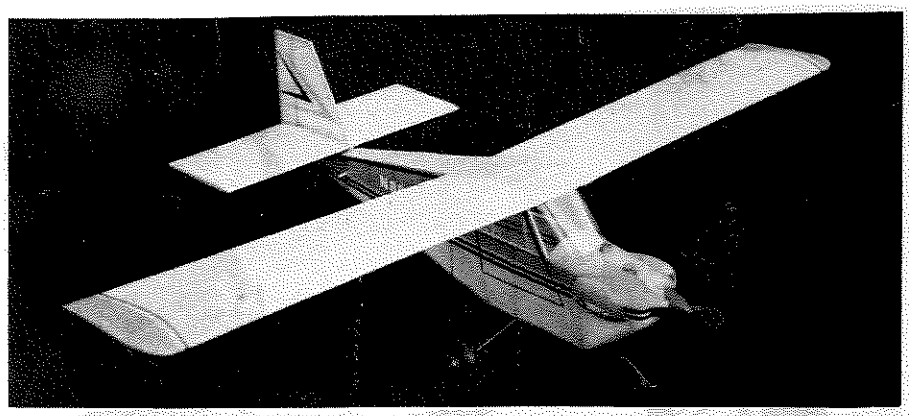
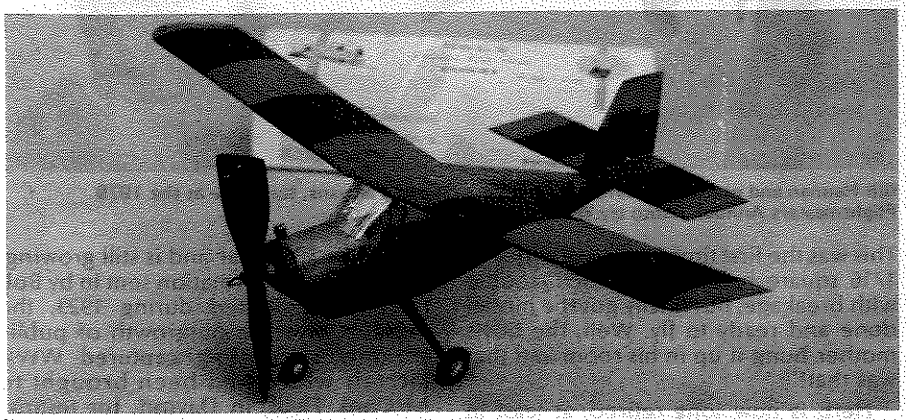




PEANUT SCALE

"Quail"

2-in-1 SCALE FOR THE BEGINNER

PHOTOS BY FUDO TAKAGI

By WALT MOONEY . . . The Aerosport "Quail" is such a simple model that Walt is presenting a "Glue Part A to Part B" article for a double-Peanut size (26") version for beginners. Peanut plans on next 2 pages.

• The Quail is a simple cantilever (no struts) monoplane design for home-builders. It is an all-metal, tricycle landing gear, high-wing monoplane with a conventional tail. It was designed to be powered by the Rockwell 600 or the Volkswagen engine. It is a single-place airplane with very good performance.

The real airplane design lends itself to being modeled very simply and is an ideal beginner's scale model. Simple, standard construction techniques are used throughout. Because this can be a first scale model for a novice, and because we haven't done so in a long time, this will be a complete "put part A with part B" type of construction article.

The model is drawn with scale dihedral, but has an enlarged horizontal tail to enhance flight characteristics. A scale length landing gear is used because it looks right and because it limits propeller diameter. A longer propeller would tend to give increased flight times, but it also might increase the beginner's trouble with adjusting the model to fly because it would be more destabilizing than the smaller propeller.

Although the model is published as a Peanut (13-inch maximum wingspan), the plans are drawn twice Peanut size (26-inch span . . . available from **RCMB**) because the beginner will have an easier time handling the larger size materials. This larger size model is the one that is described in the following construction article. The Peanut size model can be built similarly; the models in the photographs were built with an alternate wing centersection and tail surfaces so they can be disassembled and carried in a small box. This approach is not for beginners and can be accomplished by any experienced model builders without further instructions. For the Peanut size model, the omission of every other wing rib and the fuselage uprights not hatched is recommended.

