





# MISS DENVER

By JOSEPH DOLAN

I would like to introduce you to Miss Denver—a very welcome companion at a Class C stunt event or an open pylon race.

If you have already looked at the plans you will see that this is a plane that is made to look like a stunt flyer and not the latest military weapons system, or, on the other hand, some box with a wing attached. Miss Denver was designed to look like an airplane used in stunt events or sports flying while utilizing the latest and fastest method of construction possible consistent with keeping a trim weight of approximately six and a half pounds.

#### WHAT? A STANDARD LANDING GEAR?

Whoever took a lady to a contest that had three legs? You will find out, after a few flights, that Miss "D" will handle every bit as well as a tricycle geared plane with a lot less money spent on propellers. Also, if you would like to have the tricycle landing gear crowd hide their heads in the sand, install a set of electric brakes using right rudder;—right brake; left rudder;—left brake, up elevator—both brakes, using extreme throw of controls to actuate brakes.

Miss "D" was designed to win Class C stunt events but has proved also that an open pylon race is fair game. She has never placed less than second place in any contest entered. In the Mile Hi R.C. contest at Denver, Colorado, she placed first in Class III stunt. This contest had very formidable competition with German Fighter pilots for judges. In Wichita, Kansas, she took first in Open Pylon; second, Class III stunt. At the Colorado Fall Festival, she won top honors in Open Pylon as well as Class III stunt.

Miss "D" was not designed overnight. To the contrary, approximately fourteen months of modifications were made from the date of the original conception. Not being an aeronautical engineer, I did not take it upon myself to design the airfoil, but made several wings using semi-symmetrical, symmetrical, tapered, and straight wings, using contest-proven airfoils. The wing used was decided upon for the following reasons:

- (1) Any improvement a taper could make was far outweighed by the case of building a straight wing.
- (2) The airfoil had these advantages—
  - (a) good rate of sink at low engine

- rpm; (b) very stable, all stalls are clean, with no snap characteristics at any speed; (c) smooth, even flight inverted or upright, no jerking or bouncing about; (d) good speed transition.

The wing-testing program was carried out with the help of Bill Kessler of B.K. Model Products, using foam wings manufactured at his shop.

You probably noticed there is a fiberglass cowl. This is no harder to build than a normal balsa cowl and has the advantage of being stronger as well as making access to the engine very easy.

Miss "D" uses a radial mounted engine. I feel this is a definite advantage to the builder for the following reasons:

- (1) Ease of mounting engine
- (2) Completely clean fuel and battery compartment
- (3) Unequaled strength

But most important, every engine and every different size propeller demands a different right thrust setting. More good airframes have been set aside because they wouldn't track properly through loops, etc. This was not the fault of the aircraft, but simply required a small thrust change to correct. With beam mounts this is almost

impossible, but with a radial mount all that is required is to loosen four bolts and insert shims. It has been brought to my attention that a respected engine designer, Clarence Lee, does not think it proper to radially mount an engine. I have to disagree with this as I have used the method shown for several years with no damage to the engine and far less vibration than a beam mount.

#### CONSTRUCTION NOTES

The construction of Miss "D" is straightforward and should not cause any problems if instructions are followed.

A wing is a wing and I don't know of any method to build one up any easier. I prefer to use dihedral board but the method described works well in wing construction. B. K. Model Products, 4765 E. Iliff, Denver, Colorado, manufactures a foam wing, radial engine mount, landing gear and maple landing gear blocks for Miss "D", if desired.

Titebond should be used throughout the construction with the exception of the stabilizer and wingtips where contact cement is used.

Also, it had probably caught your eye that the balance envelope on Miss "D" needs no magnifying glass to locate. She flies very well balance is moved back in the envelope.

For contest work a good sixty displacement engine is required. For sport flying, a forty-five will do fine.

#### WING

Standard ailerons are used rather than strip because their efficiency is good throughout the complete speed range in addition, the roll yaw does not rear its ugly head with this type aileron and a seventy degree bellcrank. The extra work (very little) to make these ailerons will pay dividends when flying. The vertical fin may appear too small, but if you notice the lateral area behind the cockpit, this should relieve any doubt of its efficiency!

#### BUILDING STEPS — WING

- 1) Cut out the main spars, and notch, using  $\frac{1}{8}$ " hard balsa. Cut out  $\frac{3}{32}$ " ply dihedral braces. Now glue the
- 2) Cut out the wing ribs, which are all  $\frac{3}{32}$ " balsa except the two  $\frac{1}{4}$ " balsa tip ribs.
- 3) Slip the ribs on one side of the spars and glue in place.
- 4) Now lay down the  $\frac{1}{16}$ " bottom trailing edge planking. Set the ribs on the planking using  $\frac{1}{8}$ " longerons. Build up under the main spar until the ribs lie smoothly, and glue.
- 5) Pin the  $\frac{3}{8}$ " square leading edge longeron in place and glue.
- 6) Now cut four false ribs from  $\frac{3}{32}$ " balsa. These are W-3 ribs from the rear spar back. Glue two in place.
- 6a) Now cut two false ribs using  $\frac{3}{32}$ " ply. These are made using the W-2 pattern from the front of front spar forward for a pattern. Glue in place as noted on plans.
- 7) Plank the leading edge using  $\frac{1}{16}$ " balsa. This is butt-jointed to the  $\frac{3}{8}$ " leading edge longeron.
- 8) Plank the center section and glue in the cap strips.
- 9) Glue in the  $\frac{3}{32}$ " ply bellcrank mount.

