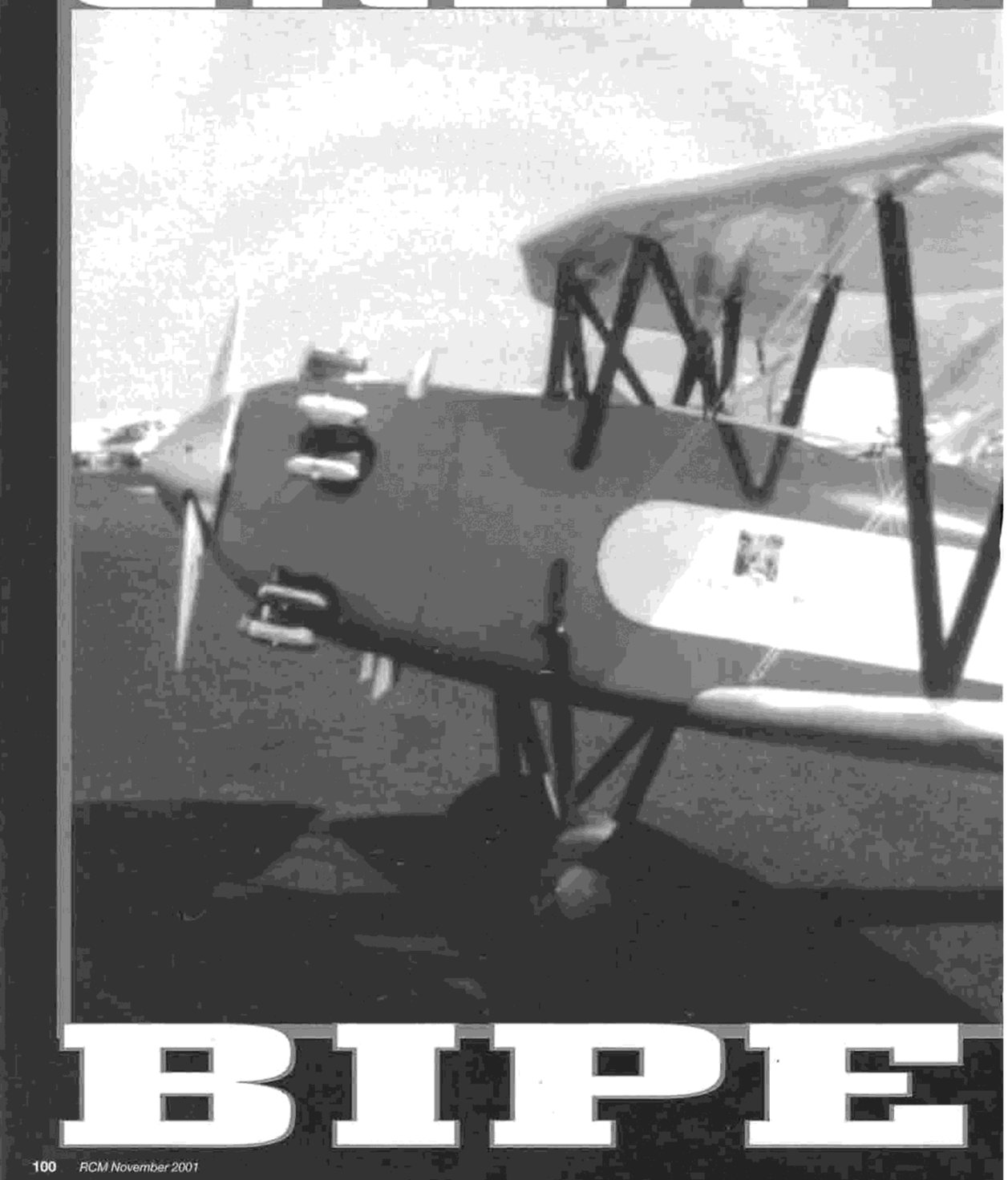
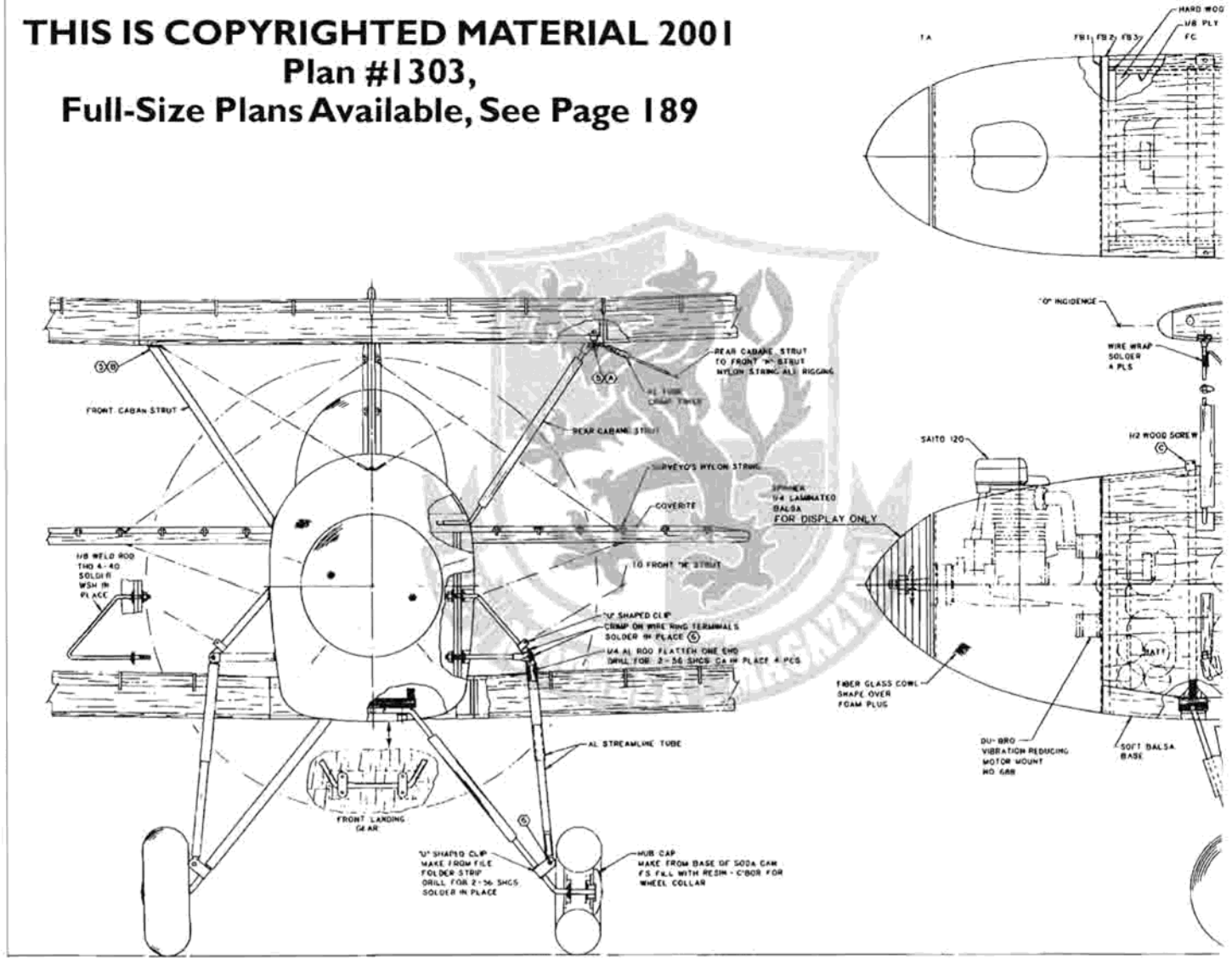
GREAT LAKES BIPE

