



● The Grasshopper is a small sport-pattern airplane, powered with a .15 to .19 engine that will go as fast and do all the maneuvers of the current pattern airplanes. Certainly it is not intended for pattern competition but, rather, for the sport flyer that likes small airplanes and spirited performance. For the past four years I have been flying and designing quarter midget racers and am certainly impressed with the performance of the .15 sized engines.

Many factors were considered in the design of the Grasshopper and weight was considered first. Most quarter midgets weigh nearly three pounds, yet the minimum weight is only 2½ pounds and excess weight saps performance. The Grasshopper with an OS .15 weighs a little less than 2½ pounds and the wing area has been increased from 300 to 324 sq. in. to further reduce wing loading. The fuselage was made as small and streamlined as possible while still allowing room for the equipment. The CG is slightly more rearward than most racers and I compensated for it by lengthening the tail moment. Elevator response is still smooth

and the nose doesn't drop as much with power off which makes landing easier. I also washed out the wing tips about 1/8 inch by twisting the wing while tightening the MonoKote covering in order to prevent tip stall. The rudder was more of a problem and had to be adjusted and enlarged several times to allow knife edge flight. The movable area of the rudder was equalized above and below the roll axis to produce yaw with less roll making knife edge and hammerhead turns easier. Each ship must be individually trimmed and adjusted to give the performance you want and adjustments should continue as you gain experience with the airplane even though the airplane flies well in general. This applies to all models, as much experience can be gained from working out minor tracking problems, slight pitch sensitivity or insensitivity, spin entry, or recovery. Most of these types of problems can be cured with just a little effort provided there are no major warps.

The Grasshopper, although not intended for racing, does meet Quarter Midget racing rules with regard to dimensions and can

easily be converted to a Miss Cosmic Wind or Little Gem and be a legal racer.

CONSTRUCTION

Use contact cement or epoxy to apply the 1/16" balsa vertical grain doublers to the 1/8" balsa sides leaving slots for the bulkheads and firewall. Epoxy bulkheads B and C between the fuselage sides. Pull the tail together and glue. Epoxy in the firewall. Add the 1/16" plywood front fuselage bottom which extends rearward 12" from the firewall and then continue the bottom sheeting with 1/16" balsa. Glue in the triangle stock around the firewall and then add the bottom nose block. Epoxy in the 1/8" plywood landing gear mount and the two 1/2" x 2½" x 1/4" plywood wing hold-down pieces and the 1/4" x 3/8" x 2½" spruce hatch hold-down piece. The 1/4" x 3/8" spruce is also used for the servo rails. Build on the rear turtledeck by first gluing on the two 1/8" balsa sides and then adding the top piece of 1/4" sheet. The forward hatch and the section over the wing are each made separately, fitted and then

A Quarter Midget inspired .15 to .19 powered sport airplane capable of all the AMA Pattern maneuvers while getting about forty flights per gallon of fuel. By Fred Reese.

GRASSHOPPER

Photos to the right show the completed Grasshopper. Adequate room for three Kraft servos, side by side. View of tank compartment shows battery located under 4 ounce Sullivan tank.

shaped later after the wing is completed and can be bolted into place.

