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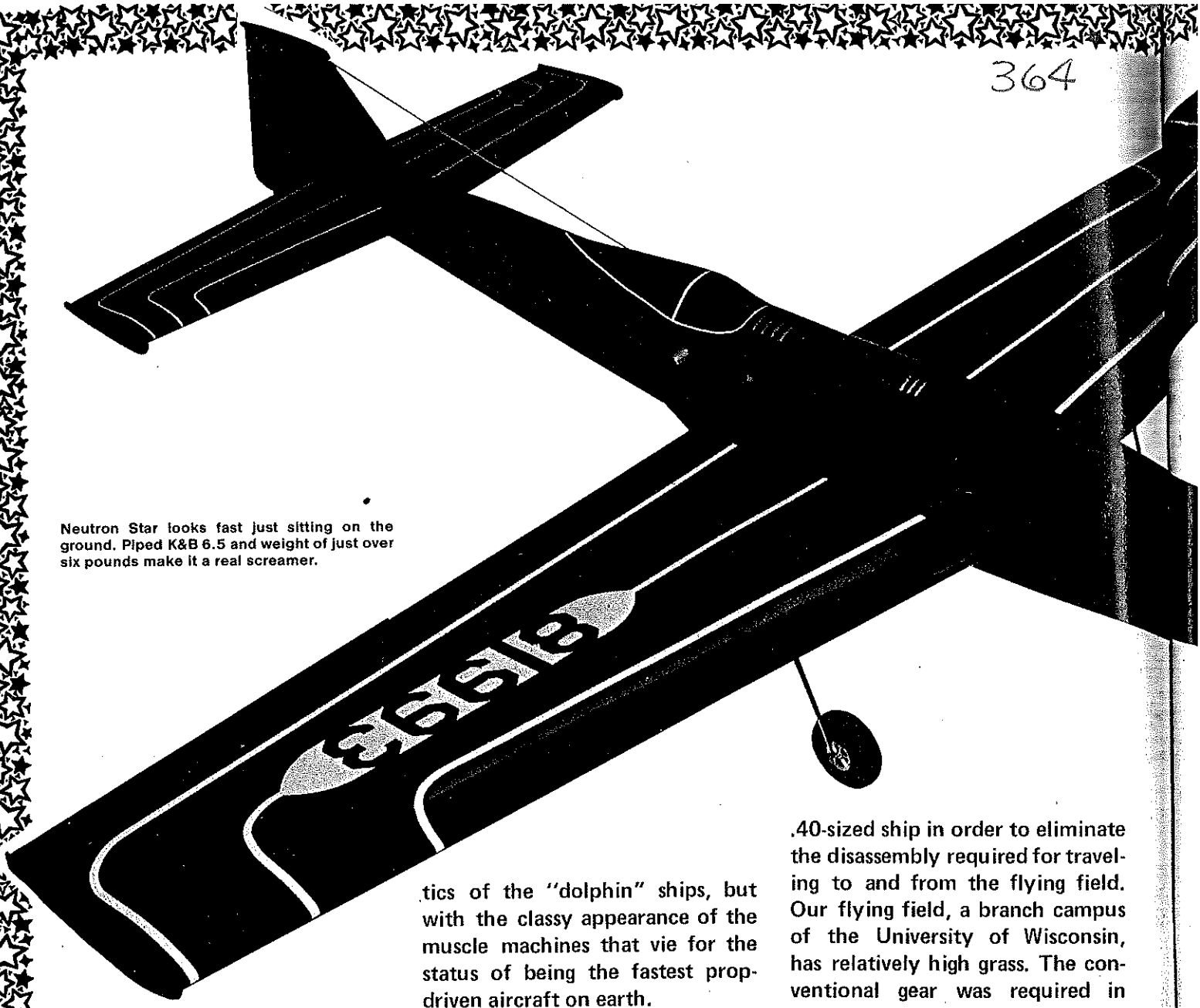


Neutron Star looks fast just sitting on the ground. Piped K&B 6.5 and weight of just over six pounds make it a real screamer.

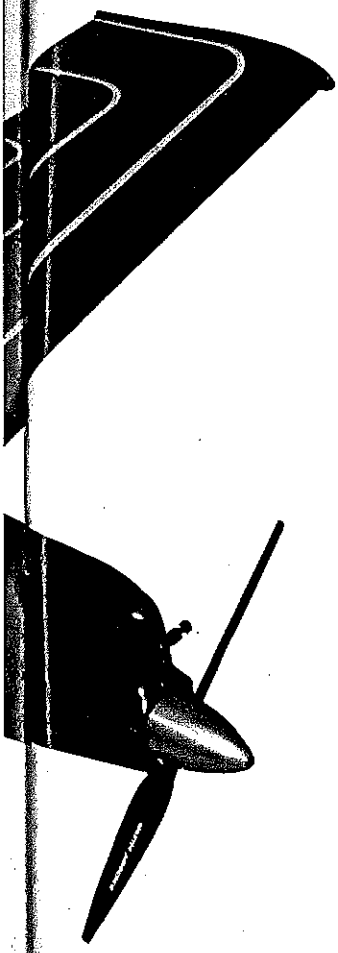
RC Pattern ships all have to look alike, right? Wrong. Here's a truly different-looking aircraft for a .40 engine that is capable of smoothly executing all AMA Pattern maneuvers and still looks unique. If you can fly a low-wing aileron model, this could be the ship that takes you into competition. ■ James Gilgenbach

Neutron Star

ARE YOU GETTING tired of the same old ho-hum Pattern ships that look like obese dolphins? Well, I certainly was. I decided to design a Pattern aircraft which would have the good flying characteristics of the "dolphin" ships, but with the classy appearance of the muscle machines that vie for the status of being the fastest prop-driven aircraft on earth.

The development of the Neutron Star has gone through five stages. The first two designs were .60-powered, with tricycle gear. The latter three were .40-powered, with conventional (tail-dragger) gear. I made the transition to the .40-sized ship in order to eliminate the disassembly required for traveling to and from the flying field. Our flying field, a branch campus of the University of Wisconsin, has relatively high grass. The conventional gear was required in order to take off and land there.

FEATURES. With the above three parameters established (classy appearance, .40-powered, and conventional gear) I then determined the other characteristics which the



craft should possess. These were gleaned from many other designs. The plywood fuselage idea was from the Supercoupe II (MAN, July 1973). The reflex airfoil concept was originally used on the Magnum 40 (RCM, November 1978). The stabilator was based upon the Cerberus (MA, August 1976) and the Shrike (AAM, January 1974) designs.

The remaining design characteristics appear to be my original ideas, but I hesitate to take credit for them. I am sure each one has previously been developed or suggested by some other designer.

To match the hot performance of the latest Pattern ships, a K&B 6.5cc (No. 9130) engine was selected in conjunction with a tuned pipe. The Supertigre X-.45, OS Max .40VF or .46VF would be good alternate choices. A rear-exhaust engine was picked in order to eliminate the unsightly appearance of a tuned pipe dangling out the side. The external pipe also produces a lot of drag. The exhaust is directed out of the side of the fuselage rather than through the canopy (as with most internal-pipe designs) in order to look more like a full-scale aircraft.

The fiberglass cowl is of the pressure type; it directs the air past the engine to optimize cooling, and has two air intakes to direct air through the tuned pipe compartment. A balsa cowl design is also shown for use with a side-exhaust engine. Either cowl is easy to make and looks great. By removing just two screws, you have unobstructed access to the engine and fuel tank.

The conventional landing gear is unique in several ways. First, the retracts are tipped and canted in such a way as to allow the main wheels to be ahead of the wing leading edge when dropped, but behind the leading edge when retracted. This forward position eliminates the tendency to nose over when taking off and landing. Second, the gear positions the aircraft at a six-degree angle of attack, thus easing the takeoff and landing. The plane doesn't exhibit any bad ground handling characteristics; it is a pleasure to taxi, take off, and land. Although the retracts do improve flight performance a fixed gear can be used without hurting too much. Third, the tail wheel design allows removal of the rudder and yet provides a crash-resistant assembly.

Another feature worth mentioning is the wing tip design. This allows a smooth flow of air over the ends of the wing, thereby increasing tip stall resistance and reducing drag. The same type of tip is used on the horizontal and vertical stabs for efficiency, consistency, and appearance.

On all the aircraft I build, I make sure that I have complete access to all the radio components and linkages. The Neutron Star is no exception. The bottom of the aircraft has five hatches to allow easy maintenance.

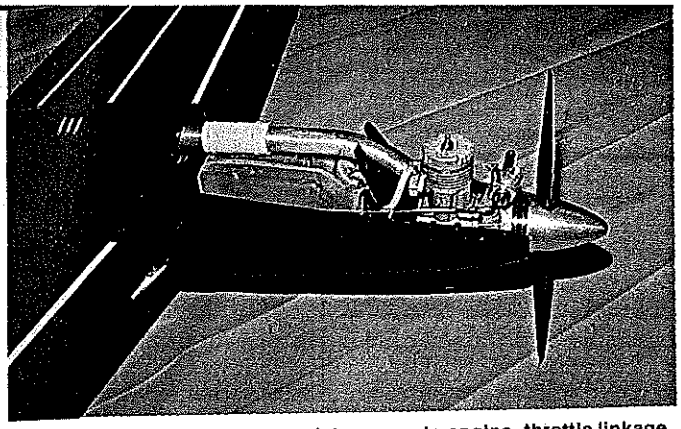
The Neutron Star can be built in the simple version (fixed gear, side-exhaust engine, and balsa cowl) with no more effort required than that needed for a conventional sport plane.

