



Putting the best of three previous designs together, Mike Sherrad has arrived at what he considers a pleasant looking twin that flies like a Little Stik. An excellent model to get started into twins.

I think that at one time or another, every RC'er has wanted to build a twin. They sound so nice in the air and they have the mystique of being difficult to fly with one engine out. In other words they are a challenge. The Twin Star is the culminative result of three of my previous twin designs, using the best attributes of each. The key to success of the twin (or any airplane for that matter) is to be light enough to give

TWIN STAR



By Mike Sherrad



good aerobatic performance, strong enough to withstand the rigors of aerobatic flying, simple to build (i.e., a box), and with enough curves to be esthetically pleasing. All of the above criteria have been met in the Twin Star so the net result is a pleasant looking twin that flies like a "Little Stik." In my judgment, the "Little Stik" is the baseline that has been used over the years to evaluate fun-style aerobatic performance. Good single engine performance is accomplished by the use of 5° outthrust. (One of the previous twins I built used only 2½° outthrust. That plane is affectionately called "Old Snap Roll" as it takes all kinds of effort to fly the thing on one engine.) The

Twin Star is capable of all the aerobatics you might do with a "Little Stik" with the possible exception of stall turns as two engines do funny things when you try a 180° stall turn. I presume the uneven thrust of two engines in the stalled state makes for very unpredictable maneuvers. I will say, though, that most R/C pilots, after they see the Twin Star fly, go away committed to building a twin that will fly as well.

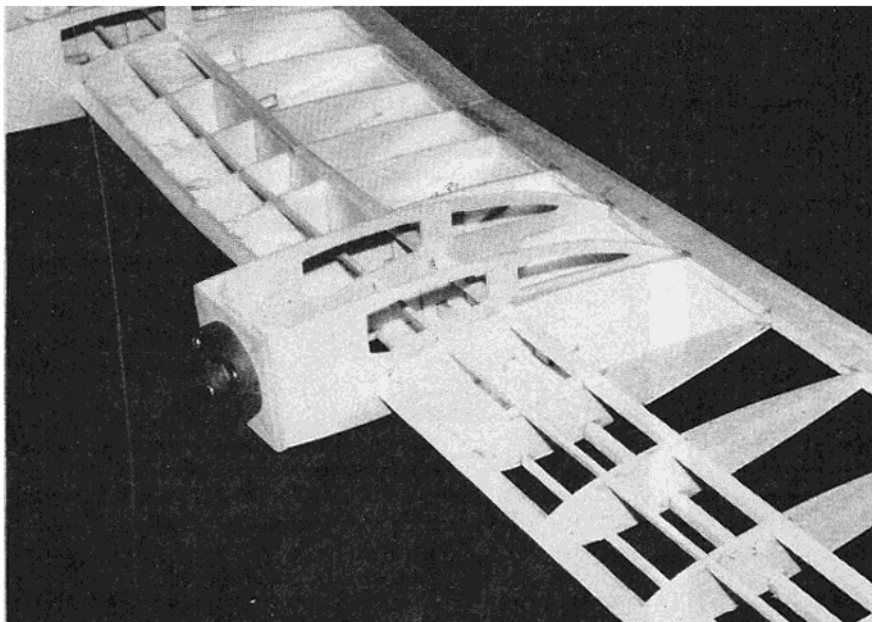
This airplane is sized to give spritely aerobatic performance and yet not be grounded by a little wind. Twin Star is small enough to be affordable both to build and to fly, and it can be carried in a small car.

CONSTRUCTION

Wing:

The wing is normally built first because in the case of a twin it is the most difficult part since the nacelles are part of the structure. This is probably different from most of your previous building experience. Start by trimming 1/4" from the rear edge of the 5/16" x 1/4" trailing edge stock. Then notch the forward edge at the rib locations. Next mark the rib locations on the corresponding leading edge (3/8" sq.).

Build one half of the wing by gluing the ribs to the trailing edge, lower spars, and leading edge. Now position the plywood nacelle sides on the upper spars and then position spars and sides onto the upper part of the wing half. Note that the nacelle sides fit between the adjacent ribs with the shorter side outboard. This sets the 5° engine outthrust. Glue all joints. Glue the firewall to the nacelle sides with Titebond or epoxy. Now is a good time to build on the wing tips. Repeat the above operations on the other wing half.



