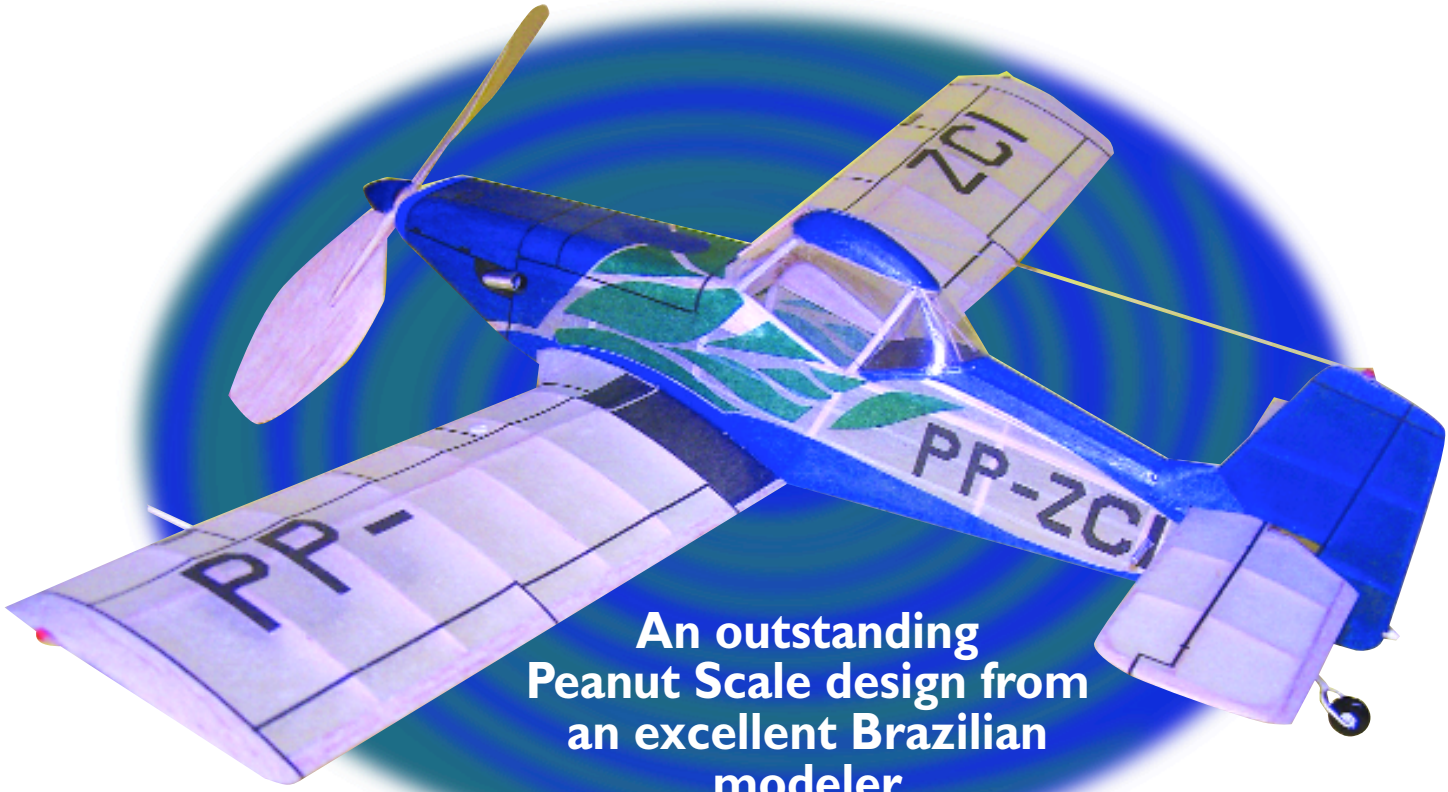


An outstanding Peanut Scale design from an excellent Brazilian modeler

Embraer Ipanema

BY CLAUDIO LOPES DE SOUZA (TRANSLATED BY RICARDO V.P. FILHO AND LARRY KRUSE)