WING CONSTRUCTION. Although the wing core could be cut out of Styrofoam, here are the necessary steps required to build a straight and true built-up wing.

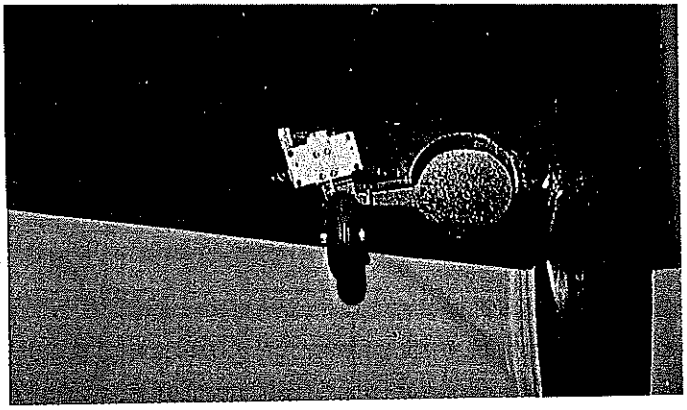
Cut out all of the wing components (except the sheeting) and sand to size. I always order a second set of plans so that I can cut out and sand the various shapes, such as wing ribs, by lightly sticking the plan onto the wood using 3M contact cement. If you use this method, stick and remove the plan to the wood several times to weaken the bond and ensure that the plan will easily come off the part later.

Tape the wing plan to a flat building board and cover with waxed paper. Pin two 1x3x36 balsa fixture blocks (wrapped in waxed paper) onto the plan, aligning the edges to the outside of the fixture alignment lines. Make sure that these balsa blocks are straight and true and that the upper inner edges are sharp and uniform. If the fixture blocks are not flat, it will be necessary to weight or pin them down securely to the building board.

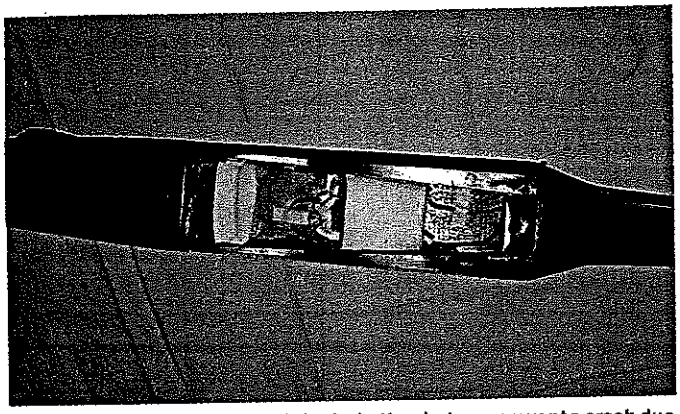
Pin the 3/8 triangular stock leading edge and the 3/8 sq. trailing edge onto the 1x3x36 fixture blocks, spacing them back from



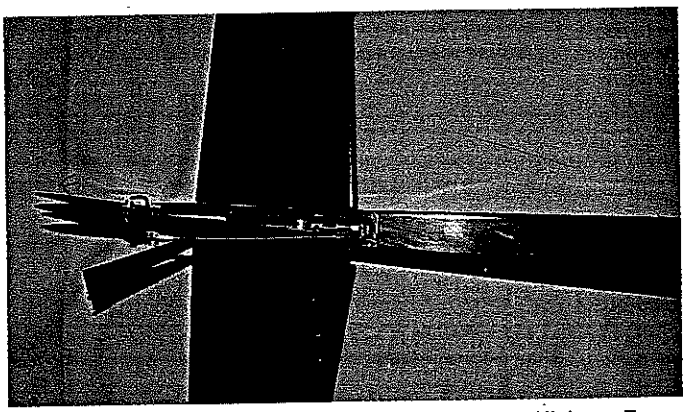
Removing the cowl allows complete access to engine, throttle linkage, tank and tuned pipe. OS 7B carb used on K&B 6.5.



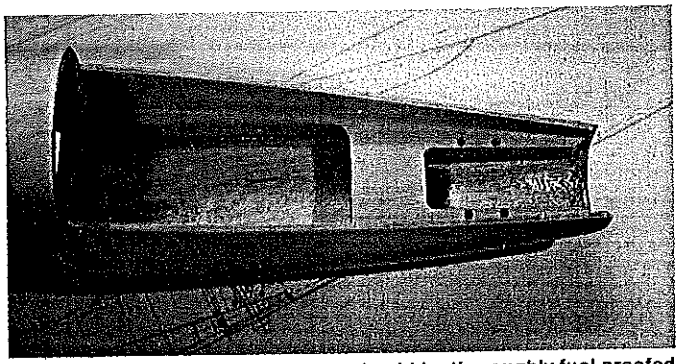
Wheels are positioned ahead of wing leading edge by canting and tipping retracts. This makes takeoff and landing very easy.



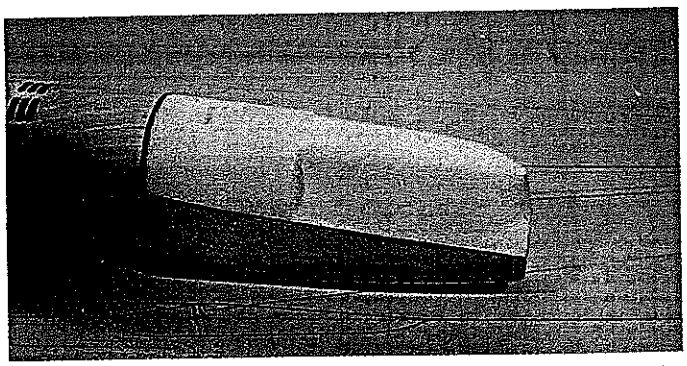
Neat radio installation not only looks better, but can prevent a crash due to vibration. Throttle servo is ahead of battery pack.



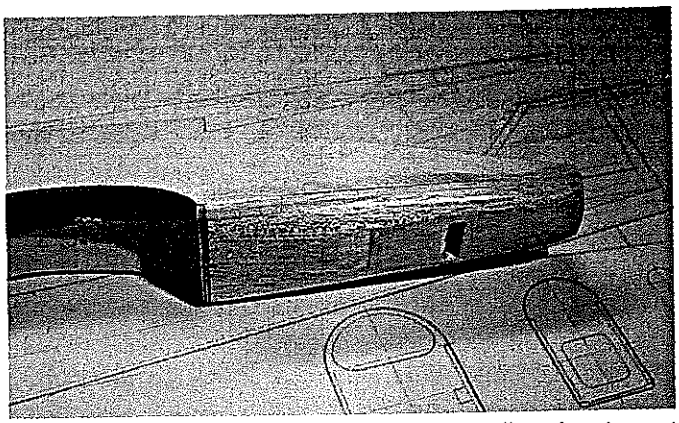
Hatch in sub-fin allows easy access to stabilator torque rod linkage. Two screws hold the hatch; Goldberg Angle Hold-Down works well, too.



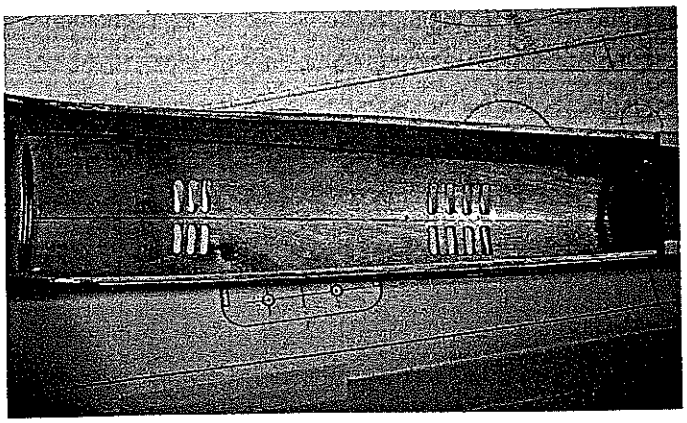
Engine and fuel tank compartment should be thoroughly fuel-proofed with slow-cure epoxy. Blind nuts under wood mount for engine bolts.



If you choose to build the fiberglass cowl, the Styrofoam plug should look like this. The plug must conform to the fuselage sides.



Holes in engine and tank compartment are for cooling of engine and tuned pipe, and help drain oil and gunk.