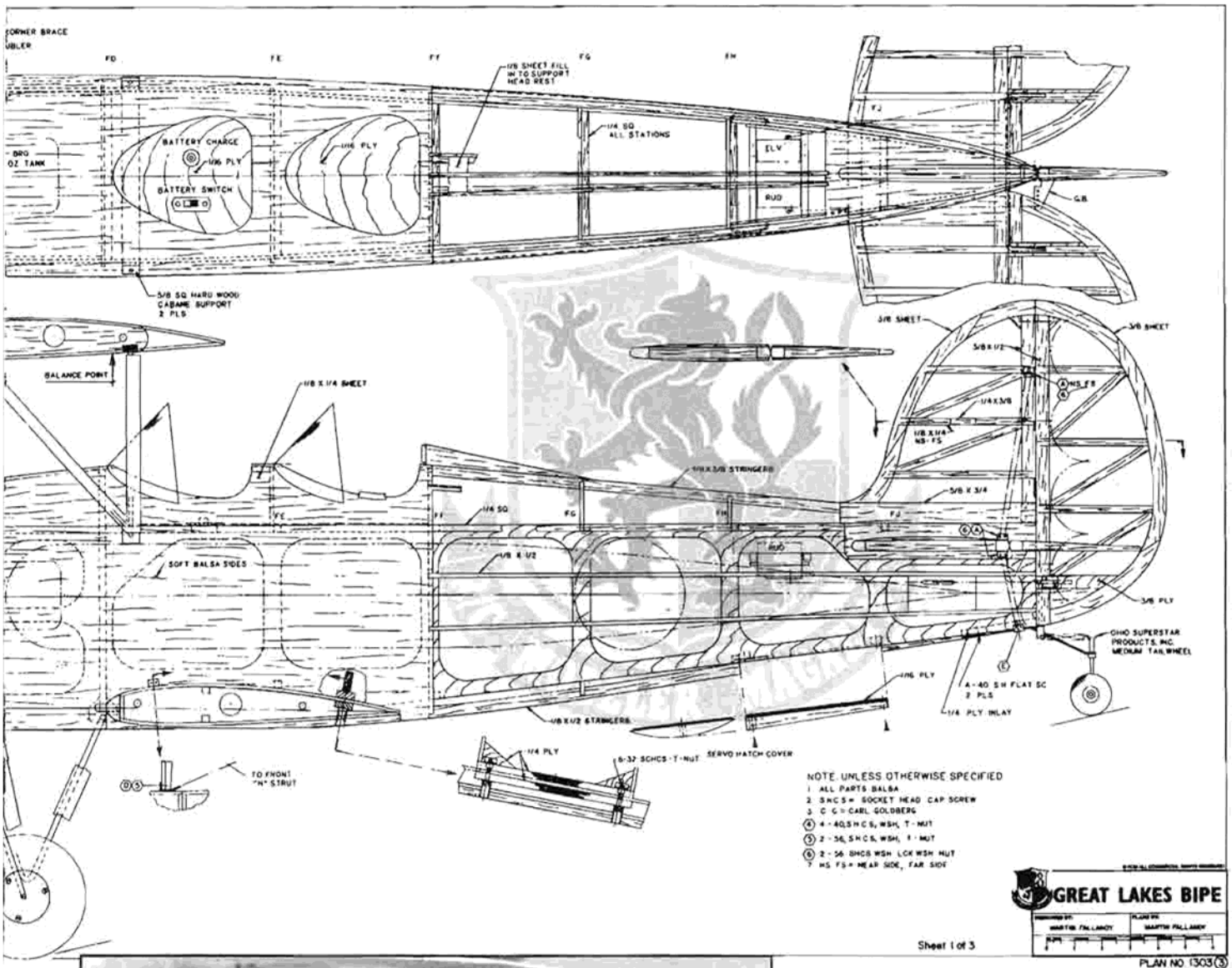


A Sport Scale Model For .90-1.20 Engine

By Martin Fallandy



The author's Great Lakes Bipe model at the Santa Paula Airport.



The full-scale Great Lakes belonging to Al and Brad Ball. This aircraft is now undergoing a major rebuild due to a crash.

Introduction:

About 75 miles north of Los Angeles is a small privately owned airport in the picturesque town of Santa Paula. This airport has no tower, all aircraft monitor one frequency and call out approaches for landing. The first Sunday of every month they have a static display of vintage airplanes and cars. They also have an annual air show, where I first noticed this Great Lakes biplane. What made it unusual is that the aircraft is powered by a five cylinder fuel injected Kinner engine. Al Ball and his son Brad built the plane from scratch, using parts from several discarded Great Lakes. Al and his son run an antique aero overhaul and Kinner parts service. On close inspection, the aircraft is very professionally done. I took several snapshots of the plane, thinking of modeling it sometime in the future.

GREAT LAKES BIPE

Designed by:
Martin A. Fallandy

TYPE AIRCRAFT
Sport Scale

WINGSPAN
72" Top/72" Bottom

WING CHORD
10-5/8" Top/10-5/8" Bottom

TOTAL WING AREA
1530 Sq. In.