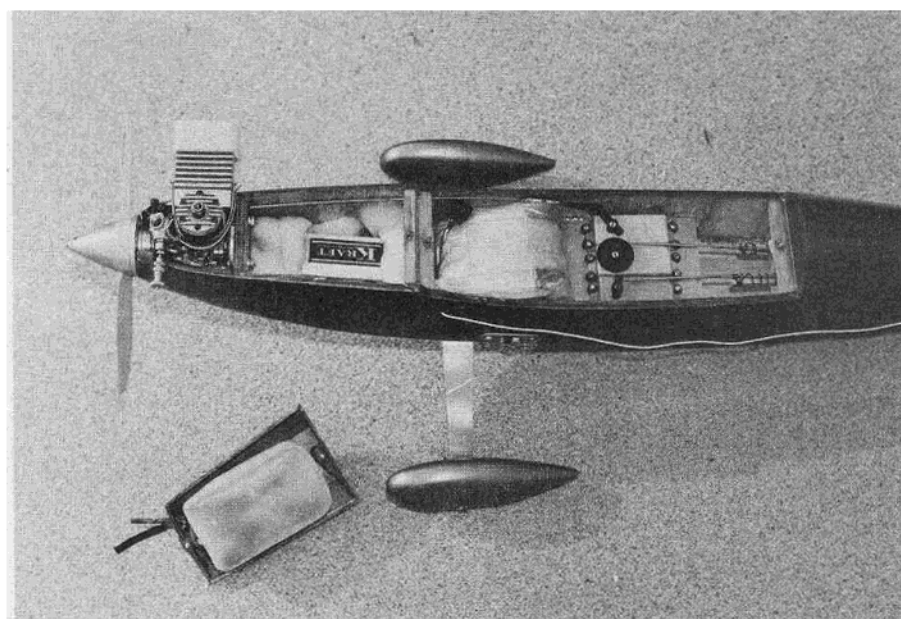
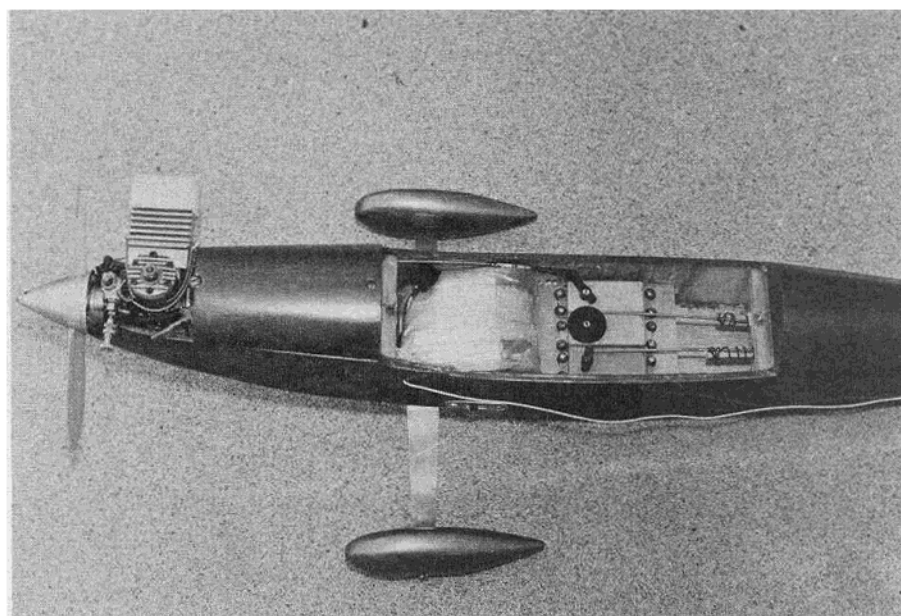
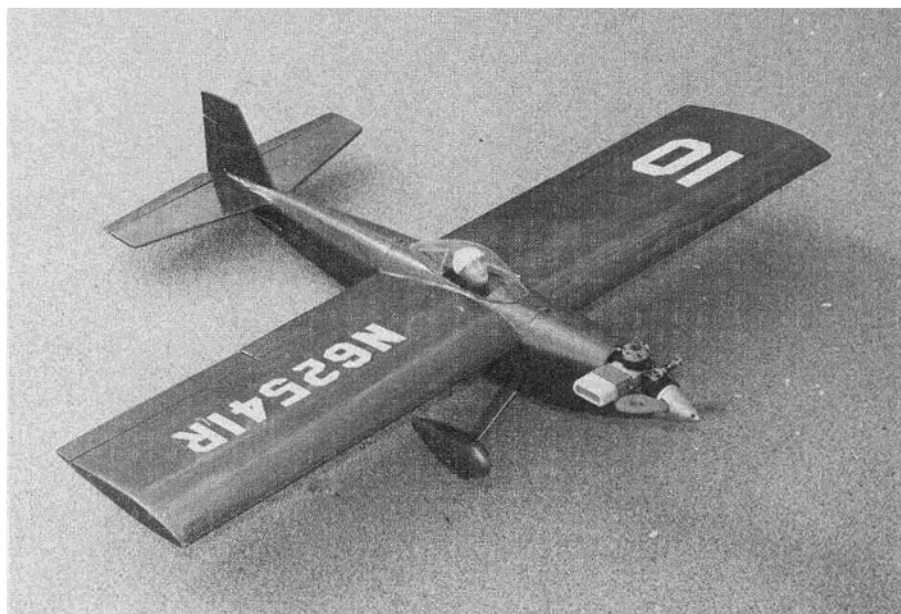
Build the wing by first cutting out the ribs. Block up a 3/16" square spar over the plan by 1/8" and pin down. Also, pin down over the plan the 1/16" x 2" bottom trailing edge. Glue on all of the ribs and then add the top 3/16" square spar, the 1/4" x 1/2" leading edge and the top 1/16" x 2" trailing edge sheet. When dry, add the top 1/16" x 3" leading edge sheet and the top capstrips and center sheeting. When dry, turn the wing over and block up the leading edge for support. Add the 1/16" x 3" leading edge bottom sheet, center section sheeting and capstrips. Be sure there are holes in the ribs for the aileron linkage before sheeting over the center section. Epoxy in the 1/16" plywood aileron bellcrank mounts and the pushrod exit sheeting. Cut out the ailerons from the wing and add the 1/8" sheet edging. I added some additional scrap balsa behind the edging at the hinge locations for additional gluing surface. Add the 1/4" sheet wing tips and sand and shape the leading edge.

