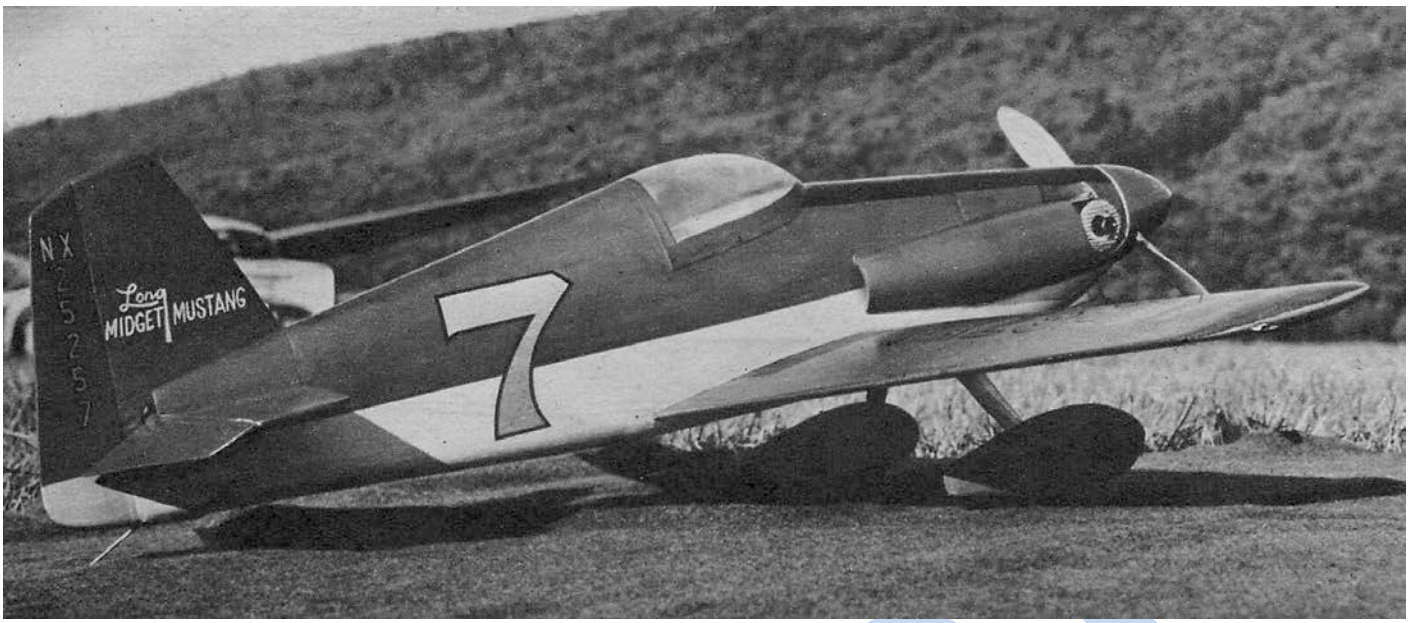
Long Midget



We Build the Long Midget. Add this Goodyear racer to your collection of U control flying scale models that fit into the Team Racing event by S.Calhoun Smith.

If you don't happen to have $5,000 handy to buy the full scale Long Midget (described on page 30), dig out the balsa and the cement. You can model this sweetheart and fly it to your heart's content.

The Long lovely is a natural control liner. The clean design lends itself to simple construction and good flight performance. We'd like to pound our private drum for Dave Long, designer of the full scale prototype. In addition to smart engineering resulting in excellent performance of the prototype Dave must have kept a soft spot in his heart for the modeler, because his design has really fulfilled our wishes for a good honest model.

The model is scaled at 1-3/4" to 1', directly from the factory three views, and if our drawing hand isn't getting too shaky, they are mighty accurate (solid scale fans take note). This odd scale was picked for a number of reasons, an important one being the combination of wing area and power that was desired. Also, the spinner size comes within a gnat's whisker of being exactly the size available from Mr. Froom. Scale wheels and canopy are also very close to those sizes procurable at your hobby dealer's. Naturally some of the curves and wiggles of these parts don't fit exactly, but outlines are included for those builders who are interested in absolute scale.

