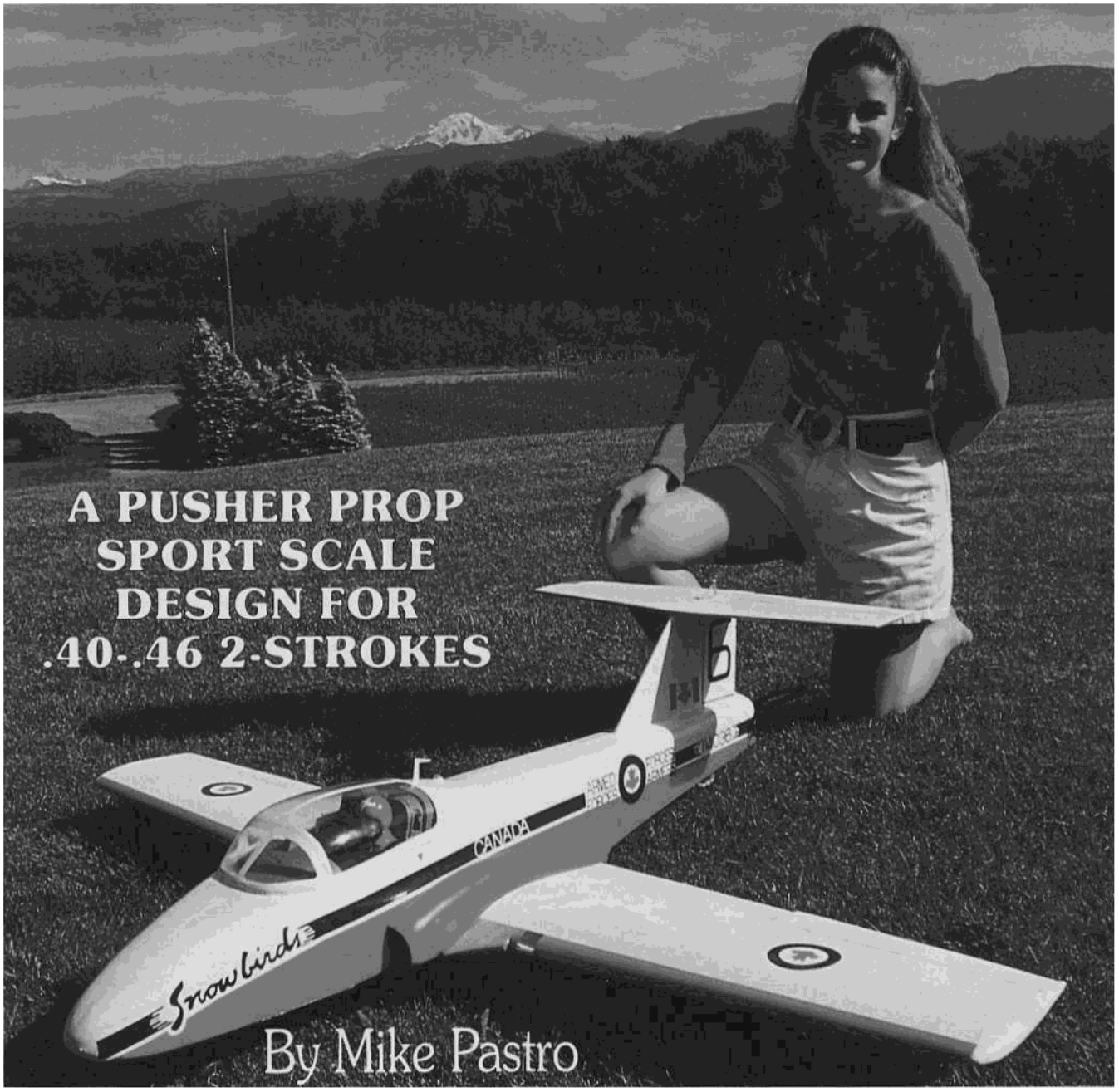


CANADAIR CT-114 TUTOR

Working as the Manager of Operations and Maintenance at Abbotsford Airport in British Columbia, Canada, I get to see aircraft of all types come and go from my office window. I even get rides occasionally (the most exciting to date being a full aerobatic routine in a Christen Eagle). As an aviation enthusiast, however, the highlight of each year happens the second weekend in August when Abbotsford Airport hosts the world reknowned Abbotsford International Airshow. For three days, top acts from North America and beyond literally descend upon Abbotsford resulting in one of the best and most famous airshows in the world.

The U.S. Navy Blue Angels or USAF Thunderbirds are always present, Italian, French, and Brazilian teams have participated, and this past year marked the first North American visit by the Russian Knights in their SU-27's. There are also many military and civilian solo performances during the three day event. It is truly an exceptional show and one of the highlights is always a performance by Canada's own flight demonstration team — the "Snowbirds."

The Snowbirds, a nine plane military jet team, are world famous for their tight formation flying. Seeing nine aircraft perform loops, rolls, and other maneuvers as though they are one is nothing short of spectacular. While the Snowbirds do not have the speed and power of the Blue

Mike Pastro shown with his two sons, Bryan and Steven, admiring Dad's model.

Angels (F-18's) or Thunderbirds (F-16's), they fly with a grace and precision that is unsurpassed.

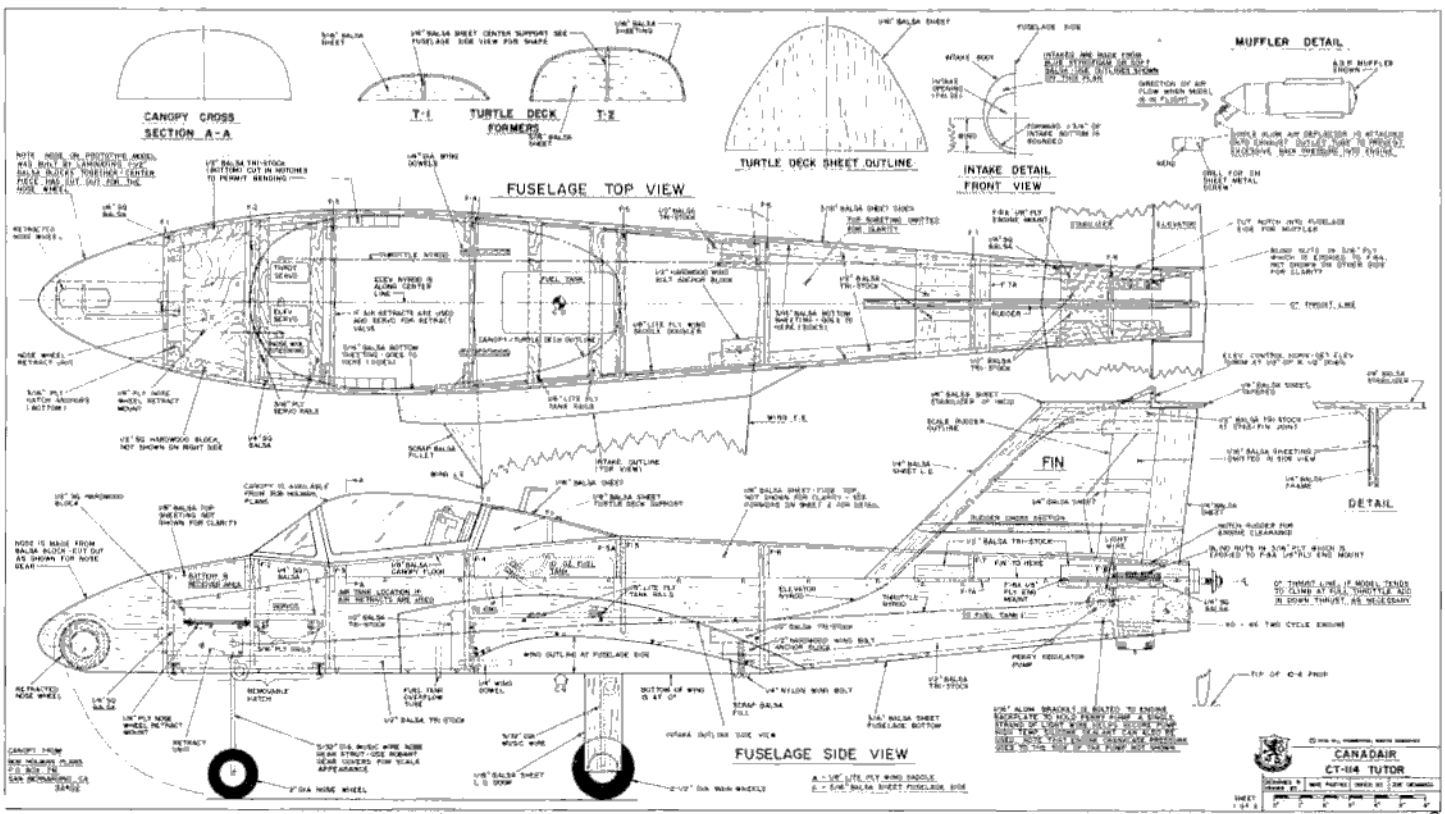
The Snowbirds have been in existence for 22 years and perform more than 60 shows per year in Canada and the United States. The aircraft flown by the Snowbirds, and the subject of this construction article, is the CT-114 Tutor Jet built by Canadair. Similar in appearance and function to the Cessna T-37 used by the U.S. Military, the Tutor is Canada's primary jet trainer. It is 22' long, has a span of 36½', weighs 7000 lbs., is powered by a single GE J85-CAN-40 engine and has a top speed of 470 mph.