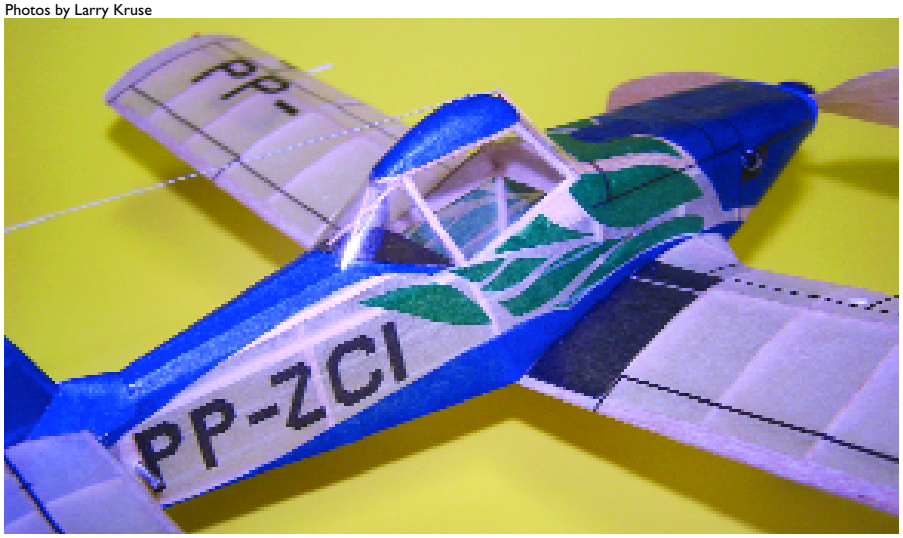
WHILE I WAS at home one day looking at an aeronautic book I found a three-view drawing of the Embraer Ipanema 201. It had nice lines and a long nose; it appeared to be an excellent candidate to scale down to make a rubber-powered FF airplane. It was even a possibility for Peanut Scale, which is one of my favorite model types.

The Ipanema is a recognizable aircraft here in Brazil, with a history that began more than 30 years ago. The first full-scale prototype for the 201 model was the Ipanema 200, and it flew for the first time in 1974.

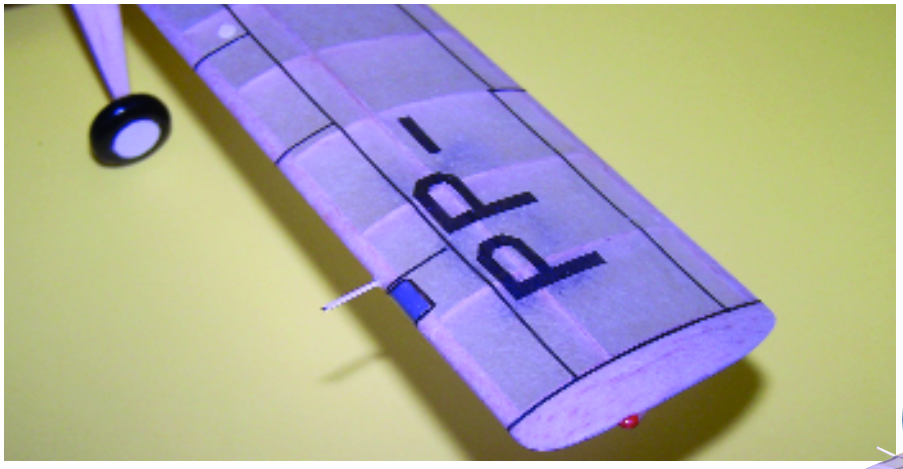
It could carry a payload of 500 kilograms and take off and land from a grass runway in less than 600 feet. With that payload capacity and flying-field

Claudio chose to use a 4.75-inch propeller with a 10.5-inch pitch for indoor flying. He molded the blades over a soda can.

Photos by Larry Kruse



The cabin area features a carved roof covered with tissue. The supports and uprights are made from 3/64 balsa. Thin acetate is used for cockpit glazing.



Claudio carved the wingtips from soft balsa. Navigation lights are made from scrap balsa, and landing lights are simulated with aluminum foil.

Nose-area details include soft-balsa wing-root fairings and exhaust pipes made from paper-backed aluminum foil. The back of the propeller is carved away for nose clearance.

adaptability, it was a tremendous success in the agricultural market from its inception.

The latest version is the 202. Its engine runs on alcohol made from sugar cane, so a rubber-powered model isn't too much of a stretch!