- 10) Now lay the wing on other side and follow above steps.
- 11) After the wing is dry, turn over.
- 12) Install the maple landing gear blocks and  $\frac{1}{16}$ " ply doublers.
- 13) Install bellcranks and  $\frac{1}{16}$ " wire push rod.
- 14) Install the landing gear clamps, making sure they line up with the holes in maple block. (These are available from Top Flite.)
- 15) Plank the leading edge using  $\frac{1}{16}$ " sheet, butt joining onto the  $\frac{3}{8}$ " longerons.
- 16) Plank the center section and cap strip. Build the wing tips separately using contact cement for lamination. Now set the tips aside.
- 17) Cut the ailerons out, following the line shown on the plans for the two end cuts; for the long center cut, measure back  $\frac{5}{16}$ " from the rear of the rear spar. Cut as deep as a number eleven X-Acto blade held at approximately a thirty degree angle, facing toward the front of the wing. You should now, with a gentle movement, be able to break the aileron out.
- 18) Leaving the top sheeting on the wing alone, cut out the rib pieces and cut the bottom sheeting even with the rear spar and glue  $\frac{1}{4}$ " trailing edge stock in place.
- 19) Even the front of the ribs off on the ailerons. Glue  $\frac{1}{16}$ " balsa sheet in place. Now pin the ailerons back on the wing and allow to dry. This will keep them from warping.
- 20) Glue the wing tips on.
- 21) Remove the ailerons and trim for proper fit.
- 22) Sand the wing and ailerons.
- 23) Glue a gauze strip onto the front and top of the ailerons and on the top and rear of the aileron slot in the wing, using model cement.
- 24) Fibreglass the center section of the wing using #7 glass cloth. Use a strip of cloth approximately 9" wide. This will protect the leading and trailing edges from rubber band damage as well as strengthen the landing gear area.
- 25) Cut a hole in the center section to fit the servo desired and glue in the mounting boards.
- 26) Glue the  $\frac{1}{16}$ " false plywood ribs in the ailerons.

#### STABILIZER

The stab and vertical fin should be built before the fuselage, since it will save time during the actual fuselage construction.

- 1) Take two  $\frac{1}{16}$ " x 6" balsa sheets the length of the stab, lay on top of each other, and cut the full size stab pattern out of this material.
- 2) Now lay one  $\frac{1}{16}$ " sheet down and content cement all  $\frac{1}{4}$ " thick wood, shown on the stab plans, in place.
- 3) Glue all joints with titebond, being careful not to get any on top of the  $\frac{1}{4}$ " wood.
- 4) Contact cement the top  $\frac{1}{16}$ " sheet in place.
- 5) Using a balsa plane, shape the front and rear of the stab, then sand.

- 6) Lay the stab on a flat surface and pin down to dry.
- 7) Cut the vertical fin out of  $\frac{1}{4}$ " balsa sheet. Round off the edges and sand.
- 8) Glue the vertical fin to the stab, making sure it is straight.
- 9) Cut out the elevators and rudder from  $\frac{1}{4}$ " sheet, then shape and sand.

#### FUSELAGE

A careful selection of wood is necessary. All wood should be soft balsa, especially the two  $\frac{1}{4}$ " x 4" x 48" sides and blocks A and B. The  $\frac{1}{2}$ " x  $\frac{1}{2}$ " longeron must be perfectly straight.

Very little plywood is used, since adding plywood will do nothing to strengthen the design but will affect performance and damage the radio equipment in case of a crash.

Dowels are used to hold the wing in place but the design is such that other methods will work as well.