I have watched and admired the Snowbirds for many years and it is with a great deal of National pride that I present this construction article.

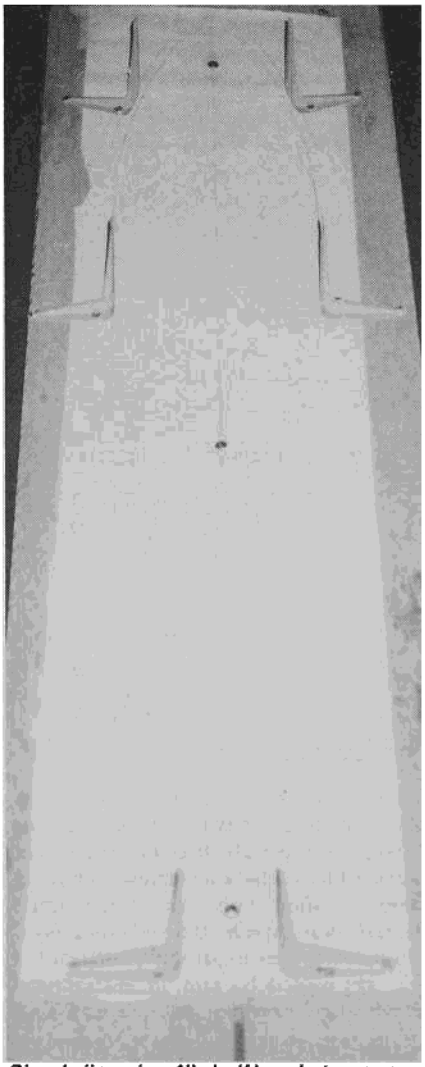
My rendition of the Tutor Jet, while not exact scale, is very authentic looking. It uses pusher prop propulsion instead of a ducted fan or a prop on the nose. As I have stated in two previous RCM articles (F-18 in April '91 and A-10 in May '93), I like pusher prop jets because they are less expensive and simpler than ducted fans and look better than "jet" models having an engine and propeller up front. Pusher jets also seem to have more static thrust than ducted fans which enables them to take off from grass fields with ease.

I designed my first Tutor Jet for .25 power and intended for it to be a hand launch "fun" airplane without landing gear. Unfortunately, by the time it was completed, the 400 sq. in., 50" span bird weighed over 5½ lbs., and was not a good candidate for hand launching! Although somewhat discouraged, I fabricated a very crude dolly system so that I could at least test the aircraft's acceleration with a seemingly undersized engine. After ironing out some bugs in the dolly system, we found that the aircraft had great acceleration with the Magnum 25. It took off from grass in less than 75' and flew very well performing rolls, loops, and split S's with ease. My friend, Kerry McAllister, test pilot extraordinaire, put on a very realistic Snowbird solo routine with the exception of a couple of tail slides that were more reminiscent of an SU-27 demonstration.

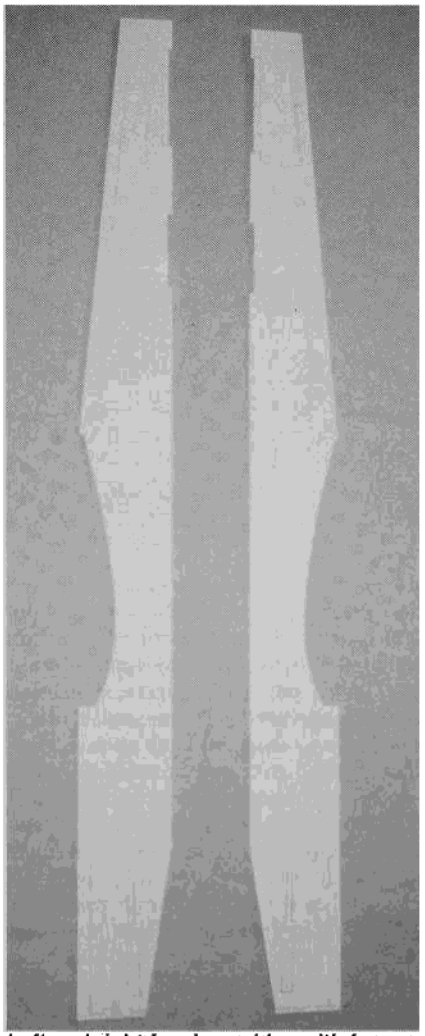
From the moment the model attained flight, I knew I had a winner and immediately began thinking about a larger version with retracts and a lot of scale appointments. After a few months of enlarging and refining the original plans, I was ready to start construction. The most significant changes from the original design, apart from size, were the wing (now foam core instead of built-up), the retractable landing gear, and the clear canopy (instead of painted foam). The new .46 size model would have a span of 60", a wing area of 550 sq. in. or so, and a ready to



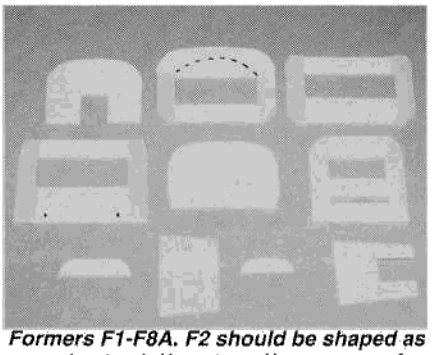
FULL-SIZE PLANS AVAILABLE — SEE PAGE 190



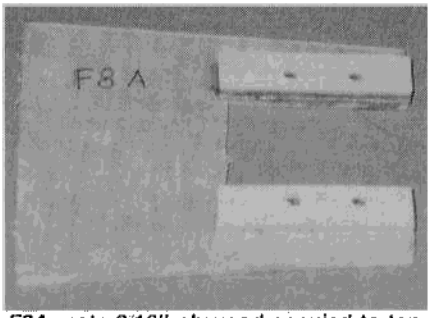
Simple jig using 4" shelf brackets ensures that fuselage is built straight.



Left and right fuselage sides with former, wing block and nose gear block locations drawn onto sides.