The page plan is 1/4 scale; 1/4" equals 1" on AT's full size plan and the finished model. Outlines are included for both the present racer version and the projected production version. The changes include: altered engine fairing shape, wider landing gear (mounted in wing), and square tips on all tail surfaces. The real Long Midget uses NACA 641A212 laminar flow airfoil.

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We have retained the thickness but used a symmetrical form for stunting.

The 32"span model weighs in at 22 ounces with an O&R 29 in the nose. Total wing area is 211 sq. in., giving the light wing loading necessary for good stunt performance. Speed is between 65 and 70 mph, and if higher speeds are desired, engines up to 40 cu. in. displacement can be used. But don't carry this too far, because too large an engine in the long nose will move the C.G. too far forward.

Construction can be started with the fuselage. The bottom portion consists of a hollowed block and the top is built up of formers with 3/32" sheet planking. If available a 3" x 4" x 22" block can be carved for the bottom, otherwise, a block 3" x 3-1/2" should be glued up of widths that are available.

Transfer the fuselage top and side view outlines to the block and cut to shape. Notch the bottom for the wing and be sure that the front face is perfectly flat for the firewall mounting. The area over the wing can be hollowed out with a coping saw, cut the side thickness to the dimension shown.

Carve and sand the outside contours to shape, checking with the templates at the cross-sections given. Complete the hollowing out with a wood gouge, retaining the wall thickness indicated.

With the lower portion of the fuselage completed, the firewall and numbered formers can be cut out and added. Glue the firewall in place with Weldwood or other hard glue. Spot in place with a couple of small wood screws, then drill as shown for four hardwood dowels. Cut 2" lengths of 3/16"dia. dowel and taper one end to about one half the diameter. Fill the holes in the balsa with glue and drive the dowels in place leaving about 1/8" projecting ahead of the firewall. Spread glue over these ends. This firewall mounting may seem rather beefy, but it will stand up under engine vibration and hard landings.

Next glue in the 3/8" sq. hardwood bell-crank mount. Two wood screws through the fuselage sides into the ends of the mount will keep it in place for the life of the model. At this point it is a good idea to carve the stabilizer and elevator and install the control system because the innards will be closed up once the top planking is on. The horizontal tail is carved from 3/8" sheet. The hardwood spar is cemented to the elevators and the control horn added. Bind the horn to the spar with heavy thread and cover with cement. Flightex hinges were used on the original model but any hinge system you prefer can be used. Install bell-crank, bend push rod to size and assemble to control horn. Solder retaining washers on push rod ends at bell-crank and horn, then cement elevator in place permanently. Be sure to notch out the top of fuselage rear so that the stabilizer has 0° incidence. Check control linkage for good free movement. The elevators should drop of their own weight when raised to up position. Have 30° travel up and down.

A 3/4" wide strip of hard 1/8" sheet should be cemented across the fuselage block at former 6 to act as a fairlead for the push rod. Notch the strip for the push rod. When the top former is added over this strip, the lead hole will be all enclosed. Line leads can be added now to complete control system.

The top formers can now be added and the planking cemented on. Select medium soft quarter-grained 3/32" sheet for planking. If the outside surface is dampened slightly with water, a full 2" wide sheet can be bent over the formers and almost the whole curve covered. Strips of 3/32" x 1/4" planking will have to be used over the sharp top curve aft of the cockpit.

The nose section of the fuselage can be completed next. Cut two blocks for the engine fairing "apple-cheeks" and rough-carve to outside shape. The insides are hollowed to about 3/16" wall thickness all around. If the production version fairings are used, cut a slot in the rear for cooling air exit on the engine side. If the racer version is built, simply hollow the whole length so air can pass out the rear end.

