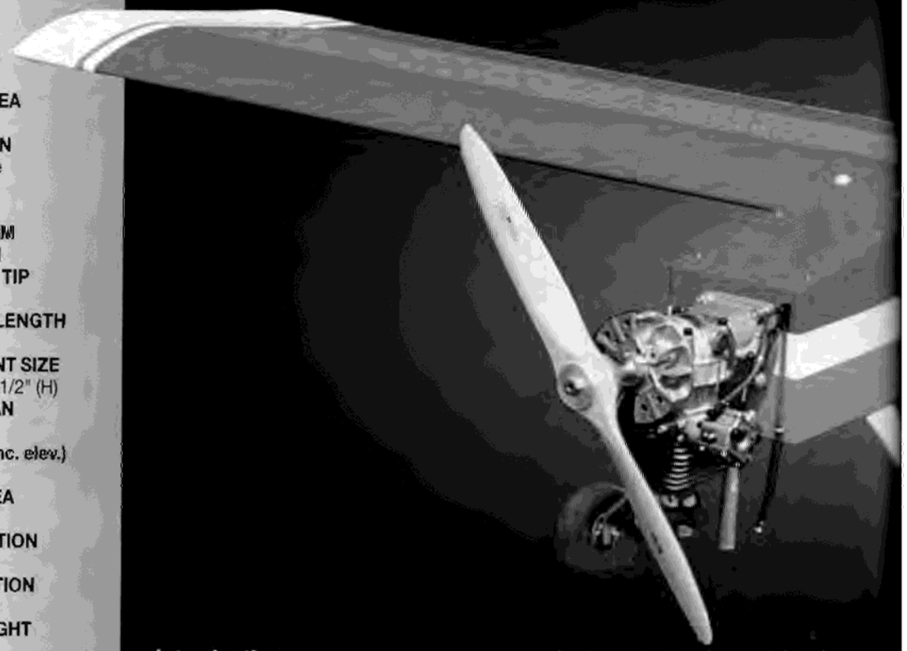
RYAN'S

RYAN'S REBEL
Designed by:
Ryan Gonsoulin
TYPE AIRCRAFT
Sport
WINGSPAN
80-1/4 Inches
WING CHORD
14-3/4 Inches
TOTAL WING AREA
1180 Sq. In.
WING LOCATION
Top of Fuselage
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
None
OVERALL FUSELAGE LENGTH
57 Inches
RADIO COMPARTMENT SIZE
12" (L) x 3-1/2" (W) x 4-1/2" (H)
STABILIZER SPAN
30-1/4 Inches
STABILIZER CHORD (inc. elev.)
12-5/8 Inches
STABILIZER AREA
288 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
10-3/8 Inches
VERTICAL FIN WIDTH (inc. rud.)
14-1/4 Inches
REC. ENGINE SIZE
1.2-2.3 Cu. In.
FUEL TANK SIZE
16 Oz. (Approx.)
LANDING GEAR
3/16" T-6 Aluminum
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
C.G. (from L.E.)
3-7/8 Inches
ELEVATOR THROWS
1-3/4" Up — 1-3/4" Down
AILERON THROWS
1-1/8" Up — 1-1/8" Down
RUDDER THROWS
3-1/4" Left — 3-1/4" Right
RIGHT THRUST
3°
DOWNTHRUST/UPTHRUST
NA
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Lite Ply, Ply, Maple
Wing ..... Balsa, Lite Ply, Spruce
Empennage .... Balsa, Hardwood Dowel
Wt. Ready To Fly .. 200 Oz. (12 Lbs. 8 Oz.)
Wing Loading ..... 24.4 Oz./Sq. Ft.



Introduction

Ryan's Rebel is designed to be a very simple and inexpensive model to build. With the growing interest in converting weed-trimmer engines into model airplane engines, an IMAA legal model was designed to complement the power range of these engines. The model was also designed to use all the same building techniques and radio equipment of smaller less expensive models. The result is a model that is big and has great slow flight characteristics, exceptional performance, and a total cost of around $175.00 (without radio and engine of course).

This article is written for someone who has intermediate building experience. However, builders who have only minimal scratch-building experience should not be worried. Ryan's Rebel is an easy model to build.

CONSTRUCTION

Construction is fast and simple. All the parts that need to be cut out prior to construction can be done in an evening or two. These parts include F1-F8, the landing gear block, stabilizer mount plate, fuselage sides, fuselage doublers, lite ply wing joiners, and the wing ribs. All other parts can be "cut to fit" during construction.

High stress areas, such as the firewall (F1), wing hold-downs, landing gear block, tail/fuselage joint, and wing center should be glued with epoxy. All other parts should be glued with medium CA, thin CA, or yellow wood glue.

Tail Surfaces:

The tail surfaces are constructed from 1/4" x 3/8", 3/8" x 3/8", and 1/2" x 3/8" balsa sticks, and 3/8" balsa sheet. These parts should be built directly over the plans. Construction is simple and straightforward.