Wing showing nacelle installation with bottom sheeting in place.

Bill of Material

Spruce

5 — 1/8 sq. x 36 (stringers, turbulator spars)

Balsa

1 — 1/4 x 4 x 48 (tail)

2 — 1/4 x 1/4 x 36 (tail)

2 — 3/32 x 4 x 48 (ribs)

2 — 1/8 x 4 x 48 (fuselage sides)

2 — 3/8 sq. x 36 (wing L.E.)

9 — 1/4 sq. x 48 (spars & longerons)

1 — 3/32 x 3 x 36 (wingtips)

4 — 1/16 x 3 x 36 (wing sheeting)

2 — 1/8 x 4 x 48 (ribs)

2 — 3/16 x 2 x 36 (ailerons)

2 — 1/4 x 5/16 x 36 TE (wing T.E.)

Plywood

2 — 1/8 x 6 x 12 (nacelles)

1 — 3/16 x 6 x 12 (firewalls, etc.)

Lite Plywood

1 — 1/8 x 6 x 12 (bulkheads)

Miscellaneous

1 — 1/4 dowel

2 — KM 30 motor mount

2 — Du-Bro S-4 tank

1 pkg. — Medium Sig glass cloth

1 pkg. — Great Planes main gear mounting block set

1 — 5/32 nose gear & mtg. bracket

1 — 5/32 wire for main gear

1 pkg. — Hinges

2 pkgs. — Throttle cable

1 pkg. — Pushrods

1 pkg. — Horns

2 rolls — Covering Material

Next, cut 1/8" slots in the center ribs for the dihedral brace. Join the wing halves using the dihedral braces as the primary alignment means. Use Titebond or epoxy. Next, make the cut-outs in the lower surface for the main landing gear blocks and glue them in place. Now the bottom of the wing can be sheeted with 1/16" balsa as shown. Add the upper surface sheeting outboard of the nacelles and the 1/8" sheeting to the outboard side and bottom of the nacelles.

Fuelproof the firewalls and tank compartments with epoxy or resin. Mount the engines and install the throttle cables and servo. Complete the sheeting on the upper surface of the wing and on the inboard sides of the nacelles. Reinforce the center joint with 5" wide glass cloth.

Make and hinge ailerons. Install aileron servo, torque rods, and linkages.

Assemble fuel tanks and lines. Sheet the top of the nacelle with 1/8" balsa. Set the wing aside until needed

TWINSTAR 15

Designed By:

Mike Sherrod

TYPE AIRCRAFT

Sport Twin

WINGSPAN

62 Inches

WING CHORD

10 Inches

TOTAL WING AREA

600 Sq. In.

WING LOCATION

Low Wing

AIRFOIL

Symmetrical

WING PLANFORM

Constant Chord

DIHEDRAL EACH TIP

1 Inch

OVERALL FUSELAGE LENGTH

37 1/2 Inches

RADIO COMPARTMENT SIZE

(L) 8 1/2" x (W) 2 1/2" x (H) 4"

STABILIZER SPAN

21 Inches

STABILIZER CHORD (inc. elev.)

6 1/4 Inches

STABILIZER AREA

131 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

7 1/4 Inches

VERTICAL FIN WIDTH (inc. rud.)

7 Inches

REC. ENGINE SIZE

(2) .15-.20 cu. in.

FUEL TANK SIZE

(2) 4 Oz.

LANDING GEAR

Tricycle

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Ail., Throt.