- 1) Cut both sides out of  $\frac{1}{4}$ " x 4" x 48" soft balsa.
- 2) Place the sides together; drill the dowel holes and make slots for the elevator pushrod.
- 3) Glue in formers F-1, F-2, F-3. NOTE: before gluing in F-2, cut the hole in F-2 to fuel tank size. This is to allow tank entry and not to hold the tank in place.
- 4) Insert the elevator pushrod and glue the sides together.
- 5) Set the fuselage on its top; glue in the  $\frac{1}{16}$ " ply dowel doublers and the  $\frac{3}{32}$ " balsa bottom sheeting.
- 6) Tack glue Block B in place, using model cement.
- 7) Turn the fuselage over; tack glue, and install Block A. Now glue in the  $\frac{1}{4}$ " square cross members.
- 8) Glue the stab in place. (NOTE: The vertical fin should already have been glued in place.)
- 9) Allow to dry thoroughly.
- 10) Round off Blocks A and B to suit.
- 11) Remove blocks A and B and hollow out. The top block should be hollowed out to  $\frac{1}{4}$ ", and the bottom block to  $\frac{3}{8}$ ". Cut out cockpit and accessory hatch.
- 11) Glue blocks A & B in place using titebond.
- 13) Install F-5. (two required).
- 14) Slot the  $\frac{1}{2}$ " x  $\frac{1}{2}$ " longeron to fit over the vertical fin and glue in place.
- 15) Install the  $\frac{1}{4}$ " square longeron braces. (NOTE: F-6 pattern.) Be certain these are inserted far enough so as not to make contact with the silk covering. The only exception is the section directly in front of the vertical fin. This is inset only  $\frac{1}{16}$ " to allow the balsa sheeting to fit.
- 16) Glue the fillet behind F-5 in place; this is 1" thick soft balsa. Glue the  $\frac{1}{16}$ " sheet fill above the stab in place.
- 17) Set the nose on  $\frac{1}{8}$ " ply and trace the firewall. (Remove F-1.)
- 18) Glue the firewall in place. If you will nail the firewall in place using pins approximately  $\frac{1}{2}$ " apart around the edge of the firewall, and leave them in place, it will strengthen this assembly.



- 19) Glue the 3/32" ply tail sheet mount in place.
- 20) Allow to dry thoroughly.
- 21) Set the fuselage on its nose and pour approximately 3/8" thick fiberglass resin behind the firewall. Allow to set up. NOTE: The resin is what the number 4 sheet metal screws go into to hold the cowl in place. It also binds the front of the fuselage together!
- 22) Sand and shape the fuselage.
- 23) After the fuselage has been covered and doped, notch block A and install F-4.

#### COWL

The fact that the cowl is made out of fiberglass should not be a problem. If you haven't used this method of construction before, you will find, after it has been tried, that it is strong and unbeatable as a styling aid in any future models you may build. I have found, after making several cowls, that the best results will be achieved if Hobby Pox cloth is used for the first layer and #7 glass cloth for the second layer. Fibreglass surfacing resin is used adding enough catalyst to make it set up as fast as possible.

- 1) Carve out the cowl block. (NOTE: Silhouette shown on plans for cowl was used because it allows you to raise or lower the engine, if desired, without having to build another cowl.) After the cowl block has been shaped, contact cement the 1/2" thick balsa sheet to the rear and finish cutting the cowl block to the fuselage contour to allow cowl attachment.
- 2) Insert the dowel in the bottom of the

cowl block and put the bottom of the dowel in a vise to hold the cowl block upright.

- 3) Cover the block with Saran Wrap, making certain it is completely covered.
- 4) Lay the Hobby Pox cloth over the cowl block, smoothing as many wrinkles out as possible. Now brush on a thick coat of resin.
- 5) Select a rubber balloon that, after being filled with air, will go over the cowl block as the air is let out, but will still exert strong pressure on the cloth. Cover the complete block with the balloon.
- 6) As soon as the resin has set up, install another layer of cloth, using #7 cloth in the same manner.
- 7) Trim the excess cloth off of the rear of the cowl. Remove from the block.
- 8) Bolt the engine to the firewall horizontally (use four 3/32" shim for right thrust) making certain the exhaust is facing down, and using 6/32" bolts and blind nuts. (These are available from Dubro.)
- 9) Cut the cowl to slip over the engine. Now drill holes through the cowl into the 3/8" resin, using #4" x 3/8" sheet metal screws to hold the cowl in place.
- 10) Remove both the cowl and engine.

#### COVERING

The entire plane is covered with silk or siron in the standard manner. The only exception to this is the area between the cockpit and the stab. This is covered in one piece. Be sure to apply 3 or 4 coats of clear dope to all balsa before covering.

#### FINISHING

After the model has been covered, apply multiple coats of clear dope until the surface is smooth and reflects light evenly. Paint and trim as desired.

#### INSTALLATION OF AILERONS, ELEVATOR AND RUDDER

These are all installed using nylon hinges. Stitch in nylon safety hinges, using approximately 3 stitches for each.

#### EQUIPMENT INSTALLATION

Install your equipment in the normal manner, mounting servos as far back as possible. The battery is placed below the fuel tank. The center of the fuel tank is placed approximately 1/2" higher than is normally used for tricycle gear installation.

#### FLYING

Miss "D" is a very smooth and gentle plane to fly and yet will respond quickly to the controls when required. When attach to the hole in the control horns farthest from the control surface. As you become familiar with the flight characteristics, move the rods inward one hole at a time, until the plane flies best suited to your preference.

My own radio is a Micro Avionics, so the plane was designed with proportional radio in mind, but it will fly well with reed equipment. These minor changes should be made for reeds: Add approximately 3/32" shim to the top of the radial mount for added down thrust and position the elevator to approximately 1/8" positive throw when the controls are in neutral.

GOOD FLYING!