Once complete and the glue has dried, sand to shape the edges as shown on the plans. Now drill a 3/8" hole through the center of each of the three flying wire

REBEL

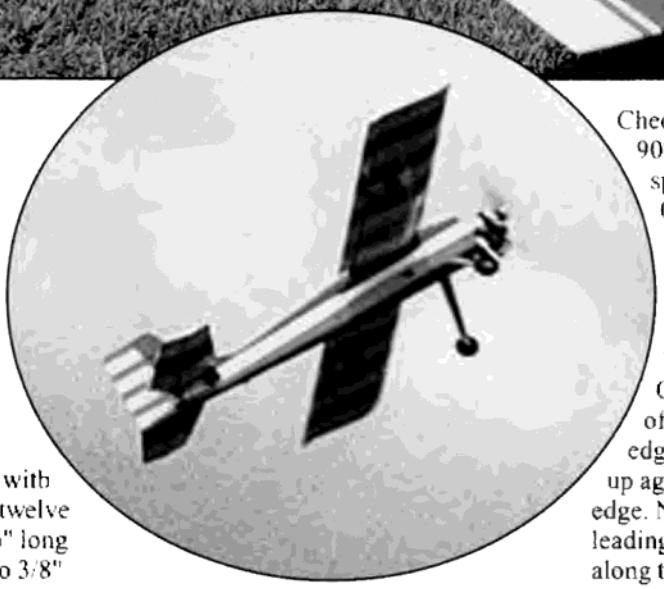
Giant Scale Sport Flier For 1.2-2.3 Cu. In. Engines

By Ryan Gonsoulin

Author's latest Ryan's Rebel shown with Ryobi (31cc) conversion engine.

The author with his model.

attachment blocks (two on the stabilizer and one on the fin). Glue into each hole a piece of 3/8" dowel. Drill holes through the center of the dowels to accept whatever size screw you plan to use to attach the flying wires. I have found that a 4-40 size screw works best here. Sand smooth for covering.

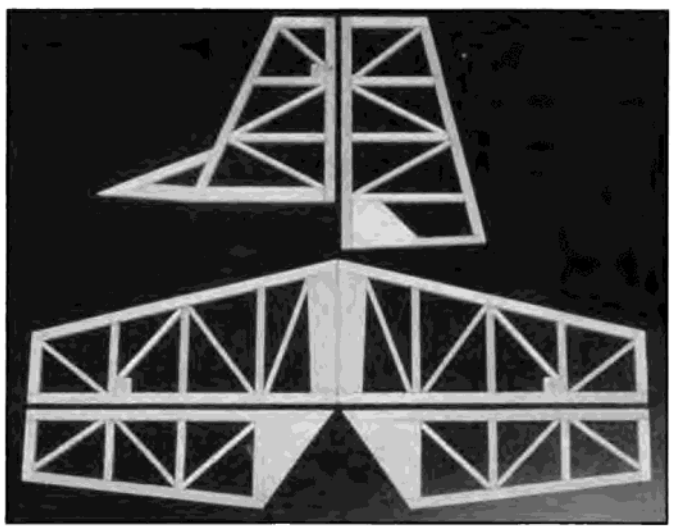


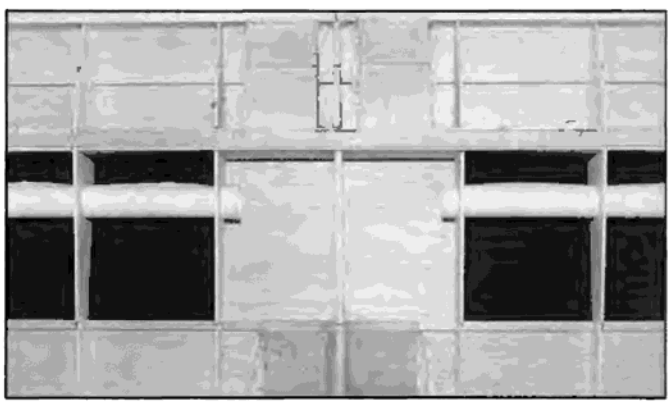
Wing:

The wing is built in one piece with no dihedral. Begin by gluing the twelve 48" spars together to make six 96" long spars. You should end up with two 3/8" square spruce main spars and four 1/4" square balsa sub-spars. Start by pinning down the plans onto your work surface. Next, pin the 3/8" square bottom main spar over the plans. Place the twelve center ribs (the ones with the hole) onto the spar 90° to the work surface. (Note: This number of ribs may vary depending on which bay you decide to place the aileron servos in.) Now install the paper tube for the aileron servo leads; do not glue yet. Install the remaining ribs onto the spar. Next put into place the 3/8" top main spar and the two 1/4" top sub-spars.

Check to be sure that all the ribs are 90° to the work surface and that all spars are in place. Now glue with CA. The leading and trailing edge can then be glued to the ribs. The leading and trailing edges will be sanded to shape after completion of the wing. The 1/16" balsa sheeting is next. Cut a straight edge along one side of each sheet. Trial-fit the trailing edge sheeting into place by setting it up against the front of the trailing edge. Now mark a line flush with the leading edge of the rear sub-spar. Cut along this line and then glue into place. Use the same technique to fit the leading edge sheeting. Once cut, glue into place. Use some of the excess sheeting to make the center sheeting section. Fit and glue into place.