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Blocks for upper and lower cowling should be cut to rough shape and spot cemented in place. The upper removable cowling should be hollowed roughly inside to clear the top of the firewall. Now spot cement the engine fairings on the sides and complete carving and sanding the nose section to final shape. All the pieces can then be removed, hollowed out and cemented permanently in place. Coat the inside of the right engine fairing and adjacent fuselage side with fuel proofer so that when the fairing is finally in place the hidden wood will be protected.

Space for the engine cylinder can now be cut into the right fairing and the engine bolted into place temporarily on the firewall. We substituted O&R 60 front crankcase bolts for the bolts on the 29 so that there would be plenty of room on the rear of the firewall for threading on double nuts. The cowl hold down fitting should be made and installed on the top edge of the firewall. This consists of a 1/2" wide strip of 1/32" brass or steel bent at right angles with the vertical portion bolted to the firewall. An Elastic Stop nut should be soldered to the horizontal portion for the hold-down screw. Heat from the soldering iron will melt the rubber in the nut, so when solder cools, mash the rubber end of the nut with pliers so that the rubber will grip the screw. A 1/2" square of 1/16" plywood should be inlaid into the top of the cowling over this fitting so that the hold down bolt will bear against a hard surface. To spot the bolt hole in the cowling accurately, thread the bolt up through the underside of the fitting and press the cowling down into place. The bolt will mark the balsa simply drill here. Scrap 1/2" sheet is carved to shape to form the air scoop on the underside of the nose.

The fin and rudder can be carved from 3/8" sheet and cemented in place next. The fin portion extends from the rear of former 8 and is flat along top of stabilizer. Add scrap blocks on each side above the stabilizer and carve to complete the rear portion of the fuselage top. The tail skid is bent to shape from 1/16" dia. music wire and cemented in place. A small patch of Flightex fabric cemented over the underside will strengthen the area. A small tail wheel and steering yoke can be added if desired. This is a Scott tail wheel of the type common on most light-planes.

A commercial canopy about 8" long is cut down to required length and cemented in place. For a really neat job, shave the balsa planking to the canopy thickness where the canopy extends over the wood. This overhang should be about 1/4" wide at former 5. The edges of the canopy will then fair neatly into the wood and any cracks between can be covered with filler.

This completes construction of the fuselage; sand to final smoothness and apply one coat of clear dope or dope filler. We like the old glider standby dope and pure talc. This will protect the wood until the final finish is on.

Wing construction is borrowed straight from Jim Walker’s Fireball, this type being strong and yet light in weight. Cut out the wing ribs and stub spars. Cement up 1/16" sheets to the width required for each top and bottom wing covering half. These wing sheets are then cut to outside shape and should be sanded smooth on their outside surfaces before any construction is started. Then when the wing is completed only a light sanding will be necessary. This will prevent the covering from sagging between ribs. The lower halves are built separately and joined later. Begin by cementing rib 7 in place first and adding succeeding ribs, working toward the root. Hold the sheet to the ribs with pins pushed in diagonally through the sheet into the rib. Do not cement rib 1 in place until later.

If the production version is being built, the landing gear legs are bent to shape and assembled to the stub bars, Bind the horizontal portion of each gear leg to the center spar with heavy thread and cover with several thin coats of cement. Next cut notches in rib 2 to receive the spars, cut a hole in the sheet covering for passage of the leg and cement the spar assembly to one wing half. The front spar will have to be beveled to the contour of the wing surface so that the covering will be smooth. The other wing half can now be assembled to the spars. The root seam should be trimmed for a good snug fit. Now rib 1 can be notched for the spars and cemented in place. Use cement liberally at this junction. Bevel the leading and trailing edges before adding the top wing covering sheets. A length of hard 5/8" sheet can be cemented to the front face of the front spar across the center section as shown, to help stiffen the wing landing gear joint. With everything nailed down tight inside the wing structure, the top covering can be added.

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This operation is a bit tricky because the work must be done quickly before the cement sets. Run a bead of cement along the top of each rib extending to within an inch of both leading and trailing edges. Lay the top sheet in place and start pinning down to each rib. Place pins at the high camber point of each rib and then work outward toward the leading and trailing edges of each rib. Pin down to ribs 1 and 7 first, to minimize warps. As the sheet is pinned down check constantly to prevent any warps by sighting along the span from the wing tip. This is important because once the top sheet is firmly cemented into place warps or twists cannot be taken out.

