



SUNRISE 2540

By BUZZ WALTZ . . . The *Sunrise 2540* is a fundamental, four-channel R/C trainer. If you want versatility in a design, you've found it . . . the *Sunrise 2540* can be flown with anything from a .25 to a .40 cubic inch glow motor, and built with either a flat bottom or semi-symmetrical airfoil.

• My sole purpose in designing the *Sunrise 2540* low wing trainer was that I am a Sunday fun flyer and I like to fly low and slow as well as being able to do basic aerobatic maneuvers when I want to. With the flat bottom airfoil, the *Sunrise* does both of these things well.

Some of the important features in the design of this airplane are that you can use any power selection that you wish from a .25 to a .40 engine (hence the name). However, I designed the airplane around the HB .25 engine. The HB .25 engine provides plenty of power as well as the economy of using a no-nitro engine. As you will see while you are building the wing, it is strong enough to take a .40 engine if you wish to do so.

The fuselage is wide enough to accommodate any radio gear that you might want to install.

Another feature that I have incorporated into the design is the use of a Dural main gear rather than the conventional wire landing gear which is always mounted into the wing. I have always liked the Dural gear and felt it is stronger and much easier to mount floats to at a later date for water flying.

The wing and fuselage are constructed of balsa and plywood. The wood to make this airplane should be readily available from your local hobby shop.

If some of the parts that I have listed in

the hardware section are not available at your hobby shop, have the owner substitute them with parts of another brand and similar quality.

I constructed the airplane using Satellite City Hot Stuff Super "T" and Hot Shot spray. On the firewall and landing gear mount and wing dihedral braces I used five-minute epoxy.

For your convenience, I have included a list of balsa and plywood materials that you will need to finish your *Sunrise 2540*. You might want to look it over after you have read the building instructions.

WING CONSTRUCTION

The wing construction is very simple, and you can build both wing panels on the plans at the same time. As the wing has a flat bottom airfoil, there is no need for a special wing jig, thus building time is much shorter. You will need a building surface such as a flat table or workbench and a Celotex ceiling panel (for sticking pins into) for the top of the table.

The first step in building the wings is to cut out the wing ribs. Using three sheets of 3/32 x 3 x 36-inch balsa sheet, cut out 20 ribs. I do this by first making a master rib out of some scrap 1/8 ply that I have laying around the shop. I cut out the rib pattern from the plan, and I glue it to the 1/8 ply using 3M spray cement. Then, I cut out the rib and the various notches with my Dremel jig saw. Now that I have

made a master rib, I lay the master on my sheet of 3/32 balsa and cut out each rib using an Uber Skiver knife with a No. 11 blade.

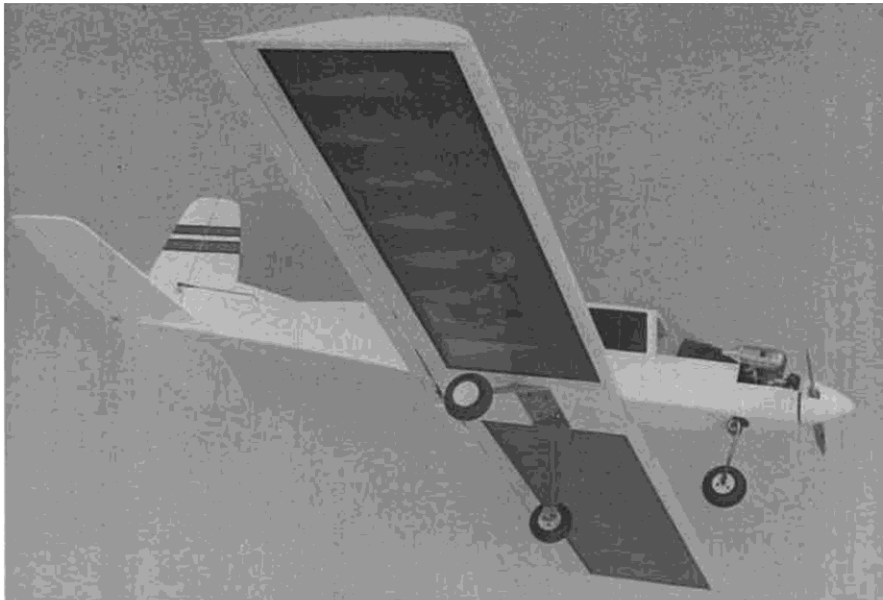
Take two pieces of wax paper and put them over the plans. This protects the plans and prevents the parts from sticking to both the plans and the building surface after they have been glued together.