Unpin the wing from the work surface. Turn it over and place back over the plans. Now the 1/8" lite ply





ABOVE:The filler blocks are glued into the wing before the top sub-spars and top sheeting are installed. The paper tubes, lite ply webbing, and balsa webbing can also be seen here.
LEFT: The completed tail surfaces. Note the 3/8" hardwood dowel insert for attachment of the flying wires.

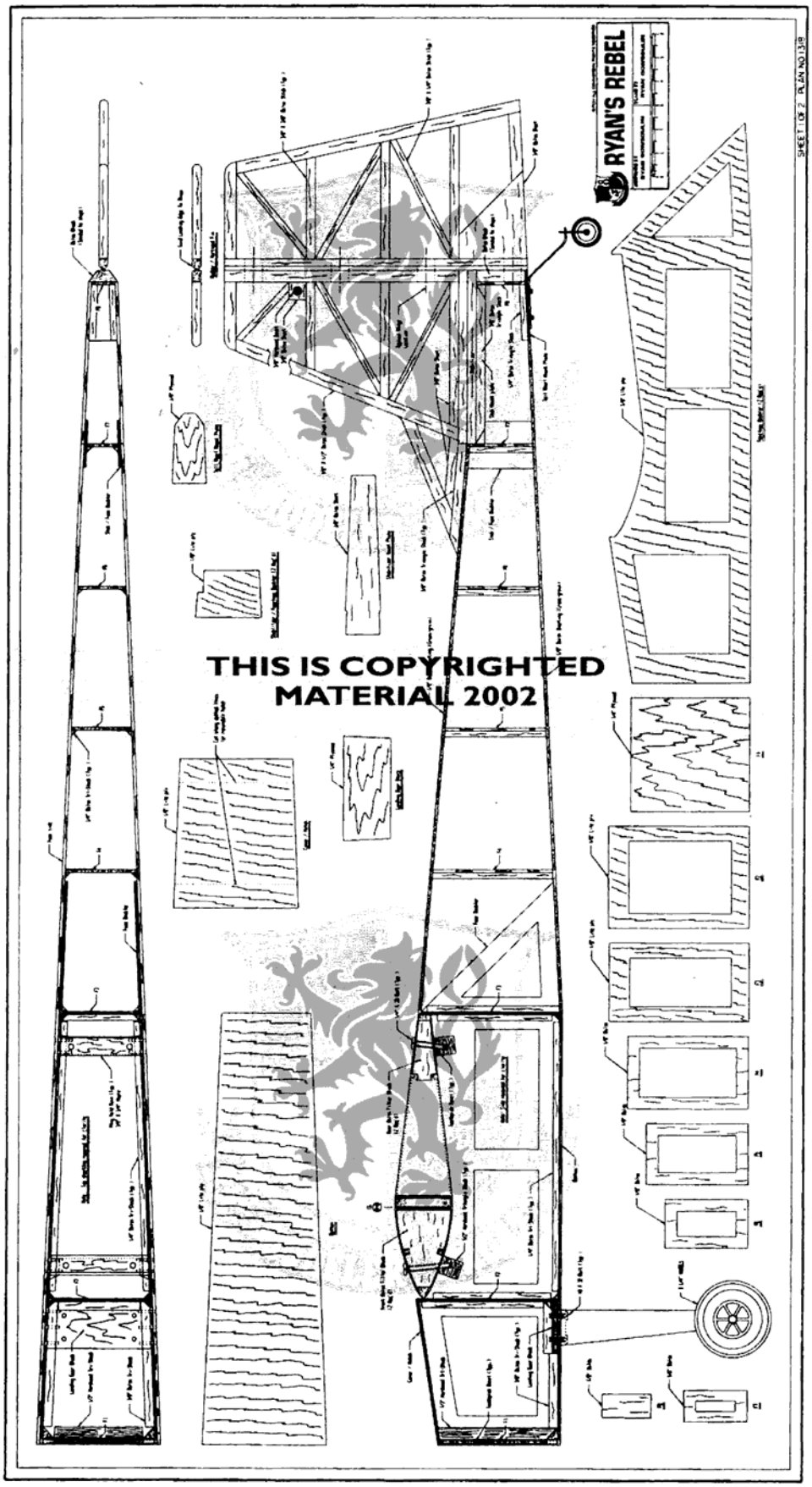
center wing joiners and the 1/8" balsa vertical grain webbing can be cut to fit and glued into place. A portion of the four center ribs must be cut away, front and back, in order to slip the lite ply wing joiners into place. The area of the ribs that needs cutting away is 1/8" in front and behind the main spar. Be sure to use a generous amount of epoxy when gluing in the center wing joiners. Next the filler blocks can be cut and glued into place. Because it is sometimes hard to obtain a tight fit with filler blocks, I recommend using Elmer's Probond polyurethane glue. It has foaming action that ensures all cracks will be filled with glue. When completely dry, sand off any excess. Once the webbing and filler blocks are glued in, the 1/16" balsa sheeting can be installed in the same fashion as mentioned earlier. Start with the trailing edge sheeting, the leading edge sheeting, and finally the center sheeting. The paper tube can now be secured by using a few drops of medium CA. It is now time to glue in your choice of aileron servo rails.

