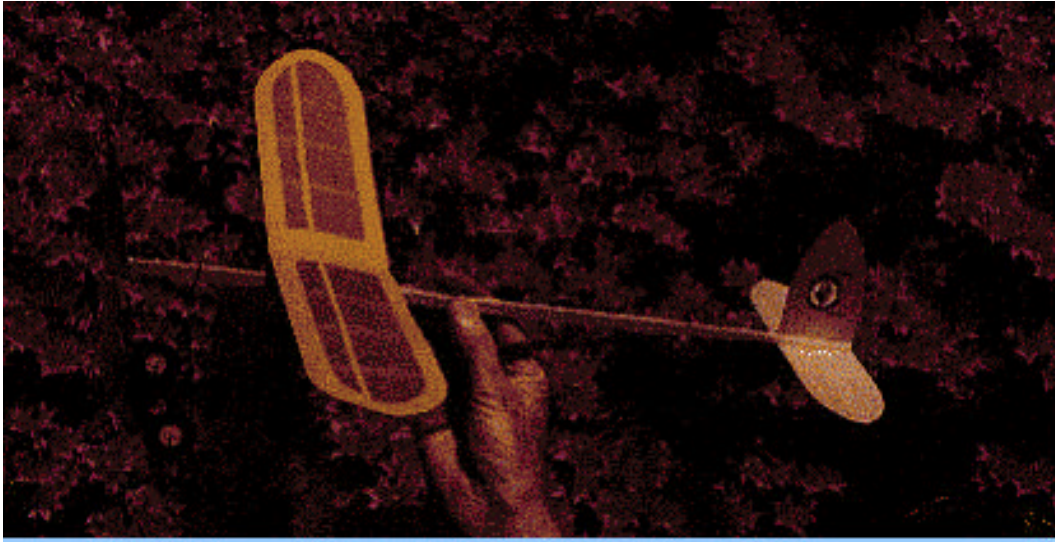


INTRODUCING THE WRAMPAGER™



Here's a versatile model design you can build and fly. It takes a sheet of balsa wood, a hard wood stick, a little tissue paper and white glue to get started. With some add-ons, you can make a dozen different types of model planes.

The Hat in the Ring Youth Aviation Program is glad to bring you this new model design. Like the WRAM Flyer, it can be built to fly in a day. But it's a versatile and more advanced model for the beginning modeler. It's a bit sleeker looking than many of the simple, angular designs intended for beginners, but it is even simpler to build than many of those. It is also so conserving of materials, that it is very inexpensive. We hope it will allow many youngsters all over the world to try modeling because almost anyone able to get the basic materials can build it. In fact, we hope parents, teachers, and other adults will build them too to show kids that a little effort can produce a whole lot of fun.

The plans for the plane are right here on the WRAM page of the Internet. (Guess why we call it the WRAMPAGER™?) You can print them out and get started with the supplies and tools described below.

Please note that we have designed the WRAMPAGER™ mainly to acquaint you with some of the many kinds of planes you can build as a modeler. It is a very basic design, but you can do a lot with it. Once you have tried it we hope you will want to build the beautiful and varied kits available from many suppliers. See our Contributors section for addresses of the outstanding companies that help support the Hat in the Ring program. They have products that can make this hobby a lifetime of fun! You can also learn a lot that is really worth learning!

Supplies. All you need is: 1) a standard sheet of balsa wood which measures 3 inches by 36 inches (we recommend a thickness of 1/16 or 3/32 inch), 2) a 1/8 by 3/8-inch stick of hard balsa wood (basswood or spruce are heavier, but stronger) as straight as possible and 18 to 24 inches long, 3) some tissue paper to cover the wings (even shoebox or giftwrap tissue will do). Stronger, light tissue available in many colors is available as "Japanese tissue" if you have access to it, and 4) glue (beginners can use milk-based white glue--it is very strong and safe, though slow to dry; older modelers might learn to safely use the super-fast glue called CA which dries in seconds).

Tools. A ruler is very helpful and sandpaper will help make the model beautifully smooth. But a good, safe hobby knife is essential to cut the parts. (Ask for help and learn how to use one under the supervision of a responsible adult. Safety is the most important thing to learn for a long and happy life, in modeling and

everything else.) Many prospective modelers will already have these tools at home. With them the basic plane can be built for less than \$2 (U.S.).

WRAMPAGER™ Types. We said we wanted this design to be versatile, and it is! The model can be built in the following different ways:

Using 1/16-inch thick balsa sheet

1) Indoor Glider. Just add modeling clay for weight on the nose of the plane and adjust the wing, moving it back and forth on the fuselage stick for the best glide, before you glue it permanently.