As I have previously mentioned, both wing panels may be built on the plans at the same time.

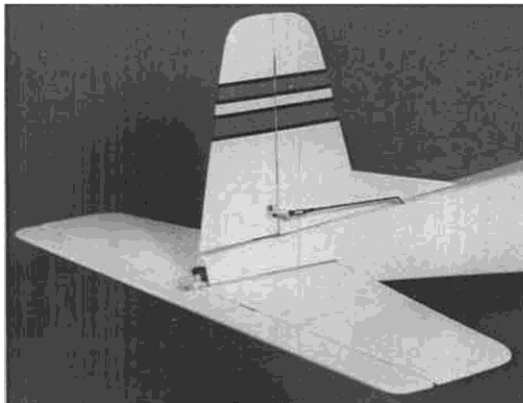
Take your 1/16 x 3-inch sheet material and cut two sheets exactly in half lengthwise to give you four pieces 1/16 x 1-1/2 x 36. This is your top and bottom trailing edge material. You are now ready to start building the wing.

Pin the 1/16 x 1-1/2 x 36 trailing edge piece in place on the plans. With a pencil, draw a line 3/16 of an inch from the aft edge of this sheet along the edge. This is a guide line for gluing on the 1/4 x 1 tapered trailing edge piece. See plans for detail.

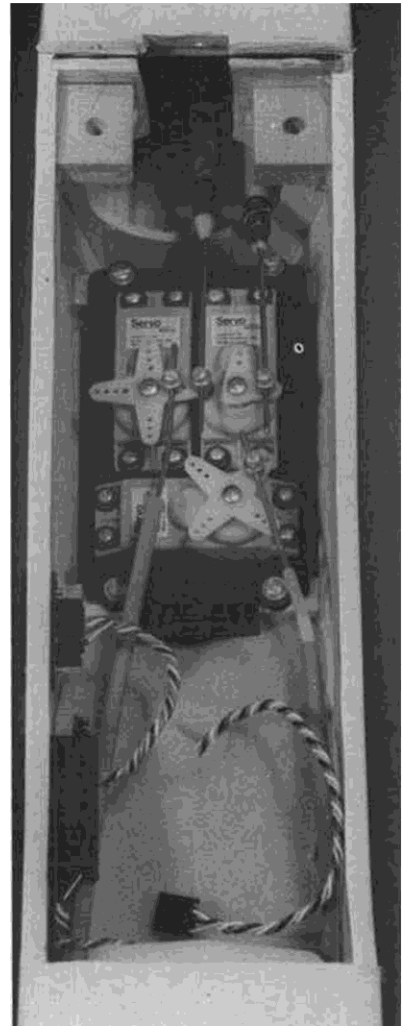
Using a wing rib as a gauge, butt the back of the rib up to the trailing edge piece and pin the bottom leading edge piece into place. Again using the rib as a gauge, glue into place the top leading edge piece (3/8 x 3/4) making sure that the 3/4-inch side is in the upright position. See plans for detail.



ABOVE: Bottom view of the *Sunrise 2540* reveals its clean lines, simple structure.



LEFT: Empennage details. Elevator and rudder are made from 3/16 sheet balsa, and are designed to swing free of each other. Note elevator pushrod exit is fuselage rear.



RIGHT: Servo installation details. Note wing hold down blocks.