Using the 1/16" balsa sheeting that remains, cut 3/8" wide capstrips, then cut them to length and glue into place. Cut away any wood overhanging the last ribs and sand smooth, then sand the leading and trailing edges to shape. Glue the 1/8" balsa rib cap on each end of the wing. Sand the entire wing smooth. The center 7" of the wing should be covered with fiberglass cloth and thinned epoxy. Finally the ailerons, which are actually a 1/2" x 3" tapered sheet, can be cut to length and sanded to shape.

Fuselage:

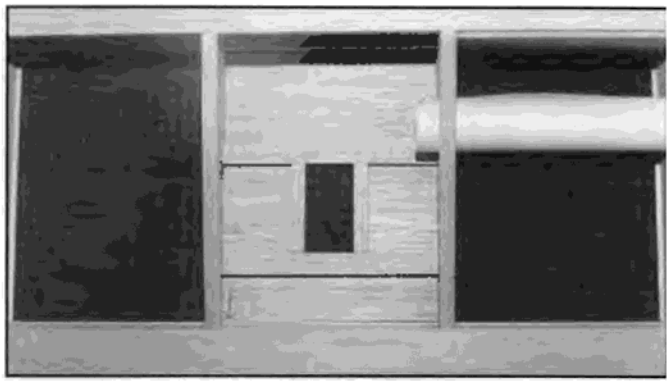
Begin by marking and drilling holes in F1 for your choice of engine. Glue the 1/8" lite ply fuselage and stabilizer/fuselage doublers to the balsa fuselage sides. Be sure to make a left and a right side. Mark the location of each former on the inside of each side and glue F1 and F8 to only one side. Be sure to glue both at the correct angle (see top view on plans). Once the glue has dried, glue F1 and F8 to the opposite side. Now place the fuselage over the top view plan. Slip the remaining formers into the fuselage. Using a No. 64 rubberband at each former will help hold them in place. Once you have the formers in their correct locations, glue in place. Next, glue in place the balsa block at the rear of the fuselage.

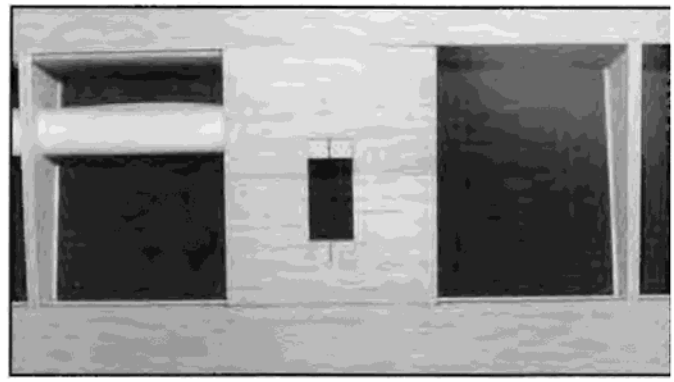
Once the sides and formers have been glued together, the 1/8" lite ply



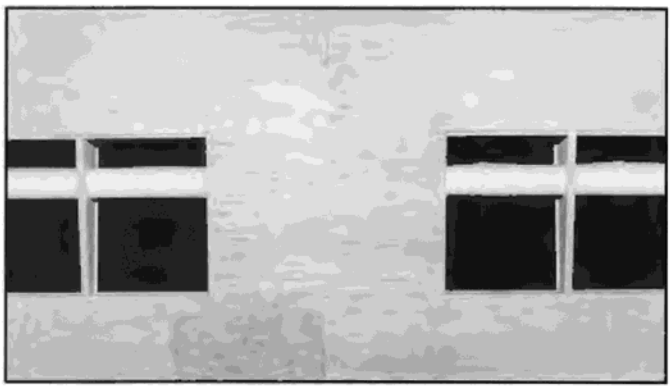
PLAN #1318

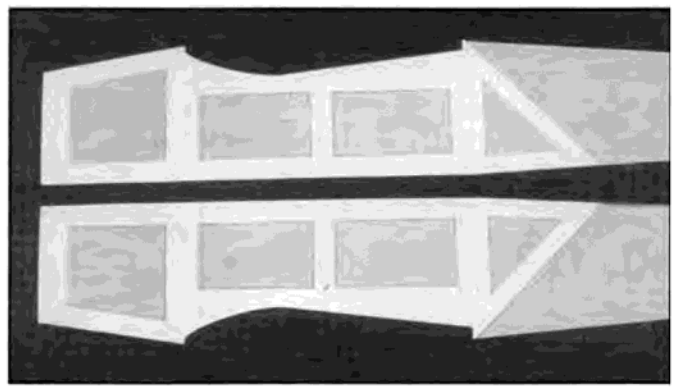
FULL-SIZE PLANS AVAILABLE SEE PAGE 181





Here the author shows how he mounts the aileron servo rails in the servo bay. Sheeting is used here in lieu of capstrips.





