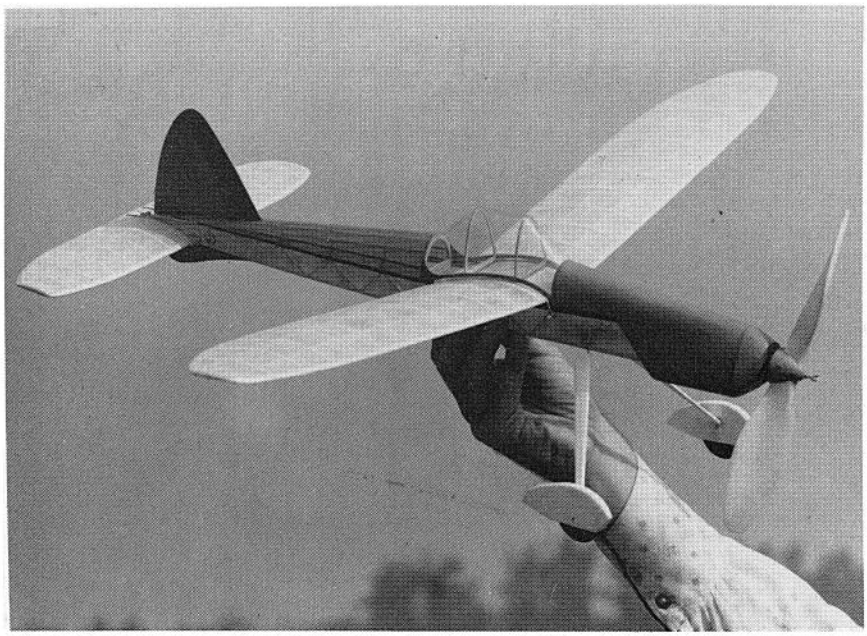
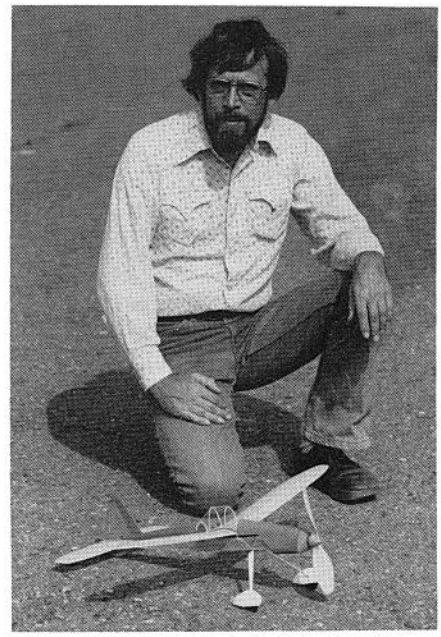


"Stormhawk" is one of the most realistic looking sport rubber models we've seen in quite a while. Wheel pants, unusual cowl, and eye-catching canopy are trademarks of the design.



John Morrill and his Stormhawk. John has an eye for designing really good-looking models.

The 'STORMHAWK'

By JOHN MORRILL . . . The Stormhawk is proof positive that a sport rubber job can have both good looks and good performance. If your flying field is known for its thermals, better put a DT on this one!

• A green field, a blue sky, warm buoyant air, 800 turns and Stormhawk is away for a beautiful two-minute flight. High above your head, now and then a glint of sun off the canopy. This is sport flying at its best. A throwback to those good old days . . . what the old timer movement is all about.

I didn't want to build an old airplane, but I did want to see what I could design that would have a 1938 flavor; see if I could rediscover the magic of the Golden Era.

Stormhawk is performance limited. It has fixed landing gear, a free-wheeling propeller, a fuselage cross-section, and weight. It follows the 1941 AMA rules quite closely. It was designed to be a good, stable flier, combining good duration model proportions with a full-scale look. Under minimum power, the model makes a fine ball-park flier. Full power turns the model into a high performance airplane.