The Peanut version shown has detachable landing gear which fits in slots in the fuselage, and the wings and tail have tubes to accommodate round bamboo stub spars. Disassembled, it fits in the 8 oz. See's mint box as shown. It's easy to carry on a trip but probably not suitable for a beginner.

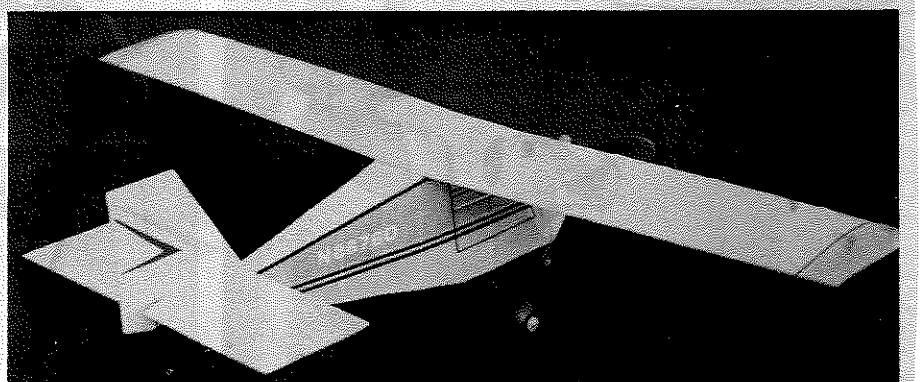
Let's start the construction of a beginner's scale model. There is a specified order to making this model. Why? The main reason is to take on the construction of the simplest parts first so that a beginner can learn and practice increasingly complex construction techniques as he goes along. If you are a beginner, follow the instructions in the sequence presented and you should be able to make a respectable first scale model with a little patience. Try not to be in a hurry.

1) TOOLS. There are a minimum of tools needed to build this model, but the following are absolutely required: single-edge razor blades (you'll need several, and be prepared to throw them away as soon as they get dull, as only sharp blades cut balsa or tissue nicely), straight pins, a soft work board (I used a pressed fiber insulating wallboard), waxed paper to protect your plans, long-nose pliers to bend wire, a 3/16-inch drill bit to make the hole for the propeller thrust bearing, some fine sandpaper, and a small paint brush.

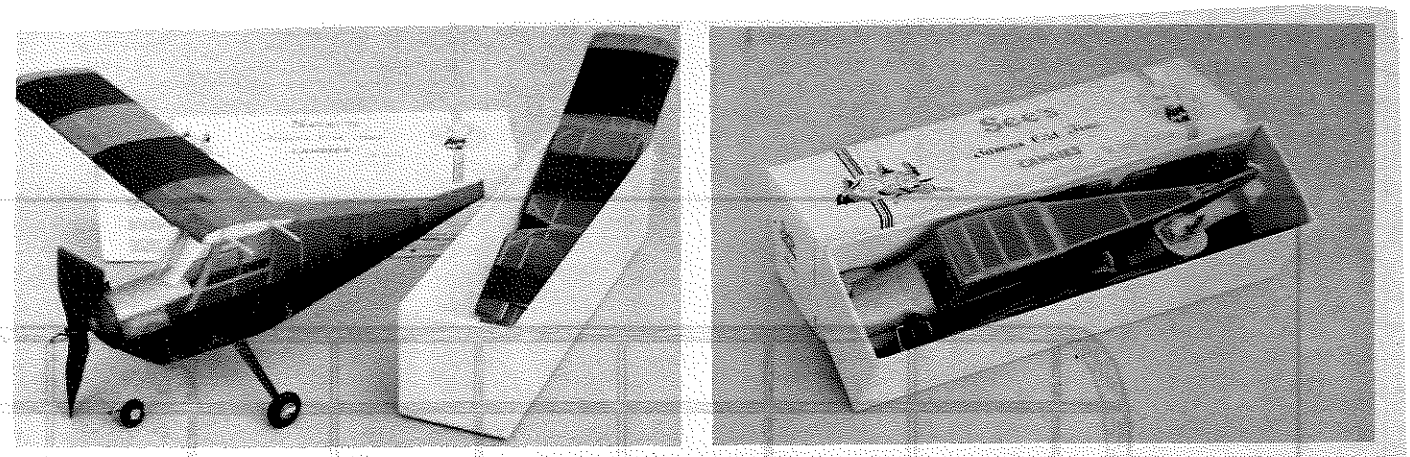
2) MATERIALS. The following materials must be obtained to build the model. They can all be purchased at any good model shop. Balsa sticks: (12) 3/32 squares, (1) 3/32x3/16, (1) 3/32x1/4, (1) 1/8x1/4. Balsa sheet: (1) 1/16 thick, (1) 3/32 thick. Balsa block: (1) soft 3/4 sq. by 6 inches long. You'll also need Japanese tissue (2 sheets), .032 piano wire, thin clear plastic sheet, a plastic propeller, the right diameter wheels, a length of 3/32 aluminum tubing, model airplane cement (not plastic model cement, either!), about four feet of 1/4-inch flat rubber, and some clear dope.