BASIC MATERIALS USED IN CONSTRUCTION

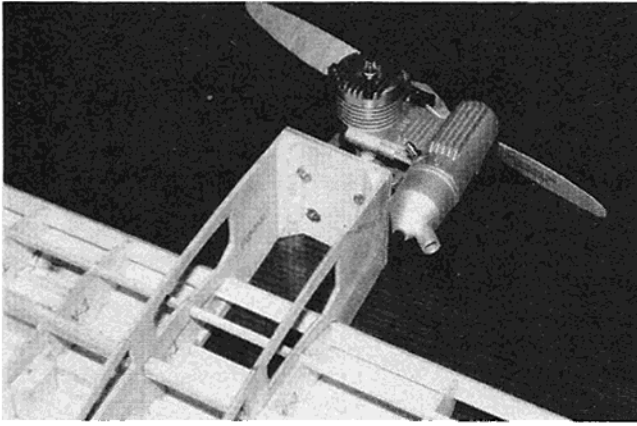
Fuselage Balsa, Ply

Wing Balsa, Ply, Spruce

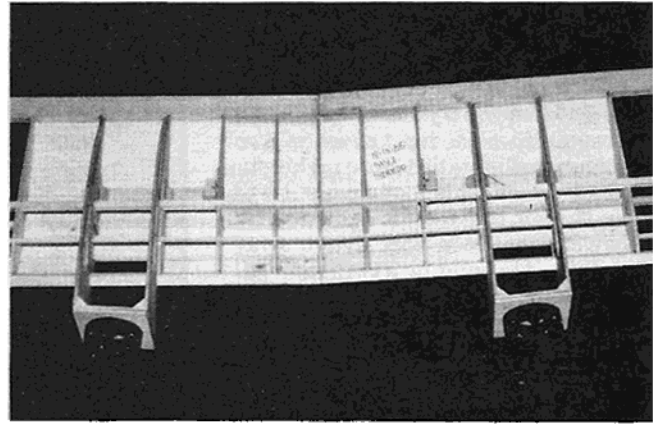
Empennage Balsa, Ply

Weight, Ready To Fly 72-80 Ozs.

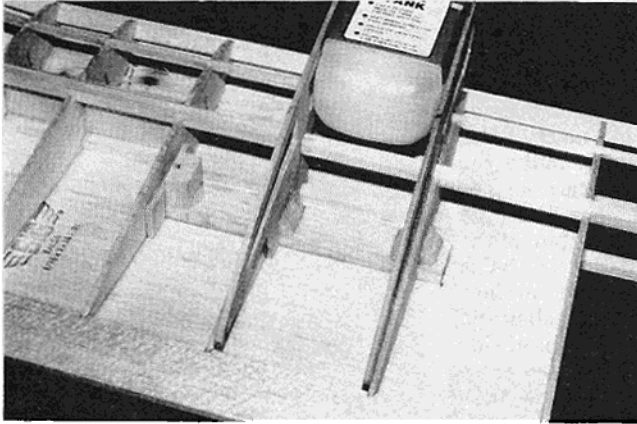
Wing Loading 17.3-19.2 Oz./Sq. Ft.



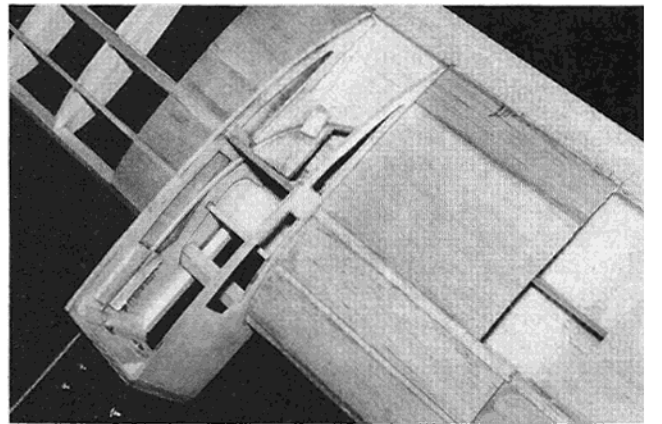
Engine nacelle with engine mounted prior to sheeting.



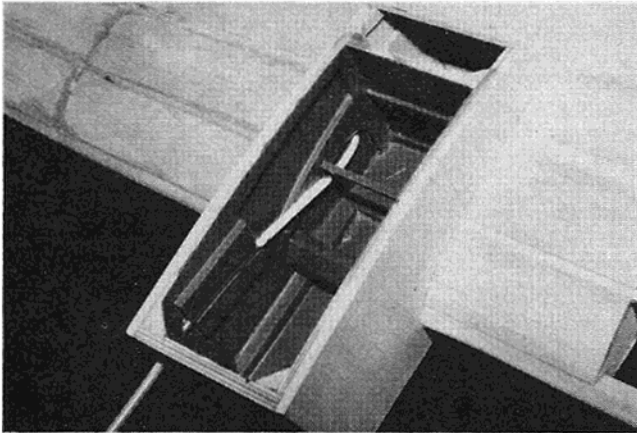
Center section of wing showing bottom sheeting, engine nacelles, dihedral brace, spar, and trailing edge.