Now cut and glue into place the 1/16 x 1/4 balsa cap strips. Also at this time, cut and glue into place the 1/16 balsa center section sheeting. This is made from a 1/16 x 3-inch sheet. Make sure that these pieces are cut cross-grain.

Now glue the bottom wing spar (1/4 x 1/2) into place along with the ribs. Glue in all ribs except the center two. These are glued into place *after* the wings are joined together and the dihedral braces are epoxied into place.

Using a piece of 3/16 x 3-inch balsa

sheet, cut cross-grain your shear webs that go between the top and bottom spars. A good way to determine the height of the shear webs is to use one of the ribs as a gauge. Now glue in the shear webs. When the shear webs have dried, glue in the top spar (1/4 x 1/4).

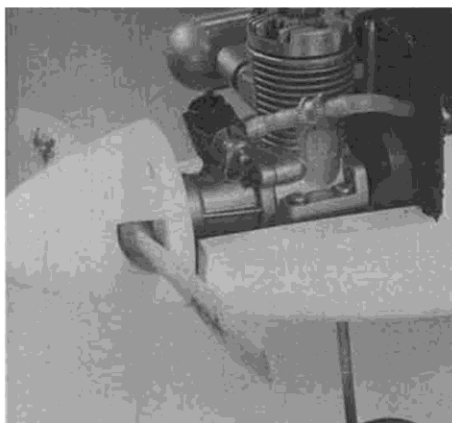
Trim any excess wood from the tips of the wing and cut your two wing tip blocks from a piece of 1/2 x 3-inch balsa sheet and glue them into place.

While everything is drying, this would be a good time to cut your two 1/16 ply

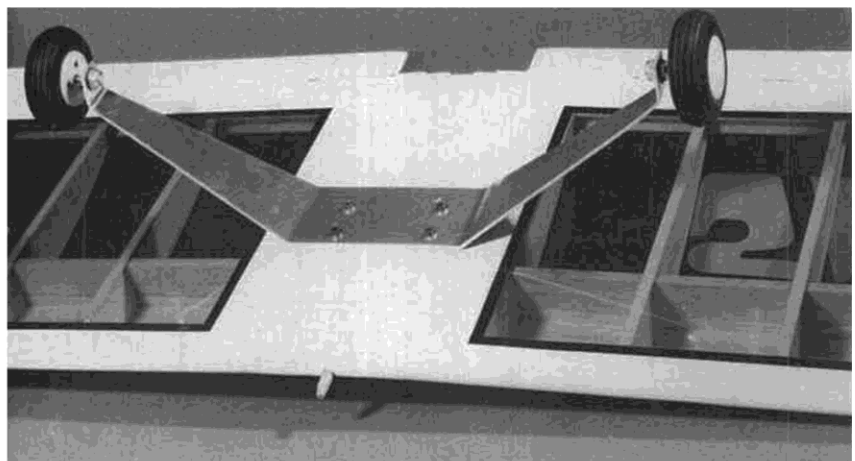
dihedral braces.

Your next step will be to join the wings together. Remove both wing panels from the plans, then trial fit the two centers together to determine how much sanding will be needed to have the pieces fit flush with each other. This is done at this time. After the two pieces fit perfectly flush, block up each tip 1-3/4 inches and sand the centers again so that they fit perfectly flush and

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The H.B. .25 engine provides plenty of power for the *Sunrise*. A 9-5 Zinger prop was used on author's plane.



Dural landing gear is used for easy conversion to floats. Plenty of beefy shear webbing used.

straight with each other. Now the wings are ready to join together.

Pin one wing section to the building board, being sure to have some paper underneath so that you do not glue the wing to the plane. Mix up some five-minute epoxy and apply it to the other section. Butt the two sections together making sure that this section is also blocked up the same distance as the other. With the two wings together, you can now epoxy the 1/16 ply dihedral braces in place, as shown on the plans. Trim the center ribs to fit, and epoxy in. Let the wing dry at this time, but do not remove it from the building board. When everything is dry, you can glue on the top trailing edge (1/16 x 1-1/2). You can also glue on the top leading edge sheeting as shown.