WING LOCATION
Biplane

AIRFOIL
Semi-Symmetrical (NACA 2412)

WING PLANFORM
Constant Chord

DIHEDRAL, EACH TIP
1-1/8" Top/1" Bottom

OVERALL FUSELAGE LENGTH
55 Inches

RADIO COMPARTMENT SIZE
10" (L) x 6" (W) x 5" (H)

STABILIZER SPAN
26-3/4 Inches

STABILIZER CHORD (inc. elev.)
8-1/2 Inches (Avg.)

STABILIZER AREA
228 Sq. In. (Approx.)

STAB AIRFOIL SECTION
Lifting

STABILIZER LOCATION
Top of Fuselage

VERTICAL FIN HEIGHT
11-1/2 Inches

VERTICAL FIN WIDTH (inc. rud.)
9 Inches (Avg.)

REC. ENGINE SIZE
.90 2-Stroke/120 4-Stroke

FUEL TANK SIZE
16 Oz.

LANDING GEAR
Conventional

REC. NO. OF CHANNELS
4

CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.

C.G. (from L.E.)
6-1/2 Inches (Top Wing)

ELEVATOR THROWS
1/2" Up — 1/2" Down

AILERON THROWS
1/2" Up — 1/2" Down

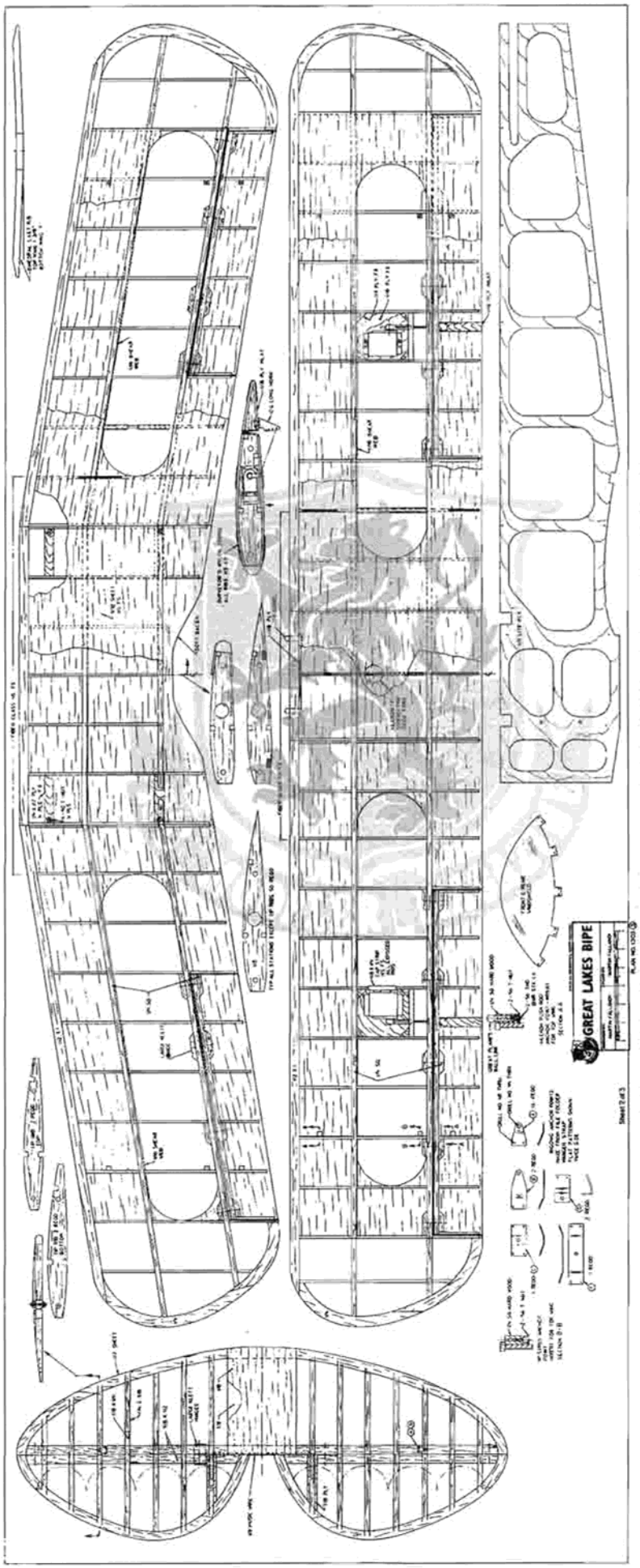
RUDDER THROWS
3/4" Left — 3/4" Right

SIDETHRUST
0°

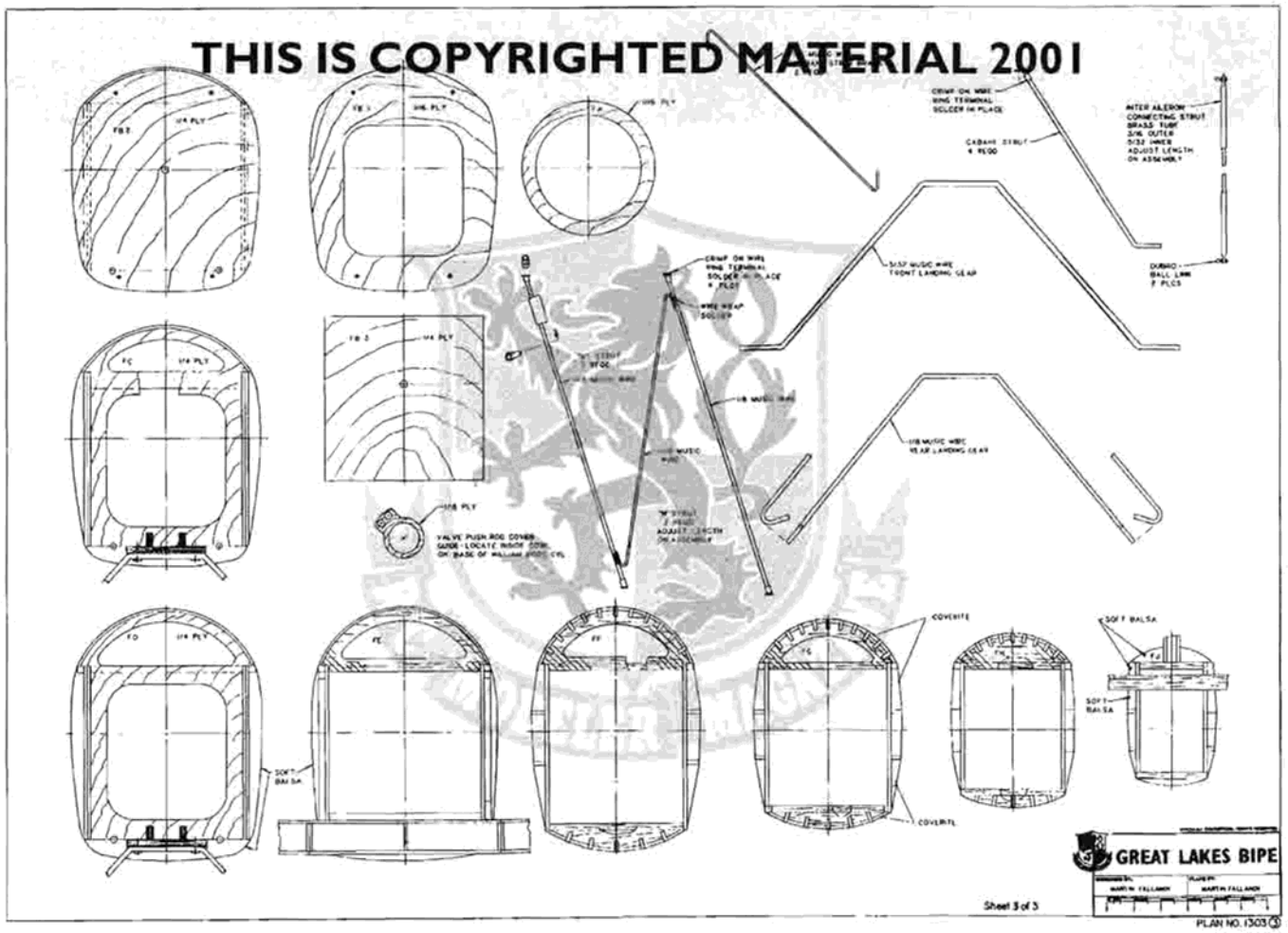
DOWNTHRUST/UPTHRUST
0°

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	216 Oz. (13 Lbs. 8 Oz.)
Wing Loading	20.3 Oz./Sq. Ft.



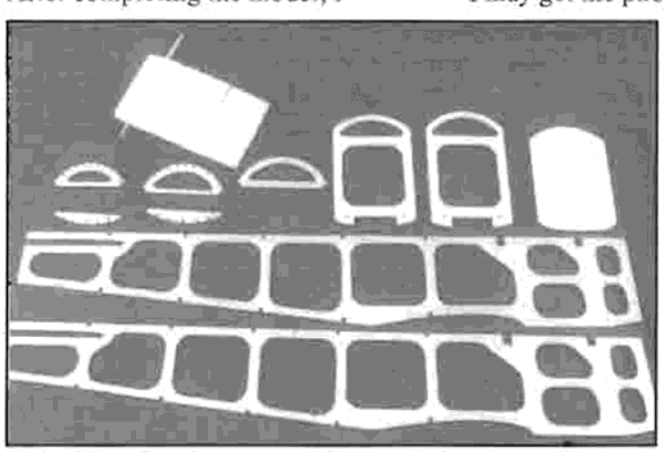