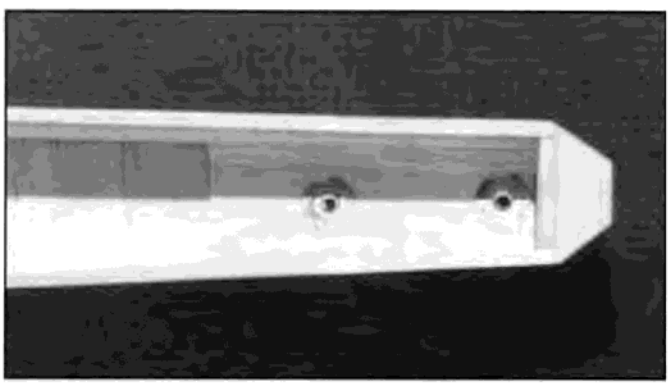
LEFT: Be sure to reinforce the center of the wing with 4-6 oz. fiberglass cloth and thinned epoxy once complete. This is a high stress area. RIGHT: When gluing doublers to fuselage sides, be sure to make a left and a right side.

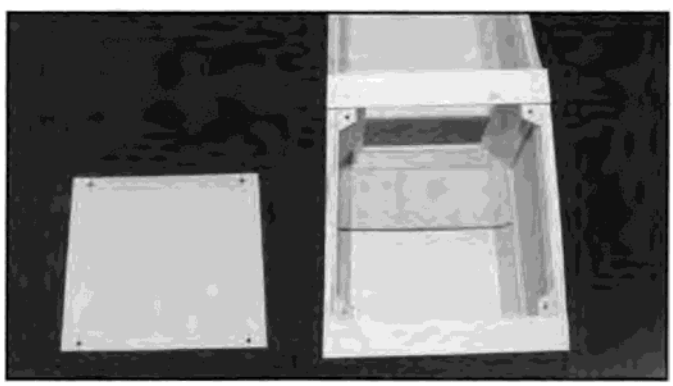
fuselage bottom can be traced and cut. Place the fuselage over the 1/8" lite ply with one edge aligned with the rear of F3. Take a pencil and trace along the outside of the fuselage from F3 up to F1, along the front of F1 to the other side and back down to F3. This cut-out is shown on the plans. Next cut and glue in place. Now the bottom 1/8" balsa sheeting can be glued cross grain from the rear of F3 to the front of the tail wheel plate. Trace and cut out the tail wheel plate (see plans). Before gluing the tail wheel plate in place, drill holes and insert blind nuts to accept your choice of tail gear. Be sure to reinforce it with balsa triangle stock. Next, glue the main landing gear block into the fuselage. All the triangle stock can then be glued into the fuselage. Be sure to use hardwood triangle stock on F1. The stabilizer mount plate can now be glued into place. Next glue the top 1/8" balsa sheeting cross grain from the trailing edge of the wing saddle to the leading edge of the stabilizer.

The forward removable hatch is made from three pieces of 1/8" lite ply. Cut two strips 6" long x 1" wide. Glue one of the pieces flush with the front of F1 and the other piece flush with the rear of F2. For each piece allow an equal amount to overhang each side of the fuselage. Now cut a piece to fit between the two pieces you just glued in place (see plans). Any hardwood will be sufficient for anchoring the hatch with screws. Trim off the excess and sand smooth with the fuselage sides. If a removable hatch is not what you want, simply cover with a single piece of 1/8" lite ply.

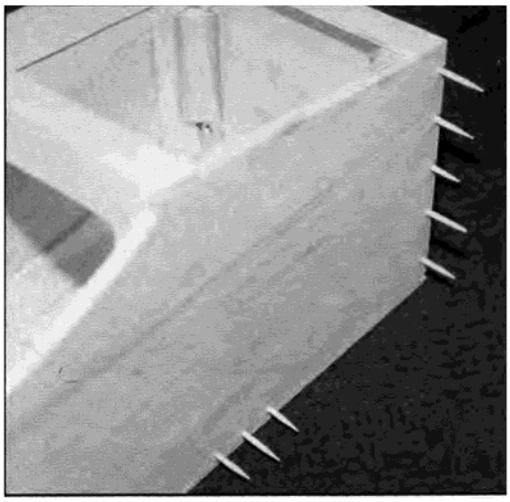
The wing hold-downs can now be cut to fit. Make sure the location is in line with the holes you plan to drill into the wing. Once you are satisfied, glue in place with a generous amount of epoxy. Also, epoxy hardwood triangle stock below each wing hold-down, as this is a high stress area.

Last but certainly not least, toothpicks (or 1/8" dowels) should be glued into F1, the wing hold-down blocks, and landing gear plate for reinforcement. The pointed ends should be removed from each toothpick, leaving a blunt end. Simply drill a small hole (3/32" or so) about 3/4" into the center of the wood. Fill the hole with yellow glue and insert the toothpicks, allowing the excess to stick out. Once the glue has dried, saw the toothpick excess off close to the





LEFT: Insert blind nuts for the tail gear prior to enclosing fuselage. Note balsa triangle stock reinforcement and the balsa block sanded to shape at the rear of the fuselage. RIGHT: Shown here is the optional removable forward hatch. Notice the hardwood to accept screws when installing the hatch, and the internal reinforcement.