Now, remove the wing from the plans, and turn it over so that you can mount the 3/16 x 3-1/2 x 3 ply landing gear mount onto the bottom of the center section of the wing. Make your piece from a 3/16 plywood sheet. Cut out a hole the size of the gear mount in the bottom of the center section. Location is shown on the plans. Insert the mount but do not epoxy at this time. Turn the wing over and block up both tips. This makes sure that the gear mount is level and flush with the building board. Now epoxy the mount into place. Cut a piece of 1/8 x 1/2 balsa stick, trim to fit and epoxy into place in back of the gear mount as shown on the detail. At this time you can cut and epoxy in place the 3/8 triangle braces as shown in the gear mount detail.

After all is dry, remove the wing from the board, and turn it over so that you can mount the Dural gear. Drill four holes in the gear and plywood mount. Using 4-40 bolts and blind nuts, install the gear at this time. This has to be done before the top wing center section sheeting can be glued into place.

After the gear is installed, remove and finish the sheeting on the top of the wing. Cut and install the top cap strips. The wing is now ready for shaping and sanding. Be sure to shape the leading edge as shown on the plans.

After you have sanded the wing to shape, you can now fiberglass the center section on both the top and bottom. For this I used two-ounce fiberglass, four inches wide. I recommend using the Sig finishing resin to glass with, for it is easier to sand after it has dried. Be sure to glass both sides of the wing.

At this time you can make and fit the ailerons, but do not glue in the hinges. This is done after the wing and ailerons are covered. Make the ailerons out of two pieces of 3/16 x 1-inch balsa. Take the aileron horns and fit them into the wing as shown. Leave a space of about an inch between the two horns at the center of the wing.

Next, take the aileron material and drill a 1/8 hole in the edge of the material for horn attachment as shown

on the plan. Cut slots in trailing edge of the wing and the leading edge of the aileron material at the locations shown. Install the ailerons and sand off the end flush with wing tip. Again, **DO NOT GLUE IN PLACE.**

Remove ailerons and finish sanding, then cover the wing and ailerons. I finished the model with Super Monokote.

Now that we have built the wing, let's move on to the fuselage. . .

FUSELAGE CONSTRUCTION

To make the fuselage sides you will need five pieces of 3/32 x 3 x 36-inch balsa sheets. Using the plan as a template, cut out two each of the top halves, bottom halves, and wing saddle doublers. Glue the top and bottom halves together as shown. Make sure that the top half is exactly 4-1/8 inches back from the bottom half. See plans.

You can now cut the tank compartment and cabin doubler pieces. These pieces are made from 1/8 balsa sheet stock. Also at this time, cut all the plywood and balsa bulkheads using the patterns supplied on the plans. Make sure that you drill a 1/4-inch hole in bulkhead "B" as shown on the plan for wing hold down dowel. When gluing in the fuselage doublers, make sure that you build one left and one right fuselage side. Glue in all the tank compartment and cabin doublers, as shown on the plans. Be sure that you leave a 1/8-inch gap between the tank compartment doubler (B-1) and the wing saddle doubler and cabin doubler for bulkhead "B". Next, glue in bulkheads "B" and "C" to one fuselage side. Only glue the bottom part, not the top angled part, this is glued later. Use a square to make sure that the bulkheads are 90 degrees to the fuselage half. After the bulkheads have dried, join the other side. Use the top view of the fuselage on the plans and cut out the tank floor from 1/16 sheet balsa and glue into place between doubler B-1 and B-2. You can now epoxy the 1/4-inch plywood firewall into place making sure that it is square with the sides of the fuselage and that you have angled it down approximately two degrees for proper down thrust.