To join the leading and trailing edges, lift up the top sheet and force cement onto each rib and along the edge seam. Clamp with spring clothes pins or Scotch Tape until cement is thoroughly dry. It is suggested that all pins and clamps be left on the wing structure overnight to insure that cement dries thoroughly inside the wing structure. This assembly process is repeated for the other wing half top covering. Add 1/2" thick block to wing tips and carve to shape when dry.

The wing is next cemented into the fuselage notch. Shave fuselage block where necessary for a good snug fit and 0' incidence. Use cement liberally. Fillets can be carved from soft block to triangular shape, bent and cemented into place. Final contours can be achieved with any commercial filler.

If the racer version is being made the landing gear is not built into the wing so that the front spar is not necessary. Make the center spar of 1/8" sheet balsa and use as a dihedral joiner. Notch ribs and spars half way through for a good joint. The landing gear can be bent to the shape shown and a 1/8" plywood bulkhead (2A) made. The inside front face of the notch in the fuselage for the wing should be cut across perfectly flat. Take off an extra 1/8" to allow for the plywood bulkhead. Notch the inside surface of the fuselage sides vertically to form a 1/8" slot on each side for the bulkhead. The landing gear can be fastened to the bulkhead with "Eye" or "J" bolts. Slide plywood bulkhead up into place and set in hard glue. The leading edge of the wing should fit snugly against the back of the bulkhead when the wing is cemented in place in the fuselage.

Add scrap block over the wing bottom at the leading and trailing edges to complete the lower fuselage contours.

Final finish can be started now. If a good finish is desired several coats of filler and dope will be needed. We didn't lean over backwards in the finish department because we didn't want to add too much weight. Two coats of filler and two coats of dope did the job for us.

The original Midget, was finished in natural metal color with metallic blue trim and numerals. Blue trim covered spinner and front of top cowling back to canopy rear edge. A blue airfoil shape runs along the engine fairings. Wing tips are blue, pants are blue with airfoil shape along center line left natural metal.

If you build the production version a trim job of your own choice seems in order. Large racing numerals on wings and fuselage and your AMA license number on wings and fin make a good decoration.

Final details such as pants and strut fairing are shown in detail on the plans.

Radial mounting of the engine presents no problems if care is used. Place large washers over the long bolts ahead of the firewall (place an extra one on the bottom bolt for slight right thrust). Place large flat washers and lock washers on bolts at rear of firewall and use double nuts on each bolt. When this is tightened down thoroughly, the engine is guaranteed to stay put. A coat of cement over the nuts adds a final "safety."

The horizontal engine mounting works well in all flight altitudes, and it is a pleasure to see the model in the air without that jug sticking up like a sore thumb. We used Jim Walker's balloon tank idea in the original, but a wedge tank can be fitted if desired.

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If a balloon tank is used, install a floor of 1/8" sheet across the inside of the fuselage behind the firewall 5/8" below the thrust line. The underside of the removable top cowling should have 1/8" sheet cemented across it at the same location. This floor and roof forms a box with equal space above and below the needle valve level for the balloon tank. This insures equal fuel level in normal or inverted flight.

Top Flite 9" dia. 6" pitch prop was used, and turned in good performance for us, but you should use the fan most suitable for your engine for maximum speed and power. If heavier engines are used, small lead weights will have to be added in the tail to maintain C.G.

Test flights of the model were made at Lock Haven's Cub Haven Airport, and the model did all the tricks in the book first crack. Using the U Reely control handle flights on 50 to 90 ft. lines have been made with good performance. We personally like the long line flying because sweeping, graceful, maneuvers are possible that can't be achieved on short lines.

Flying the model with wheel pants is only troublesome in high grass and we were pleased to find them still intact' after one of those ground wiping loops that bent the gear back into the wing.

Air Trails Magazine September 1949