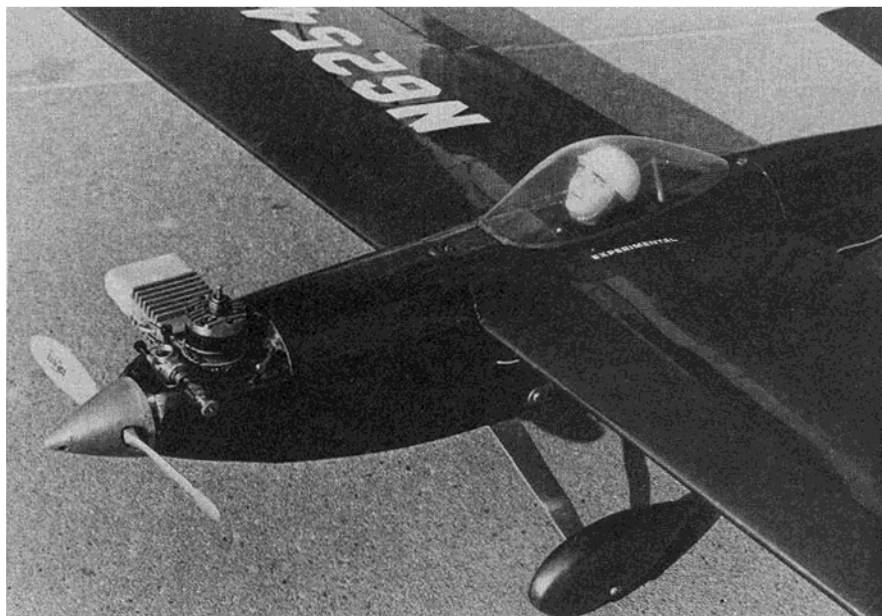
The center top section of the fuselage must now be fitted to the wing so that it fairs into the turtledeck and the forward hatch. After fitting, rough shape the center section and then glue into place. Add all of the hollow dowels, and, with the wing in place, drill down through the hold-down blocks and then set the blind nuts. Now firmly bolt the wing and hatch into place and finish shaping the fuselage.

Glue the rudder to the stabilizer and cut a slot in the turtledeck so the assembled tail surfaces can be slid in and glued. Add the aileron bellcranks and linkage, do all final sanding, and you are ready to cover with your choice of the miracle iron-on covering films. After covering, fit the canopy to the fuselage and then cut away a 1/8" wide strip of the covering where the canopy touches the fuselage. Add the 2" Williams Bros. head and any other cockpit details and then epoxy the canopy into place. Bolt on the landing gear, engine mount, engine and servos. Hinge the surfaces, install the pushrods, horns, tank, etc. I used servo tape to secure the aileron servo in the wing.