Plan #1303, Full-Size Plans Available, See Page 189

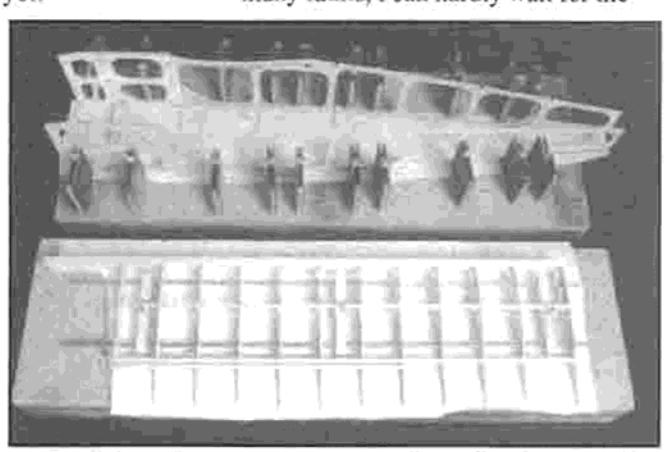


On returning to Santa Paula during the week, I found the hangar, biplane, and met Al Ball. He is very gracious and invited me to take as many pictures as I required. Circling the plane a number of times, I shot three rolls of film. Next, I sent a note to good friend Dick Gleason — this fellow is a great source of information on just about any aircraft you may run across. You can reach him at: 705 10th Avenue SW, Austin, MN. He sent me more than I needed to get started on the plans. After completing the model, I returned to Santa Paula, hoping to get a picture of the model with Al's plane. On locating Al, I was told the tale of the munching of the Great Lakes. Seems Al and his son, on a cross country to Arizona, were caught in a wind shear on landing, rolled over and cart wheeled. Fortunately, Al and his son suffered no ill effects, but the Great Lakes was pretty well bent. Brad is rebuilding the plane, as time permits as part of his process in obtaining his A&P license. At the rate I go, I may get the photo yet.