3) READ THE PLANS. Spread the plans out on the top of your work board so you can review the entire plane. Lay a covering of waxed paper over the plan. This will keep the model airplane cement from sticking to the plan as you build the parts of the model directly on top of the plan.

4) CONSTRUCT THE HORIZONTAL TAIL. It is built flat on your work board



The 26-inch version described in the text. Absence of curves, good-size tail surfaces and good proportions combine to make a model that anyone should be able to build and fly.



Walt made his Peanut Quail so that it could be completely disassembled and packed into a See's candy box. This is something best left to the experts, however, and beginners should concentrate on building and flying technique before trying anything like this.

directly over the plans. The structure consists of balsa sticks cut to length and cemented in place. The leading edge and the spar are made from 3/32 square. The trailing edge, which has a gap to clear the vertical tail, is made from 3/32x3/16. Cut this long piece to the length shown and pin in place over the plan. Do not pin through the wood; instead, use a pin on both sides of each stick in several places.

Now, using 3/32 squares, cut the cross pieces to fit and cement them in place. Use care in making the cuts so that the parts fit exactly. The cut should not be angled unless it is meant to be angled, as are the parts nearest the center where the horizontal tail has a notch to clear the rudder movement on the real airplane.

The cross pieces are called ribs. The ones at the extreme ends, or tips, are a single continuous piece, whereas all the others must be made in two pieces to allow the spar to be continuous. Allow the horizontal tail structure to dry thoroughly.

5) CONSTRUCT THE VERTICAL TAIL. This structure is very similar to the horizontal and is also built directly over the plan on the work board. Wood sizes are the same except that the triangular piece below the horizontal tail location is cut from 3/32 sheet. There is an opening in the vertical tail between the leading edge of the tail and the spar for the horizontal tail mounting. Make sure to leave a 3/32-inch space between the bottom triangular sheet piece and the longest rib.

Again, the tip rib is continuous, but the other ribs must be in two pieces to allow a continuous spar.

Leave the vertical tail in place on the work board until the cement is thoroughly dry. Don't get impatient.

6) CONSTRUCT THE FUSELAGE SIDES. The fuselage side structure is shown hatched (lots of little diagonal lines emphasizing the sticks) so that it is easy to see.

The fuselage side structure uses 3/32 square sticks for the longerons (these are the lengthwise members) and for most of the uprights. Three sets of uprights are exceptions to the previous statement. The upright at the very front and the slanted one at the front of the side windows are 3/32x1/4. The most aft upright carries the rear peg to support the rubber motor and must be cut to size from the 3/32 sheet.

To get both fuselage sides as near identical as possible, they should be built one on top of the other. Select the sticks for the longerons from the stiffest of the sticks that you have. Try to get four sticks with about the same stiffness. (One soft longeron will give you a warped or twisted fuselage later.) Pin the longerons in place on the work board. Avoid sticking pins through the wood.

There are several places where the longerons have sharp changes in direction. They should be cut and cemented back together for maximum strength at these points.

Now carefully cut the uprights and cement them in place. Don't forget to make the motor peg holes in the aft uprights before you cement them in place.