Using your motor mount and the plans, drill all the necessary holes for the mount, throttle cable and steering cable. Mount the motor mount with 4-40 bolts and blind nuts. Apply a small amount of epoxy around the edges of the blind nuts so that they will remain in place when you remove the mount. Cut out bulkheads A-1 and A-2 from 3/16 sheet stock. Drill holes in A-1 for fuel lines and cut out the bottom of A-2 for the shape of the fuel tank. Install the fuel lines and tank at this time. Glue into place as shown on the plan bulkheads A-1 and A-2, with A-2 angled slightly forward as shown.

From the 1-2-inch balsa material left over from the wing tip blocks, cut the two side cowl pieces and glue into place.

At this time, install the nose gear and the control cable. Some trimming of the steering arm and the side cowl block will

be necessary for proper fit and clearance.

Turn the fuselage over on its top, and using 3/16 balsa, sheet the front half of the fuselage making sure that the sheeting is cut cross-grain. Cut out the hole for the front nose gear and sheet the bottom of the engine compartment. Also, glue in the 1/2-inch triangle pieces as shown in the plans. This will enable you to later round off the front of the fuselage to match the spinner, giving the plane a more streamlined look.

Turn the fuselage back over on the bottom. You can now glue in the bulkheads "D" and "E". Again, only glue the bottom half, not the angled part. After everything is dried, start at bulkhead "C", apply glue to all the angled sides of the bulkheads and slowly bend in the fuselage sides to the bulkheads. Add some moisture to the outside of the fuselage as this softens the balsa and allows it to bend more easily. This is where Hot Stuff Super "T" really helps, because you do not have to hold down the sides very long.

You can now glue in the 1/4 x 1/4 balsa stringers along the top of the fuselage between the bulkheads all the way back to the tail. Be sure to glue these a little bit higher than the fuselage sides. See detail on the plans (bulkhead "B"). When sanded, a flat gluing surface can be made for the 3/32 sheeting. Cut and glue in the 1/4 x 1/4 balsa cross braces in the cabin top as shown. Also, glue in the 3/4 x 1-inch windshield block. Do not shape at this time. Trim the 1/4 x 1/4 balsa stringers attached to the fuselage at the back so that they fit together evenly and glue. Do not glue the bottom pieces together at this time. They are joined after the horizontal stabilizer is glued into place.

Starting at the top of the fuselage, at the windshield block, sheet cross-grain with 3/32 balsa to the rear of the fuselage. Stop here and make the horizontal stabilizer.

STABILIZER CONSTRUCTION

Use the plans as templates and make two front pieces and one back piece from 3/16 x 3-inch balsa sheet. Glue the three pieces together and sand smooth. Cut hinge slots in the locations shown. Slide the horizontal stabilizer into place in the slot in the rear of the fuselage, and place the wing in the wing saddle. Make sure that both wing and stabilizer are parallel to each other. If not, trim either wing saddle or stabilizer slot so that they are. We recommend that you trim the stabilizer slot.

Once they are aligned with each other, you can now cover the horizontal stabilizer leaving bare the parts inside the fuselage so that the epoxy will adhere to it. Epoxy the stabilizer into place and bring the bottom rear fuselage pieces together. Pin these until the epoxy has hardened. Again, make sure that the stabilizer is parallel to the wing. Adjust as necessary. If you like, the stabilizer can be braced with some scrap 1/4 x 1/4 balsa sticks.

Once this has dried, you can sheet cross-grain the bottom rear of the fuselage with 3/32 balsa as you did the top. After all has dried, trim the 3/32 balsa sheeting top and bottom flush with the fuselage sides. Sand the fuselage sides, top, and nose to shape. Finish sanding for covering.

At this time, install the wing hold down blocks as shown, as well as the triangle stock gussets on top of the blocks as shown in the detail on the plans.

ELEVATOR CONSTRUCTION

Cut from a piece of 3/16 x 2 x 36-inch balsa one elevator strip 1-1/4 x 21 inches as shown on plans. Round the edges and cut the slots for the hinges in the locations shown on the plans so that they match those you have already cut for the horizontal stabilizer. Cover the elevator and set it aside.

