 — 1/4" aircraft ply - fire wall
2 — 3/8" x 1/4" x 48" basswood - main spar
2 — 3/16" x 3/16" x 48" basswood - mid spar
1 — 3/8" x 1/4" X 12" spruce - servo rails
* 1 — 1/8" x 2" x 36" balsa - landing gear ribs
1 — 1/4" x 3" x 36" balsa - stab, wingtips
2 — 3/32" x 3" x 48" balsa - trailing edge cap
4 — 3/32" x 2" x 36" balsa - ribs
3 — 1/16" x 3" x 36" balsa - planking, shear webs
1 — 1/4" x 36" balsa tri stock - fuselage, fire wall
1 — 1/4" x 1" x 48" trailing edge stock
1 — 3/8" x 3/8" x 48" balsa - leading edge
2 — 1/4" x 2" x 36" aileron stock
2 — Wooden clothespins - stab brace
12 — Toothpicks or 1/8" dowels - stab, stab brace
1 — 1/4" dowel - pushrod
*1 — 1/16" lite ply - landing gear doubler
*2 — 3/4" x 3/8" x 3-1/4" landing gear blocks
1 — 15-min. epoxy
1 — Super Jet
1 — Instant Jet - for hinges
1 — 3/8" x 3" shrink tube - for elev. pushrod
1 — Hayes mount #AS-25
2 — 3/32" strip aileron rods - Goldberg #402
2 — Short control horns - Goldberg #441
4 — 4-40 blind nuts
4 — 4-40 x 5/8" screws
4 — #4 socket head wood screws
8 — #2 x 1/2" wood screws
9 — E-Z Hinges
3 — Snaplinks and pushrods
1 — Flexible pushrod - cable type, Sullivan #508
1 — 4 oz. fuel tank - Sullivan #SS-4 or #RST-4
1 — E-Z Connector
1 — Foam pad
1 — Roll covering
1 — Jar fuelproof dope or paint
*2 — 1/8" x 36" music wire
*4 — Landing gear straps
*4 — 1/8" wheel collars
*3 — #4 brass washers
*3 — 2" or 2-1/2" wheels
*1 — Steering arm - Goldberg #280

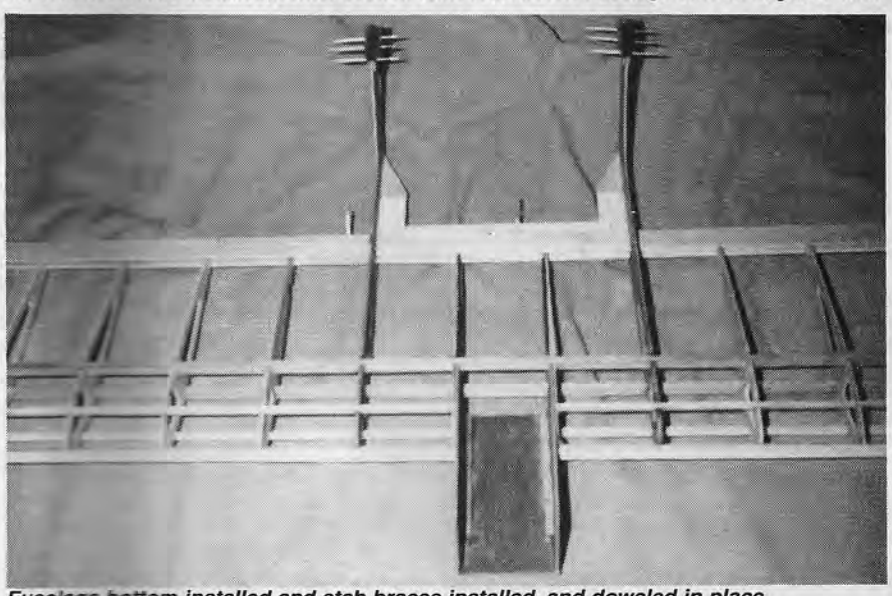
** Optional for landing gear*

wingtips with braces at the main spar and near the trailing edge. Cut the hatches for the top and bottom of the fuselage. Glue 1/4'' sq. balsa blocks in all four corners of the top and bottom of the fuselage box. Hold the covers in place and drill 1/16'' holes in the corners of the hatches for hold-down bolts. Remove the hatches, enlarge the holes in the balsa blocks to 1/8'', and glue a 3/8'' long piece of Gold-N-Rod in each hole. You now have your hatch hold-down blocks (use #2 screws). Glue the rest of the shear webs in and you're almost done. Install the engine mount in the center of the fire wall. Run the throttle cable down through the planking into the fuselage between the spars, along the right side of the fuselage and out through the fire wall. Run the steering cable along the bottom of the fuselage in the left-hand corner and through the fire wall.

Cut your aileron and elevator to size and shape, then cut the hinge slots. Round the leading edges on the wing, wingtips, and the stab. Do your finish sanding to all parts.



LEFT: Aileron rods installed, center section removed. RIGHT: Fuselage sides being installed.



Fuselage bottom installed and stab braces installed, and doweled in place.