Try to make both fuselage sides exactly the same. Use enough cement to hold the uprights, but don't get too much on the joints. It's heavy, and besides, you have to separate the two sides after they are dry.

One of the biggest problems a beginner has is using too much cement and getting it slopped over everything. Try to put only a tiny drop of cement on each end of each upright before it is put in place. The uprights should be cut accurately to length so they are a good fit between the longerons. The cement that is squeezed out of the joint should be wiped up using a short length of scrap balsa stick rather than being allowed to dry and add unnecessary weight.

Allow the fuselage side assemblies to dry completely.

7) CONSTRUCT THE WINGS. The wings are also constructed directly over the plan and have a leading edge, a trailing edge, ribs, two spars, and wing tip pieces.

Cut the wing ribs out of the 1/16 sheet first. The typical rib pattern is shown on the side view.

There are a lot of ways to make ribs, and two alternatives will be discussed.

The first way is to make a rib pattern out of thin cardboard or thin plastic to the shape of the wing rib, including notches for the spars. Using this pattern for a guide, cut out 18 identical ribs one at a time from the 1/16 sheet.

The other way is to cut two balsa ribs to the correct shape. Then cut 16 pieces of 1/16 sheet balsa to the right length and width for rectangular rib blanks. Stack all the blanks together and put a rib on each side of the stack. Using straight pins pushed through everything, clamp it all together and carve all the rib blanks at the same time to match the end ribs.

Whichever way it's done, make sure all the ribs are as identical as you can make them. Use fine sandpaper to smooth out any rough edges.

Now cut two wing tips from 3/32 sheet balsa to match the shape shown on the plan.

Pin the 3/32x1/4 trailing edge pieces on the plan. These are wide enough so that a pin through them will probably not split the wood or seriously weaken it. Now take two ribs and cement their aft ends to the trailing edge, one near the tip and the other close to the center (but not at the center) rib. Cement the leading edge 1/8x1/4 balsa stick on these ribs using pins through the work board to hold the leading edge in place. Do this for both the left and the right wing.

Now carefully cement all the ribs in their proper locations between the leading and trailing edges. All the ribs except the center ribs should be exactly vertical with respect to the work board.

The two center ribs, one on each wing, must be leaned towards the tip of that wing a very slight amount to allow for the final wing dihedral angle. Cement the wing tips in place. Block them up above the work board about 1/8 inch at the start of the wing tip curvature. Of course, they must be cemented to the trailing edge at the back, which is pinned to the work board. Let the wing dry and then add the two 3/32 square spars.

The ends of the spars where they are cemented to the tips must be scored with a razor blade at the tip rib so they can be bent sharply down to the tip, and they must be beveled to fit the tip neatly.

Let the wing assemblies dry com-

pletely.

8) CONSTRUCT THE BODY BOX. The main fuselage structure is a box consisting of the two fuselage sides separated by appropriate crosspieces and formers. Remove the fuselage sides from the plans and, using a razor blade, carefully separate one side from the other. This is done carefully one joint at a time. Wiggle the razor blade gently rather than just pushing it along by brute force.

All crosspieces are cut from 3/32 sticks. These can be the softest sticks available. There is a crosspiece at the top and bottom of each upright. Cement the fuselage sides together at the very tail end. Then cement the crosspieces from the wing trailing edge location to the rear motor peg. Again, make sure the fuselage is true and the sides vertical, and let the assembly dry.

Crack the longerons at the bend back of the windows and add the crosspieces forward to the nose. Let this assembly dry completely.

9) CONSTRUCT THE ENGINE COWLING AREA AND NOSE BLOCK. Cut out former A, C, two B's, and two D's from 1/16 sheet balsa. Remove the top crosspieces at A and C and replace them with the formers. Do likewise at B and D, leaving a slight space between the sheets for the landing gear wire.

Now cut two pieces of 1/32 sheet to fit the fuselage sides between A and B and between the top and bottom longerons and cement in place. Cut two pieces of 1/16 sheet to cover the bottom of the fuselage from A to B. Laminate the two pieces to make one 1/8-inch thick piece for the bottom of the cowl.