2) Indoor R.O.G. Plane requires adding a 5 to 7-inch propeller assembly, rubber-band, and wheels. It will Rise Off Ground under its own power, as the name implies. Assemblies are readily available from America's Hobby Center, Bruckner Hobbies, Sig and many hobby shops. If you already have a WRAM Flyer, the same propeller assembly can be used.

3) Rubber-Powered Racer. This is a fast-flying variant of the R.O.G., and needs no wheels. The wings are glued toward the rear of the plane and the model is launched from your hand.

4) Indoor Electric. Miniature electric motors are available, along with small rechargeable batteries to power your plane. Ask an experienced modeler about these.

Using 1/16 or 3/32-inch balsa sheet

5) Outdoor R.O.G. Like #2 above, but can use multiple strands of rubber as its motor for greater power. A basswood or spruce stick is recommended for fuselage strength.

6) Outdoor Electric. This variant of model #4 can use up to three 50 mah batteries to power a mini motor. Some modelers are even trying capacitors in place of batteries, but again these require experience and knowledge.

7) CO2 Motor. Small propeller-drive motors are available that are powered by capsules of carbon dioxide gas (the same gas that gives soda drinks their pop). These are practical for the Wrampager, but require some experience. They range in price from \$20 and up.

8) Outdoor Jetex-type motor. These are re-usable rocket motors practical for the model, but also require experience and help from a responsible adult.

9) Radio Control. All the other model types described here are free flight. Electric power or CO2 power, however, will give you enough flight time to make single channel R/C flying practicable with the Wrampager. Here a lot of help from an experienced modeler will be needed to adapt it to simple rudder control. Learn about radio control from magazines and hobby sources. It is an amazing hobby that in advanced planes will allow flight control like that of full-size airplanes.

10) Hand-Launched Glider. This plane is simply tossed into the air as the name indicates. Materials used should be light but sturdy for maximum flight time and durability. A small piece of sandpaper glued to the side of the fuselage will aid in getting a good grip for throwing.

11) Catapult Glider. For this version, fit a small wire hook or a glued wood counterpart under the front end of the body stick. A rubber band sling attached to a short stick provides launch power.

12) Hi-Start Glider. This is a special version of the standard Wrampager. It performs best with a center wing section added as shown on the plans for a sailplane. Like the catapult glider it uses a hook. The hi-start

needed is a long elastic band of about 15 feet (this is available as elastic cord used for sewing if you can't find enough elastic motor rubber) tied to a 30-foot length of kite string to provide power. One end of the hi-start is attached to a nail in the ground of a sizeable field. The plane's hook is attached to a loop in the other end of the line. By stretching out the cord while holding the model, tension builds up. When the model is released from your hand, the glider will climb to substantial height and release itself from the line for a high start on its flight.

Now that you know the possibilities, pick a model type you want and let's get started!

Basic Construction. Keep in mind the accompanying photos of completed planes--it will make building easy. First print out the two plan sheets. The parts page gives you templates for each wing and the horizontal and vertical stabilizers. Each of the standard model wings will require 10 inches of your balsa sheet. You will see that the balsa wood needed for the stabilizers is right there in the wing section you cut out. Using a model knife (again with adult help if you are not experienced), cut the components from the balsa sheet. When you have done this, lightly sand the edges of all parts to remove any roughness and to make the components as attractive as possible. It is usually easier to do this now, before the plane is assembled.

Next, cut the hard wood stick that will make your plane's body or fuselage. You will be gluing the horizontal stabilizer (sometimes called the elevator) to the underside of the stick. See the plan for the way in which you should cut the rear of the stick before gluing on the stabilizer. The vertical stabilizer (sometimes called the rudder) is simply glued to the top of the stick, exactly above the elevator. Keep everything as perfectly aligned as possible. The elevator should be at right angles to the fuselage and the rudder at right angles to the elevator as the glue is drying.

Cut out the ribs for the wings (eight for the standard model, 12 if you are making the sailplane with its added central wing). At the points shown on the plan, glue each rib, at its uppermost back end only, onto the wing's trailing edge. Let the glue dry thoroughly. Then apply glue to the forward end of the rib (working with only one wing section at a time) and bend the wood of the leading edge onto the ribs. It will help to pin down the wing to keep it straight and free of warps as it dries. Warps in the wing can cause flight to be erratic and should be avoided as much as possible.