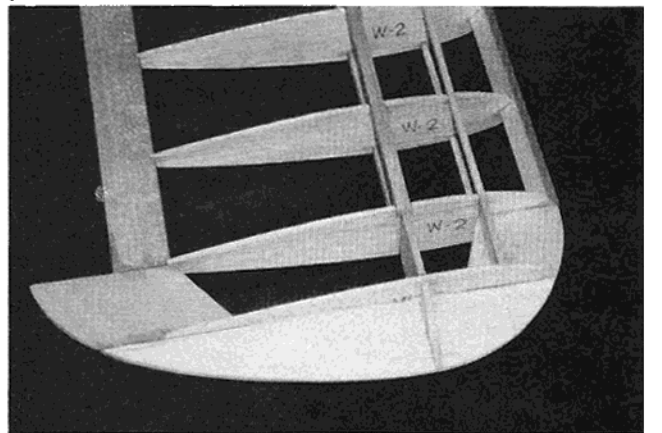
Main landing gear mount and tank installation.



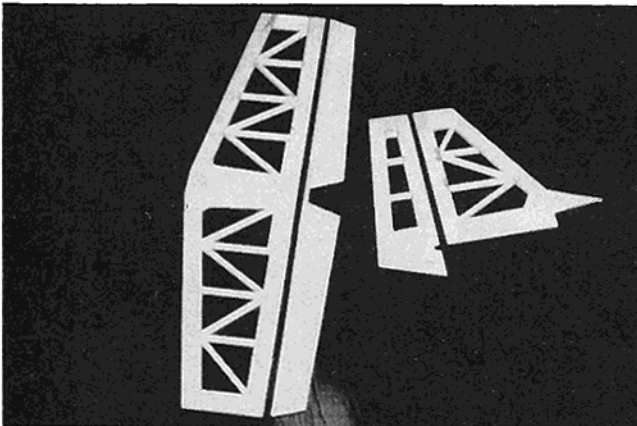
Engine nacelle showing throttle cable and wing top sheeting in place.



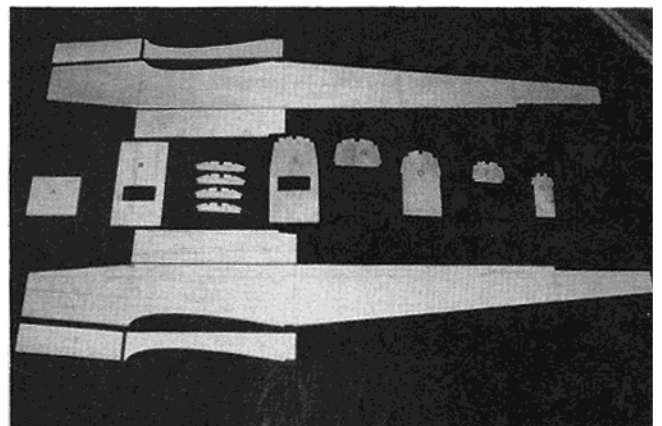
Nacelle completed and painted prior to top sheeting.



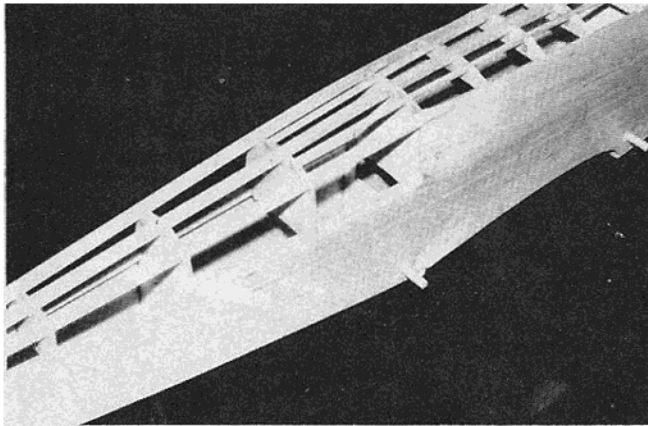
Wing tip detail.