Toothpicks (or 1/8" dowels) can be used for "pin" reinforcement. It is essential that this be done at F1, the landing gear block, and at the wing hold-downs.

fuselage. Now you can final-sand the entire fuselage for covering.

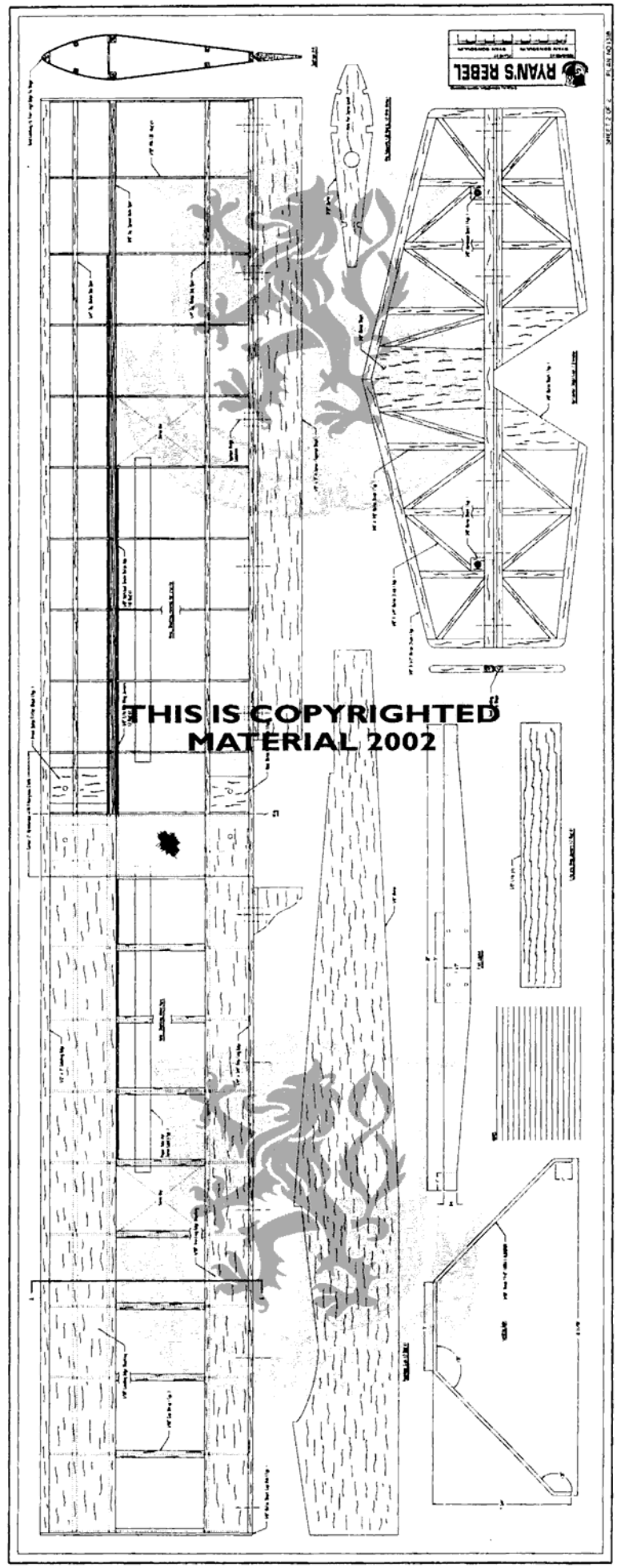
Final Assembly/Covering:

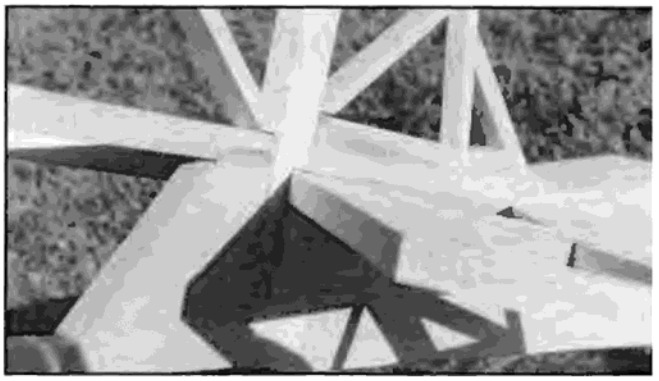
The author likes to completely assemble the airplane "ready to fly" without the covering. This allows for the cutting of holes if necessary without messing up the finished product. Start by placing the wing in the wing saddle of the fuselage. Make sure that the wing is perpendicular to the fuselage by stretching a piece of string from each wingtip to the rear end of the fuselage. You should have the same measurement on each side. Once it is straight, drill the four bolt holes through the wing and through the wing hold-down blocks in the fuselage. Remove the wing and install blind nuts or tap the holes in the wing hold-down blocks. Replace the wing and bolt into place. 1/4-20 bolts are recommended here.