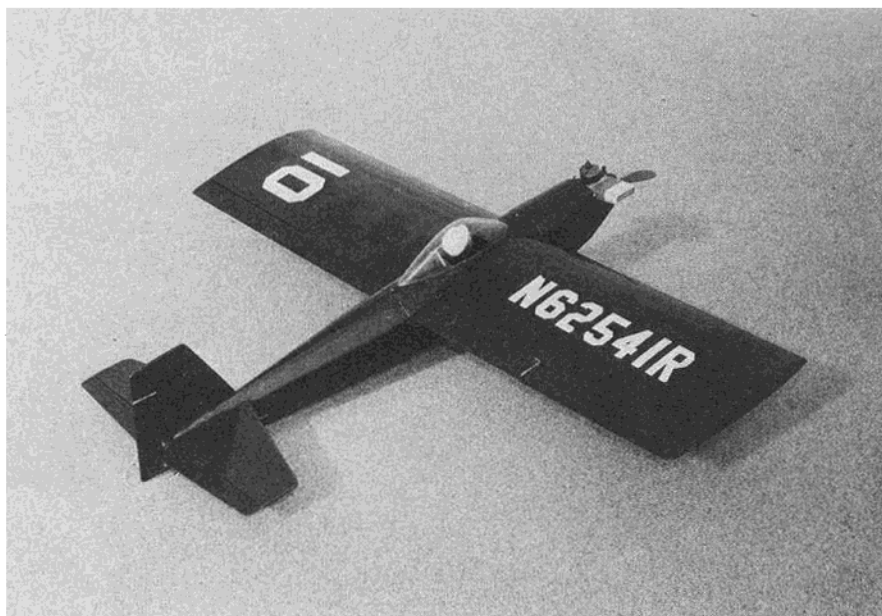
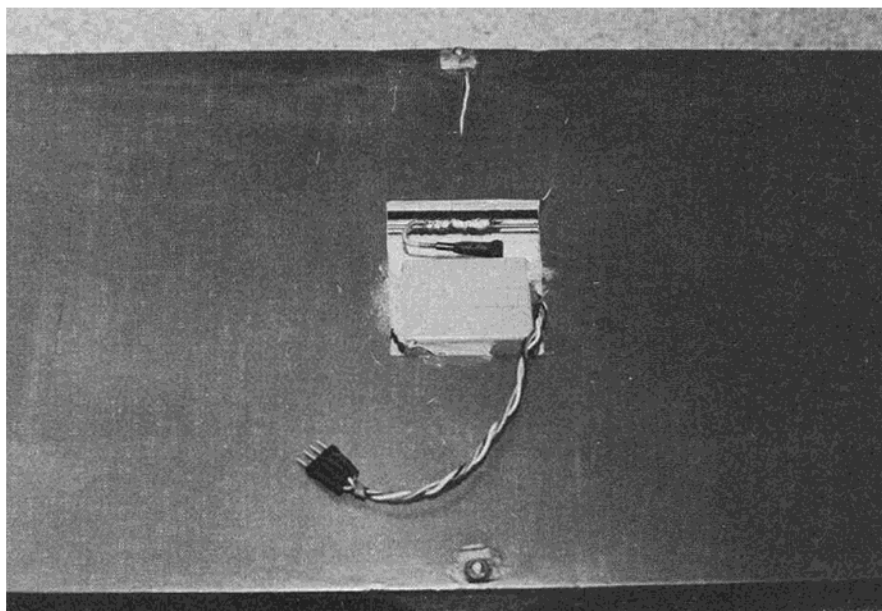
Please note that the landing gear should be moved back about 1/2" if you fly from a hard surface to facilitate take-offs. Ground looping is usually caused by the wheels being too far forward of the CG. For the first flight, adjust the control movement of the ailerons and elevator for 3/16" travel in each direction and 3/4" for the rudder. After the ship is trimmed, you can adjust the movements to your preferred degree of sensitivity. Be gentle with the rudder on take-off and hold full up elevator until the airplane just begins to break ground.

Fly safely! □





Photos to the left and below show the Murphy Muffler installation on author's O.S. Max .16 powered Grasshopper. Underside of wing shows aileron servo installation. Try Carl Goldberg's new Aileron Coupler, released after the photos were taken. Grasshopper ideal for Quarter Midget training or general sport flying with minimum fuel costs.



GRASSHOPPER
Designed By: Fred Reese

TYPE AIRCRAFT

1/4 Midget, General Sport

WINGSPAN

36½ Inches

WING CHORD

8⅞ Inches

TOTAL WING AREA

324 Square Inches

WING LOCATION

Mid-Wing

AIRFOIL

Semi-Symmetrical

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

None

O.A. FUSELAGE LENGTH

32½ inches

RADIO COMPARTMENT AREA

(L) 9" X (W) 2¾" X (H) 2"

STABILIZER SPAN

14 Inches

STABILIZER CHORD (incl. elev.)

4 Inches (average)

STABILIZER AREA

56 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

3¾ Inches

VERTICAL FIN WIDTH (incl. rudder)

4½ Inches (Average)

REC. ENGINE SIZE

.15 to .19 cubic inch.

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rudder, Elevator, Throttle, Ailerons

BASIC MATERIALS USED IN

CONSTRUCTION:

Fuselage Balsa and Ply

Wing Balsa

Empennage Balsa

WEIGHT, READY-TO-FLY

40 Ounces

WING LOADING

17 oz./sq. ft.