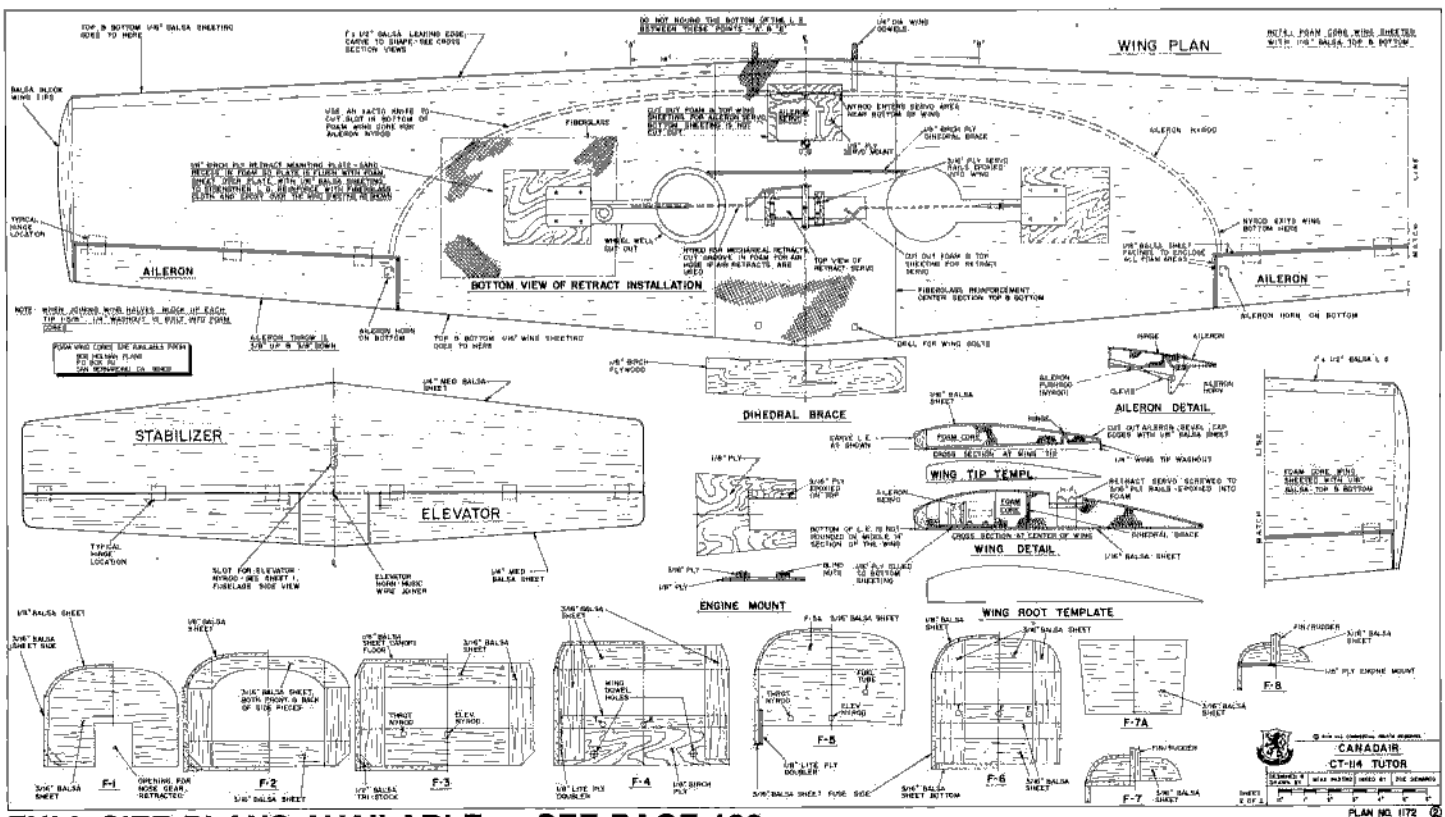
Formers F1-F8A. F2 should be shaped as per dashed line to allow room for battery/receiver.



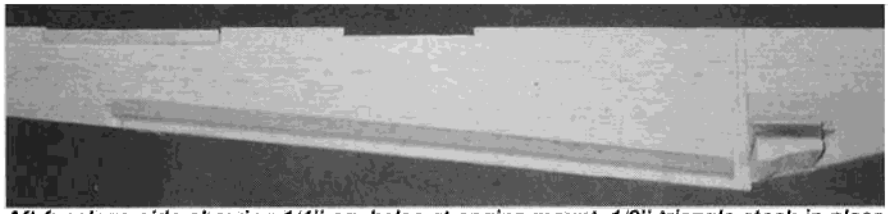
F8A, note 3/16" plywood epoxied to top. Blind nuts are installed for engine mount bolts.

fly weight in the 7-9 lb. range.

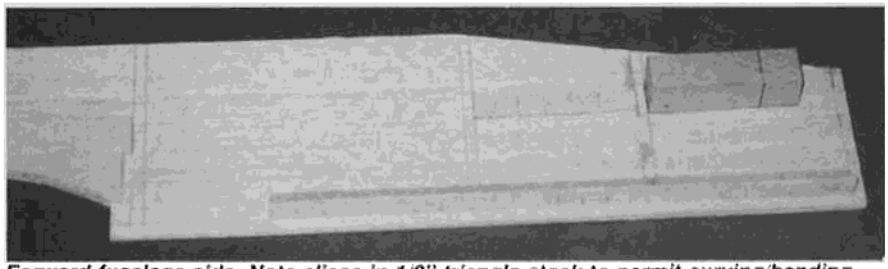
All of the necessary wood parts were cut out in two evenings and the fuselage was assembled and sheeted in one day. The wing cores were cut using the Feather Cut system and were sheeted and assembled in one more day. In fact, I had the basic airframe finished in less than a week. The retracts, radio, tank, and engine installation took a couple of evenings. The canopy fabrication took the most time because I had to



FULL-SIZE PLANS AVAILABLE — SEE PAGE 190



Aft fuselage side showing 1/4" sq. balsa at engine mount, 1/2" triangle stock in place 3/16" up from bottom, and wing anchor block glued to wing saddle doubler.



Forward fuselage side. Note slices in 1/2" triangle stock to permit curving/bending.

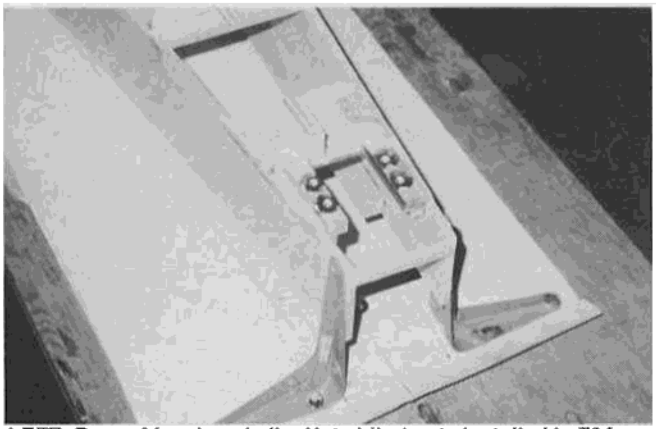
Fuselage in jig.

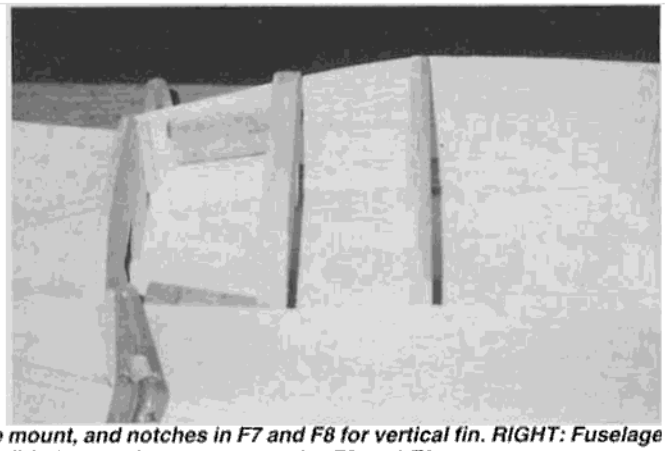
construct a vacuum forming rig and a plug for the canopy. (Canopies and wings are available from Bob Holman Plans — read on . . .)

I started construction in July and wanted to be finished by Airshow time so that I could get some good static photos of the model in front of the real one. I accomplished this and was able to show the aircraft to a number of current and former Snowbird pilots. The model was a hit and I was fortunate to get some great pictures.

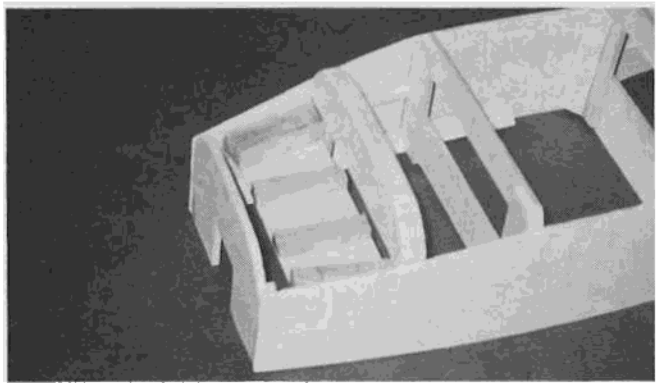
Once all of the static photos were taken, it was time to go flying. On an overcast Saturday morning in August, my support crew (Kerry McAllister and Rip Kirby) and I fired up the ASP 46 and sent the aircraft down the grass runway. The plane accelerated quickly but hit a rough spot which caused the prop to strike the ground, killing the engine (I had not installed a tail skid as on previous designs). The same thing happened on the second attempt. Finally, we found a smooth strip of grass that allowed a proper take-off run. The model was airborne in less than 100' and climbed out at a very steep angle. It flew very well at low to medium throttle settings but wanted to climb under full power and needed down trim. Even with this slight problem, Kerry performed loops, rolls, and inverted flight and the like. The landing was very slow and smooth.