The Ipanema is still in production, and it has undergone only minor changes since it first flew. More than 1,000 are operational today, making it one of the world's most popular agricultural aircraft.

I tried to simplify the project as much as I could to save as much weight as possible. The model is scale, including the wings and stabilizer areas as well as the fuselage proportion and profile.

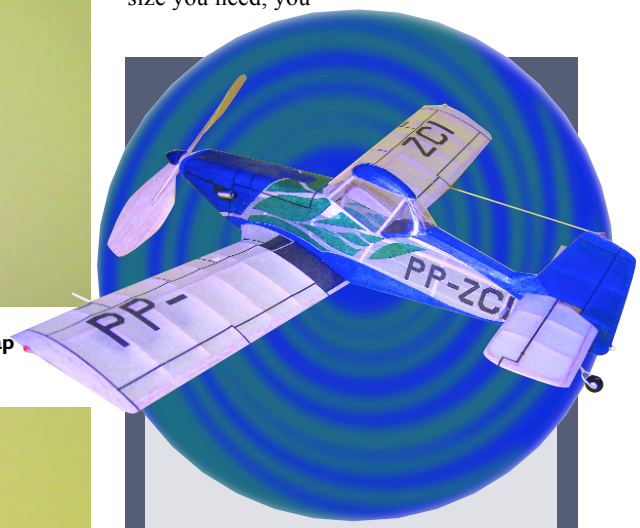
CONSTRUCTION

You will need a flat balsa or plywood board on which to build the model.

Choose your balsa wood carefully. Take your time because wood selection is the soul of any model airplane.

Lay the plans over the board and cover them with plastic.

Fuselage: If you don't have the balsa-strip size you need, you



Embraer Ipanema

Type: FF Peanut Scale

Wingspan: 12.75 inches

Flying weight: 9 grams

Wing area: 38.25 square inches

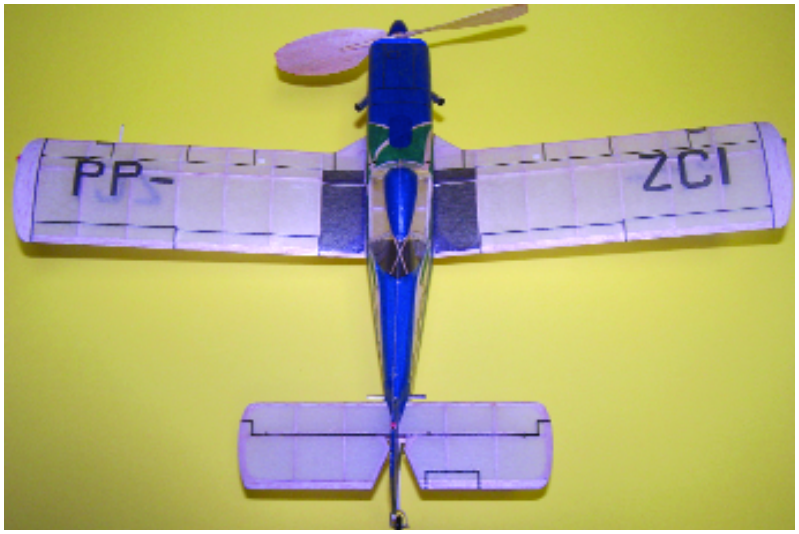
Length: 8.5 inches

Motor: One loop of 3/32-inch rubber

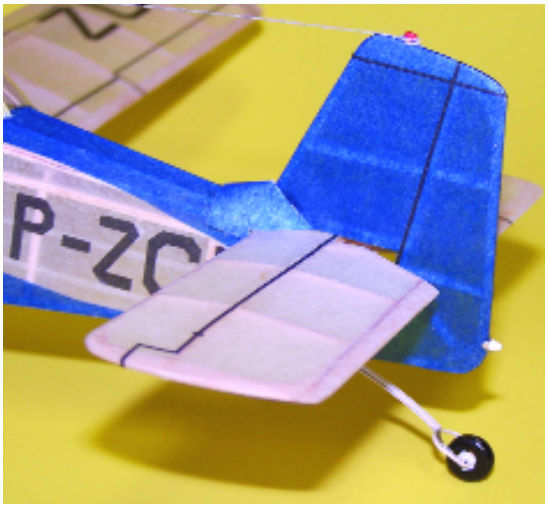
Propeller: Handmade 4.75 x 10.5

Construction: Balsa, bamboo

Covering/finish: Japanese tissue



Ample wing area, a proportionately large stabilizer, and a long fuselage to house a rubber motor make the Ipanema a natural Peanut Scale subject.