FIN AND RUDDER CONSTRUCTION

From the remaining pieces left over from the horizontal stabilizer construction, cut out the two vertical tail pieces. Cut the hinge slots as shown and sand to shape, rounding the edges. Trial fit the pieces together using the hinges, and finish sanding. Note the gap between the rudder and the fuselage for movement clearance. Separate the rudder from the fin and cover both. After covering, you can permanently hinge these pieces together. Be sure to use epoxy on the hinges.

FINISHING THE MODEL

Place the wing on the wing saddle and locate the hole for the front 1/4-inch wing hold down dowel. Drill a 1/4-inch hole and epoxy the dowel in place. Use details on the plans for references.

Cover the fuselage and the ailerons and hinge the ailerons to the wing. Be sure to use epoxy when installing the hinges. I also recommend that on all control surfaces that you drill a 1/16 hole through each hinge and pin with a toothpick using some Hot Stuff as the adhesive. This should be done on the ailerons, rudder and elevator.

Locate the holes for the landing gear and install at this time. Before you cover the fuselage, I recommend that you mix some resin and give the engine compartment two coats. This helps to fuel proof the wood. Cover the fuselage. I always cover from the bottom to the top. That way when someone is looking at your covering, the seams cannot be seen. Drill the holes for your engine in the mount. Attach the mount to the firewall.

At this time insert the nose gear in the steering arm and insert in the bottom hole in the mount. Push up enough to slide on the 5/32 retaining collar. Slide the rest of the nose up thru the top hole in the mount until flush. Slide the 5/32" collar to the bottom on the mount and tighten. Slide the steering arm up to the mount and tighten the screw. Attach the engine to the mount.

Slide the wing into the wing saddle and measure for the holes in the rear of the wing for the wing bolts. Drill the two holes the appropriate size for tapping

the hold down blocks for 1/4-20 threads. Remove the wing and drill the holes in the wing slightly larger for the 1/4-inch nylon wing bolts to pass through. Tap the hold down blocks. Hot Stuff the threads and retap.

Place the rudder on top of the fuselage, and with a soft pencil draw around the part which is to be epoxied to the fuselage. Cut away the covering inside of the line. Be careful not to cut into the balsa below the covering. This gives you a good wood-to-wood bond. Mix some five-minute epoxy and lay a bead along the bottom of the fin and place it on the fuselage. Use small pins to hold it in place while hardening. Using a square, lay on either side of the fin and on the horizontal stabilizer to make sure that the fin is perpendicular to the stab. Hinge the elevator to the horizontal stabilizer and attach as earlier described. Attach control horns at the locations shown on the plans.

To make the pushrods for the rudder and elevator, I use a 1/4-inch dowel. I measure the approximate length needed for the rods and cut. In each I drill a 1/16 hole all the way through the dowel about 1/2 inch from the end, and then I cut a lengthwise slot from the hole to the end of the dowel approximately halfway through and round off the end. I then cut the 12-inch DuBro rod with clevis in half. Using Hot Stuff, I insert a length of the wire rod (with L bend) into each pushrod end and wrap with heavy thread and apply more Hot Stuff. On the end with the clevis, I make a lazy "Z" bend for the rudder control. The one for the elevator is left straight.

Install the radio as shown and connect the control rods for the rudder, elevator, throttle, and steering. Install the wheels, propeller, and spinner.

To mount the servo in the wing, I cut a rectangular hole starting at the back of the spar just large enough for the servo to fit into. I cut two pieces of 3/8 x 1/4 ply approximately 1-1/2 inches long and epoxy to the top of the wing. Using rubber grommets, washers, and small wood screws, I attach the servo.

Last but not least, I attach the windshield to the fuselage. I use Hot Stuff for this. Cut the windshield from 5 mil clear plastic (acetate or mylar) using the pattern on the plan. I like to attach the windshield last. That way I eliminate the chance of damaging it while installing the radio and other gear.