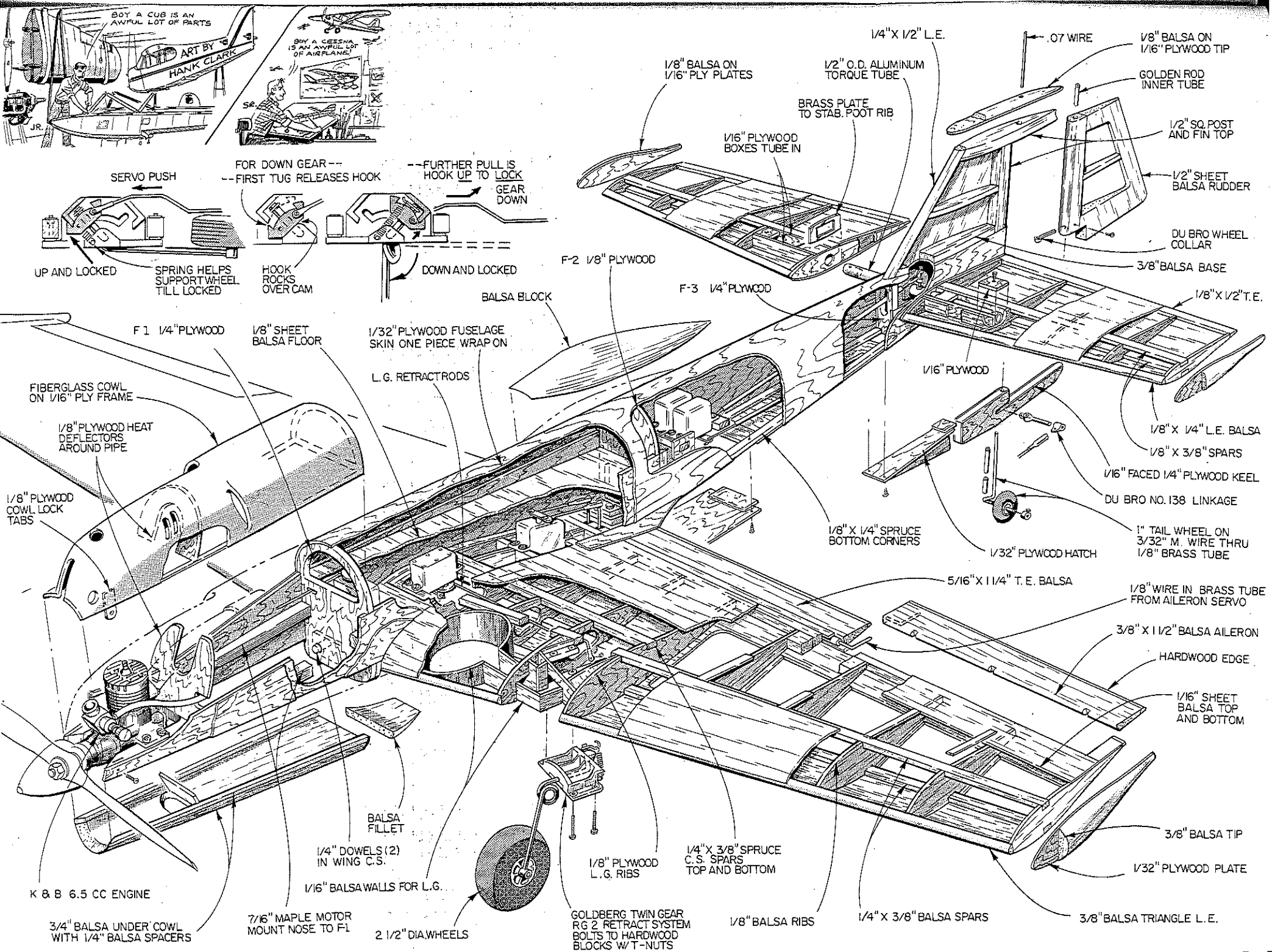
Before enclosing the tuned pipe compartment, it is fuel-proofed with epoxy, and aluminum foil is glued into the top to reflect heat.

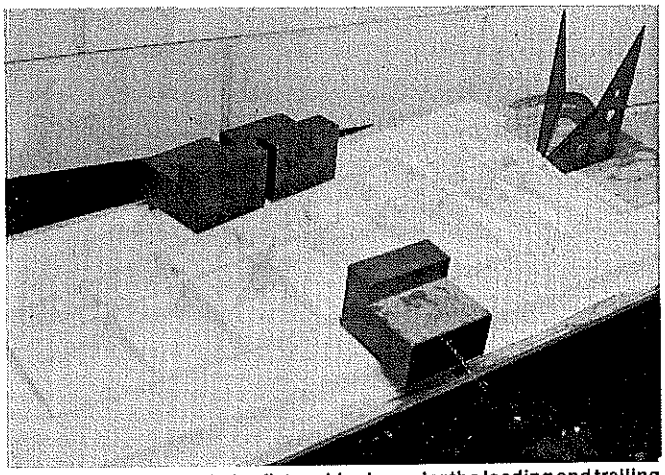
the fixture edge 1/8 in. to match the plan location.

Using a small triangle, position and glue (using Jet or Hot Stuff) all the ribs but W1 to the proper location by aligning the triangle to the plans below. Make sure you determine ahead of time which wing half you are building, and mark it accordingly to avoid a costly error. Remember, you will be building the left wing half top-side-up and the right wing half bottom-side-up.

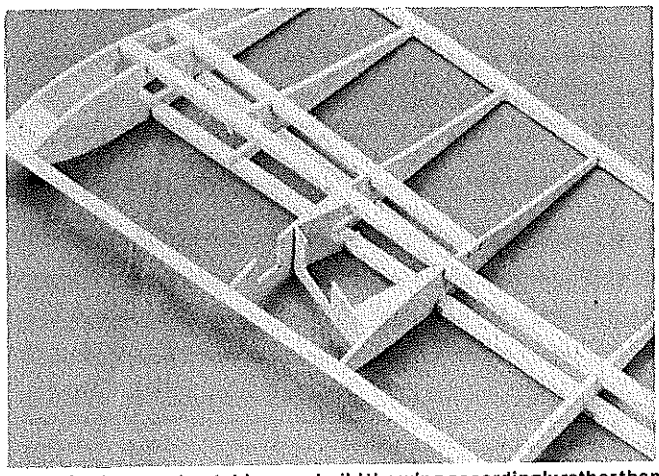
Position W1 at a 1-deg. 45-min. angle off the vertical, and glue it in place. This is done to approximate the dihedral and simplify the joining of the two wing halves later on. An adjustable triangle works great for this step; if you don't have one, just tip W1 back 1/16 in. (at its maximum thickness) off the vertical. Be sure you remember which half you are building so that you tip W1 in the proper direction.

Position and glue the two top spars (the ones facing up) in place. Remove the wing half from

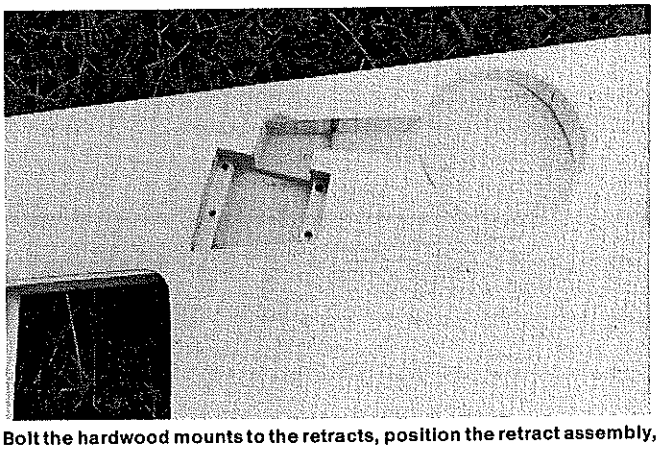

BOY A CUB IS AN AWFUL LOT OF PARTS
ART BY HANK CLARK
JR.
BOY A CESSNA IS AN AWFUL LOT OF AIRPLANE!
SR.
SERVO PUSH
FOR DOWN GEAR--
--FIRST TUG RELEASES HOOK
--FURTHER PULL IS HOOK UP TO LOCK GEAR DOWN
UP AND LOCKED
SPRING HELPS SUPPORT WHEEL TILL LOCKED
HOOK ROCKS OVER CAM
DOWN AND LOCKED
1/8" BALSA ON 1/16" PLY PLATES
1/2" O.D. ALUMINUM TORQUE TUBE
1/4"X 1/2" L.E.
.07 WIRE
1/8" BALSA ON 1/16" PLYWOOD TIP
GOLDEN ROD INNER TUBE
BRASS PLATE TO STAB. POOT RIB
1/16" PLYWOOD BOXES TUBE IN
1/2" SQ. POST AND FIN TOP
1/2" SHEET BALSA RUDDER
DU BRO WHEEL COLLAR
3/8" BALSA BASE
F-2 1/8" PLYWOOD
F-3 1/4" PLYWOOD
1/8"X 1/2"T.E.
BALSA BLOCK
F 1 1/4"PLYWOOD
1/8" SHEET BALSA FLOOR
1/32" PLYWOOD FUSELAGE SKIN ONE PIECE WRAP ON
L.G. RETRACT RODS
1/16" PLYWOOD
FIBERGLASS COWL ON 1/16" PLY FRAME
1/8" PLYWOOD HEAT DEFLECTORS AROUND PIPE
1/8"X 1/4" L.E. BALSA
1/8" X 3/8" SPARS
1/16" FACED 1/4" PLYWOOD KEEL
1/8" PLYWOOD COWL LOCK TABS
DU BRO NO. 138 LINKAGE
1" TAIL WHEEL ON 3/32" M. WIRE THRU 1/8" BRASS TUBE
1/8" X 1/4" SPRUCE BOTTOM CORNERS
1/32" PLYWOOD HATCH
5/16"X 1 1/4" T. E. BALSA
1/8" WIRE IN BRASS TUBE FROM AILERON SERVO
3/8" X 1 1/2" BALSA AILERON
HARDWOOD EDGE
1/16" SHEET BALSA TOP AND BOTTOM
BALSA FILLET
1/4" DOWELS (2) IN WING C.S.
1/8" PLYWOOD L.G. RIBS
1/4"X 3/8" SPRUCE C.S. SPARS TOP AND BOTTOM
3/8" BALSA TIP
1/32" PLYWOOD PLATE
K & B 6.5 CC ENGINE
1/16" BALSA WALLS FOR L.G.
3/4" BALSA UNDER COWL WITH 1/4" BALSA SPACERS
7/16" MAPLE MOTOR MOUNT NOSE TO F1
2 1/2" DIA. WHEELS
GOLDBERG TWIN GEAR RG 2 RETRACT SYSTEM BOLTS TO HARDWOOD BLOCKS W/ T-NUTS
1/8" BALSA RIBS
1/4" X 3/8" BALSA SPARS
3/8" BALSA TRIANGLE L.E.