The rudder fairing is made from paper and covered with tissue. The tail wheel can be made to turn or mounted solid.

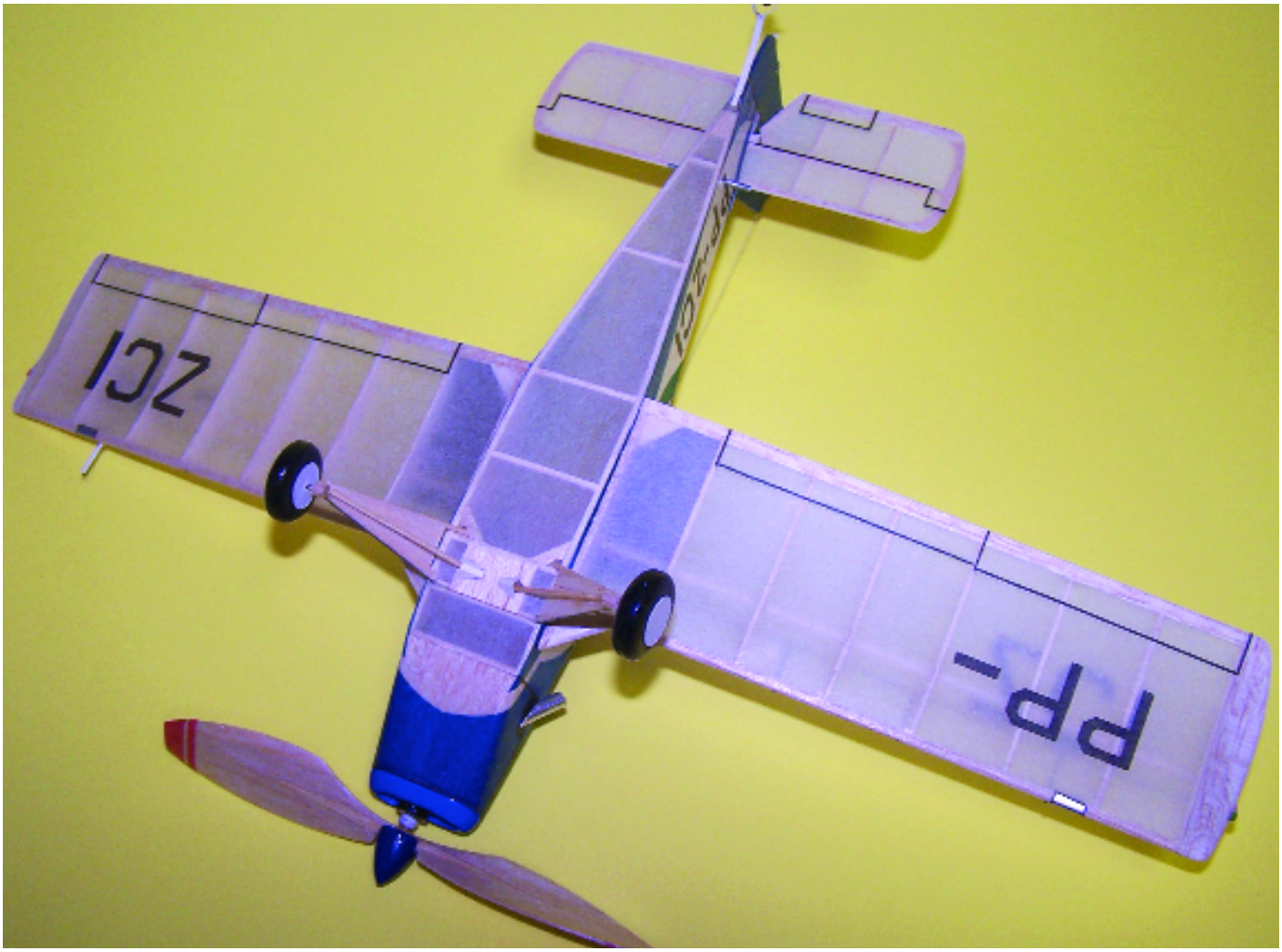
can manufacture your own using a balsa stripper or even a metal ruler.