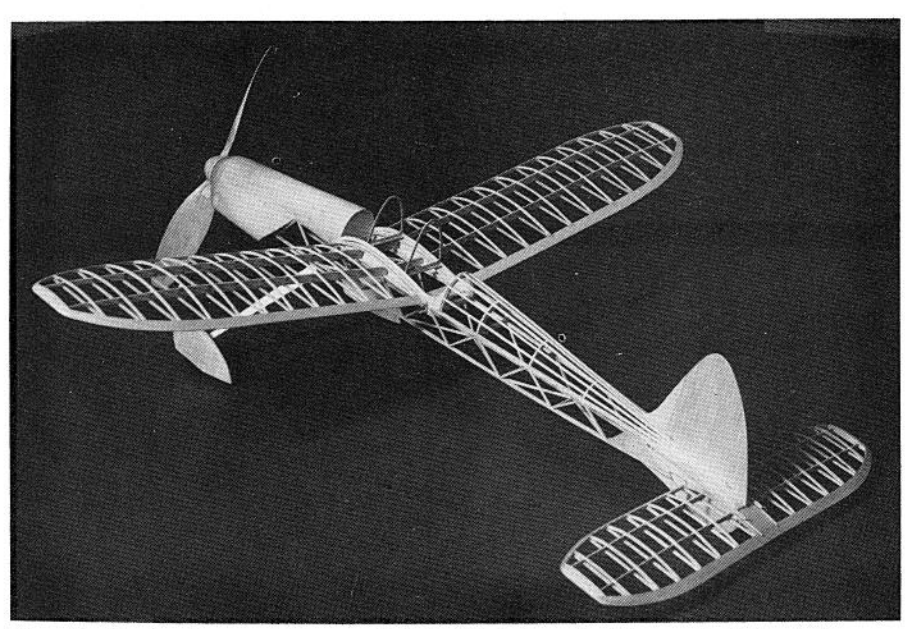
If you are a novice builder or new to stick-and-tissue construction and are saying to yourself, "I would like to build that model, but it is too complicated," take another look at the plan. Stormhawk is intentionally laid out in all staight lines; there are no compound curves. It thus becomes quite easy to sheet the nose, lay out the stringers, and most important, to tissue cover the model. If you feel the sliced rib construction on the wing and stab is too difficult, by all means substitute solid ribs. The canopy and wheel pants are not as difficult as they first appear, and I will cover their construction later on.

CONSTRUCTION

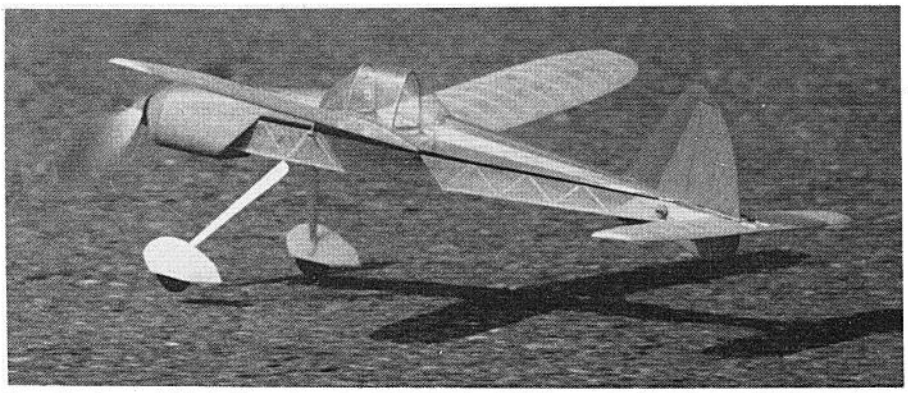
Before we start actual construction, I would like to mention our structural aims. Stormhawk should weigh in at 90 grams, or 3 ounces, ready to fly; any heavier and the glide suffers. My model weighs 68 grams, finished, without the motor. I am using 4 strands of 1/4-inch rubber, braided. The motor weighs 20 grams.

The fuselage main frame is a truss construction for light weight and good torsional strength. Sheet balsa sides could be substituted for ease of construction. If you elect to do that, you will be adding weight and destroying the light, airy look that is the aesthetic hallmark of the tissue-covered model.