Mounting the tail is next. Start by aligning the stabilizer onto the stabilizer mounting plate. Be sure the stabilizer is level and parallel with respect to the wing. Once you are satisfied, glue in place with epoxy. Next, align the fin. Be sure that it is straight and 90° to the stabilizer. Once again glue with epoxy. After the glue has dried, reinforce the fuselage/stabilizer/fin joint with 3/8" balsa triangle stock. Glue with epoxy.

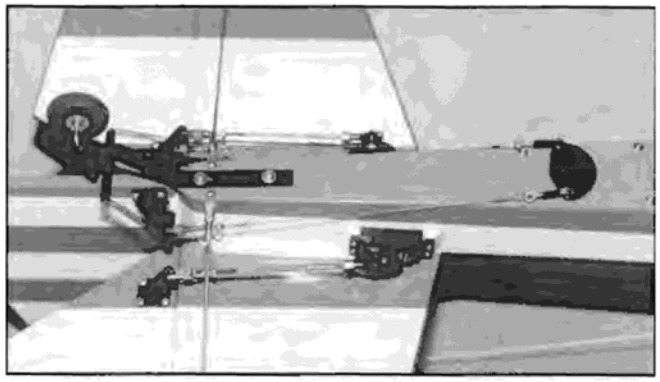
Hinges:

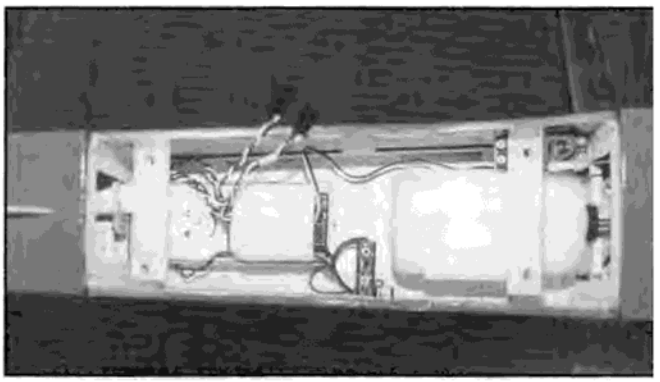
1" wide CA type hinges evenly spaced along each control surface have been used on all of the author's Ryan's Rebels to date with no problems. Just be sure to use enough hinges and a sufficient amount of CA. Recommended (as a minimum) are four hinges on the rudder and on each elevator half, and five hinges on each aileron. Simply cut a slot into the wood with a hobby knife and insert the hinge. A 1/8" slot in the center of the hinge helps allow the CA to reach deep into the wood. Be sure to glue the hinges with thin CA once you are finished covering the model.





It is important to reinforce the horizontal stabilizer and vertical fin with 3/8" balsa triangle stock This along with the flying wires will help secure the tail surfaces to the fuselage.





LEFT: The author shows how he arranges the rear of the model including elevator servos, the rudder servo, tail gear, and flying wires. RIGHT: As mentioned in the text, the battery and receiver are best located between F2 and F3. Also shown is the switch, throttle servo, fuel tank, and the wing hold-downs.

Radio:

Radio installation is left up to the builder. Recommended is one servo for each aileron, one servo for each elevator half, one servo for the rudder, and one for the throttle. Standard servos (40-50 oz. of torque) can be used on all control surfaces except the rudder. A servo with at least 75 oz. of torque is recommended for the rudder. It is very simple to mount all the servos, except the throttle servo, externally. This provides for a very neat hook-up with the control surfaces. The battery and receiver is best located in the fuselage between F2 and F3.

Landing Gear:

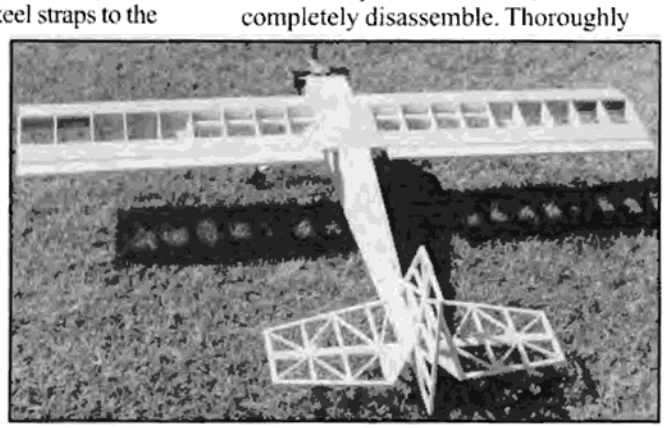
The flat layout and finished dimensions of the main landing gear is shown on the plans. The gear should be made from 3/16" thick "T-6" (6061) aluminum. If obtaining aluminum, or bending aluminum is something you cannot or do not want to do, then the gear can be purchased from a number of model landing gear manufacturers. The author last purchased Ryan's Rebel landing gear from TNT Landing Gear for around $35.00. The choice of tail gear is left up to the builder.

Flying Wires:

The flying wires for the tail can be built in a variety of ways. The author prefers to use Du-Bro steel landing gear straps (Catalog No. 158), Du-Bro threaded and solder rod ends (Catalog No. 302 and 303), 2-56 rods, and 4-40 nuts and bolts to make the flying wires. Start by bending the steel straps to the proper angles. Next, cut the rods to length and attach the rod ends. Last, mount the flying wires to the tail surfaces using the 4-40 hardware. Other modelers have used, with success, heavy-duty fishing leader material in lieu of steel rods. Either arrangement should work fine.