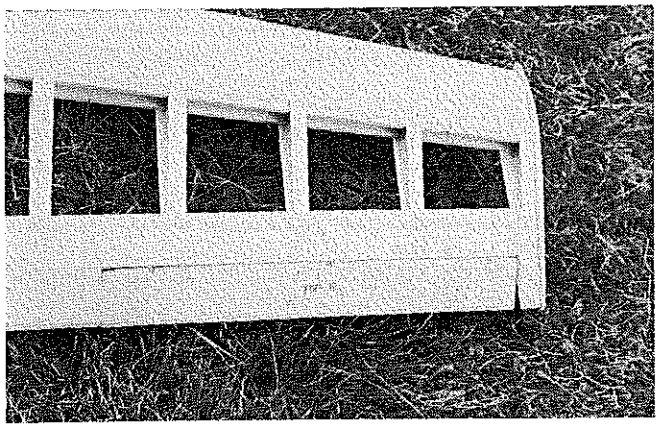
The wing is built using balsa fixture blocks under the leading and trailing edges. An adjustable triangle aligns the center rib W1.



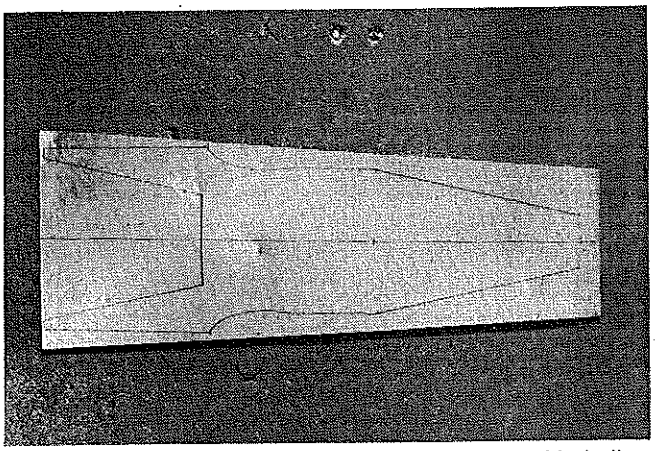
If you plan to use retractable gear, build the wing accordingly rather than trying to modify it after it's built and sheeted.



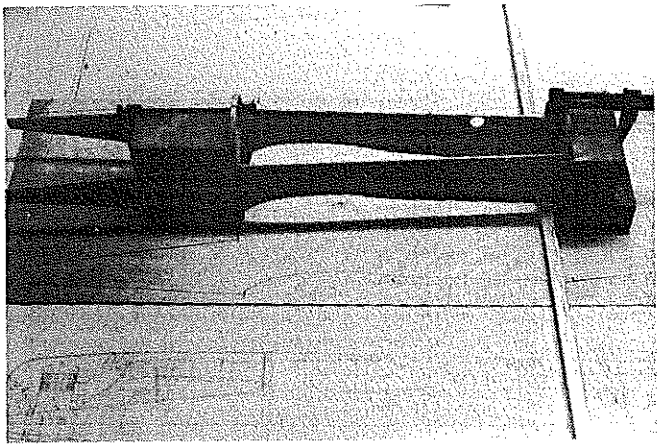
Bolt the hardwood mounts to the retracts, position the retract assembly, spot glue the mounts, and remove the retracts.



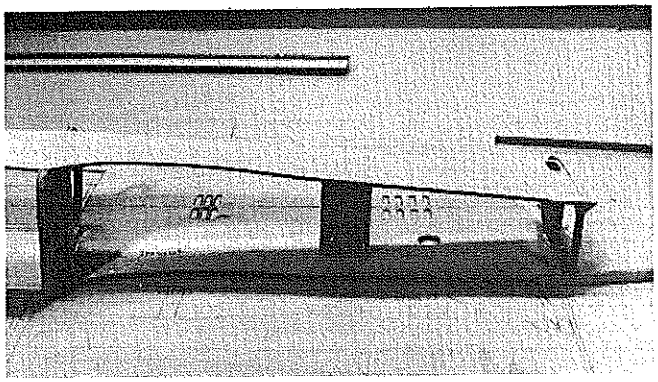
Mark ailerons to avoid getting them mixed up during final assembly. Note the spruce trailing edge.



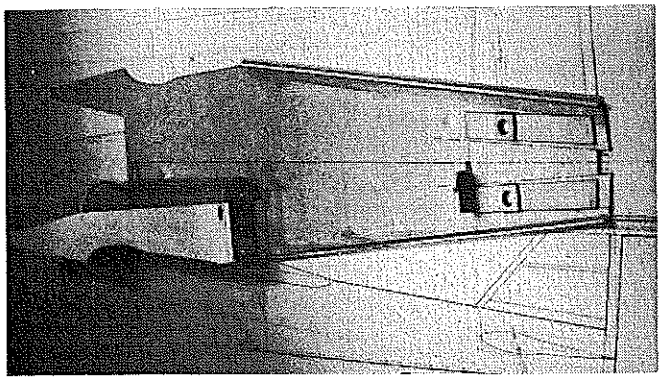
Fuselage skin of 1/32 ply must be marked accurately to avoid misalignment during assembly. Cut with hobby knife and straightedge.



Squaring blocks and ½-in. spacer are used to assemble the fuselage box accurately. Drawing a center line on your building board helps.