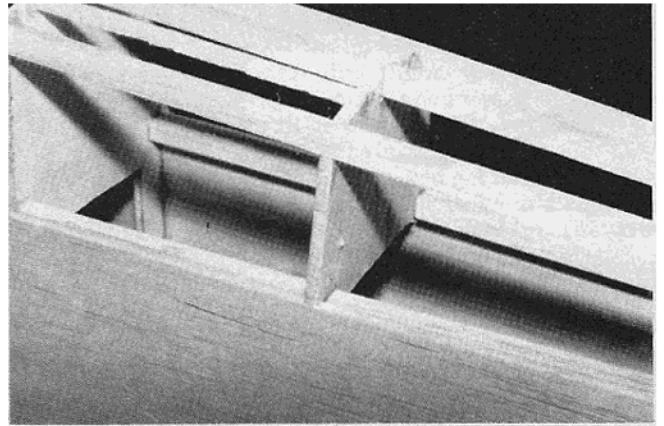
Tail feathers.



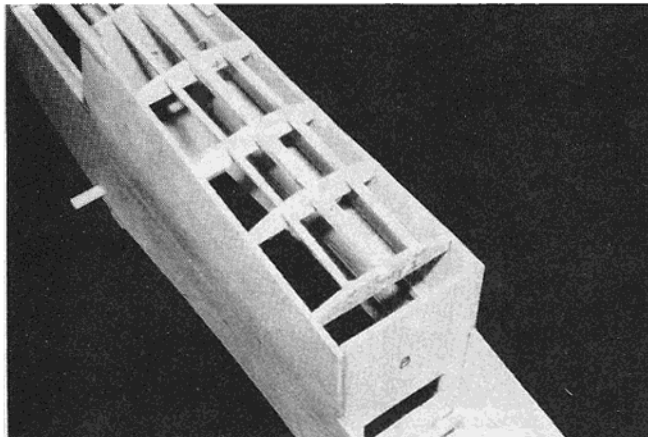
Parts for fuselage assembly.



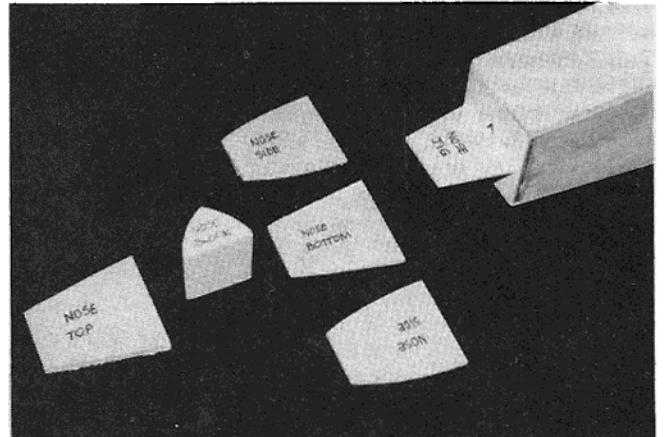
Detail of top of fuselage.



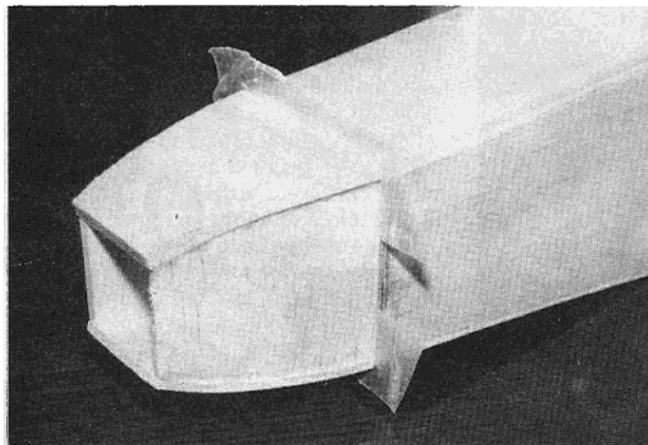
Fuselage detail, note 1/4" sq. inside of fuselage sides.