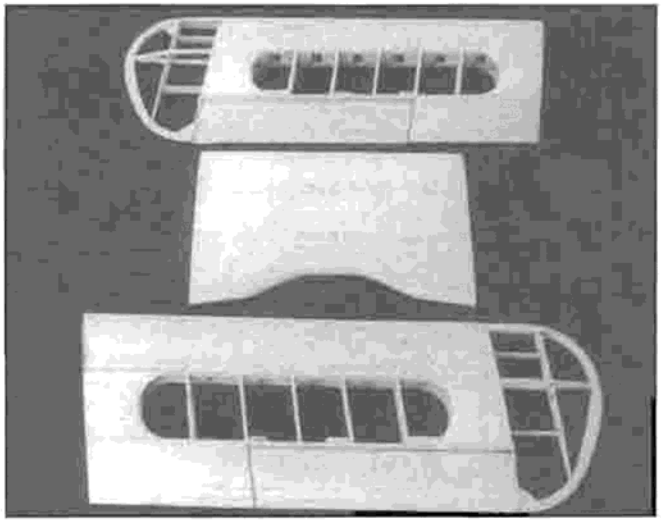
CONSTRUCTION

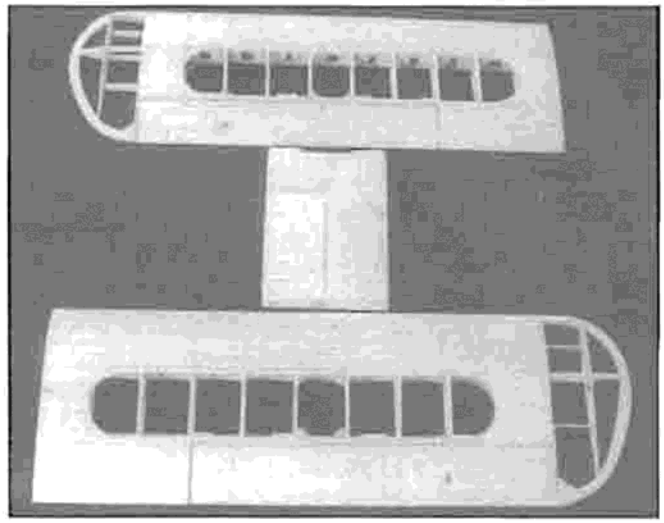
Biplanes are a little more work to build than single wing models, but the rewards are well-worth the effort. There is nothing prettier than a biplane clearing the weeds coming in for a landing or gracefully doing aerobatics. I tend to build heavy, so don't hesitate to add lightening holes to suit. Also you may have a different method of building, so feel free to do things your way. I would recommend that you maintain the perimeter, as the model flies well as shown. Another of my many faults, I can hardly wait for the



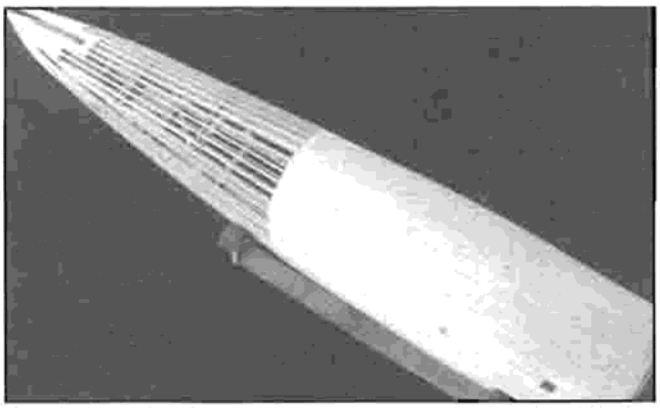


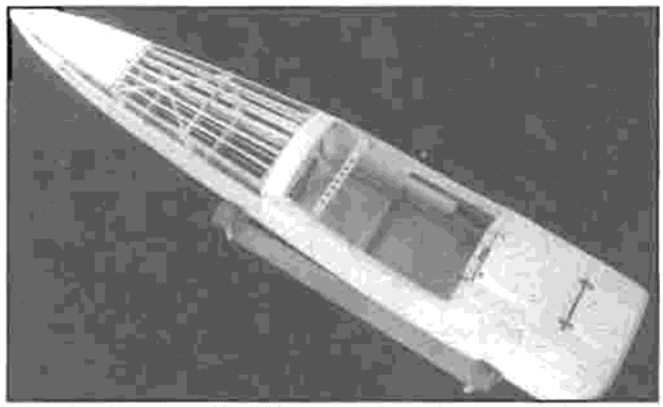
LEFT: Wing ribs, fuselage bulkheads, and fuselage sides. Note: Do not cut the 1/4" sq. notches in the edges of the fuselage side frames, go by plans and text. RIGHT: Fuselage and wing sections laid-up on the RCM Wing and Fuselage Jigs.



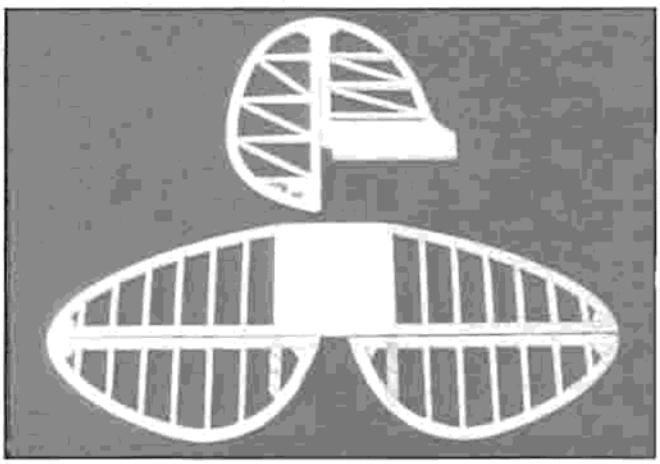


LEFT: Top wing: Center section and the two outer panels. RIGHT: Bottom wing: Center section and two outer panels.

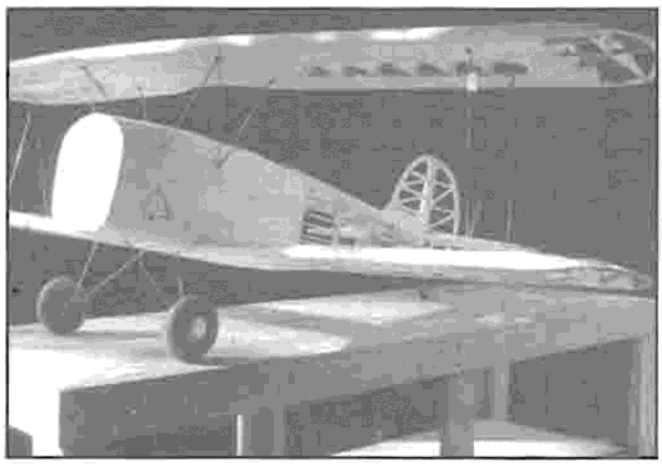




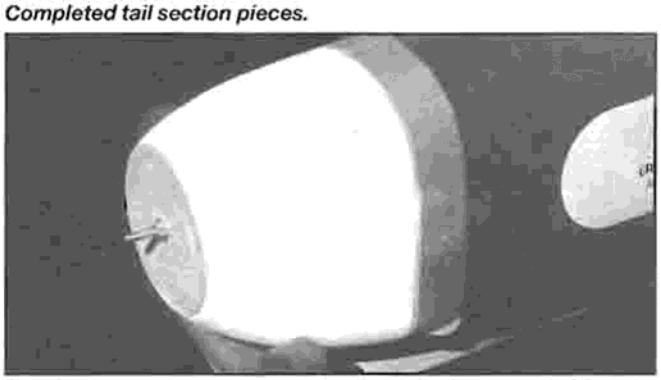
LEFT: Framed-up fuselage in the construction cradle. Note the cabane plug-in points. RIGHT: Bottom view of completed fuselage. Note landing gear mounting points and servo area.