Use a piece of paper to make a pattern for the 1/32 sheet top cowling piece. It is wrapped around formers A and C and cemented to the longerons. Cut the balsa slightly oversize and trim it carefully to fit. If your balsa sheet is too stiff to bend around the formers, wet it with water, which will soften the balsa.

Carve the cowl bottom laminations to shape.

10) CONSTRUCT THE NOSE BLOCK. The nose block is composed of two major pieces which, because of their thickness, must each be laminated from three pieces of 3/32 sheet.

The nose block forward of A is shaped as shown in the side view, top view, and the section above the detail of former A.

The other part of the nose block is made to fit snugly in the front of the fuselage box. Its shape is shown by the dotted line in the section above the former A detail. However, building tolerances may vary from model to model (especially for beginners) in this area and this part should be carefully made to fit the nose of your own model.

The nose block assembly should be easily removable from the front of the fuselage box, but should not fall out on its own accord.

Make the front part of the nose block slightly oversize. Cement the two major parts together. When dry, fit the block in the nose and, using a sharp razor blade, carve the nose to shape. Use fine sandpaper to obtain the final contour and match the rest of the engine cowling shape.

Now locate the position for the hole in the nose block to accept the thrust bearing. Drill a through hole.

A standard drill bit can be used to make holes in balsa, so long as you go slow and carefully. However, neater, cleaner holes can be made using a sharpened piece of brass tubing. If you have a piece of suitable diameter brass tubing, you can sharpen it by using a knife point to bevel the inside to a sharp edge. This can then be twisted while it is being pushed through the block. Back the block up with the work board so the back of the hole will not just split out.

With practice, the brass tube method of making holes will result in very neat, smooth holes in balsa.

11) CONSTRUCT THE PROPELLER ASSEMBLY. The plastic propeller and the plastic thrust bearing used for this model can be obtained at most model shops, or can be purchased by mail from Peck-Polymers. (See advertisement in this magazine.)

Bend a hook to match the shape shown in the side view. Thread this through the nose block assembly and the hole in the thrust bearing. Put a washer on the wire and then thread it through the propeller. Then bend a short right angle on the wire to retain the propeller.

For the simplest airplane, no spinner is required. However, one can be installed if you so desire.

12) CONSTRUCT AND INSTALL THE LANDING GEAR. This is composed of two main assemblies: the nose gear and the main landing gear. Each assembly is composed of three types of parts: the wire landing gear structural member, the wheels, and the fairings that make it look like the scale landing gear.

The wheels can be purchased, or made by the builder. On the model in the photograph, the nose wheel is hardwood and the main wheels are inflatable Trexler Airwheels (No. 2), which are very lightweight balloon tires on hardwood hubs.

For lightweight wheels at minimum cost, make them by laminating several balsa discs. Here is how to go about making a balsa wheel with only sandpaper, pins, and a razor blade for tools.

Take the 3/32 sheet and cut out four balsa circles the diameter of the main wheel. Poke a center hole in each balsa circle with a pin. Now, changing the grain direction, cement the discs into a four-layer stack using a pin to make sure they are all concentric.

When this is dry, use the sandpaper to shape the tire. Then paint the entire tire flat black. From heavy paper (I like magazine cover paper because it is strong, shiny, and can be found in almost any color), cut out two wheel hub discs per wheel. Put a pin hole in the exact center and cement them on both sides of the wheel. Make all the wheels in the same fashion.

Now, using the piano wire and the pliers, bend up the main landing gear wire to the shape shown on the plan. It should lay flat on the plan after it is bent. If it won't lay flat, adjust all the bends, one by one, until it does. A wire that won't lay flat will make a landing gear assembly whose wheels do not track parallel.

Slip the wheels over the wire and hold them in place with a drop of cement.

The nose gear wire is bent similarly, but it is a little more complicated. Bend it carefully to match the shape shown in the side view and in the landing gear shape details. Retain the nose wheel with a drop of cement.

When the cement is dry, try fitting the wire into the fuselage. When it fits properly, cement it in place. Adjust the nose gear, if necessary, to make the model roll straight ahead.

The front fork representation and the main landing gear spring fairing representation can be simulated with paper, card, or even balsa sheet.

13) COVER THE MODEL. This can be an unlucky step for a beginner, but it will turn out well if you are patient and willing to do a piece more than once.