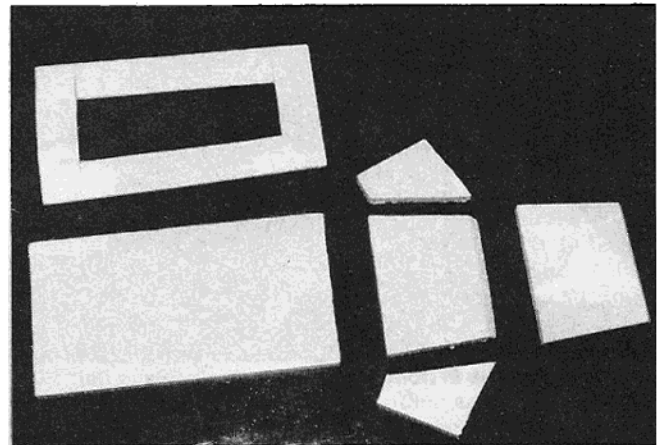
Top of fuselage showing 1/8" spruce and 1/4" balsa stringers.



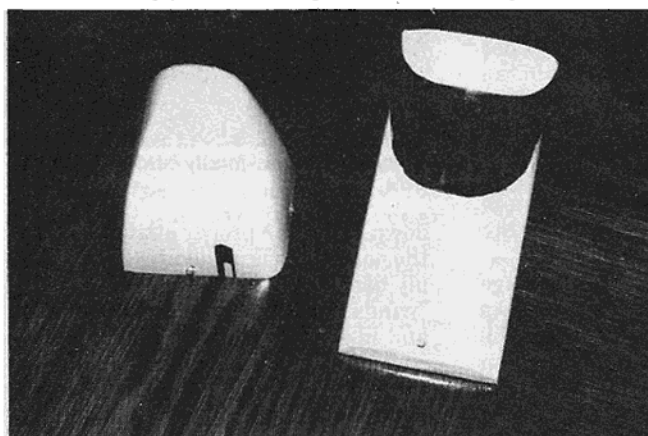
Parts for nose assembly, note jig glued in place.



Nose assembly prior to cutting loose from fuselage.



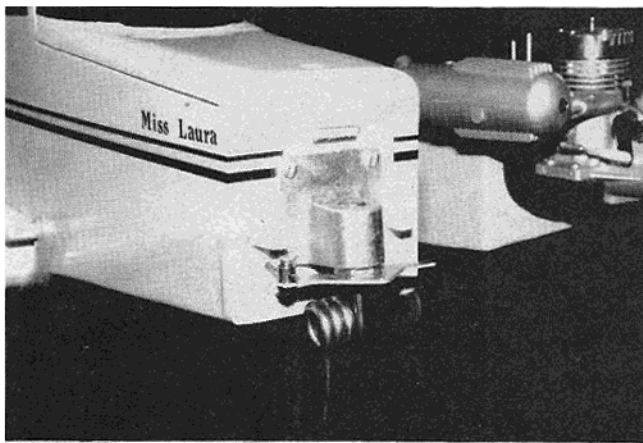
Parts for "windshield" hatch.



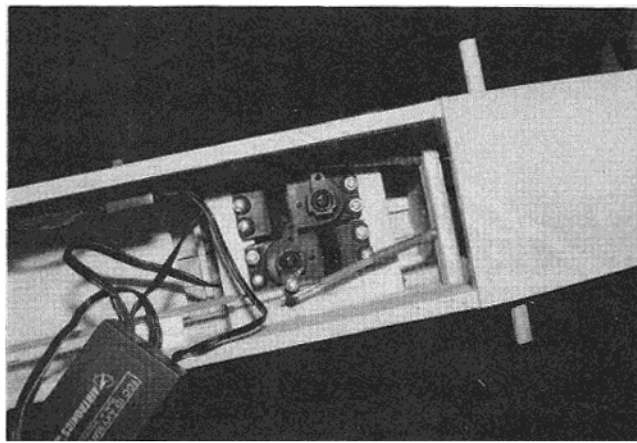
Nose assembly and windshield hatch completed.