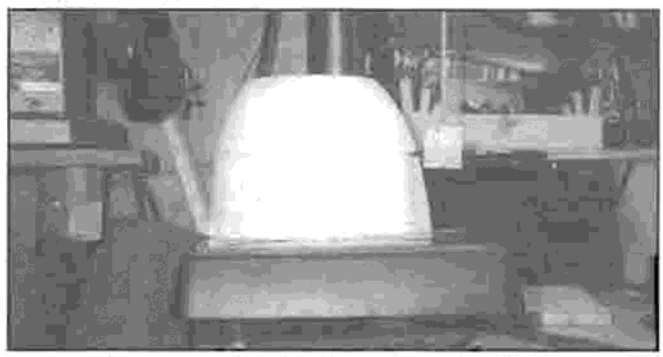


Completed tail section pieces.

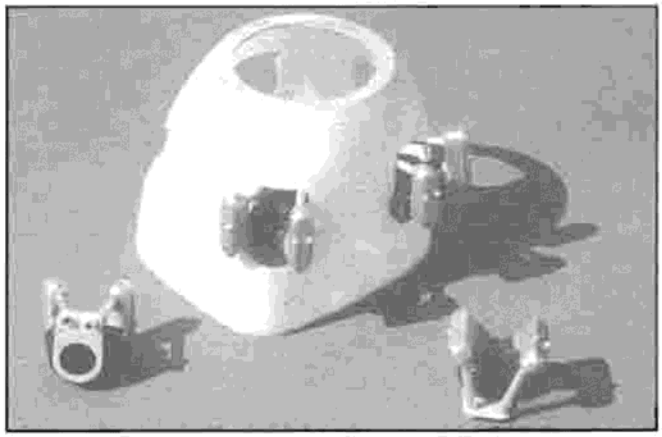


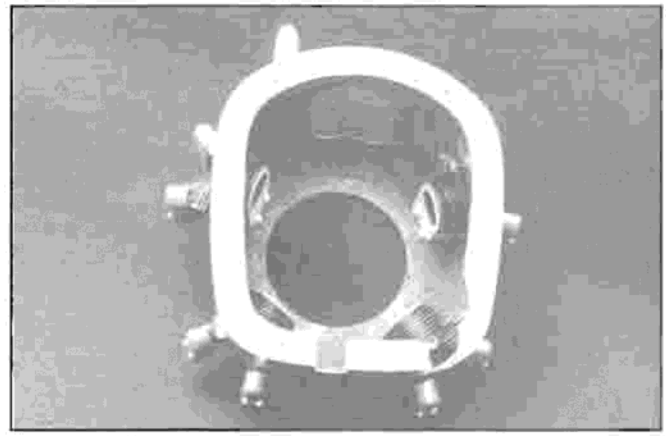
The bare bones airframe.



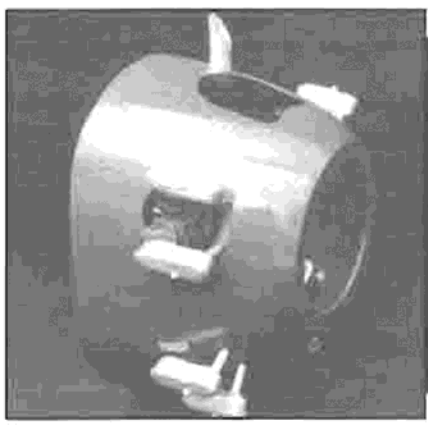


LEFT: Foam cowling plug in place on nose. Note the 1/4-20 all thread used to keep everything in alignment during shaping. RIGHT: The cowl has been placed on a drill press table and a ball point pen is held in the drill press attachment while the cylinder is rotated, to scribe a line for the cylinder locations.



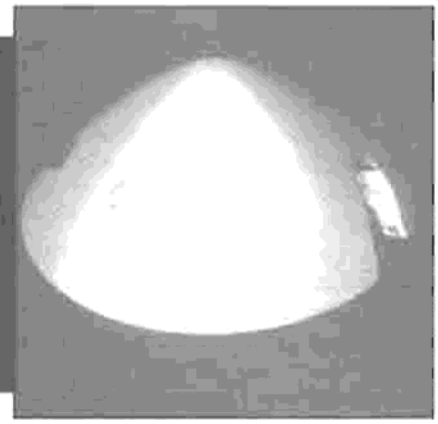


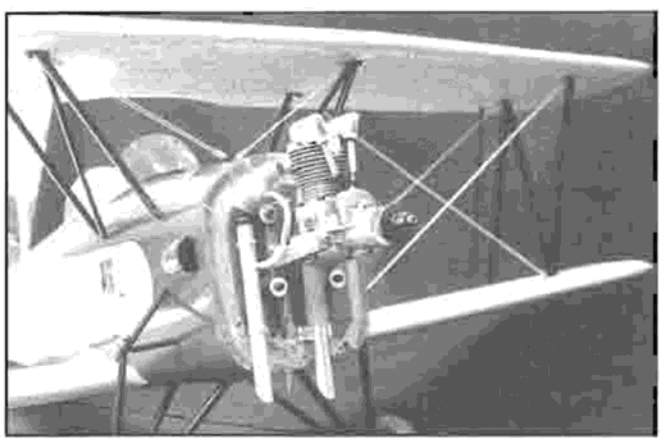
LEFT: Modified Williams Bros. cylinders being fitted to the cowl. RIGHT: Inside view of cowl shows how the Williams Bros. cylinders are secured to the cowl with baking soda and CA.



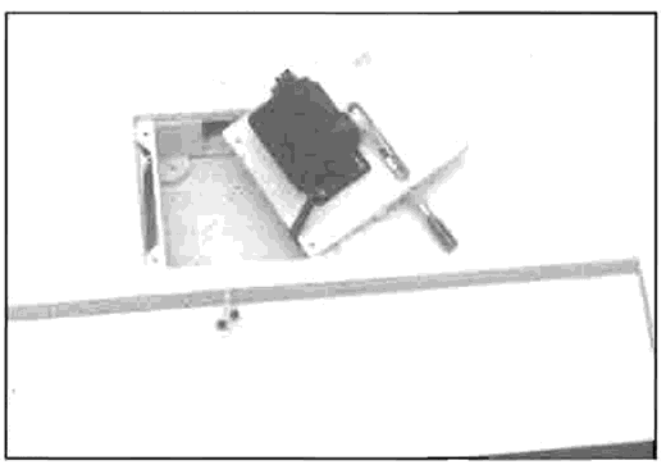
LEFT: Completed cowling.