Cover the wing and stab, but not the tailbooms or the fuselage. Instead, use fuelproof dope or paint. Install radio gear, engine, fuel tank, and landing gear if used. Now we are ready to fly.

Radio Gear Location:

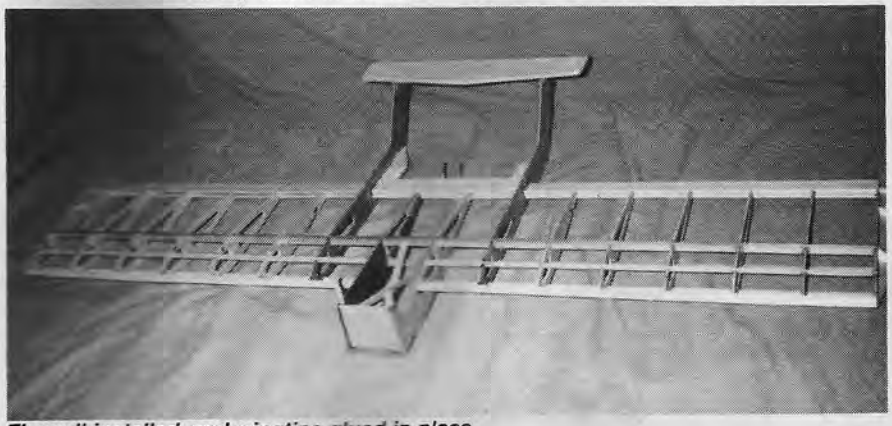
Right servo — throttle.
Center servo — ailerons.
Left servo — elevator.
Lower inverted, left side — steering.
Switch mounts on top hatch in the left rear corner.

Battery goes in space beside the steering servo.

Receiver fits beside or behind fuel tank.

Trim and Balance:

Start with the balance point on the main spar, and then move it back a little at a time until you are comfortable with the way it flies, but do not go further than 1/2'' behind the main spar. Set the ailerons on the centerline of the wing and give 3/4'' travel.



Firewall installed, and wingtips glued in place.

LEFT: Landing gear blocks, servo rails, and stab installed. RIGHT: Center section planked, radio boxes and servo trays ready for equip

Set the elevator so it has 3/8'' movement, any more will cause the plane to stall even at high speed. This is more noticeable as the balance point is moved back. The fire wall should have 1/8'' down and 1/16'' right thrust built into it. The wing to stab incidence should be 0°. With landing gear installed, set the take-off incidence at 3½° to 4°. When landing, bring the plane in at a slow glide and let it settle onto its belly or landing gear, do not force a landing. After the trim flight, the plane can be easily hand launched with no assistance as it flies out straight and level after it is launched.

Performance:

The performance is outstanding, it's capable of 10' inside or outside loops back to back, it will turn around almost on its axis, and rolls at more than one revolution per second. It will do vertical Figure 8s and an inverted flat spin that is out of this world. At 1/3 throttle, the plane will do most maneuvers including outside loops back to back. The plane will also fly surprisingly slow and is really stable. If a dead stick occurs don't panic, the plane glides really well. It will not tip stall, but when stalled, the nose will drop quickly (approximately 4'). If trimmed and balanced properly, it will fly upright or inverted with little or no trim or stick change. By sealing the hinge gaps, it will increase the roll rate about 30%, and also helps overall performance.

Combating:

We use a 3'' metallic party streamer 20' long attached with 5' of three pound fishing line that breaks when a hit is scored. (This set-up works.) We found that regular crepe paper will break under the stress and speed of a long combat match. It also causes too much drag on the plane, and affects its performance, where the metallic streamer has practically no drag at all. On several occasions, crepe has tangled around landing gear or wingtips and causes the plane to pitch and yaw sideways, becoming hard or impossible to control, especially at low speed when trying to land. A couple of planes have been severely damaged in this way.

Now, decide on the size of the combat box, try to keep it in close so you don't lose your depth perception. Remember, it is hard to watch your plane and one or two others so the sound of the engine is a giveaway of your position as well as sight. A quiet plane is hard to locate. Combat styles vary so here are a couple I use. Keep your plane low and you can sometimes sucker your opponent into the ground. Make an extremely low pass at low speed so as not to be heard, and when your opponent flies over, **attack**! Avoid the loop chase as it is likely to confuse you, and when looping around each other you stand a good chance of getting cut, or worse yet, getting hit by your opponent. Remember, anyone with any plane and enough guts can fly combat. Combat is probably 60% luck and 40% skill, so if you're lucky, you're ready to combat. The most important thing is to **try to remain calm**, and have fun!