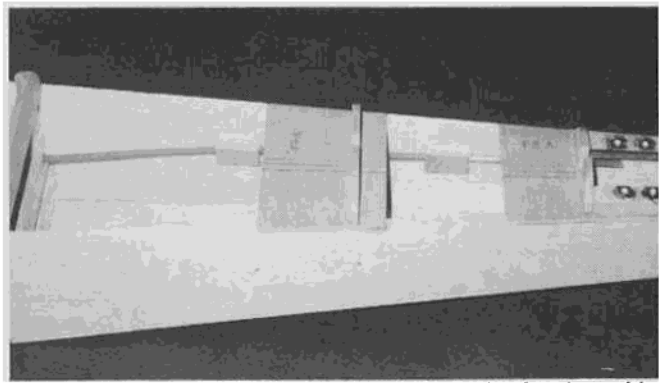
One noticeable difference between this model and my previous pusher designs was how quiet the engine sounded. On previous designs I used Du-Bro Muff-L-Aires because I found that conventional mufflers, when installed with the exhaust outlet facing forward, robbed the engine of power. I'm not an engine expert but I believe that this was caused by ram air entering the muffler, and resulting in excessive back



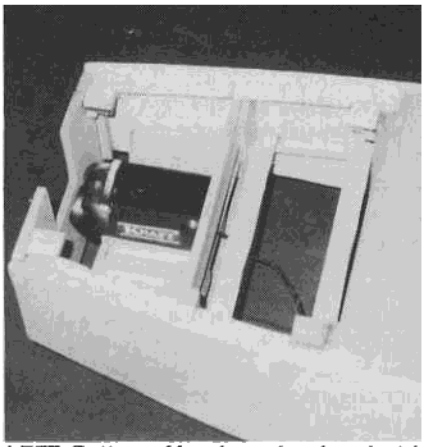


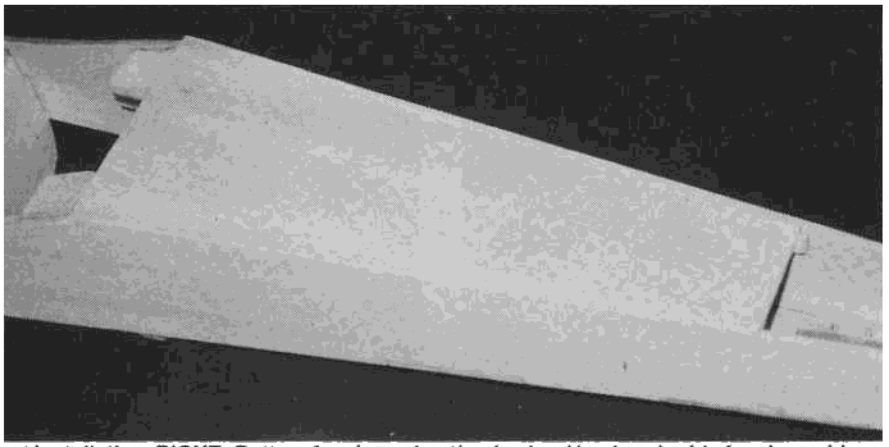
LEFT: Rear of fuselage in jig. Note blind nuts installed in F8A engine mount, and notches in F7 and F8 for vertical fin. RIGHT: Fuselage still in jig, prior to installation of nose gear retract plate. Scrap 3/16" balsa used as spacers under F2 and F3.





LEFT: Hardwood blocks added to plywood landing gear plate for retracts to screw into. RIGHT: Secure throttle NyRod to fuselage side.





LEFT: Bottom of fuselage showing electric retract installation. RIGHT: Bottom fuselage sheeting is glued in place inside fuselage sides.

pressure in the engine. On this model I added a simple air deflector made of 1/16'' aluminum to the muffler exhaust outlet (see plans) to prevent the ram air effect. The modification works very well and allows the standard muffler to be used with no loss of power.

Back in the shop, I examined the model closely and found that the engine appeared to have some ''up thrust'' instead of being at 0° as drawn on the plans. This likely caused the pitch up tendency at full power and was easily fixed by adding some washers under the two engine bolts closest to the prop. If you build carefully from the plans, your model should not have the pitch up tendency. If it does, the problem is easily corrected by adding down thrust to the engine.

The model also seemed to be a bit tail heavy. The initial balancing was done without fuel so my guess is that the fuel in the lines to the engine caused the tail heavy condition. Therefore, balance the model with a full load of fuel even if your tank is centered over the C.G.

With respect to the prop-to-ground clearance problem, I simply extended the landing gear as shown on the plans.

Our subsequent trip to the flying field was very rewarding. The pitch problem was gone and the lengthened landing gear provided plenty of prop-to-ground clearance. Kerry is an exceptional R/C pilot and flies models in a very realistic manner. His flight demonstration faithfully duplicated a Snowbird solo performance. I was very satisfied that I had achieved what I set out to accomplish!

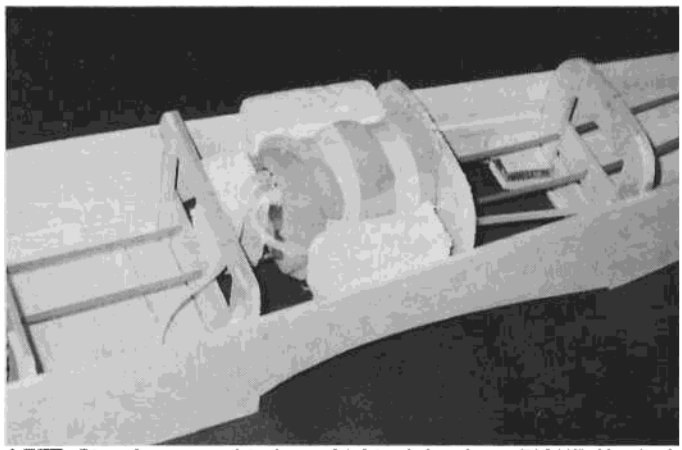
I have spent a lot of time designing and building the last few years and not much time flying so my pilot skills are only average at best. I have flown this model several times and can honestly say that it is easy to fly if you are accomplished at flying low wing sport aircraft. It is very smooth and stable and can perform aerobatics with ease. While it can fly quite fast, it is also very stable at slow speeds. Even with an all-up weight of 8½ lbs., this plane can fly very slowly and has no tendency to snap when it stalls. As with my previous designs, I attribute this to the flat bottom wing and wash-out.

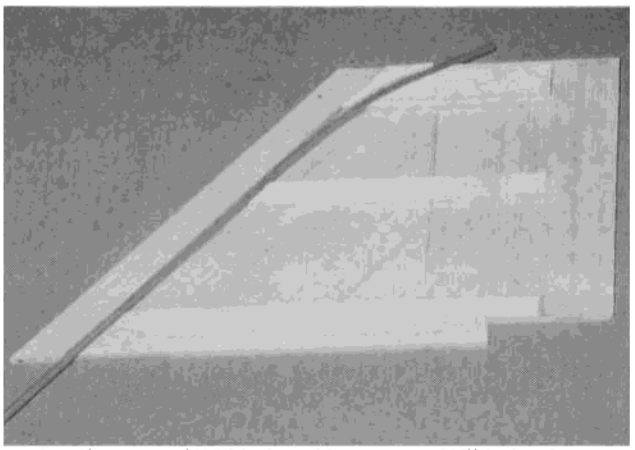
If you have considerable aileron experience and are looking for an easy to build and easy to fly jet type model that looks incredibly realistic on the ground and in the air, this one's for you.