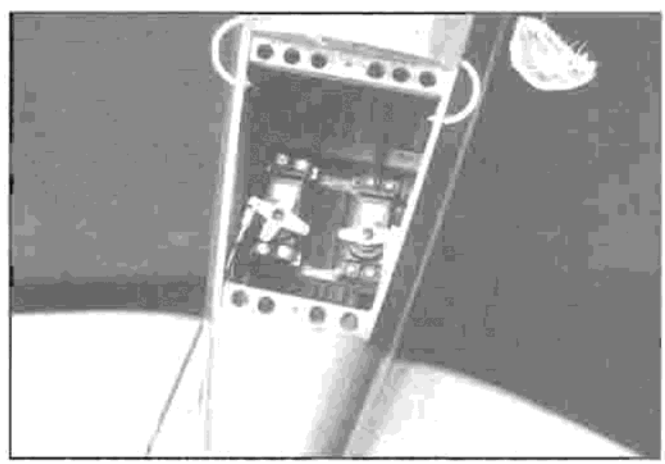
RIGHT: Completed display spinner ... unfortunately, it cannot be used for flight



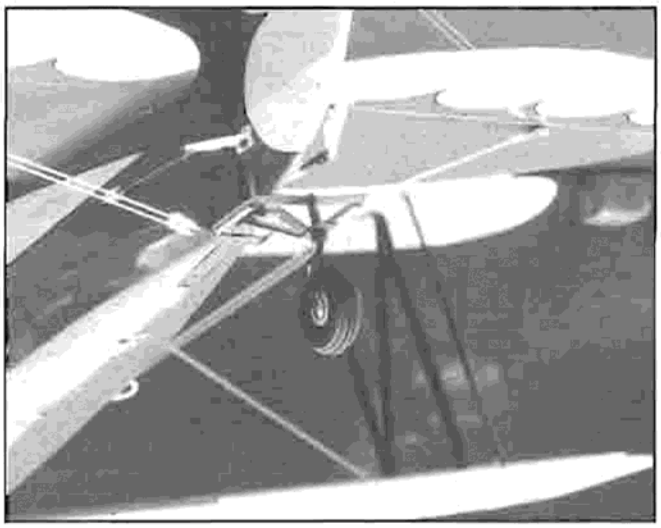


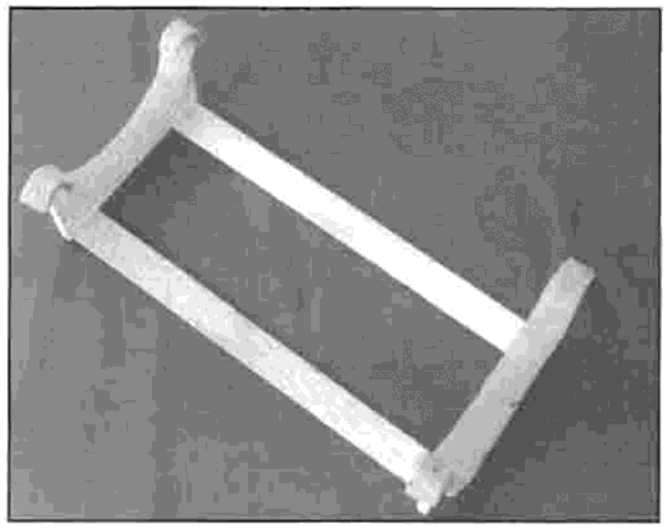
LEFT: Saito 1.20 is mounted to the firewall using Du-Bro soft mounts. The engine intake is on the aircraft's L side, the exhaust is on the R. Very clean set-up. RIGHT: Completed front end.





LEFT: Aileron servo mounting in bottom wing. RIGHT: Rudder and elevator servo mounting location is in rear of fuselage on author's model. Access is through hatch in bottom.





LEFT: Ohio Super Star tail wheel used by author. RIGHT: Here's the cradle used by the author to support the fuselage during assembly.

model to fly, so I often end up doing surgery to add various components. I guess the thought here is to plan ahead.

Fuselage:

The fuselage is a box section laid up inverted in the RCM Fuselage Jig (*RCM* February '72). With the side formers parallel in the jig, thread pieces of 1/16" piano wire through the predrilled holes. These wires will accurately position the 1/4" square balsa pieces that separate the sides, the formers are then added to the box. Before adding sheeting and stringer, make provisions for the fuel tank, servos, RX, switch harness, and control links. Make sure all peripheral components, landing gear assembly, engine mounts, tail wheel assembly, and required T bolts are in place. These assemblies can now be removed for the fuselage final completion. The tail wheel assembly is functional, however, only the front and rear main wheel struts are functional. The out rigger part of the main gear assembly is for scale appearance only. The cowl is made of fiberglass over a foam plug. Make sure the front and back faces of the foam block are parallel. Bolt former FB2 to former FB with a sheet of plastic wrap between the two. Glue former FA to the center of the foam block, centered on a 1/4" dia. hole through the block. The foam block may now be bolted to FB, using a length of 1/4"-20 threaded bar stock. Place a large washer under the front 1/4"-20 nut to avoid burying the nut in the foam. The plug may now be formed with the fuselage. Make the end that mates with the fuselage slightly under-size to allow for the thickness of the fiberglass.

Wings:

The wings have a semi-symmetrical airfoil (NACA 2412) and were laid up on the RCM Wing Jig (*RCM* August '67). Both the fuselage and wing jig articles are available from RCM for a very nominal fee. Both wings are built in three sections, center and two outer panels. Be sure to glass the center part of each completed wing as shown on the print. The flying wires are for scale appearance only and are not functional. Both wings are covered with Coverite, which adds greatly to their strength. One Airtronics standard ball bearing servo was used in each lower wing. The upper and lower ailerons are coupled together on both sides, so if you like violent maneuvers, you may want to use high strength servos or run each aileron with a separate servo. While the lower wing is still uncovered, remember to run string through to pull the servo "Y" connector.

Tail Section:

The horizontal stabilizer/elevators and the vertical fin and rudder assemblies are all constructed flat, then sanded to shape. I like to place the rudder and elevator servos as far aft as possible to provide the shortest possible pushrod, but you pay a price for this configuration with added weight up front. The alternative is to place the servos in the standard position, above the lower wing.

Finish:

The model was covered with Coverite. All painting was done with spray cans of Rustoleum. This paint is both glow and gasoline fuelproof. Only two colors were used, Sunrise Red and Almond Cream. The pin-striping is the peel-off type, but it would not stick very well. This was solved by taking a very small paint brush with only a few bristles and drizzling CA along the edge of the pin-striping after it was in place. The CA seems to wick under the pin-striping and mix well with the pin-striping glue. With the exception of the cabane struts, N struts, main gear, and

The completed model, ready to go.

tail wheel assemblies, which were painted flat black, the entire model including lettering was shot with Clear Gloss Polyurethane. All lettering was done by Vinylwrite here in California. The owners, Art and Cynthia, have now decided to retire, but all is not lost, as they have sold the business to one of their good friends and avid modeler, Peter Watkins, 3361 Mt. Veeder Rd., Napa, CA 94558, (707) 259-1280.