Final Assembly:

Finally, mount the landing gear, engine, switches, flying wires, and fuel tank. A 16 oz. tank is recommended. Make sure it is gasoline friendly if using a gasoline engine. Now that your Ryan's Rebel is completely assembled, take this opportunity to check the C.G. as shown on the plans. Make any changes necessary to obtain the proper C.G. Once you are satisfied, completely disassemble. Thoroughly



As can easily be seen here, this is a very simple airframe. Note the Saito 300 engine being used to power this model.

MATERIAL LIST (WOOD ONLY)

Qty:	Size:	Description:	Use:
(1)	3/8"x4"x36"	Balsa Sheet (6-8#)	Tail Feather, Stab
(3)	3/8"x1/4"x36"	Balsa Stick	Tail Feathers.
(3)	3/8" Square x 36"	Balsa Stick	Tail Feathers.
(6)	3/8"x1/2"x36"	Balsa Stick	Tail Feathers.
(1)	1/4"x12"x12"	Plywood	F1 & LG Block.
(2)	1/8"x6"x48"	Balsa Sheet (8-10#)	Fuse Sides.
(2)	1/8"x24"x12"	Lite Ply	Fuse Doublers, Bottom, F2, F3, Joining Spar, Hatches.
(4)	1/8"x4"x36"	Balsa Sheet	F4, F5, F6, F7, F8, Top & Bottom Sheeting, Rib caps Misc. Parts.
(2)	3/8"x36"	Balsa Triangle Stock	Fuse Reinforce,
(4)	1/4" x36"	Balsa Triangle Stock	Fuse Reinforce.
(1)	1/2"x36"	Hardwood Triangle Stock	Firewall Reinforce.
(1)	3/4"x3/8"x12"	Maple Stick	Wing Hold Down.
(4)	3/8" Square x 48"	Spruce Stick	Main Spar.
(8)	1/4" Square x 48"	Balsa Stick	Sub-Spars.
(2)	1/2"x3"x36"	Tapered Balsa Sheet	Ailerons.
(2)	1/4"x3/4"x48"	Balsa Stick	Trailing Edge.
(2)	1/2"x1"x48"	Balsa Stick	Leading Edge.
(4)	3/32"x4"x36"	Balsa Sheet (6-8#)	Ribs.
(4)	1/16"x4"x48"	Balsa Sheet (8-10#)	LE Wing Sheeting, Capstrips.
(4)	1/16"x3"x48"	Balsa Sheet (8-10#)	TE Wing Sheeting.
(2)	1/4"x3/8"x18"	Maple Stick	Servo Rails
(1)	2"x3"x12"	Balsa Block	Wing Mt. Filler, Tail Post.
(1)	3/8" Dowel x 12"	Hardwood Dowel	Flying wire mount.

clean all wood prior to covering with your choice of material and colors.

Once you are finished covering, reassemble your Ryan's Rebel, making sure that every screw is tight. Then recheck to make sure the C.G. is okay. You are now ready for flight.

Engine:

As mentioned earlier, Ryan's Rebel was designed for the 1.2-2.0 cubic inch weed-trimmer conversion engines. The prototype used the Ryobi 31cc (1.9 cubic inches). It proved to be good reliable power. The Ryobi would be the perfect choice for the Sunday flier. If you really want to spice up your life, bolt on a Zenoah G-38 (2.3 cubic inches). This engine will provide more than enough power, literally. My latest Ryan's Rebel is currently powered with a G-38 and can hover at about 40%-50% throttle. An engine larger than a G-38 is not recommended. If you plan to use an engine larger than 2.0 cubic inches, I suggest using a heavier grade balsa than normal and some additional reinforcement at the firewall, tail/fuselage joint and the wing center. Other engines that have powered Ryan's Rebel successfully are the McCulloch 32cc conversion engine, Moki 2.1, and the Saito 300 twin.

First Flight:

Check and make sure that the control surfaces move in the correct direction. The first flight should be made using the low rate control surface deflection. Get your engine running, taxi out to the runway and point your Ryan's Rebel into the wind. Advance the throttle slowly. Once you are traveling fast enough, pull back gently on the elevator. You will quickly see just how predictable this model really is.

For landing, line up with the engine just above idle. This plane slows nicely so there is no need for a long approach. Once you're a few feet above the runway, bring the engine down to idle and flare for a perfect landing.

If you keep the engine toned down and the control surfaces at low rate, this plane is as good as a trainer. But if you turn up the engine and go to high rate on the control surfaces, you will be amazed at how snappy this model can be.

Conclusion:

If having a big plane without having the expense of a big plane is what you want, then Ryan's Rebel is your answer. It builds quick and easy and has great flight capabilities. In a few short flights you will figure out that Ryan's Rebel can be flown slow and stable or fast and wild. So please do your fellow modelers a favor and tell them about Ryan's Rebel, you will all agree that it is the best flying value out there.

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