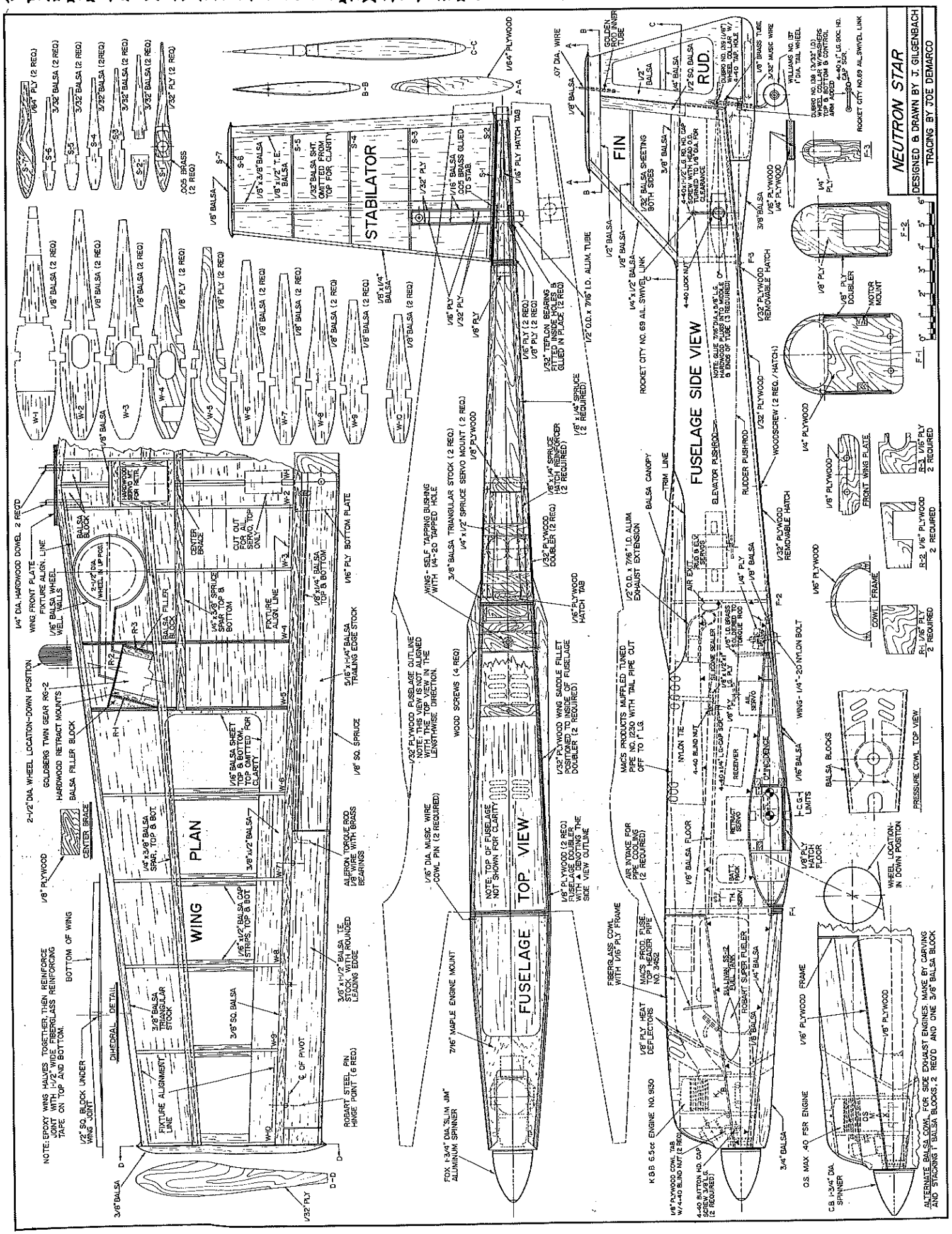


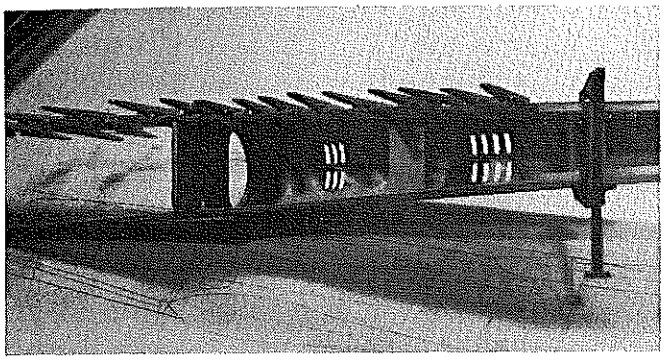
Once the fuselage box is glued, add a temporary balsa reinforcement brace between F1 and F2 to support the sides of the box.



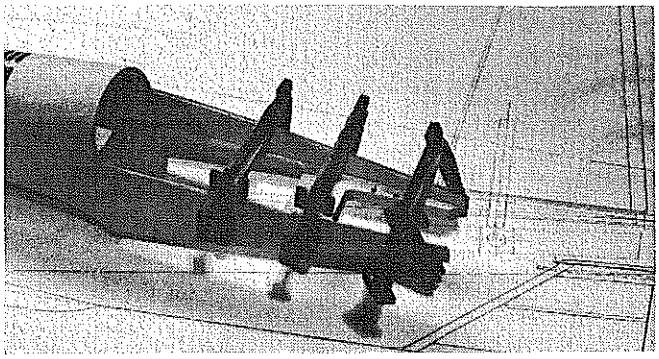
Before gluing the box to the fuselage skin, check alignment by rolling the box from side to side, starting from the center line.

FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 140

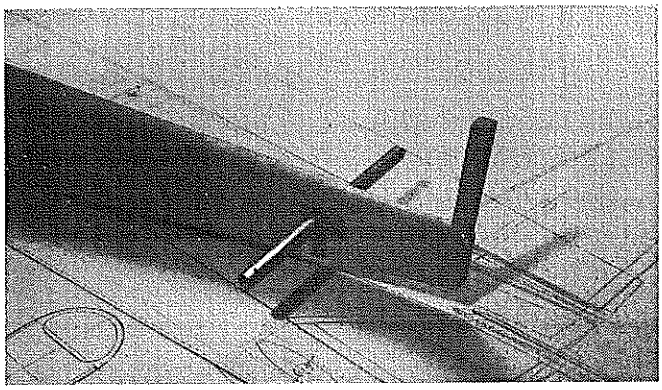




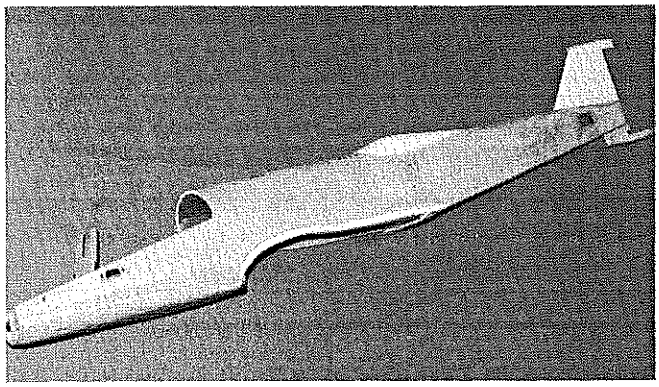
After half the skin is glued to the box, apply glue to other half and roll it into place, holding with clothespins and modelers' clamps.



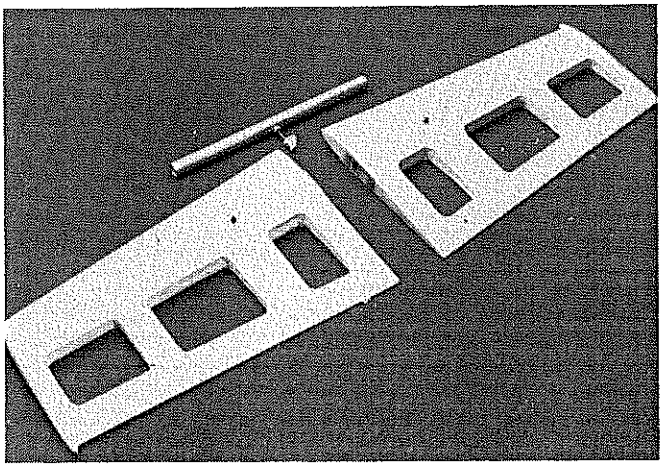
Maple engine mount is positioned parallel to work surface and glued to fuselage sides. Clamp until glue is thoroughly cured.



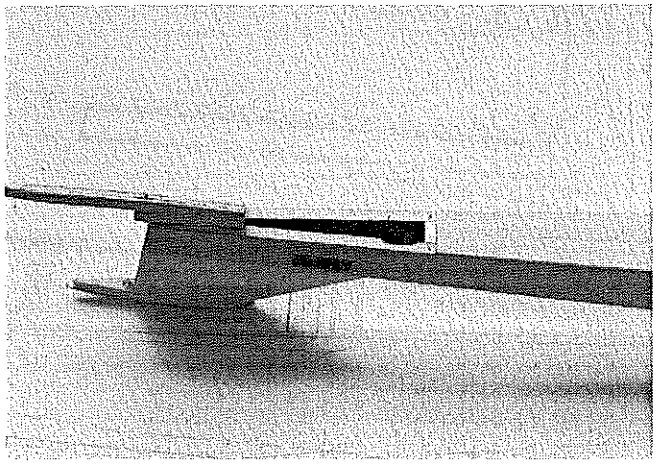
Make sure that the stabilator torque shaft is parallel to the wing saddle and that the shaft rotates smoothly without being loose.



Before doing any painting, all accessories should be installed and checked for smoothness of operation. This saves a lot of trouble later.



Plans show a built-up stabilator, but it could also be made from a foam core sheeted with 1/32-in. balsa.



The plywood sub-fin also serves as a mount for the tail wheel. Part of the sub-fin is an access door for the stabilator linkage.

the fixture, and position and glue the two remaining spars in place. Add the ⅜ x ½ balsa piece between W6 and W7. Add the balsa block for the ¼-in. dia. wing locating dowel.

Cut the torque rods, bushings, and ends to length. Assemble and bend the torque rod assemblies. Put Vaseline on the bearing areas for lubrication.

Assemble the torque rod assembly to the 5/16 x 1¼ trailing edge. Glue the two ⅛ x ¼ balsa and ⅛ sq. spruce strips to this assembly, and sand the top and bottom flat. Prepare the small trailing edge piece at the wing tip for assembly to the wing half.

If retracts are to be used, install R1, R2, and R3 at this time. Reinforce them with the balsa filler blocks. *Do not,* however, install the hardwood retract mounts at this time.

Sand and sheet the wing half. Add the cap strips.

Lay the wing half on the flat portion of the bottom surface with the remainder of the wing hanging off the building board. Position and glue the trailing edge assembly and trailing edge tip to the wing half. Be careful not to glue the torque rod to anything.

Cut out the well portion for the retract. If standard landing gear is to be used, install the typical hardwood block to mount the landing gear strut.

If retracts are to be used, sheet the well area. Install the gear first by bolting the hardwood mounts to the retracts with blind nuts, then positioning the retract assembly into the wing to the location where the unit will function properly. Spot glue the mounts in place with Super Jet and double-check the gear action. Once you are satisfied that the gear operates properly, unbolt the gear from the mounts and permanently Super Jet the mounts in place. Cut out for the retract servo.

The second wing half is completed to the same point.

Add the center brace and epoxy the two wing halves together by placing a ½-in. sq. spacer under the center section, with the wing inverted.