The Great Lakes and Gilmore Lion Logos were done by Kinkos from a snapshot taken of the real plane. Kinkos also supplied me with a zip diskette, from which, they tell me, more logos can be made. So, if you decide to plunge ahead, contact me through RCM and I'll send them to you at cost. You will still need the Great Lakes printing from Vinylwrite, as the Kinkos printing came out on the white sticky paper, which does not match the Almond Cream strip on the side of the fuselage.

The spinner and rocker arm valve covers were sprayed with metallic silver and then with several coats of Clear Gloss Polyurethane. This is as close as I could come to chrome. All ribs, wing, and empennage, were covered with surveyor's nylon string, held in place with CA. The string was tapered in at each end with a Dremel tool. This was supposed to simulate stitching, but I don't think I'm fooling anyone. One thing it does accomplish, it holds the Coverite off the sheeting, showing each rib full length.

As my good friend, Que Quigley says, "You can only carry scale so far." I'm sure some of you may want to go much further than I did, but the rest of the model is calling.

Cowl And Engine:

A Saito 1.20 was used for power and was more than adequate. The Kinner engine has the pushrods behind the cylinders, the Saito has them in front, wish they would get together. The other four barrels were made from William Bros. 1/4 scale engine cylinders No. 727. The cylinders were modified to try to simulate the Saito. The pushrods were covered with 1/4" O.D. aluminum tubes. The tubes fit into a 1/16" ply holder that positions them in relation to the cylinder base. All of this occurs inside the cowl. The cowl was formed over a foam plug, using two layers of the heaviest glass cloth I could find (about the weight of a burlap bag), two layers of medium, and one of fine. The cowl was then painted with a coat of Hobby Poxy Stuff, thinned to the consistency of the proverbial cream, and sanded to a glass finish. Fortunately, Dick Kidd and Harry Higley covered how to cut the hole in a cowl to fit your engine, in the April and May '99 issue of *RCM*. This method was used and worked well.

Rigging:

The rigging wires are white nylon string. The anchor points are shown on the print. The string passes through a small aluminum tube, through the hole in the anchor point, back through the tube, and the tube is crushed with round nosed pliers. After pulling taut, the same operation occurs at the opposite end.

Flying:

Because designing and scratch-building is the fun part of the hobby for me, I have no reference as to how the model will fly. So, I always try to enlist the help of our local hobby shop owner to do the honors, and, let's face it, I'm not the greatest R/C pilot. Jay Replogle flies them all, from Madera Open Class to helicopters, and now electrics. He is located at: 17721 Vanowen St., Reseda, CA 91335, (818) 609-1968. If you're in the area, stop in, they have it all, you will be glad you made the effort.

All test flights were done before the model was completely finished. (This was learned the hard way. It's very disconcerting to finish a model, then find out all it needs is a fur coat and a tail to be a complete squirrel.) So, the Great Lakes was first flown when there was just enough there for proof of principle. Most models of a real plane that flew well, will also fly well. The Great Lakes was no exception, it will do all the maneuvers, loops, rolls, Cuban eights, barrel rolls, etc. The flying wires are for appearance only and are not structurally required. If you are prone to violent maneuvers, snap rolls, etc., try one or two. Return to base and flex a few things and check for cracks.

I like dual rates on the TX and set mine up with half throw on both elevators and ailerons. Taxi with full up elevator for more positive ground handling. At our field we have to taxi a ways to the runway, so I always have a friend hold the plane and slowly advance to full throttle. Make sure all is running well and that the engine is running clean. Having done everything humanly possible to assure success, taxi out to the center of the runway, remembering the infamous "P" factor that we've all had explained to us. Translated, you may want to add a little right rudder to keep it from hurtling straight up the runway. Gently apply throttle. I hold neutral elevator, as the tail will come up shortly, steer with the rudder. At about two-thirds throttle she should become airborne. Start a gentle turn to the right or left, depending on your field, keep it close, climbing all the while. After a few orbits and some left and right turns, you should have it pretty well trimmed. When you feel secure, do a stall. Slowly pull the throttle back, all the while holding it in a landing attitude. Keep pulling the throttle and elevator back until she stalls. This should not be a violent maneuver. It should shudder slightly, then fall forward. Release the controls, recovery will probably be automatic with so much wing area. With the plane in a shallow dive, slowly add power and resume normal cruise. What you are looking for is a flat stall, you don't want it to fall off on one wing or the other. With a flat stall, if you stall a little high on landing, you won't have a disaster. If you balance where shown on the plan I can almost guarantee a flat stall. Should you not have a flat stall, land a little hot, get both wheels on the deck while the plane is still flying. When back in the shop, check for wing warps and the correct balance point.

Aerobatics are best done emulating the full-size aircraft. In other words, drop the nose and pick up a little speed before entering a loop, roll, etc. I'm sure you could put a bigger engine on the front end and bore holes at will, but doing aerobatics that look like those that planes of the era did, will be more comfortable.

Landings are pretty straightforward. My preference is to fly along the center of the runway at 20 or 30 feet high in the direction of the intended landing. This is a good time to check for any crosswind. As you approach the far end of the runway, start a 180° turn parallel to the runway. When opposite the spot where you intend to land, start your turn towards the runway. As the turn progresses, control altitude with throttle. A perfect pass would be 180° turn with a slight straight in just before

runway contact and closed throttle. This should land you full stall with no ground loop to fight. If you encounter a crosswind, bank into the wind and cross control with the rudder. Check this out first with a pass 5 to 10 feet above the runway. On final, as you have the plane going straight up the runway, land full stall, and be ready for it to cock into the wind. If you land slow enough, this should not be a problem.

In general, this is a very easy flying plane, but like any biplane it is wind sensitive, use the normal precautions and I know you will be successful.

Conclusion:

This is the most detailed model I have built to date. The effort was rewarded when I returned to Santa Paula with the model. On the first trip Al and his son were not around, but many people recognized the model as Al's plane. They had all flown the real plane; it seems Al is very generous with his biplane. I was generously offered a ride in the full-size one when the aircraft is repaired, very tempting!

Have a go at it, it's a great plane and if I can help, don't hesitate to contact me through RCM. Happy landings.

✈