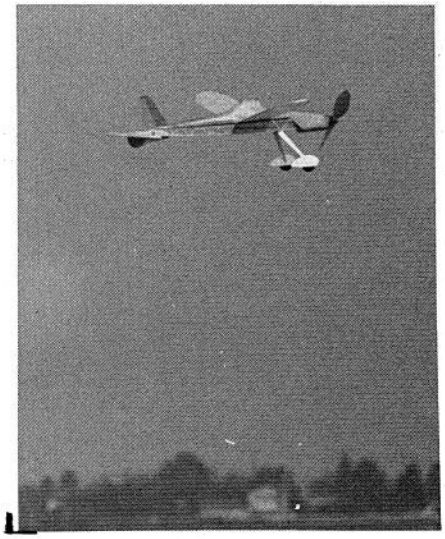
I feel that Stormhawk would fly better with a little more wing area. I would therefore suggest the wing span be increased 2 inches (to 28 inches). This is easy enough to do, since the wing ribs are on 1-inch centers. The stab need not be changed; it will work fine as it is. If the model dutch-rolls with the additional wingspan, a slight amount of additional



Stormhawk's structure may look complicated at first glance, but it really isn't. Sheet ribs can be substituted if you just can't bring yourself to make the sliced ribs shown. Note canopy frames.



Stormhawk caught just after release for R.O.G. takeoff. The model fairly jumps off the ground on full winds. Model consistently turns in two-minute flights. Photo by Erik Daarstad.



Coming in for a landing after a nice flight. Right/right flight pattern. Daarstad photo.

rudder area will cure that tendency.

FUSELAGE

The fuselage side frames are built with the second one on top of the first one to assure symmetry. Assemble the basic frame upside down over the top view of the plan. Add the top crosspieces and then the bottom. The bottom is narrower than the top and is indicated by the shading on the plan. A small triangular template will help you get the angle the same on both sides. Diagonals are added between the bottom crosspieces. Formers are next added, being erected perpendicular to the top longerons. The wing saddles, through which the wing must slide freely, are cut from 1/32 plywood. Use a brand new No. 11 Uber Skiver blade. Cut the inside airfoil shape first, then the outside contour. The 1/32 plywood is very easy to cut using a sharp blade. Add the rear stringers; they butt against "J" and lie on top of "K". Place the center stringer first, then the ones on either side. The spacing is shown on former "K". They are again spaced evenly across where they end at the fuselage rear. The lineup on the intermediate formers should be automatic. Finish the rear fuselage with 1/32 sheet, grain running crosswise. The nose sheeting may now be put on. I use white glue for sheeting. As it ages, it doesn't pull the wood down around the formers, adding an unintentional scalloped effect. I use Ambroid for all the rest of the frame construction. I feel it is still the best wood cement for stick construction.

The top sheeting is put on first. Cut the piece extra long by a couple of inches. Butt it along the top longeron of one side. Let the glue dry. Now bend it over the formers. Use rubber bands to hold it in place. The wood will now be at all sorts of cockeyed angles to the other longeron and end formers. Make sure it covers everywhere it needs to. When the glue is dry enough to hold the wood in place, cut it flush with the top of the other longeron and glue it into place.

Trim the overhang from the formers at each end. The cowl pieces are now added. Bevel one edge at an acute angle and cement it on the longeron side. A little effort here will produce a perfect joint to the top sheeting. Use two pieces, one on each side. Wet the wood, bend it around and overlap the two pieces on the bottom. Hold in place with rubber bands until the wood has dried. Make one cut longitudinally along the bottom center with a good sharp blade. This will give you a perfect butt joint. Glue the wood to the formers and hold in place with rubber bands. Trim when dry.

The landing gear wire is bent to the plan. Make a 1/32 ply former that will fit inside the fuselage frame. Lash the wire to the former with thread. Smear the thread with glue, position, and glue the former into place. Small triangular gussets may be fitted on the fuselage bottom to attach tissue where the wire exits the frame.