Safety:

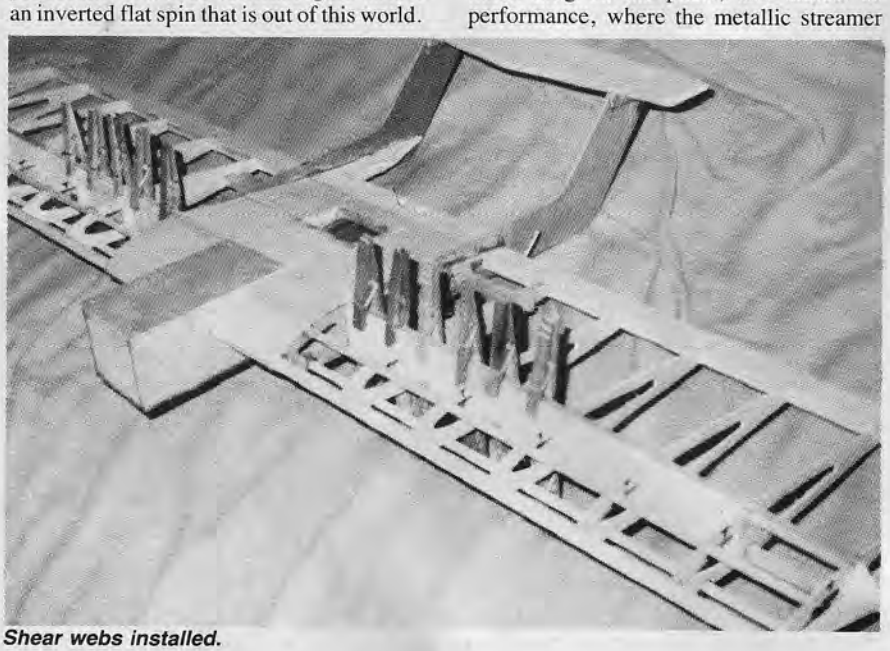
1. Always use a throttle on your plane. (No C/L engines.)

2. Shut engine off if mid-air occurs even if your plane seems undamaged, as the structure may be damaged and fail at the wrong time. (When flying over or towards the pilots, pits, or spectators.)

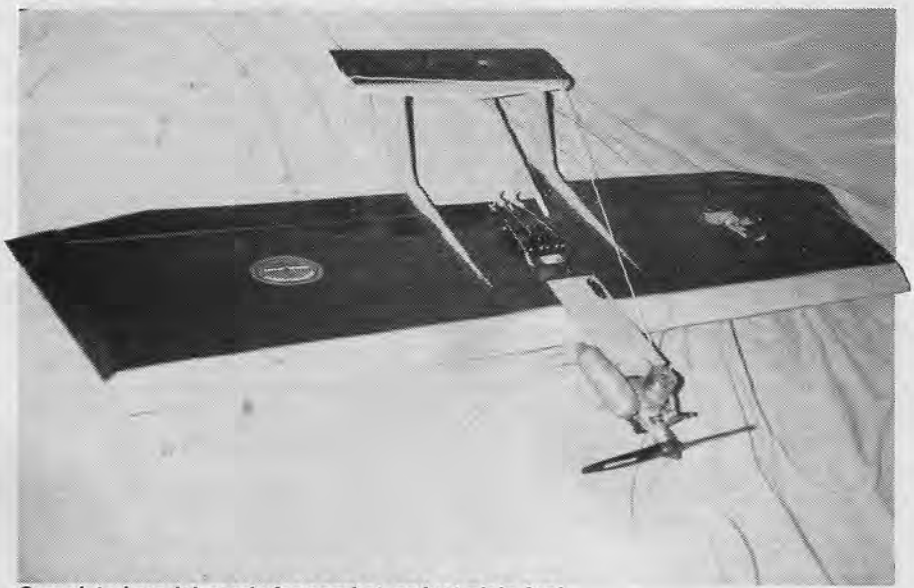
3. Pay attention to what or who you combat over. Fall-out from a mid-air goes everywhere and is not always controllable.

4. At first sign of trouble or confusion, abort any attack and regain your composure, it will help save your plane.

5. Use your common sense. Most people



Shear webs installed.



Completed model, ready for combat, or just plain fun!

know when they are doing something that they shouldn't.

General:

I use an O.S. 25FSR on my plane which will give the plane unlimited vertical climb. The .25 will also fly about 13 minutes wide open on the 4 oz. tank. I have had an O.S. 32F on the plane at one time, but removed it because I was not comfortable with it as it was hard to keep up with, and the .25 makes it fast enough. I have not had the chance to try it, bit I feel a good .15 would give satisfactory performance.

The plane is odd looking, but it is pleasant to look at and people always come over and ask, "Does it fly?" "How well does it fly?" "Is it hard to fly?" The answers to all these questions are answered as soon as they see it fly, and their jaw hits the ground from surprise. The plane is different to look at and watch fly, so pay attention until you get used to the shape. Anyone who is an intermediate flier can handle the plane, but I do not recommend it for beginners. The plane is a blast to fly whether you enjoy the excitement of combat or you just want to have some fun with it. Many of us don't know what that stick on the left is for (myself included), but try pulling it back about 1/2 way and you can still do just about anything with the plane that you want, and it will surprise you how well it will do it. When flying combat, I recommend that you fly it a little nose heavy. For aerobatics, move the weight back until you get the desired flight. With the weight to the rear of the balance point, the plane will slow in a hard loop or a quick nose up position and this is not desirable when in combat, but enhances flat spins and other maneuvers.