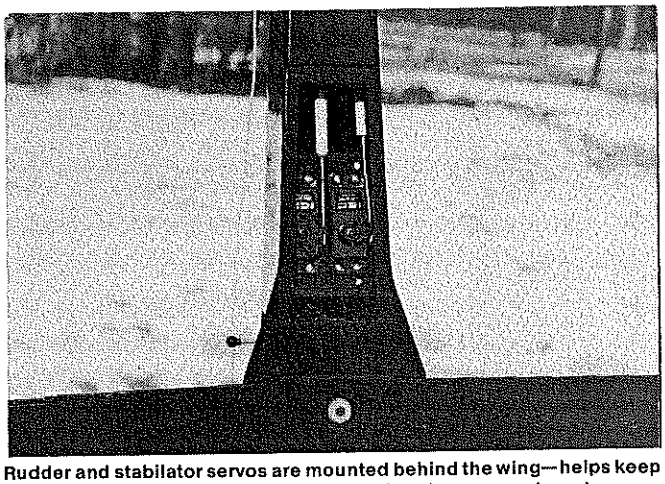
Cut out the top sheeting and W1 ribs for the aileron servo, and add the 1/16 plywood bottom plate. Reinforce the center section with 1½-in. fiberglass tape, and add the center fairing from the back of the wing up to the retract servo cavity. Add the wing tips, the retract servo mounts, and the hatch floor.

Cut out the plywood front wing plate and F1, and drill the two ¼-in. holes in both pieces (stacked to assure proper alignment). Epoxy the wing front plate, dowels, and front wing fairing to the wing.

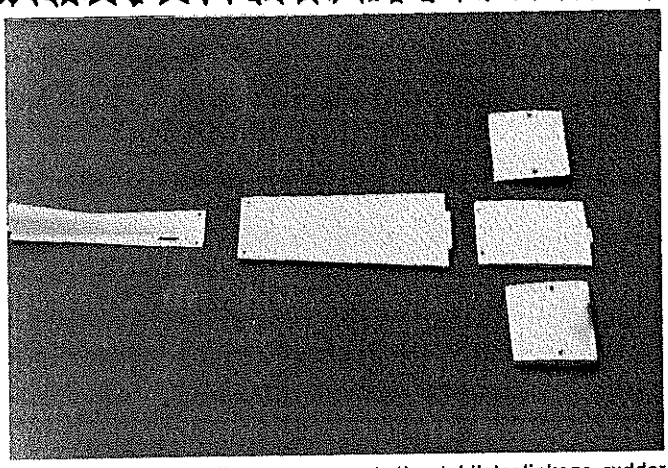
Glue the ⅛ sq. spruce edging to the aileron, and sand it to shape. Fit the ailerons to the wing, but don't install them permanently. Now place the wing in a location where it won't get damaged.

The fuselage consists of a plywood box inside a 1/32-in. plywood outer skin.

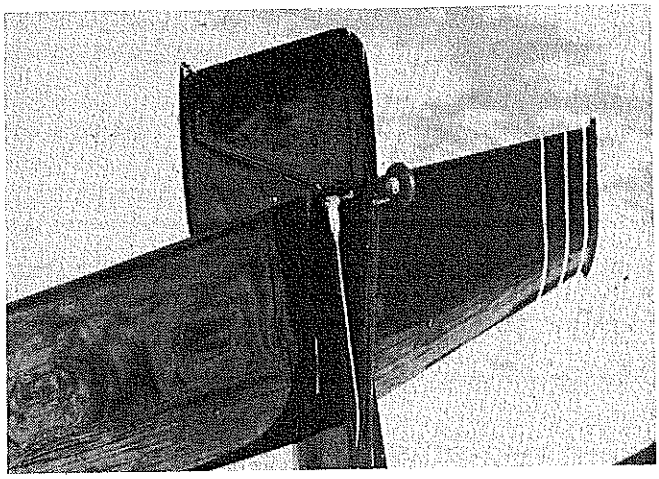
Carefully cut out all of the fuselage compo-



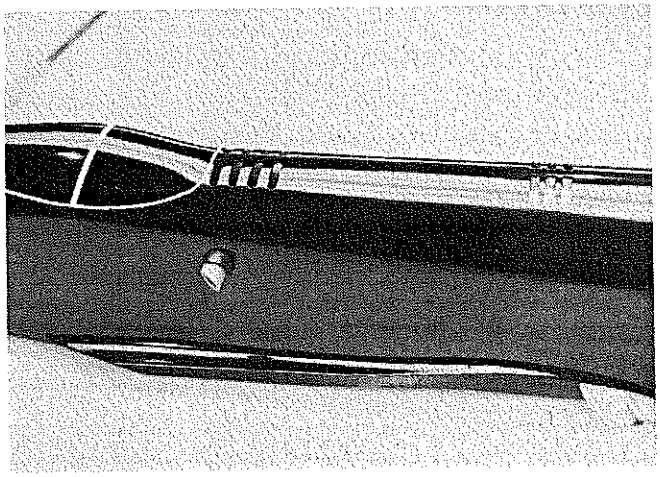
Rudder and stabilator servos are mounted behind the wing—helps keep pushrods rigid and allows enough room for pipe compartment.



Five bottom hatches allow easy access to the stabilator linkage, rudder, stabilator and retract servos, and the retract mechanisms.



The rudder/tail wheel linkage is simple and very rigid. Note the two 4-40 socket head cap screws which hold stabilator halves to the shaft.



Exhaust ducting out the side keeps oil away from the wing saddle joint and helps minimize cleanup. Holes are for cooling.

nents. Make sure that any of the parts which are required in duplicate are as identical as you can make them, especially the two ⅛ plywood doublers.

The maple engine mount can be made with a few simple machine tools. Acquire a small piece of 5/4 (1⅛) maple from the local lumber yard scrap pile. With a table saw, cut off a 7/16-in. piece. Next, on a jig or band saw, cut out the shape.

When cutting out the 1/32 plywood skin, lay out the center line onto both sides as accurately as you can. Lay out the vertical center line on formers F1 and F2 carefully, too.

Assemble the two ⅛ plywood doublers to F1 and F2, forming the fuselage box. Use 5-min. epoxy for this step. To assure proper alignment, set up the assembly on your building board with the former center lines aligned to a straight line on the building board and the former sides perpendicular to the building board center line and top surface. I would suggest using squaring blocks to simplify this procedure. It will be necessary to use a ½-in. spacer under F2.

Once the glue on the fuselage box is set up, add a temporary balsa reinforcement brace halfway between F1 and F2 to support the sides of the box. Next, add the two triangular balsa pieces to the back side of F2 and sand them flush to the sides of the doublers.

Lay the 1/32 plywood fuselage skin flat, and glue on the two ⅛ x ¼ spruce longerons and the doublers for the stabilator. (It should be noted that the photos show the stabilator doublers at a different location than the drawing. Installing these doublers per the drawing will allow much better knife-edge flight.) F3 can also be glued to the doublers and skin at this point. Before gluing F3, check to make sure that it fits properly by rolling it from its home position on one-half of the fuselage to its home position on the other side. If it does not roll perfectly from one position to the other, either sand its radius smaller or glue balsa onto the radius.

Accurately position the box assembly onto the center line of the skin. Roll the box over to one of its home positions on the skin to note the alignment, then roll the box to the other home position and note the alignment. Remove or add material to the radii of F1 and F2 until proper alignment is attained in both home positions. Now epoxy the box to the skin in one of the two home positions by brushing 15-min. epoxy onto one of the box sides and rolling the box into position starting from the skin center line.

After the epoxy has set, remove the fuselage assembly from the building board and wet the outside portion of the skin, which will be bent, with water mixed with ammonia. After the radiused portion is thoroughly soaked, very carefully bend the skin halfway to its final shape. It will not normally bend to its proper form immediately; it wil require rewetting and rebending several times before it will bend all the way without cracking. The important thing here is to be patient and not try to form the skin to its final shape on the first try.

Once you can bend the skin to the final position, brush 15-min. epoxy onto the box side, F1, F2, and F3, then bend the skin to its home position and clamp to the box and formers with clothespins and modeler's clamps. After the skin is clamped, eyeball the straightness of the entire assembly (use the center lines for reference). Make any minor alignment adjustments that are necessary, and epoxy the vertical stabilizer post in place.

After the epoxy has set and the clamps have been removed, place the fuselage onto a flat building surface with F1 directly on the surface and a ½-in. spacer under F2. Clamp and epoxy the maple engine mount to F1 and the fuselage sides, measuring the height from the mount to the building surface to ensure that the mount is parallel with the building surface.

Align the engine to the engine mount, mark and drill the four mounting holes, and install the four 6-32 blind nuts. (Note: It will be necessary to drill out the K&B 9130 engine to accept 6-32 mounting bolts.)

Cut out the balsa floor for the pipe compartment, and glue the plywood pipe mount to it.

Brush Hobbypoxy Formula 2 all around the engine compartment. If a pipe is being used, brush the Hobbypoxy inside the pipe compartment and on the top side of the pipe compartment floor for fuel proofing. Apply aluminum foil to the pipe compartment roof and the top side of the pipe compartment floor with Super Jet.

Test mount the engine and tuned pipe assembly with the pipe compartment floor temporarily positioned in place. When you are sure that everything fits properly, epoxy the pipe compartment floor permanently in place.