Bolt the wing to the fuselage and using the balance point marked on the plan, check the plane for proper balance. If weight is needed, place it as far forward as you can. With a full tank of fuel, the plane should have a slight nose down attitude. It is always better to be nose heavy than tail heavy.

I think that you will find this to be a very pleasing airplane, giving you many hours of flying fun. If you want, attach a set of floats and go find some water. The Sunrise loves it. Safe Flying!

MATERIALS LIST FOR THE SUNRISE 2540

(All Measurements in Inches Unless Otherwise Noted.)

WING

- 1 - 1/2 x 3 x 36 Balsa sheet (wing tips).
- 2 - 1/4 x 1 Balsa trailing edge stock.
- 5 - 1/16 x 3 x 36 Balsa sheets (wing sheeting).
- 2 - 1/4 x 1/4 x 36 Balsa sticks (top spar).
- 2 - 1/4 x 1/2 x 36 Balsa sticks (bottom spar).
- 4 - 3/16 x 1 x 36 Balsa sticks (leading edge and aileron material).
- 2 - 3/8 x 3/4 x 36 Balsa sticks (leading edge).
- 3 - 3/32 x 3 x 36 Balsa sheets (rib material).
- 1 - 3/16 x 3 x 36 Balsa sheet (sheer web material).
- 8 - 1/6 x 1/4 x 36 Balsa sticks (cap strips).

FUSELAGE

- 4 - 3/32 x 3 x 36 Balsa sheets (fuselage sides and doublers).
- 1 - 3/8 x 36 Triangle stock (gusset material).
- 1 - 1/2 x 36 Triangle stock (gusset material).
- 2 - 1/4 x 1/4 x 36 Balsa sticks (fuselage top stiffener material).
- 1 - 1/8 x 1 x 36 Balsa stick (tank compartment doubler B-1 and B-2).
- 2 - 1/8 x 1/2 x 36 Balsa sticks (fuselage cabin doublers).
- 2 - 3/16 x 3 x 36 Balsa sheets (bulkheads A-1 and A-2 and fuselage bottom front sheeting).
- 2 - 3/32 x 3 x 36 Balsa sheets (fuselage sheeting top and bottom rear).
- 1 - 3/4 x 1 x 12 Balsa block (top fuselage windshield former).
- 1 x 1/8 x 3 x 36 Balsa sheet (bulkheads D and E and miscellaneous doublers).

STABILIZER:

- 1 - 3/16 x 3 x 36 Balsa sheet (front and rear stabilizer pieces).
- 1 - 3/16 x 2 x 36 Balsa sheet (elevator).

RUDDER:

Make from scrap left over from stabilizer and elevator pieces.

PLYWOOD MATERIAL:

- 1 - Sheet 1/16 x 6 x 12 for wing dihedral braces
- 1 - Sheet 1/8 x 6 x 12 for cabin formers
- 1 - Sheet 3/16 x 6 x 12 for main gear mount (cut 2 it you plan to mount floats later) and firewall

HARDWARE LIST:

- 1 - Kraft tank part #200-147.
- 1 - Kraft mount part #200-062.
- 1 - Kraft wheels part #200-075.
- 2 - DuBro control horns #105.
- 15 - DuBro hinges #117
- 1 - DuBro 1/4 x 20 wing bolts pack #142.
- 2 - DuBro 12-inch steel rods with clevis #108.
- 1 - DuBro nose gear #152.
- 1 - Sig nose gear arm with collar #102
- 2 - Sig 1/4 x 20 threaded wood blocks #218.
- 1 - Royal Dural main gear #R-19.
- 1 - Royal aileron horn set #R-197.
- 1 - Sullivan Golden Rods set #503 (throttle and steering).
- 1 - 1/4 x 36 Wood dowel (elevator and rudder control rods)
- 1 - Can fiberglass resin
- 1 - Package 2 ounce glass cloth
- 1 - K&S .005 plastic windshield sheet #304.