CONSTRUCTION

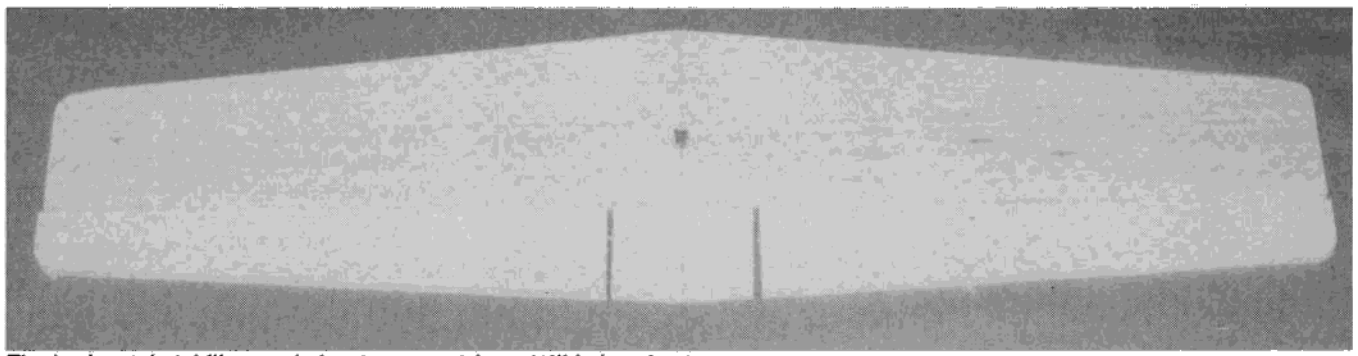
General:

As with any building project, read the



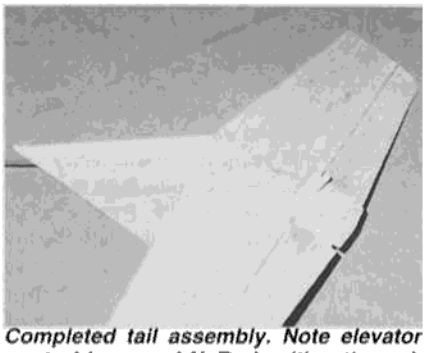


LEFT: Styrofoam used to keep fuel tank in place. RIGHT: Vertical fin construction uses 1/16" balsa skins over a 1/4" balsa frame.

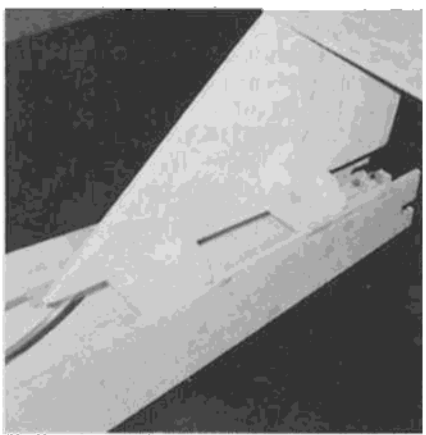


The horizontal stabilizer and elevator are cut from 1/4" balsa sheet.

Use square when gluing stabilizer to vertical fin. 1/2" balsa triangle stock should be glued to this joint to increase strength.



Completed tail assembly. Note elevator control horn and NyRod exiting through top of stabilizer.



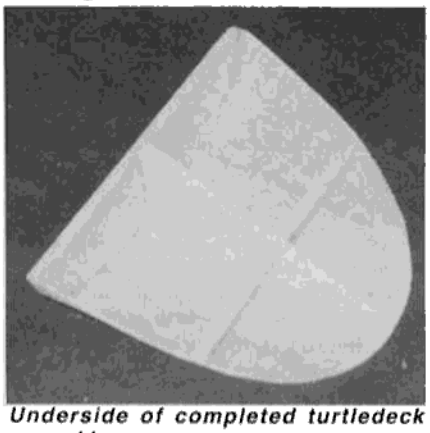
Tail assembly glued in place on the fuselage. 1/2" triangle stock used at base for added strength.

instructions and examine the plans prior to starting construction. Determine your tank, retract, and servo locations, and the NyRod routes prior to drilling holes in formers, etc. The plans show one possible set-up but it is a good idea to confirm that it will work for your radio, retracts, and engine.

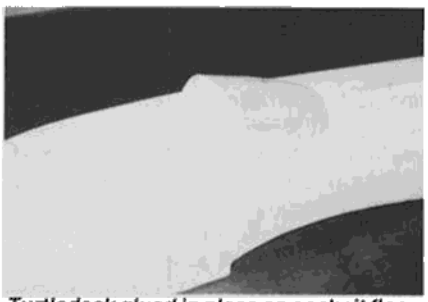
I realize that not everyone has access to a foam cutting and vacuum forming system so I have made arrangements with Bob

Top sheeting glued in place and cut out for cockpit floor.

Ensure that you get a good fit, glue joint where the vertical fin meets the top sheeting.



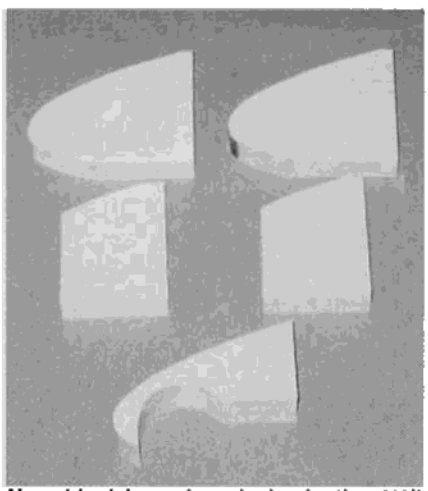
Underside of completed turtledeck assembly.



Turtledeck glued in place on cockpit floor.

Holman Plans to make canopies and foam wing cores available. Bob (who also produces parts for my A-10 design) does quality work and his parts are reasonably priced (see parts list for prices and ordering information).

Fixed gear are not shown on the plans but could be easily added. Simply cut a notch in the main wing and epoxy in a grooved birch landing gear block. For the nose gear,



Nose block is made up by laminating 1½" thick balsa pieces together. Cut-out in center piece is for retractable nose gear.

simply install a 1/8" ply former at the nose gear location and bolt on a steerable nose gear assembly. I used a Kraft electric retract for the nose gear and two inexpensive mechanical retracts for the main gear. Air or mechanical retracts could be used on all three.

A Perry regulator pump or pump equipped engine is highly recommended so that the fuel tank can be located at the Center of Gravity. Without a pump, the tank would need to be placed as far rearward as possible and a lot of weight would be required in the nose to balance the model. Even with a center mounted tank, some nose weight will be required. Again, balance the aircraft with a full tank of fuel.

I used gap filling instant glue for the entire aircraft with the exception of the following: wing dowels, wing bolt anchor blocks, dihedral joints and braces, retract mounts/plates, formers F4 and F8A, nose block, and rudder-to-fuselage joint. Five minute epoxy was used at these locations.

I did not incorporate rudder control and the plane flies great without it; however, a functional rudder could be easily installed.

Now let's get started . . .

Tail Surfaces:

Cut and glue 1/16" balsa sheet to form the shape of the vertical fin (the grain should run from top to bottom). Note the cut out for engine clearance. Glue 1/4" thick balsa frame over top of the sheeting, leaving a groove for the elevator NyRod. Glue NyRod into position and then sheet over top with 1/16" balsa. Round leading edge and sand trailing edge to achieve taper shown on plans.

Cut stabilizer and elevator from 1/4" medium density balsa. Round leading edge of stab and elevator and taper elevator as shown on plans. Cut notch in stab for elevator NyRod. The elevator control horn which connects both elevator halves is held into position by the fixed balsa piece which is between the elevators. A groove must be cut in the balsa to make room for the control wire (do not get glue on the control wire). Drill holes in the elevators to accept the control horn wire and then hinge and install the elevators. Alternatively, a one-piece elevator could be used which, while not scale, is easier to install.

Lay the stab/elevator on the building surface with the top side down so that the NyRod notch is over the edge of the surface (so the NyRod can be passed through it). Place the vertical fin into position on the stab (the NyRod is fed through the notch) and use a square to ensure that it is at 90°. When you are sure that the fin is centered and square to the stab, tack glue it into position with instant glue. When dry, epoxy 1/2" balsa triangle stock at the fin-to-stab joint.

Set assembly aside.

Fuselage:

Pin the fuselage top view plan onto your building surface and cover it with wax paper to protect it.

Nail or screw wood blocks or 90° shelf

brackets (available at hardware stores) to the building surface along the outside edge of the top view. One on each side at the front, middle, and tail is all you need. This simple jig will ensure that your fuselage is built straight.

Construct formers F1 through F8 as shown on the plans. All are made from 3/16'' balsa except for F4 which has some 1/8'' birch ply and engine mount F8A which is 1/8'' birch ply. Drill holes for NyRods, fuel tubing, and wing dowels. Note that 3/16'' ply is epoxied to the top of F8A (engine mount) to permit the use of blind nuts. Drill the engine mount holes and install the blind nuts now. If fixed gear is to be used, a 1/8'' birch ply former will need to be installed at F2 for the nose gear mounting bracket.

Use the outline on sheet #1 to cut two fuselage sides from straight and firm 42'' x 4'' pieces of 3/16'' balsa. Mark all of the former locations on the fuselage sides (on the inside) for reference later on. Be sure to cut out the notches for F7A and F8A.