Position the stabilator torque shaft through the rear of the fuselage, and insert the two 1/32-in. thick x ¼-in. wide x 1⅝-in. long teflon (or, as a substitute, plastic) bearings into the gaps between the holes and the shaft. Using flat toothpicks between the hole and the bearing, shim the teflon

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you to be extremely cautious when using MEKP. It can still cause blindness if contact with the eye occurs.

This column is being written on New Year's Day but will be read by you in late February or early March. Let us remind RCers that, if they haven't already done so, now would be a good time to have their radios serviced before the contest season is upon us. Maybe it was working OK when you hung it up last year, but maybe it won't work so well today. An ounce of prevention is worth a pound of cure.

Have a safe month.

John Preston, 7012 Elvira Court, Falls Church, VA 22042.

For Fun/Winter

Continued from page 18

with ballast. Raves. DeBolt rotates wing and stab angles to incorporate downthrust you don't see. That works better than ordinary downthrust—don't know why. Hal did that with his first Live Wire in about 1950.

That Air Scout by Concept. We found it fast, groovy, beautifully coordinated. Mike loves it. An Owen Kampen design, it has been taken over from Concept by Ace. The .15 takes a 7-in. diameter prop, but it flies far nicer on an 8-4. A three-channel joy if you've had stick time.

Srull is still flying our Flitecraft Cardinal. Moves out like a Kavalier on ailerons and a .35. So smooth your problems vanish, provided you have gone beyond Primary. We're fascinated by Flitecraft's boxy .29 trainer for three channels. Looks different, high cabin, stumpy. It's a somewhat-Scale of the Polish Wilga. If you have soloed, you'll love this as a step up. Asked a beginner—who was doing well—if we might fly his. You find yourself tooling around on rudder by banking and unbanking as if the rudder was aileron. Would love to have one for fun flying—my speed.

Highly impressed by Airtronics Q-Tee. Until now, we've seen it flown only on TDs with huge thrust offsets, right and down, and guys zooming all over the joint fighting the wind with the crate going like a rocket-kite. So along came a beginner, a young couple. His first crate, never flown. A birthday gift from her. If it flew, he was in for a big Christmas. She was there to judge. If it didn't fly, his Christmas would not be aeronautical. One of our instructors helped put it up. Quite beautiful and a glide that went forever—two 360s over the fence! The happy couple jumped up and down, mad with delight. Things like that get to you.

Bill Winter, 4426 Altura Ct., Fairfax, VA 22030.

Neutron Star/Gilgenbach

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bearings snug to the shaft, while keeping the shaft parallel to the wing saddle. When you are confident that the shaft is aligned properly, Super Jet the bearings to the fuselage, being careful not to stick the bearings to the shaft. A little Vaseline on the shaft will help prevent this. Scrape the inside of the bearings to allow easy rotation of the shaft without excessive play.

Install the bottom of the engine and tank compartments. Cut out the engine cooling passages and fuel proof both compartments with Hobbypoxy Formula 2.

Install the remaining bottom of the fuselage (including the sub-fin), and fit the two hatches.

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Neutron Star/Gilgenbach *(from page 73)*

Make sure the center line of the sub-fin is parallel to the center line of the fuselage.

Install the vertical stabilizer. Build and fit the rudder and tail wheel assembly to the fuselage.

Form and install the canopy. The canopy can easily be fitted to the fuselage by taping 60-grit sandpaper to the fuselage and sanding the balsa canopy block to that shape.

Position the wing on the wing saddle, and check the incidence using the motor mount as a reference. Sand the wing saddle if necessary to obtain 0 deg. incidence. Be sure it is parallel between the stabilator shaft and the wing. Glue the 1/32 plywood fillets to the wing saddle using the wing to hold them in place and assure a tight fit. Put waxed paper between the wing and fillets to avoid gluing the fillets to the wing.

Install the wing hold-down bolt mount into the fuselage. Position the wing squarely on the fuselage (check that the wing tips are equidistant from the sub-fin tip). Drill through the wing into and through the wing hold-down mount with a 17/64-in. drill. Remove the wing, redrill the hole in the mount to 3/8-in. dia., and install the self-tapping bushing.

Form the fuselage wing fillets, vertical stab fillets, canopy fillets, wing tip fillets, and bottom wing fairing fillets using a 3:1 mixture of microballoons and Hobbypoxy Formula 2. Set the fuselage and wing aside to cure.

Cowl. Although the model will fly without a cowl, its performance and appearance are greatly improved by the addition of one. You have a choice of a fiberglass cowl or a balsa cowl.

Fiberglass cowl. Cut a piece of 2-in. thick Styrofoam to 3⅜ x 11, and glue a ½ x 3⅜ x 11 piece of Styrofoam to it (to form a 2½ x 3⅜ x 11 piece). Trim off the back edge for a good fit of the 3⅜ wide surface to the fuselage cowl area. Trace the fuselage outline onto the Styrofoam block.

Place a 1/16 x 3⅜ x 10½ piece of plywood onto the fuselage cowl area, and trace the fuselage outline onto the plywood. Cut out the plywood cowl frame bottom with a 3/16 wall all around, including the ends. (Note: the ends will be trimmed off later.)

Cut out the rear cowl frame, and glue both the bottom and rear cowl frames to the Styrofoam block.

Sand the desired shape using 60-grit dry sandpaper. Remember to form the two air intake scoops if a tuned pipe is going to be used. Sand the entire cowl and frame approximately 1/32-in. smaller on all sides to allow for the added thickness of the fiberglass that must still be applied.

Cut a 1/16-in. 45-deg. chamfer all around the outside of the Styrofoam where it is glued to the frame. Glue the two 1/16 dia. cowl pins to the fuselage. Mix up a 50/50 batch of microballoons and Hobbypoxy Formula 2, and brush it onto the top and sides of the cowl and frame. Cut out two 1-in. wide pieces of 6-oz. fiberglass. Place them over the front of the cowl and over the pipe air intake to reinforce the air intake holes. Cover the remainder of the top and sides of the cowl plug with one large piece of 6-oz. fiberglass. Work out all the air bubbles, and set the cowl aside to cure.

After the epoxy has cured, trim off the excess fiberglass, and rough-sand the structure, being careful not to sand through the fiberglass. Mix up a batch of two parts micro-balloons to one part Hobbypoxy Formula 2, and apply a second coat to the fiberglass areas. When this has cured, cut out the openings, and sand the cowl to its finished size, then dig and scrape out the Styrofoam. Cut out the two 1/16 plywood frame braces on the bottom, front and back.

Install the two cowl hold-down tabs and heat deflector to the cowl. Install the engine, pipe, and the fuselage heat deflector.

Fit and install the balsa blocking inside the cowl to direct the air past the engine. Install the throttle linkage. Make sure there is no interference with the cowl in place.

Apply a 50/50 mixture of microballoons and Hobbypoxy to the inside of the cowl. After curing, check the fit again with the cowl in place.

Balsa cowl. To build a balsa cowl take the following steps:

Cut out two 1 x 3⅜ x 10⅜ and one ⅜ x 3 x 7½ balsa blocks. Trim the back edge of each of the 1-in. thick pieces so that they fit properly to the fuselage cowl area when set on the 3⅜-in. wide side. Without the engine or tank installed, place the first 1-in. thick balsa block onto the fuselage, and trace the fuselage outline onto the block. Shape the outside of the block to match the fuselage.

Cut out and glue the 3/16-in. wide bottom cowl frame and back cowl frame to the first balsa block. Install the ⅛ plywood former behind the engine. Hot Stuff the 1/16 dia. cowl pins to the fuselage.

Install the engine and tank. Cut out the first block to fit over the engine and tank. Position the second and third blocks and do the same. Remember to shape the inside of the cowl in such a way as to allow the air to flow past the engine, as shown in the pressure cowl top view.

Add the cowl hold-down tabs, and glue the three blocks together. Shape and sand the entire cowl to size, allowing clearance for the throttle linkage.

Brush a coat of Hobbypoxy Formula 2 on the inside and outside of the cowl assembly for strength and fuel proofing. Double check to make sure the cowl fits with all the engine and fuel compartment components installed. Refit and recoat with epoxy if necessary.

Stabilator. The two stabilator sections can be built up in much the same way as the wing. Several points need to be mentioned to ensure proper alignment. Do not glue the top and bottom plywood locating plates (where the 4-40 bolts go through) to the stabilator halves. After you have built up the basic framework and before sheeting with 1/32 balsa, mount the stabilator torque shaft to the fuselage, and install the stabilator sections to the shaft with the fuselage resting on a flat building surface.

Bolt the locating plates to the torque shaft, and position the two stabilator halves parallel to the building surface and snug against the teflon bearing surfaces. Make sure the two halves also align with each other, then glue the locating plates in place, being careful not to glue the torque shaft to the stabilator halves.

When the glue is cured, remove the stabilator halves, sheet them with 1/32 balsa, add the tips, and form the fillets using microballoons and epoxy.

Final assembly and checkout. Before you do any sanding, painting or covering, I strongly recommend that you completely install all the components including the radio, engine, and landing gear, and assemble the aircraft. Check to make sure that all the alignments are correct and that all the controls operate properly without interference or binding. Check for any warpage in the wing or stabilator halves. If something does not function correctly or there is some misalignment, correct the problem before proceeding any further. A misaligned aircraft will never fly properly, and a jammed control can easily cause a crash. A little extra effort at this point will pay off in the long run.