When the glue is fully dried, add the spar strip to the top of each wing in the position shown on the plan, gluing it in place flush with the wing top. When this is dry, go over each wing with light sanding to remove any excess glue or other roughness.

Next, you will want to prepare the wings for joining. As the plan shows, an angle called dihedral is built into the joined wings. This will make the wing more stable in flight, just as dihedral does in the WRAM Flyer. To prepare the wing, rest the center on a flat surface and raise the wingtip 1 1/2 or 3 inches as shown on the plans for the model type you are building. Sand the center with your sandpaper held around a flat piece of wood that is held exactly vertical as you sand. Continue until the sanding block reaches both front and back of the wing's center. (Incidentally, a piece of sandpaper glued onto a flat stick like a paint stirrer makes an ideal tool for this job. It will be an excellent help to you in future modeling projects, too, so is well worth taking the time to make.)

Now you have a choice. You can cover each wing section with tissue paper now (see below, and note that only the top of the entire wing will be covered) or you can glue the wing sections together and cover them later. The dihedral shown on the plans should be double checked as you glue the wings together to make sure the joints fit snugly and the wingtips are also properly raised.

Sailplane note: After wing sections of the sailplane are joined and dried, glue in a rib at each joint.

Next, you will be adding the pylon at the center of your wing. Position each of the two pylons at opposite sides of your fuselage so that they are flush with the bottom of the fuselage stick and even with each other

side by side. There will now be a gap of 1/8 inch between them (the width of the fuselage) and this must be filled with scrap wood which is glued in place. Take care not to glue the pylon sides to the fuselage yet. Trim the scrap wood you add so that the curved top of the pylon is filled front to back and is smooth across its top. When the glue is dry, leave the completed pylon in place. It now can be glued to the center of your wing's underside. Again make sure that the wing is glued onto the pylon so that the dihedral of the wing is even at both wingtips and the model looks like the sketch shown on the plan.

The tissue covering can be applied using white glue. The glue should be diluted with an equal amount of water. A soda bottle cap will do for the mixing since you will need very little. A small fine-tipped brush will help in applying the glue, which should be applied only to the outer edge of the wing wood itself--not on the tissue. Start by applying a small amount of glue at the wing's center and carefully and gently pull on the tissue so it is smooth across the wing. Continue along each side and glue the tip section in the same way, taking your time to do as smooth an application as possible. When the glue is dry, the tissue can be left as it is. Or, if you have used Japanese tissue, it is possible to shrink it tight for even better appearance. This is done by simply spraying or lightly brushing on some water and letting it dry. There is a potential problem in this in that the wing can warp because wood is sensitive to moisture. One way to minimize warpage is to pin down each wing section onto a board and let the applied water dry thoroughly before you start the next wing section. The tissue covering should be tight and smooth when all is dried.

Balsa wood is a little fragile, as you will have noticed. It is also the strongest practical material for its weight and therefore continues as the most popular model building material. The plane should be handled carefully, however, and when you fly it don't let the family dog retrieve it!