Cut the 3/64 x 3/64 strips for the fuselage. Cut bulkhead F-1 from 1/32 light plywood and bulkheads F-2 to F-8 from 1/64 balsa.

Affix the 3/64 balsa-strip fuselage side to the board with pins. Build the second fuselage side directly over the first. Use pins placed in an "X" shape over the strips rather than sticking pins through the thin balsa, thereby weakening it.

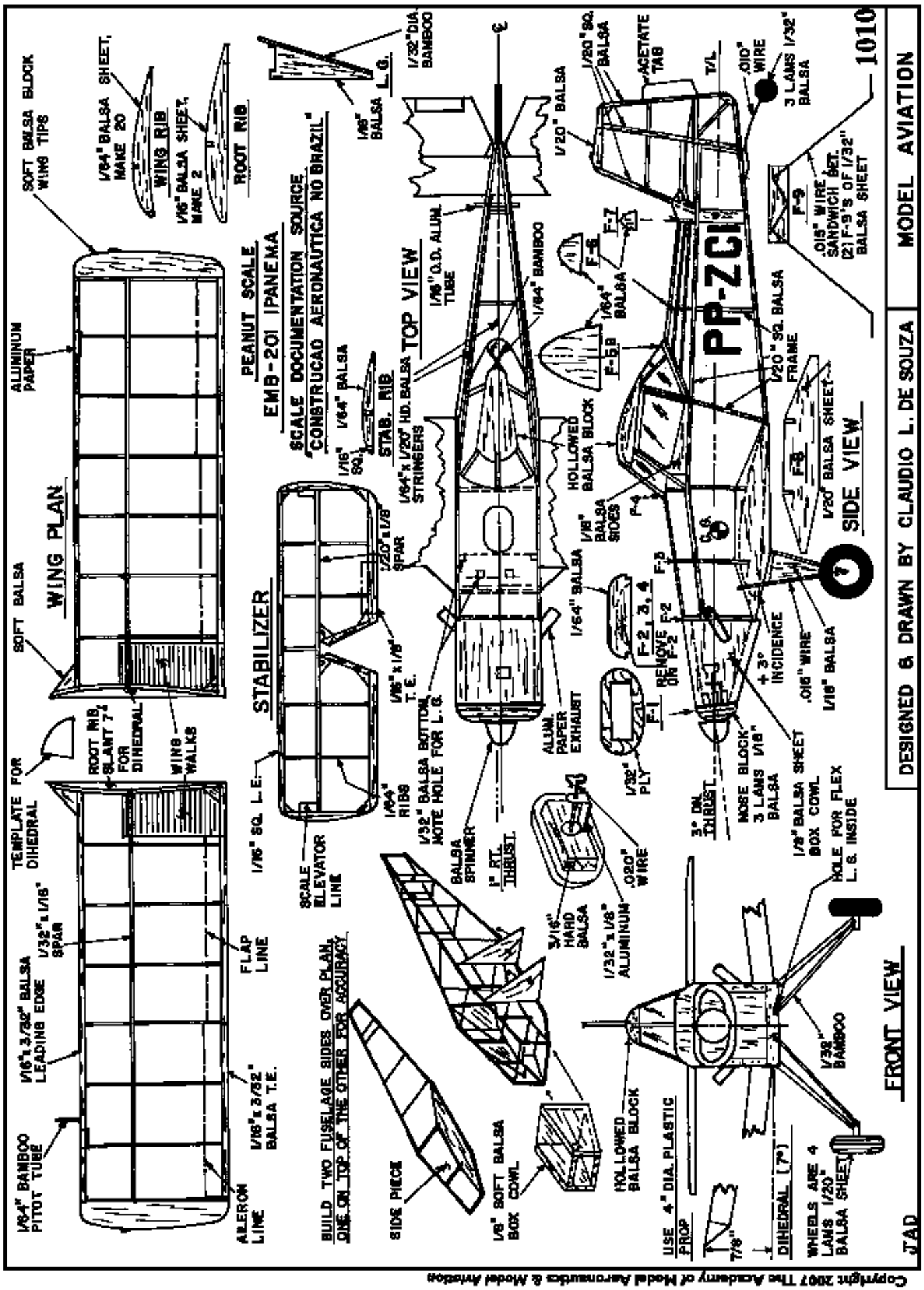
After the sides dry, unpin the fuselage laterals and lightly sand them with 320-grit paper. At this point they are ready to be used to complete the fuselage assembly.