The first and most important step in covering any model is to make sure the balsa structure is shaped correctly and is smooth. There is no way to get rid of an unsightly structural bump under a finished covering job.

Remove all the assemblies from the work board. (If you've followed these instructions in order, the cement is certainly dry.) Inspect each one for unwanted cement bumps or other imperfections, and remove them. Then, using the sandpaper, carefully shape the leading and trailing edges to the section shown on the plans. The leading edges of the wing and tails are rounded, and the trailing edges are tapered to a triangular cross section. The tips of the tails are not rounded, but the wing tips are sanded to a smooth rounded shape that blends into the leading edge and matches the trailing edge.

Lightly sand all the structure to remove bumps and get smooth, faired contours. A large flat sanding block is a help because it spreads the load over several items of structure and helps keep sandpaper corners from catching and knocking ribs loose as you sand.

When you think you are done sanding, inspect each part, and do it again very lightly. Blow off all the dust from the sanding effort. Clean, smooth parts are essential for a good covering foundation.

Now take your tissue paper and look at it. If it is wrinkled, iron it smooth using a low heat setting. The tissue has a grain to it. That is, most of its fibers are in one direction. All parts should be covered with the tissue grain direction matched to the long direction of the part.

Cover the parts in the order in which they were built, simple ones first. Cut each tissue piece slightly oversize. About 1/4 inch extra all around is about right for the tail pieces.

I like to use about 20 layers of newspapers on top of the work board as a cutting surface for the tissue.

The best adhesive I've found for attaching tissue is white glue thinned out with an equal amount of water. Model cement will work, but it tends to dry out too quickly.

Take the horizontal tail and apply a thin coat of adhesive on the outside edge structure only. Do not get glue on any inner structure. Now, with the proper tissue piece laying flat on your work board, set the structure on it glue side down. Immediately pick up the part. If the tissue was smooth and the part was smooth the covering will be okay as is. Make sure the tissue is attached all around the outline, pressing it down with a fingertip wherever it isn't. If there are wrinkles, pull them out gently by grasping the loose tissue outside the structure and pull it in opposite directions. Set the part aside to dry.

Cover one side of the vertical tail, the bottom of each wing panel, and one side of the fuselage similarly. When this has been done the first part will probably be dry, and the excess tissue can be trimmed off. A very sharp razor blade is required to trim tissue without tearing. Nothing will cut wet tissue satisfactorily, so the part must be dry before trimming. Slice the excess tissue off all around the horizontal tail. Do the other parts also.

Now cover the other side of the tail surfaces in a similar fashion and set aside to dry.

The upper surface of the wing, because of its contour, requires a slightly larger amount of excess tissue. Cut it about 1/2 inch wider than the wing panel, all around the edges. Apply adhesive to the leading and trailing edge, the root rib, and the wing tip. Then lay the part on the work board and gently lay the tissue in place on top. Starting at the center of the edges, gently stretch the tissue and adhere it to the structure. Pull out all the wrinkles, if possible.

The second fuselage side is covered like the first. The top and bottom of the fuselage are done similarly. A separate piece of tissue is required for the top and bottom cowl pieces. Cover the outside of the nose block with tissue too.

The covering now needs final trimming. To get the tissue color continuous around the leading and trailing edges, the final trim should be about 1/8 inch outside of the structure. This excess tissue is then wrapped around the edge and cemented down. Where the outline is curved, as on the wing tips, the excess tissue must be slit several times so it will lay flat without wrinkling along the edges.

14) SHRINK THE TISSUE. The model is covered and will certainly fly if nothing more is done to the covering. However, to get a really nice looking cover job that will last, the tissue must be tautened and doped.

Wet tissue will shrink, and when dry will be tighter and smoother than before. However, very wet tissue will dissolve and sag off the model. To shrink the tissue it should be lightly dampened. The best way is to spray it with a very fine mist of water. I have used a Mennen's spray deodorant bottle as my spray gun for years, but any sprayer that will give a very fine mist is fine.

The tissue will sag as soon as it is damp, indicating that it is wet enough. Don't overdo it. Prop the parts up so they do not have tissue laying on the work board or other surface and allow to dry. When dry, inspect the covering. There may be loose sections that need more shrinking. If so, do it again.