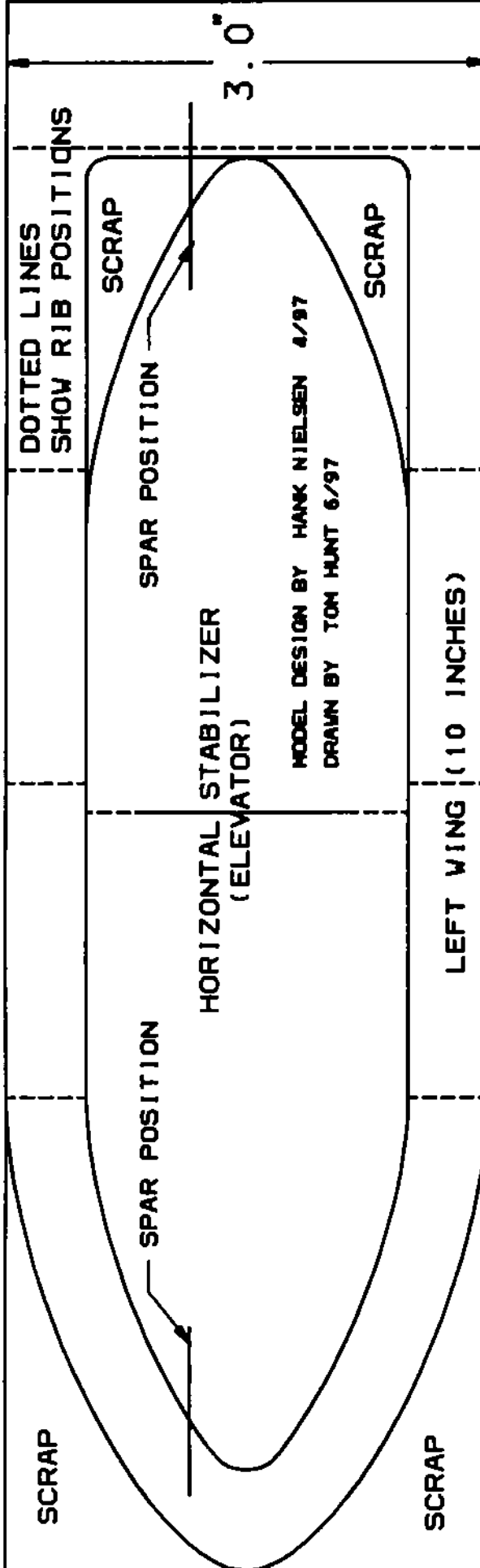
Now lift off the wing from the fuselage. If you have been careful with the pylon glue, it will be easily moved. You will see that the wing can be positioned anywhere along the fuselage. You can now test glide the plane before adding any of the power components you may want to use on it. Simply tape a small weight on the front of the stick. Or, use modeling clay which is handy because it can be added or subtracted to adjust the weight needed. Then slide on your wing to a position about one-third back from the nose. To test glide, go to a safe area free of obstacles and aim the nose at a spot about 25 feet away and about two feet below your hand. Gently throw the plane. If the wing position and weight are right, the plane will glide long and flat and you have created a plane that really flies! If the plane tends to climb too fast and then sink back on its tail, add more weight or move the wing back. If it dives, move the wing forward on the fuselage stick.

You will now be able to add features you may wish from the list above and then make further wing and weight adjustments as needed. When you are satisfied, the pylon wing mount should be glued in place. You can double and cross-grain the wood on the sides for a stronger pylon.

One note about flying. Most free flight planes and gliders, too, are adjusted to fly in circles. This is done by gently bending the rudder in the direction you wish. The plans show a couple of small wires glued to the fin (or rudder) to hold it in the desired position. You may want to add these.

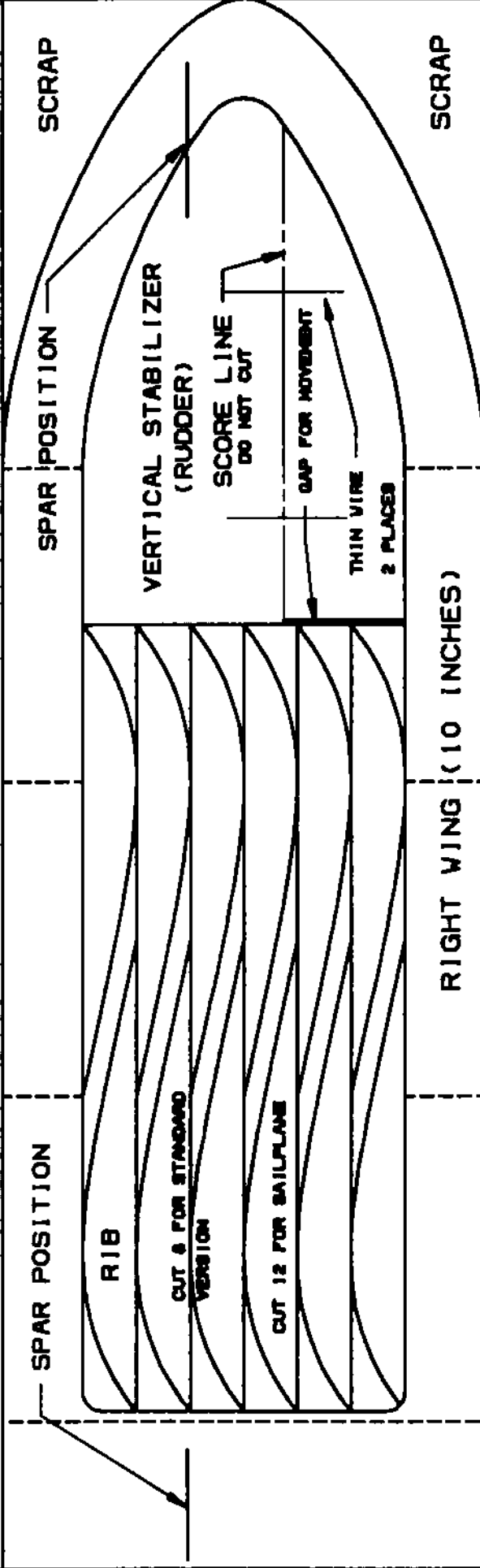
The model design shown is by Hank Nielsen, founder WRAM's Hat in the Ring Youth Aviation Program. Tom Hunt, senior engineer for the former Grumman Aerospace and president of Modelair Tech, one of the program's sponsors, very graciously did the drawings.