Set the fuselage sides over the top view of the plans. Note that the top part of the fuselage from the windshield back is



Everything on the bottom of the model, except the slightly undercambered airfoil, is flat and easy to cover. The small landing-gear-strut fairings and simulated axle housings add to the overall effect.

Full-Size Plans Available—See Page 175



narrower than the bottom part.

During assembly keep the basic fuselage box at a 90° angle until the glue sets. To do that you can cut small balsa triangles and brace it as shown.

The top of the fuselage will then be brought in per the plans. Cut the upper and lower portion of the fuselage and then assemble the box. Glue in place bulkhead F-1 and the formers up to F-7.

Build the engine cowl from extremely light balsa and prepare to attach it and fair it into the front of the fuselage. Install the 1/64 top sheeting all the way up to the cabin and add the stringers. Make the nose block with the plug that fits former F-1 and shape it with sandpaper.

Moving aft, make a template and set the cabin ceiling, which is made from a carved balsa block. Glue the vertical cabin strips in place.

Epoxy the landing gear, which is made from .015-inch-diameter music wire, between two F-9 formers made from 1/16 balsa. Glue this former in the fuselage and add the gear legs, as shown on the plans. Note that the legs flex to the inside of the fuselage.

The main wheels are made from light balsa, shaped with a Dremel tool, and the tail wheel is made from 1/32 balsa sheets glued with the grain crossed. The tail wheel may be set to spin freely or glued in a fixed position. To make the bushings for the wheels I have been using hypodermic syringe needles with success.

The nose has an aluminum washer in the front and an "L"-shaped piece imbedded in the plug to help adjust both the downthrust and the side thrust. The photos show how it works. It does provide a full range of thrust adjustment for flight trimming.

Wings: These are the most important part of any aircraft. The success of flight depends on them entirely, so take your time and try to build them with extra care.

The rib profile I used is the best one I found to improve general flight characteristics in a model this small. Carefully select the wood you will use. Cut the ribs from 1/64 balsa except the root wing ribs, which are made from 1/16 hard balsa.

Make a plywood template for the main ribs as well as the root ribs. Cut the LE and TE from 1/16 x 3/32 medium balsa. Fashion the main spar from 1/32 x 1/8 hard balsa.

The wingtips are made from soft balsa block that is carved and then hollowed as much as possible to save weight. The triangular root wing fairing is also made from soft balsa.

Build the wing in the usual way, by pinning the main spar, the TE, and the LE on the board over the plans and carefully adding the wing ribs. Make sure they remain vertical as the glue dries.

Keep in mind that the root ribs are glued with a 7° angle to set the proper dihedral. The dihedral template can be your guide.

Sand the LE exceedingly carefully to obtain the proper round shape. Sand the TE carefully to taper it as shown.

Tail Group: Make the stabilizer TE from 1/16 x 1/8 balsa and the LE from 1/16 x 1/16 balsa. The ribs are 1/64 balsa sheet, and the main spar is 1/20 x 1/8.

Notice that the stabilizer has a Clark Y shape, which is sanded in after the assembly dries. Build the rudder over the plans using 1/20 strips and sheet.

Propeller: Since this model has such as long nose, try to build the propeller assembly as light as you can to avoid adding lead in the tail to compensate for the CG.

I prefer to build my own propellers, molded over a cup or a soda can, but a commercial version such as a Peck-Polymers cut to roughly a 4-inch diameter will do the job. I chose to use a 4.75-inch propeller with a 10.5-inch pitch, but the choice of dimensions is up to you.

Add a freewheeling device if you intend to fly this model outdoors. If you will fly it indoors you can glue the propeller directly to the prop shaft, which is made from .020-inch-diameter music wire.