Cut the wing saddle doublers from 1/8'' lite ply and glue onto fuselage sides (remember to make left and right sides).

Glue 1/2'' balsa triangle along the bottom of the fuselage sides (actually 3/16'' up from the bottom) to permit rounding later on. The triangle stock used for the front should be partially ''sliced'' every 1/2'' or so to enable it to bend to match the curve in the fuselage.

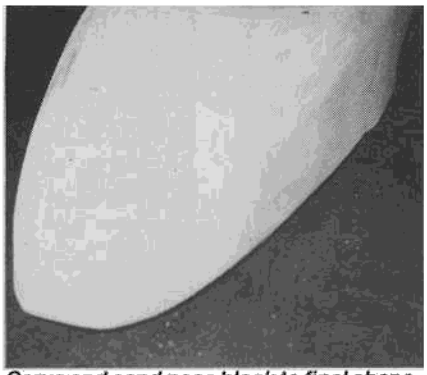
Cut hardwood wing mount blocks and epoxy them into position as shown on the plan. Fillet the space between the bottom of the block and the wing cut-out with balsa that is the same width as the block. Epoxy 1/2'' balsa triangle stock on top of the block for added strength. Also epoxy hardwood blocks into position for the nose gear mount.

Place fuselage sides over top of the plan (inside the jig) and trial fit formers into place. Some may need to be sanded slightly to achieve a proper fit. When satisfied with the fit and alignment, start gluing the formers in one at a time (use the lines drawn on the fuselage sides for reference). Note that F2, F3, and F6 should be 3/16'' up from the surface. Place 3/16'' scrap balsa underneath them to ensure proper clearance. When dry, the fuselage assembly can be removed from the jig.

For added strength, glue 1/4'' sq. balsa at the F8A engine mount and at F1, and 1/2'' balsa triangle stock at the F4 former as shown on the plans. Also, glue the 1/4'' balsa servo rail supports (these should also be sliced every 1/2'' or so to permit bending), and the 1/8'' lite ply fuel tank rails into position at this time.

Cut the bottom sheeting from 3/16'' balsa and glue it into position (note that the bottom sheeting between F1 and F3 is a removable hatch and is not glued into place).

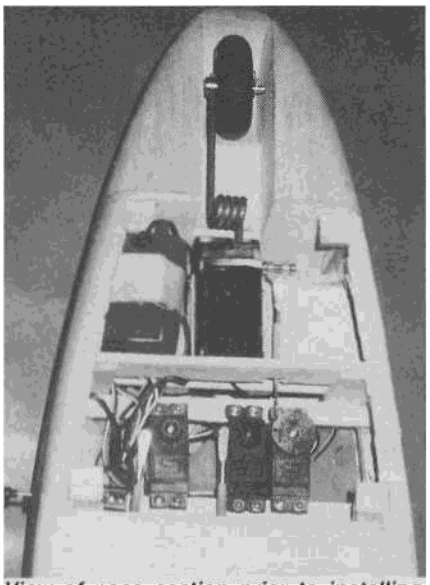
Install the throttle NyRod through the predrilled holes in the formers and anchor it as necessary to prevent flexing.



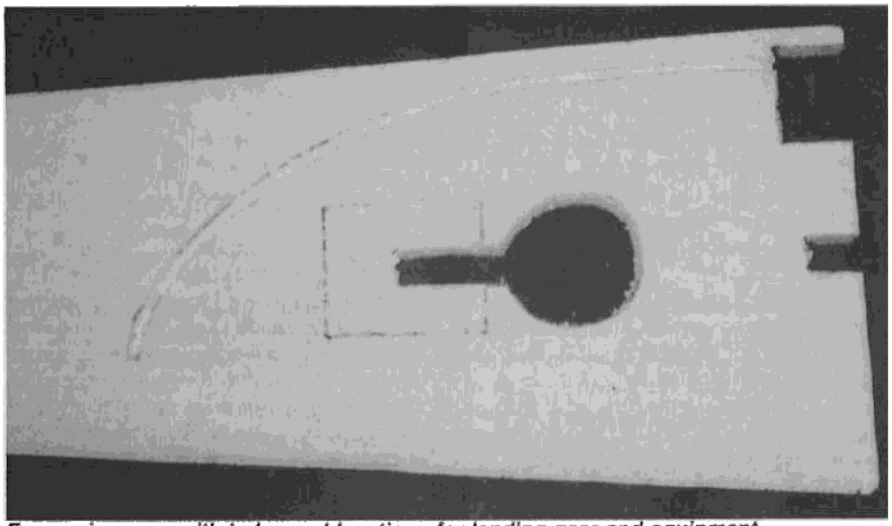
Carve and sand nose block to final shape.

Route the elevator pushrod from the stab/fin assembly through the predrilled holes in the formers and trial fit the stab/fin into position between the slots in F7 and F8. With the fuselage sitting on a flat and level surface, ensure that the stab/fin is ''square'' to the fuselage. The distance between the surface and the stab should be the same at both tips and the fin should be 90° to the building surface. When satisfied with the alignment, epoxy the vertical fin to F7/F7A and F8/F8A. Add 1/2'' balsa triangle stock as shown on the plans for added strength.

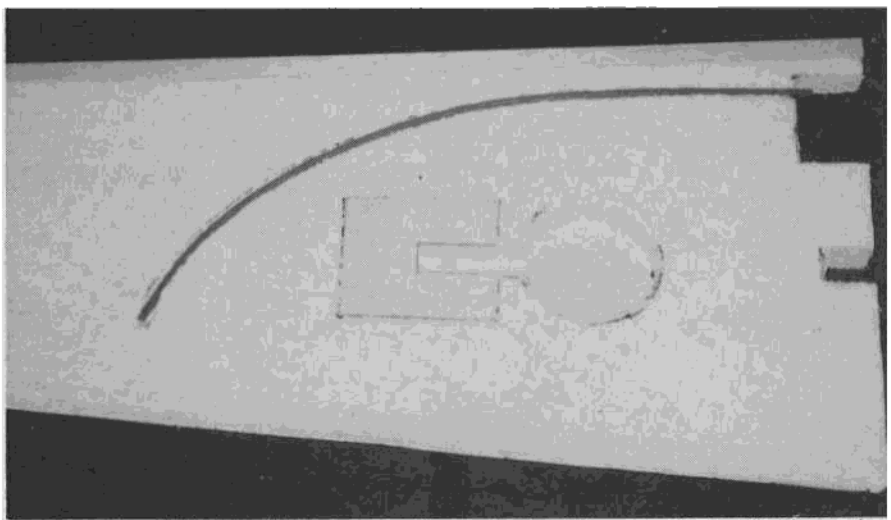
Cut the nose retract mounting plate from 1/8'' birch ply, install the nose retract, and then screw the plate into the hardwood blocks. The plate may have to be trimmed slightly to enable it to fit into position.



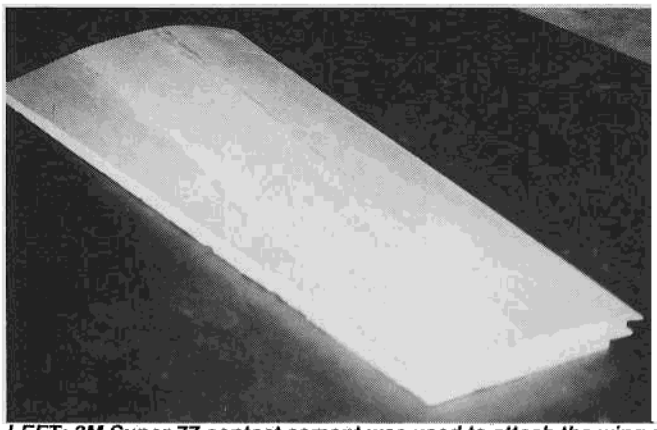
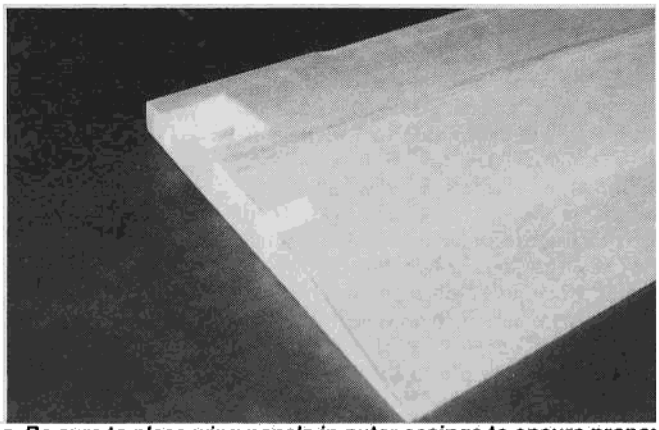
View of nose section prior to installing hatch. Note the plywood hatch retaining blocks glued into the corners.