Completed nose minus nose and hatch/windshield blocks (note battery).



Nose showing nose gear detail.

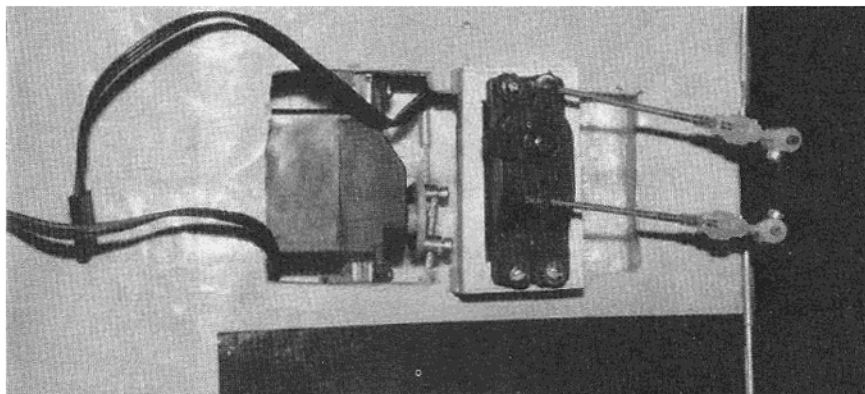


Installation of elevator and rudder servos in fuselage.

to mate with fuselage.

Tail Feathers:

The tail feathers are built directly over the plans using 1/4" square sticks, 1/8" plywood, and 1/4" x 3/4" sticks. The 1/4" dia. dowel elevator coupler should be reinforced with glass cloth. Epoxy the fin to the horizontal stabilizer and then hinge the elevator and rudder in place. Glue and pin the elevator hinges. Do not glue rudder hinges as yet since one hinge will be added later at the base of the rudder and fuselage. Set aside to be joined to the fuselage later.



Installation of throttle and aileron servos in wing.



Completed airplane in front of grandfather (old "Snap Roll").



Completed model fondly held by author's wife.

Fuselage:

Begin by cutting out two fuselage sides from 1/8" sheet balsa, one set of 1/8" lite ply fuselage doublers, and a complete set of formers. Note that former A is made from 3/16" plywood, and formers B and C are made from 1/8" lite ply. All the rest of the formers are made from 1/8" sheet balsa. Start fuselage assembly by gluing the lite ply fuselage doublers in place, then glue the formers B and C to one of the fuselage sides. Now, glue the other fuselage side to the formers to form a box. Next, add 1/4" sq. servo tray rails. Use a scrap piece of trailing edge stock to join the rear of the fuselage together. Make sure that center line of fuselage is straight. Then add the rest of the formers. The rear section of the

fuselage is stiffened by adding 1/4" sq. balsa sticks between the formers at the top and bottom of the fuselage sides. Next add the pushrod tubes through the formers in the rear of the fuselage. Then add the top 1/4" sq. sticks and the 1/8" sq. spruce sticks. The wing mounting dowels are added next and the wing is mounted in place with rubber bands so the elevator and rudder can be mounted perfectly true with respect to the wing.

The stab is glued to the fuselage with Titebond and then 1/4" sq. sticks are added underneath to reinforce the joint. With the wing still mounted on the fuselage, add the nose gear so the plane maintains the proper attitude on the ground. The nose gear mounting bracket may be moved up or

down to get the proper attitude. Next, the nose hatch is made using a 1/8" lite ply base and 1/4" sheet balsa top. The "windshield" is made from 1/8" sheet and is sanded to a round shape. The nose hatch is made to be removable as these planes require the battery pack to be located forward to obtain the proper C.G. (You might also need to add an ounce or two of lead depending



Author running up engines for first flight (RCM doesn't recommend sitting in front of aircraft).