Finishing. Although each modeler has his favor-

ite method of finishing a model, I would like to recommend mine. Apply a good epoxy primer to the fuselage, cowl, vertical stab, wing tips, stabilator tips, hatches, and wheel wells, then a paint such as K&B Super Poxy. Cover the wing, stabilator, and rudder with Super MonoKote.

While I am discussing finishes, I would like to clear up the popular myth that a black airplane is difficult to see. Think about it. When you fly your plane (of any color) far away from you, what do you see? You either lose sight of it completely, or you see a black silhouette. The Neutron Star is black to start with; therefore, it has less tendency to blend in with the background. By using a contrasting color on the top, the top and bottom can also easily be distinguished.

Why then are there so few full-sized aircraft painted black? The answer is quite simple: black absorbs heat, causing expansion of certain sections while others remain stable. The result is an out-of-trim aircraft. If the Neutron Star is left out in the sun, it too will go out of trim until it cools down in flight. Just keep the Neutron Star in the shade when not flying.

Trimming and flying. After the plane is finished and assembled, check out all the controls again to ensure that they function properly. The stabilator, contrary to popular belief, is not overly sensitive. As a matter of fact, it is quite gentle. Start out with a travel at the trailing edge of 7/16 in. up and ½ in. down. I accomplished this differential throw by adjusting the servo arm on my Cox/Sanwa servo. An Airtronics servo has the same type of splined output shaft. If you use another type of servo, adjust the centering screw until the proper throw is attained. For spins and snap maneuvers, the travel should be approximately 1 1/16 in. up and 13/16 in. down. I use the

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dual-rate feature on my radio to accomplish both of the above throws.

The ailerons should have a throw of 5/16 in. up and down for a roll rate of three rolls in five seconds. For good spins, the aileron throw should be 7/16 in. up and down. Dual rate allows both throws. Consistent stall turns and spins can be achieved with a rudder throw of 1¼ in. left and right; however, knife-edge flight and four-point rolls require much less.

Check the CG. Normally it is not necessary to add any ballast, but add weight if necessary to stay within the proper CG range.

If you took the normal precautions during the building phase, the gross weight should be under 6½ lb. with retracts and tuned pipe.

The Neutron Star in the simplified verson (with fixed landing gear and a standard muffler) can be built and flown by anyone who has successfully built and flown a low wing aileron aircraft such as a Sig Kougar or Goldberg Skylark 56. It is especially resistant to wing tip stalling, and it has no bad handling characteristics.

With retracts, dual rates, a hot engine, and a muffled tuned pipe, the Neutron Star turns into a real grooving screamer, which can go from horizon to horizon in no time flat while performing all the AMA Expert maneuvers with ease.

Bill of Materials

Balsa: Four 1/32 x 3 x 36, twelve 1/16 x 3 x 36, one 3/32 x 3 x 36, four ⅛ x 3 x 36, one ¼ x 3 x 36, one ⅜ x 3 x 36, one ½ x 3 x 36, one 1 x 3 x 36, three ⅛ x ¼ x 36, two ⅛ x ⅜ x 36, four ¼ x ⅜ x 36, two ⅜ sq. x 36, one ½ sq. x 36, one ⅛ x ½ x 36 T.E. stock, one 5/16 x 1¼ x 36 T.E. stock, one ⅜ x 1½ x 36 T.E. stock, two ⅜ Triangular stock.

Aircraft ply: One 1/64 x 3 x 6, one 1/32 x 12 x 48, one 1/16 x 6 x 12, one ⅛ x 12 x 24, one ¼ x 6 x 12.

Hardwoods: Two ⅛ sq. x 36 spruce, two ⅛ x ¼ x 36 spruce, two ¼ x ⅜ x 36 spruce, one 5/4 (1⅛) x 3½ x 12 maple, one ¼ dia. x 6-in. hardwood dowel.

Hardware: One pr. Goldberg twin-gear RD-2, one pr. Du-Bro #250T wheels, one Williams #137 wheel, two Du-Bro #140 wheel collar, four Du-Bro #138 wheel collar, one Du-Bro #139 wheel collar, two Rocket City #69 aileron swivel link, four Du-Bro #136 6-32 blind nuts, thirteen Du-Bro #135 4-40 blind nuts, two 4-40 x ⅜-in. button-hd. cap screw, one 4-40 x ¼-in. soc.-hd. cap screw, two 4-40 x ½-in. soc.-hd. cap screw, two 4-40 x 1-in. soc.-hd. cap screw, one 4-40 x 1½-in. round-hd. cap screw.

One 4-40 lock nut, one ⅛-in. I.D. x 12-in. brass tubing, one 3/32-in. I.D. x 12-in. brass tubing, one ½-in. O.D. x 7/16-in. I.D. x 12-in. aluminum tubing, one ⅛-in. x 36-in. music wire, one 3/32-in. x 6-in. music wire, one .07-in. x 1¾-in. pushrod wire, two 1/16-in. x ½-in. music wire, one Wing self-tapping bushing, with ¼-20 tapped hole, one Wing ¼-20 nylon bolt, fourteen wood screws, six Robart steel pin hinge point, one Sullivan SS-12 fuel tank, one Robart Super Fueler.

Miscellaneous materials: one 1½-in. Gold-n-Rod inner tubing, one .005-in. x 1-in. x 4-in. brass shim stock, one 1/32-in. x 1-in. x 6-in. Teflon, one 12-in. sq. 6-oz. fiberglass cloth, one Ace 1½-in. fiberglass reinforcing tape.

Electric Champs/Jolly

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There were 22 direct-drive models, 24 gear-drive models, and four Old-Timers entered. Each was given a number and placed in the static judging area. The contestants then viewed the models, made their choices, and recorded them at the registration desk.

The results: Gary Ittner, 1st place direct drive; Larry Jolly, 1st place gear drive; Ross Thomas, first Old-Timer. Gary's model featured a 13% semi-symmetrical section, a glass fuselage, and built-up tail surfaces. Utilizing a Leisure racing system, the all-up weight was 50 oz. Larry entered his 05 version of his F3E Olympian. The model features all-wood construction, wingspan of 87.5 in., wing area of 750 sq. in., Eppler 205 airfoil, and 43 oz. all-up weight. The model used Larry's own design 3-to-1 gear drive and 12¼-8 fiberglass prop. Ross Thomas entered a Leisure 67-in. Playboy. The model is a reduction of the Playboy Sr., which was kitted by Cleveland. His model used a Leisure motor unit coupled to an Astro gear reduction unit, using an 11-7 Rev-Up prop.

Immediately following the judging, Round One began. There were 50 contestants broken down into 20 five-man heats. I'm afraid the weather didn't cooperate for this contest. Santa Ana wind conditions prevailed all day Saturday, damaging many models. Because of the bad winds, the man-on-man system really helped even out the scores. At the end of Round Two, Roland announced the names of the top 24 who would proceed to day two. There was an extra surprise as all 24 of the top finalists received a free Sanyo battery pack valued at $35.

For the top 24, there was much anticipation for Sunday, which dawned as a rare California day; it was cold and overcast with low ceilings. The sky showed a constant threat of rain. The top 24 were broken down into four six-man heats. The two rounds were run smoothly and were uneventful as the weather remained constant. The ships that got high enough to max Saturday continued through Sunday.

By noon the semi-finals were over. It was now up to Mike Harper and Chuck Welman, Pacific RC Soaring Assn. computer operators, to calculate the results. There was much excitement as the mass of contestants gathered around Roland as he announced the top six who had qualified for the last flight.

Mike Charles, Jeff Rebholz, Mike Reagan, Frank Heacox, Frank Chasteler, and Steve Neu would be the final fliers. Field Director Larry Jolly announced that the last flight would launch at 1:00. The field was busy as contestants helped the finalists to prepare their models for the long last flight.

At 1:00 there were six finalists and their timers standing in the middle of the field. The sky was flat gray with overcast, the wind was cold; these were definitely poor soaring conditions. Larry asked each competitor to check his model and timers to clear their watches.

All heads nodded, all six were ready, their models in the launch position over their heads. Larry counted down, 5-4-3-2-1-launch. All models were away. Steve Neu was in trouble as his model suffered some kind of radio failure. The others climbed away into the bleak sky.

Mike Charles and Jeff Rebholz battled it out for the highest climb. At one minute and 25 seconds, Larry began the countdown: "5-4-3-2-1, shut them off! Gentlemen, good luck!"

Mike Charles was high man, maybe 100 feet higher than Jeff Rebholz, who was about the same height over Mike Reagan and Frank Heacox. It was obvious that all modelers were trimmed for minimum sink. All five models were sinking slowly to the ground.

Frank Chasteler was first down, at just over four minutes. Frank Heacox managed six minutes in the flat air conditions. At this point, Jeff and Mike were at the same altitude, Jeff's Olympian having a slightly better minimum sink than Mike's Ultra. Mike Reagan had his Mirage in some questionable air. Charles and Rebholz immediately headed for Reagan's thermal.