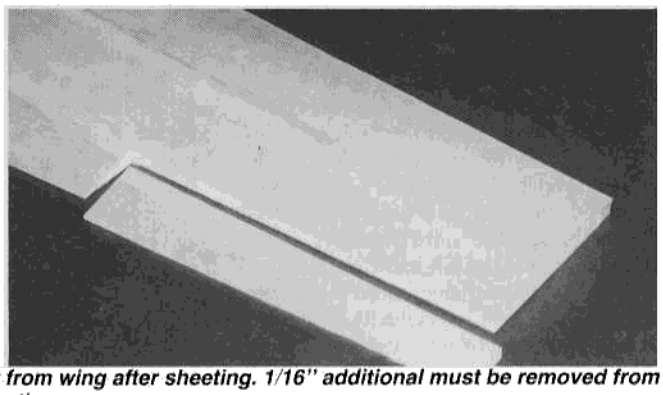
Foam wing core with holes and locations for landing gear and equipment.



Leading edge, NyRod, landing gear mount, and wheel well liner are all glued in place prior to installing wing skins.

LEFT: 3M Super 77 contact cement was used to attach the wing skins. Be sure to place wing panels in outer casings to ensure proper washout. RIGHT: Top sheeting cut out at servo locations.

LEFT: Bottom sheeting cut out for wheel well. RIGHT: Aileron is cut from wing after sheeting. 1/16" additional must be removed from ends and leading edge of aileron to make room for 1/16" balsa sheeting.

Wrap the fuel tank in foam and place it into position over the tank rails. Route the fuel tubing through the formers and the vent tube through the bottom sheeting as shown on the plans. Fuelproof the balsa where the vent tube exits.

Route retract air hose and servo extensions between F3 and F4 as this compartment will not be accessible once the top sheeting is installed.

Sheet the top of the fuselage with a relatively light grade of 1/8" balsa. If your balsa does not bend easily, scribe it lengthwise with an X-Acto knife. You may find it helpful to make paper templates of the required sheeting and use them to cut the balsa. The canopy floor is also sheeted with 1/8" balsa.

Build the turtledeck frame by gluing formers T1 and T2 to the 1/8" balsa turtledeck support. Use the outline on the plans to cut out the top 1/16" turtledeck sheeting and glue it over top of the frame. Glue the completed turtledeck into position and use lightweight spackle or balsa filler to fill any gaps.

The fuselage nose is made by laminating pieces of 1½" thick balsa together. The pieces are cut as per the side view outline (note that the center piece has a cut-out for the retracted nose wheel) and then glued together. The block is then cut to match the top view outline (a band saw is handy for this). Epoxy the completed nose to the fuselage and then carve it to final shape.

Construct the fake intakes from blue Styrofoam or balsa using the outlines and contours shown on the plans. If foam is used, it is a good idea to cover it with lightweight cloth and epoxy resin to make it dent resistant. This can later be spray painted to match your covering.

Epoxy ply or hardwood hatch anchor blocks into place for the forward hatch and then screw the hatch into position.

Carve the fuselage bottom to achieve scale contours and final sand the airframe.

Fuelproof the engine mount area.

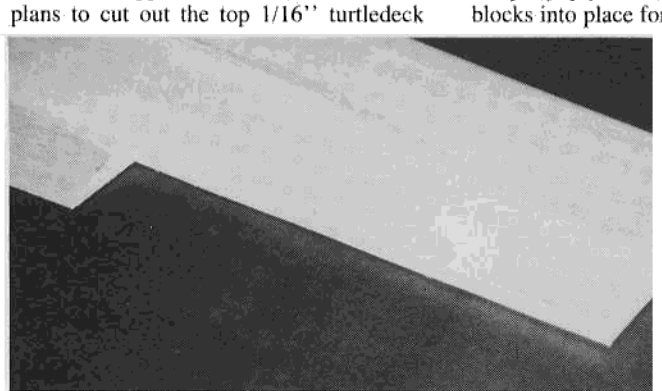
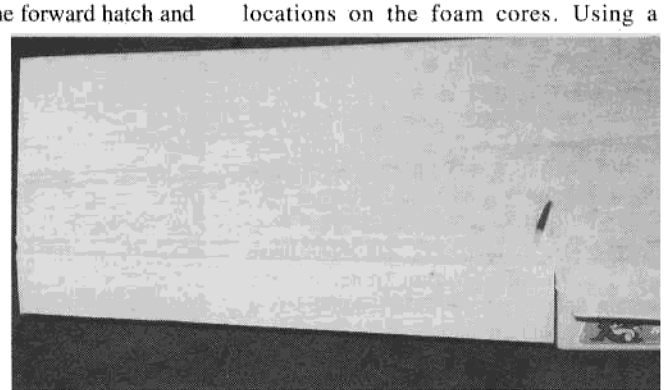
For added strength at the engine location, you may wish to fiberglass the aft 5" or so of the fuselage with light cloth and resin. Similarly, you may wish to fiberglass the front 5" or so to make the nose more "dentproof."

Trial fit the engine and muffler assembly. Cut an opening in the fuselage side to accommodate the muffler.

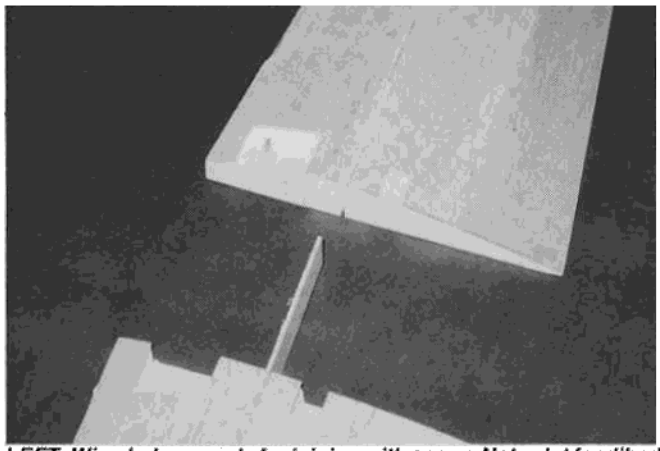
Wing:

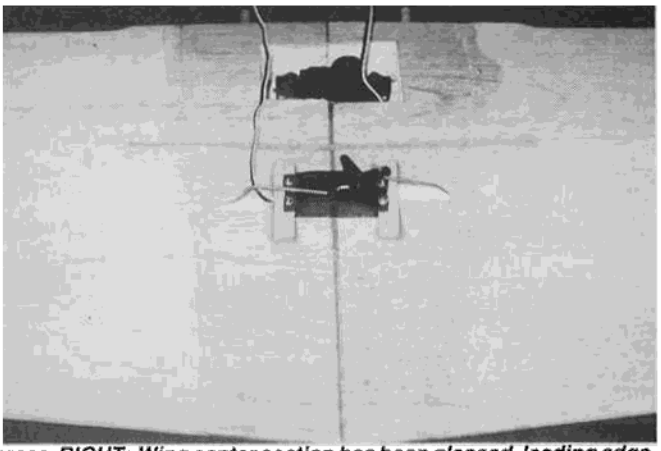
Use the root and tip airfoil outlines shown on the plans to fabricate templates for cutting the foam wing cores. Alternatively, you can order a set of wing cores from Bob Holman Plans.

Using a black felt pen, trace the NyRod, wheel well, retract plate, and servo locations on the foam cores. Using a

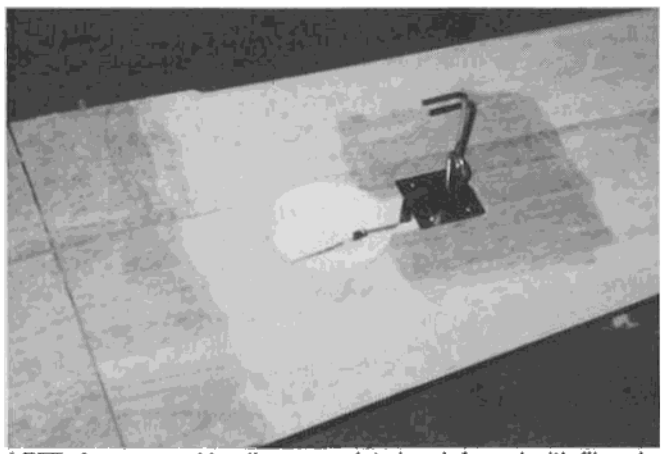



LEFT: An additional 1/16" must also be cut from the aileron opening, then capped with 1/16" balsa. RIGHT: Underside of aileron installation. Note that hinges are installed just under the top sheeting.