The wheels are made in a balsa/ply sandwich. Discs of 1/32 ply sheet are cut to the proper diameter. A 1/8 sheet balsa disc is glued to either side. A 3/32-inch hole is drilled for the hub. Get a long (1-1/2 inch) 4-40 bolt and two washers. Put the bolt through the wheel center, a washer on each side, and tighten the nut. Chuck the bolt in a 1/4-inch electric drill. The drill should be held in a horizontal stand . . . an elementary lathe. With sandpaper sticks, true the wheel up and shape the sides. Take the bolt out of the wheel and glue in a 3/32-inch diameter aluminum tube axle bearing. The wheel pant center with the wheel cutout is made from a piece of triangular trailing edge stock, 1-1/4 x 3/8 inch. It is sandwiched between sides made of hard 1/16 sheet, glued to the wire, then wrapped with silk, nylon, or in my case, Coverite. Recesses are gouged out for the wire on the inboard side of the wheel pants.

The canopy is put on after the model is covered. I used the movie film cement technique. The film cement is available from photographic stores and comes in small 1/2-oz. containers.

Cut the canopy frames from 1/32 ply, using a sharp knife. Cement them in place. Using the windshield outlines on the plan, cut heavy paper templates and check to make sure the windshields fit your model. If not, adjust the patterns. Let the celluloid protrude slightly beyond the windshield frames. Next, put several coats of clear dope on all framework where the celluloid will attach. Using small pieces of masking tape, hold the celluloid in position. Do one windshield at a time. With a very fine brush (00000) and finger pressure to hold the celluloid tightly against the

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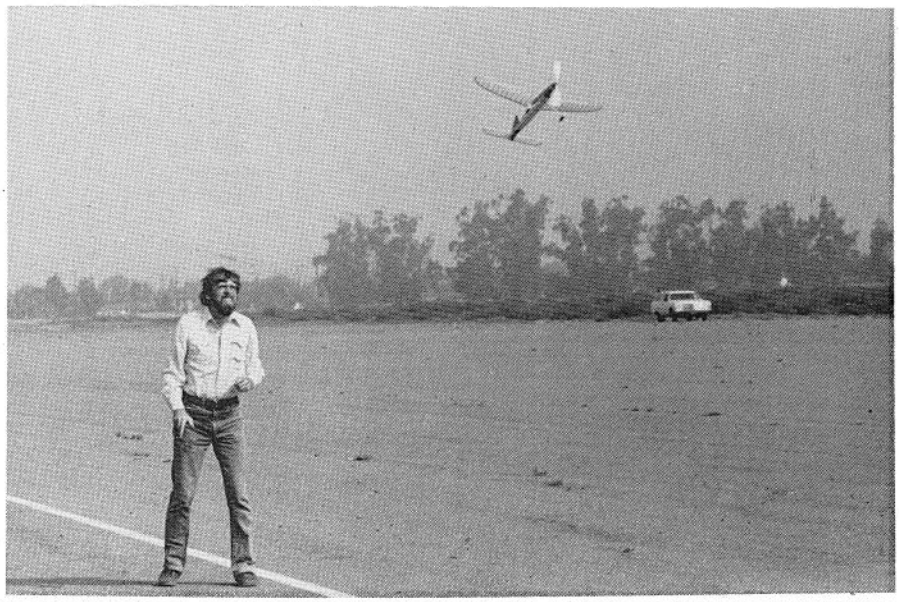

Good action shot of John hand launching his Stormhawk. Model has a pretty steep climb angle for a sport rubber job. Photo by Erik Daarstad was taken at Mile Square Regional Park.

Stormhawk . . . *Continued from page 75*

framework, place a small drop of film cement. Capillary action will carry the cement around, and in 30 seconds or so, the canopy will be bonded. You may then continue on the next section until your windshield is completely cemented. After the front and rear windshields are in place, trim the celluloid overhang flush with the frames. The center section is then added. The trick to a neat job is *not* to glue the center section to the upright frames. Cement it only to the top of the wing saddle on either side.

The small ply pieces that hook into the stab leading edge are also put on after the model is covered and with the stab in place, in order that a good stab fit can be made.