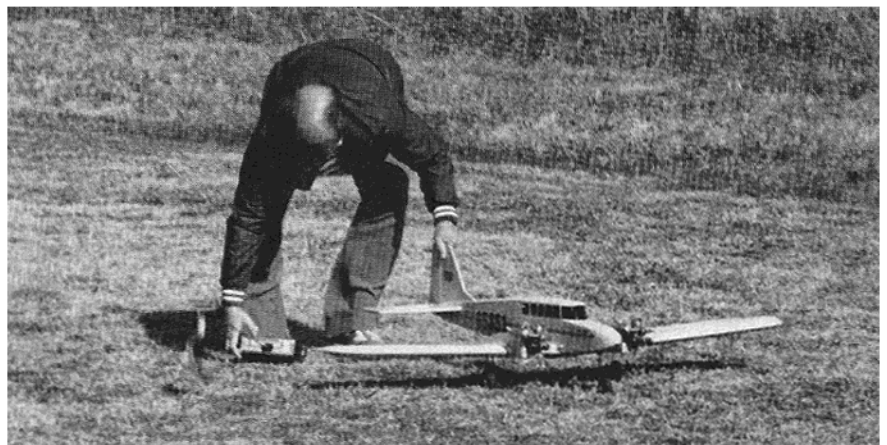
on how heavy you build the rear of the fuselage.) Next the nose cone is built; this is made of 1/8" sheet and a soft balsa nose block. How round you desire to make the nose cone and the "windshield" determines how much you desire your plane to **not** look like a box. You may add an additional layer of 1/8" sheet to help round out the shape of these parts. I have built these parts completely box-like (square) and have an airplane that flies perfectly well, but looks like a box so I tend to make these areas somewhat rounded to get away from the boxy appearance.

Covering:

Any film or fabric material may be used to cover the model. I would recommend Solartex if you are going to use larger engines or Solarfilm if you are going to use smaller engines. The prototype was covered with Flitekote, Solarfilm trim, and vinyl numbers with a bit of polyurethane to seal the trim.

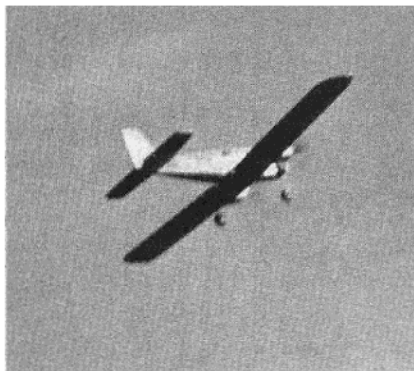
Flying:

The most important thing about flying twins is to make sure the two engines are well broken-in and matched. I run a new set of engines for two hours before I take to the air and I play with the rpm to match them up as well as I can at idle, mid-range, and at full throttle. Once I am happy with the performance of the engines and the balance of the airplane, I am ready to take to the air. I make sure the controls operate in the proper direction, the surfaces are in neutral position, and the throws are adequate. The single biggest problem I have had with twins is getting the two engines to rev up at the same rate. It seems that one of the engines always revs up faster than the other one and I experience terrific asymmetric thrust problems while the two engines are



Ready for first flight.

both attaining max rpm. The best way to eliminate this problem on your first flight is to hold the plane on the ground until both engines are running at max rpm and then release the



Fly by.

plane. This will eliminate one of the "instant death" problems on your first flight. Once the plane is in the air and is trimmed-out and flying okay, you can throttle down to low rpm. When you have plenty of altitude, you can

jockey the throttle back and forth to see the effect of uneven rev-up rates. Assuming both engines run well on your first flight, you can try a few aerobatic maneuvers. I'm sure you will be pleasantly surprised that you have a twin that flies like a "Little Stik." Before you get too carried away though, throttle down and check the sink rate and observe the stall characteristics while you have lots of altitude. This will prepare you for the first landing and will let you know how the plane slow flies. It will also let you know if both engines are going to run at low throttle. As long as airspeed is kept up, this plane will fly on one engine. In fact, the plane will continue to fly quite well with one engine at full throttle as long as you keep up airspeed and don't try a snap roll into the dead engine. The plane will climb on one engine and will circle the field indefinitely. Until you get your

confidence up, the best action to take when one engine quits is to throttle down and immediately land. It would be good to have an observer standing beside you to tell you when you have had engine failure so you can chop the power. A sure save on engine failure is to kill the other engine and come in dead-stick. This is absolutely foolproof and eliminates all danger of snap roll/spin due to engine failure. However, once you get your confidence up (and your experience level up) you will fly the Twin Star on one engine and even do a little bit of showing off to thrill the spectators. □

First landing.