15) DOPE THE COVERING. Thin your dope at least half and half with dope thinner. Use a soft brush and put a thin coat on all the parts. Do both sides of a part as nearly at the same time as possible. The parts will really warp if you dope one side and let it dry before doing the other side.

Two coats of dope will be enough for the wings and tails. The fuselage should be given one or two more because it will be handled quite a bit.

16) INSTALL THE WINDSHIELD AND WINDOWS. Use thin clear plastic, cut it slightly larger than the window opening, and using thick dope or model cement, glue it in place. Use care to avoid smearing the clear plastic.

Cut the windshield to match the pattern. Temporarily put the wing in place and install the windshield, cementing it to the cowl and the fuselage uprights but not to the wing.

17) COMPLETE THE SCALE DETAILS. Using a black felt pen, draw the movable surface outlines and the door outline. Carve the cowl cheeks from the block balsa and cement in place. Make the magneto and the gas tank cap from scrap balsa and install them. Add the rudder tab, made from thin card stock.

If the model is to have color trim, apply it at this point. Carefully cut contrasting colored tissue to the exact shape and install it, using thin dope as an adhesive.

Cut out tissue numbers or use commercially available decals for the license numbers on the fuselage sides.

18) ASSEMBLE THE MODEL. Cement the two wing panels together at the proper dihedral angle. Cement the horizontal tail into the slot in the vertical tail. Cement the wing in place. Cement the vertical tail in place on the aft end of the fuselage. Make sure the surfaces are all lined up accurately.

Tie a loop of rubber together to make a motor about 16 inches long. Drop it into the fuselage so that the aft motor peg can be inserted to hold it. Hook it onto the propeller hook and wind the propeller a few turns to eliminate the slack and put the nose block in place.

HOORAY!! The model is finished. Ready to go flying? Not so fast! There are a few more important items to perform.

19) MAKE A PREFLIGHT CHECK. Before you even try your first test glide, inspect the entire model. Make sure all parts are securely fastened. Look at the model directly from the front and directly from the back to make sure the wings and tails are on properly. The tail surfaces should not be warped at all. If they are, hold them over a heat source and twist them opposite to the warp, holding them until they are cooled off. Eliminate the tail warps.

The wings should have a small twist in each one. Their structure is such that they tend to warp correctly, but they may not warp the same amount. What is desired is a slight amount of wing twist so that the trailing edge at the tip is about 1/8 inch higher than the leading edge. This is known as "washout" and helps the model fly smoothly by keeping the wings from stalling at the tips. Make sure the wings are properly washed out.

Ballast the model using modeling clay so it balances at the indicated CG.

20) FLY YOUR MODEL. Wait for a calm day; don't try it in a high wind. Find some nice smooth grass to make the first test flights over. Test glide the model. It should glide smoothly straight ahead. If the model dives, either remove a little nose ballast, add a little tail ballast, or warp the trailing edge of the horizontal tail up.

If it noses up and stalls before diving into the ground, it requires opposite adjustments.

If it turns sharply to either direction, check the vertical tail for warps and the wings to see that they have the same washout. If the surfaces are correct, it is possible that one wing is heavier than the other. If this is true, add clay to the light wing for balance.

When you have a proper glide, wind the propeller about 50 turns and try a short hand-launched flight. This should merely extend the glide. Make a series of test flights, gradually increasing the number of turns until the model is climbing nicely. If the powered flights show signs of strong deviations from a desirable pattern, use thin balsa shims between the nose block and the fuselage to alter the direction the propeller will pull the model.

The most usual thrust adjustment required is "down thrust," which is needed to keep the model from trying to climb too steeply under power. Side thrust is used to alter the powered flight turn directions.

For long flights, wind the propeller with the rubber stretched out. Have someone hold the model for you and pull the nose block out until the motor is stretched two or three times its relaxed length. Wind the propeller, gradually returning the nose block to the fuselage as the maximum turns are put in. A commercial rubber lube or castor oil can be used to make the rubber slippery and allow maximum winds with a stretched motor winding technique.

Have fun with your Quail. •

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