A propeller blank is shown on the plans. This propeller works much more efficiently than a plastic propeller, and is recommended for a good climb.

I use braided rubber motors. This is an old-time trick and effectively prevents the unwound rubber bunches from shifting around and changing the center of gravity, thus upsetting the glide trim. It is used only with a free-wheeling propeller, as it offers no advantages with a folding prop. A braided motor is under tension when unwound, and consequently requires a stop on the propeller shaft so the propeller is loose to free-wheel. I have included a sketch of the free-wheel clutch I use and the soldered brass collar, which is the stop. This works well and a few minutes' study will, I hope, make the mechanism clear.

And how to make a braided motor? Quite simple, really. The motor must consist of an even number of strands. I will desribe a 4-strand motor. Measure out your motor in the conventional manner. I use about 1-1/3 the length between the prop hook and rear motor peg for each strand. Tie the rubber together using a square knot with an overhand tied on top of it. Lay the motor out in a 2-strand configuration. Find the center and mark it. Stretch slightly and wind in about 100 turns. Fold the wound motor in half, making 4 strands. Attach your prop hook at the fold and put the other two ends on the same peg. Now pull taut and let the propeller unwind. The motor will twist around itself and end up in the neatest braid you could hope to see. If it is now shorter than the distance between hooks, you will have to try again with less turns. Chances are that it will still be long. Don't worry. Put the motor in the model and wind it up about 100 to 150 turns. Let it unwind. When stopped, you won't see the neat braid, but rather lumpy knots distributed along the motor. This is all right as long as there is enough tension in the motor to keep the nose plug from falling out. The knots will always show up in the same place and the CG will remain constant. If you want to find the exact number of pre-turns, you can get back to that perfect braid.

WINGS & STAB

The leading and trailing edge of the wing and stabilizer are laminated from pieces of 1/16 x 1/8 balsa. You may make a cardboard template for lamination, or do as I did and use closely-spaced pins on the inside profiles. I wet the wood with water and pin it to the laminated outline. When the wood is dry, remove, coat with Ambroid, and put back on the form until dry. Some people use white glue and do the whole job at once, but I feel the Ambroid is better when it comes to carving and sanding the outlines to their respective cross-sections. I do that shaping first thing after the outlines are dry from the glue.

Sliced ribs were chosen for the wing and stab ribs. I like the appearance of this technique and find it assembles as fast as solid ribs.

Pin the laminated outlines to the plan. Add the rib bottoms, which are 1/16 square. The spars are cut from hard 1/32 sheet. First, cut strips 1/2 to 5/8 inch wide from the sheet. Make them a little over-length. If the wood grain wants to distort and put a bend into the spars, it will now do so. From these pieces, using a long straightedge, cut your spars. They should come out perfectly true. Lay the spars in place and glue them to the rib bottoms.

Make a template for slicing the ribs from a piece of cardboard. Cut rib stock from 1/16 x 3-inch sheet. Make this stock the exact width as the length of the ribs will be for your wing and stab. Now slice the ribs. Make them a little thicker to allow a final sanding of the finished wing. Lay the sliced rib tops in and glue. The center section ribs are cut 1/32 inch thick to allow the center 1/32 sheeting to lay in flush. Dihedral is put in the wing using the plywood joiners.

FLYING

We have already talked about weight, propellers, and motors. Start with 100 turns and work your way up. The original required very little trimming. I fly to the right under power and glide. The plans incorporate the incidences and downthrust that the original model needed for good trim. The CG is 50% of the wing chord, and is on the plan. Set your glide circle with the movable rudder, and power circle with sidethrust adjustments. The lifting tail is there to control power stalls and works beautifully. This is a docile airplane and mine proved easy to trim. You can expect one-minute flights in cool evening air, and two-mintute flights in warm buoyant air. I had a seven-minute flight one day at Taft, followed by a five-minute flight. I gave up after that, as my legs started giving out. If you put a folding prop on Stormhawk, put in a dethermalizer; you will need it! I have enjoyed flying this airplane immensely and am sure you will also. •