Manufacture a reverse-"S"-shaped hook to avoid having the rubber climb over the hook under full winds. You can make the

spinner from a shaped balsa block or vacuum-form one if you have the time and the tools.

Covering: Japanese tissue is the best choice for this application since covering is one of the most important procedures in producing any Peanut Scale model. The covering can make the airplane extremely heavy or misaligned; it depends on your skills in keeping the weight down and avoiding any kind of misalignment that may occur during this process.

Each modeler has his or her own way of covering a model. I prefer to use a 50% solution of Elmer's glue diluted in water.

The first step in preparing the framework for covering is to sand all the surfaces with 320-grit paper and give everything a final sanding with 400-grit paper. Apply at least two very light coats of thinned dope, sanding between the coats.

Build a tissue-shrinking frame from 3/8 square balsa. Make it a bit smaller than the sheets of tissue you'll be using.

Glue the covering paper to the frame, keeping in mind that there will be some waste. After the glue dries, wet the paper with rubbing alcohol.

After the alcohol evaporates and the paper is dry and preshrunk, remove it from the frame. Now you can start the actual covering process. This method dramatically reduces the possibility of misaligning the parts.

Apply the paper to the various framework pieces using the Elmer's 50% solution. Try to keep it as tight as you can while you go. The only parts of the model that may require several smaller pieces of paper to get a smooth, unwrinkled covering job are the top of the fuselage, the cabin roof, and the nose area.

After the covering is completely dry, pin the flying surfaces to the building board and wet them with rubbing alcohol. Wait for the alcohol to evaporate and dry completely before moving the parts.

When you remove the parts from the board and give them a light coat of diluted dope, pin them back in place and let them dry overnight.

Finishing: The first full-scale Ipanemas were painted white with blue stripes for cost and effect. Nowadays they can be found with fanciful color schemes.

To finish my model I made the panel lines, flaps, ailerons, rudders, and elevator lines from extremely thin stripes of black tissue held in place with dope.

If you want to add writing to the model or the prefix of the airplane, draw or print the word or letters on bond paper. Simply place a piece of tissue paper over the letters or figures, fix it in place with tape on the corners, and cut out the characters with a sharp X-Acto knife. Place the pieces over the airplane and brush thinned dope over them. The results are excellent!

It's time to install the rest of the details that make the airplane come alive. The exhaust tubes are made from aluminum foil-backed paper that is painted black on the inside and glued at 45° angles to the fuselage.

A drop of glue holds the wheels in place, and the wheel hubs are made from paper. If you want to add realism you can achieve the wheel-fork details using paper strips.

The windshield and the windows are made from thin acetate that is cut to shape and carefully glued in place with cyanoacrylate or canopy glue. The wire that goes from the windshield all the way to the rudder is a "wire deviator." It can be simulated with nylon fishing line.

The landing lights can be replicated using aluminum foil glued on the cowl and on the LE. Finish it all off with pitot tubes, navigation lights, lights, fuel-tank caps, wing demarcation, etc.

Those small details add to the model's general appearance and certainly add to the "Wow!" factor.

Now you can glue the wing to the fuselage. Ensure that the wings are at a 7° angle and double-check to make sure the proper alignment has been achieved.

Flight: The Ipanema is incredibly easy to fly. The prototype almost flew itself from the working station. Necessary adjustments were minimal.

Balance the model as shown before starting test flights. If you intend to fly outside, choose a calm day and preferably a grassy area such as a football field.

I started the first tests with a 3/32-inch-wide rubber motor and increased the number of turns for each flight. In the powered part of the flight the airplane climbed while making a left turn, and in the glide portion of the flight it made a gentle right turn all the way to the landing.

To achieve the desired turn radius I glued a small, clear acetate tab to the rudder so I could increase or decrease the angle to achieve a tighter or bigger turn radius. A total of 2°-3° of downthrust is necessary to avoid looping in the powered part of the flight. A total of 1° or 2° of right thrust is needed to correct the torque effect.

Don't forget to lubricate the rubber as you increase the number of turns, and always use a winding tube.

That's it! You're ready to experience enjoyable flight with this superb model.

I thank my friends Ricardo Filho and Larry Kruse for their support and encouragement in publishing this design. I wish you all the very best and good flights. MA

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