Questions. If you have any questions about this model, you can E-mail them to us at the following email address: wramhitr@wram.org. We cannot guarantee answers to every inquiry (we are all unpaid volunteers with other work that sometimes gets in the way). Please let us know how you like the plane. If you send photos, we will try to post some of them on this site--but since we cannot return them, please send only your spare copy. We also will do our best to display them at the annual WRAM Show where they may be seen by thousands of modelers.



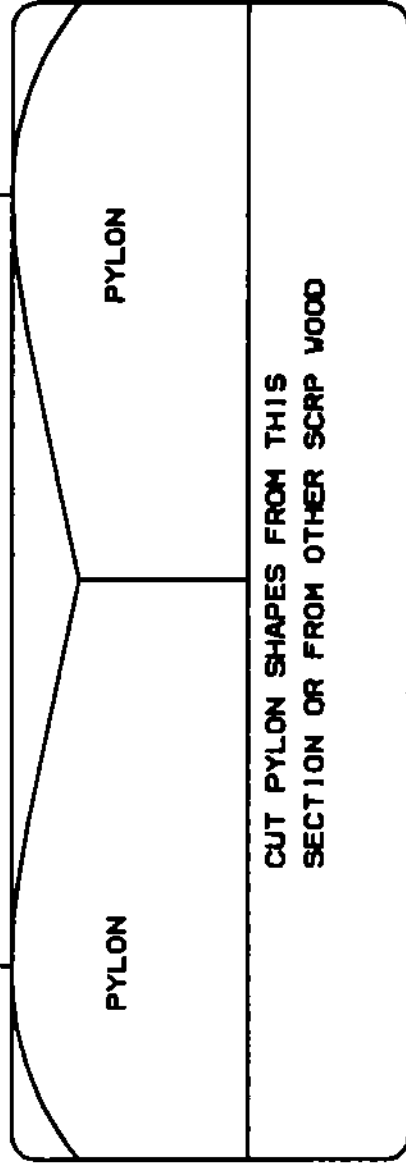
SHT 1 OF 2
PARTS

WRAMPAGER



SHT 2 OF 2
 CONSTRUCTION
 DETAILS AND
 CENTER WING
 FOR SAILPLANE
 (OPTIONAL)

DOTTED LINES
 SHOW RIB POSITIONS



CUT PYLON SHAPES FROM THIS
 SECTION OR FROM OTHER SCRP WOOD

CENTER SECTION (SAILPLANE ONLY)

8 INCHES

SPAR
 POSITION

SPAR
 POSITION

RIGHT WING SPAR

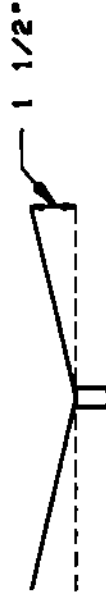
LEFT WING SPAR

CENTER SECTION SPAR (SAILPLANE VERSION ONLY)

CUT THESE SPARS FROM YOUR LAST SECTION OF BALSA SHEET

CENTER SPAR IS ONLY USED ON SAILPLANE WING SECTION ABOVE (SEE INSTRUCTIONS)

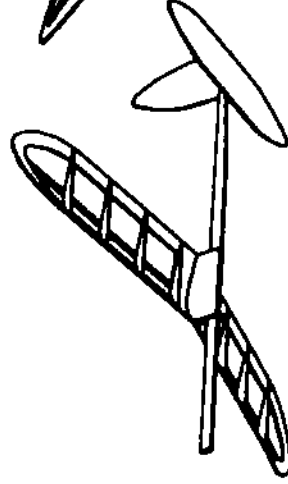
DIHEDRAL DETAIL



STANDARD VERSION



SAILPLANE VERSION



STANDARD VERSION

SAILPLANE VERSION

MOUNT RUDDER HERE

CUT AWAY BOTTOM AS SHOWN

TAIL END OF FUSELAGE STICK

MOUNT ELEVATOR HERE

5.0

MODEL DESIGN BY HANK NIELSEN 4/97
 DRAWN BY TOM HUNT 6/97