LEFT: Wing halves ready for joining with epoxy. Note slot for dihedral brace. RIGHT: Wing center section has been glassed, leading edge dowels installed, and servos screwed in place.



LEFT: Area around landing gear plate is reinforced with fiberglass for increased strength. Note pushrod installation. RIGHT: Fake air intakes are made from blue foam, covered with light fiberglass and epoxy finishing resin, then painted to match your covering material.

hacksaw blade, cut out the wheel wells and servo areas. Using an X-Acto knife, cut the slots for the NyRod (wing bottom) and retract linkages or air tubing (wing top). Sand down the retract plate area by 1/8'' so that the retract plate will be flush with the foam when glued in.

Epoxy the retract plates and aileron NyRod (use the blue ones) into position. Do not glue the last 2''-3'' of the NyRod at the aileron end as this will have to bend towards the aileron horn.

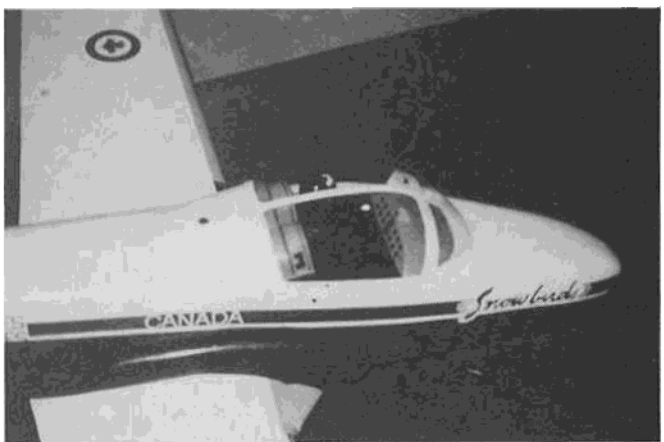
Using white glue or epoxy, glue the 1'' x 1/2'' balsa leading edge stock onto the wing core, ensuring that the bottom of the leading edge is flush with the bottom of the wing core. Use masking tape to hold the leading edge in position while drying. When dry, remove the tape and carve/sand the top of the leading edge stock to match the curve of the wing core (be careful not to gouge the foam).

Glue sheets of 1/16'' x 4'' balsa together to form the wing skins. Three sheets will be required for each panel side (12 sheets in total). Place the bottom sheeting over top of the bottom piece of foam left over from the foam cutting process (skinning the wing over top of this bottom piece will ensure that the wing's washout is maintained). Using an appropriate foam wing adhesive (I use 3M Super 77), spray both the bottom sheeting and the bottom of the foam wing core. When the glue is ready (read the instructions on the label), press the core onto the bottom sheeting. When dry, remove the excess balsa around the edges.

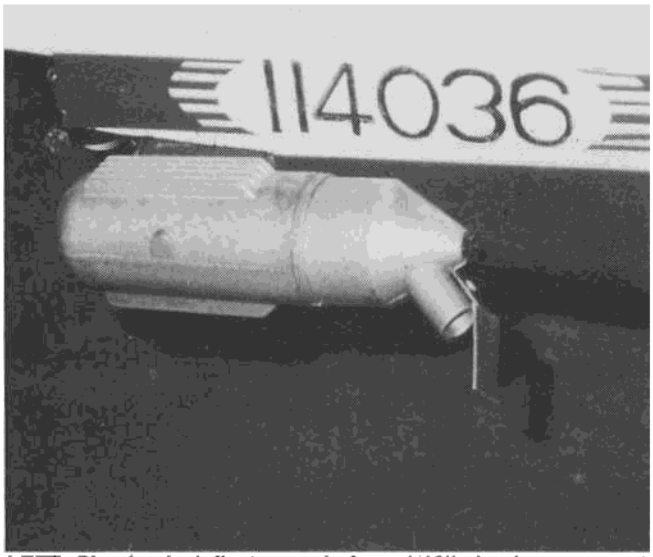
Keeping the foam core on top of the bottom foam piece, repeat the above process for gluing the top sheeting. Again, trim the excess balsa away once the wing is dry.

Carve/sand the leading edge of the wing as shown on the plans. Note that the center 14'' of the leading edge should not be rounded on the bottom (the section between the outer edges of the balsa fillets).

Mark the wheel well/retract opening on



LEFT: Engine with pump installed. RIGHT: Canopy in place and detail work completed. Note switch location.



LEFT: Simple air deflector made from 1/16" aluminum prevents excessive back pressure at exhaust outlet. RIGHT: Bottom view of completed aircraft.

CANADAIR CT-114 MATERIAL LIST

Balsa sheet
12 — 1/16" x 4" x 30" (wing, vertical fin, turtledeck sheeting)
4 — 1/8" x 4" x 30" (fuselage top sheeting)
2 — 3/16" x 4" x 42" (fuselage sides)
4 — 3/16" x 4" x 30" (fuselage bottom, formers)
3 — 1/4" x 3" x 30" (rudder, stab/elev., laminated wingtip)

Balsa Sticks/Block
2 — 1" x 1/2" x 30" (wing leading edge)
2 — 1/2" x 1/2" x 36" triangle stock
1 — 1/4" x 1/4" x 36" stick
1 — 15" x 4" x 1½" (nose)

Hardwood
1 — 1/2" x 1/2" x 5" (nose gear blocks)
1 — 1" x 1/2" x 3" (wing anchor blocks)
1 — 4" x 1/4" diameter dowel (wing dowel)

Plywood
1 — 1/8" x 4" x 30" Birch ply (retract plates, engine mount, dihedral brace, former F4)
1 — 1/8" x 4" x 24" Lite ply (wing saddle doublers, fuel tank rails)
1 — 3/16" x 1/2" x 18" Ply (servo rails, hatch anchors) — note that hardwood could be used instead

Canopies and foam wing cores are available from: Bob Holman Plans, P.O. Box 741, San Bernardino, California 92402, Ph: (909) 885-3959 Fax: (909) 889-9307.
Price (U.S. funds): Wing Cores, $25.00; Canopy, $15.00; shipping and handling $6.00.

Miscellaneous
(other than engine, radio, and retracts)
1 — Perry regulator pump (or pump-equipped engine)
1 — 10 oz. fuel tank
1 — 40" fuel tubing
3 — 36" blue NyRods
2 — control horns (ailerons)
1 — control horn that connects both elevators
1 — 2" dia. nose wheel
2 — 2½" dia. main wheels
2 — 1/4-20 nylon wing bolts
3 — 5/32" wheel collars
1 — package of 12 medium size hinges
2 — 6' rolls of covering (1 white and 1 red for Snowbird's color scheme)
— spray paint for fake intakes
— fiberglass cloth and resin (wing joint, nose, wing retract plates)
— lite cloth and epoxy resin to cover fake intakes made of foam
— 2 ozs. instant glue
— 5-minute epoxy
— miscellaneous bolts, screws, and blind nuts for engine mount, servos, hatches, and retracts
— 1/16" x 1" x 3" aluminum for pump bracket

If fixed gear is to be used, the following will be needed:
1 — steerable nose wheel strut and mount
1 — 5/32" x 36" music wire for main gear
4 — landing gear hold-down straps
2 — 6" x 3/4" x 3/8" hardwood landing gear blocks.

the bottom wing sheeting and cut out the sheeting. Line the inside of the wheel well with 1/16" balsa. Also, cut the servo openings in the top sheeting.

Mark the aileron outline on the wing top sheeting and cut it out (the cut should be 90° to the wing bottom). Cut or sand an additional 1/16" from the aileron cut-out and cap this area with 1/16" balsa. Also, trim 1/16" from the aileron root and 1/8" from the aileron tip and cap both ends with 1/16" balsa. Draw a line on the aileron top sheeting 1/16" back from the leading edge. Bevel the leading edge of the aileron along this line as shown on the plans and cap the leading edge with 1/16" balsa.

Hinge the aileron by installing the hinges just beneath the top 1/16" wing sheeting. Install the aileron horn and then cut a 1" x 1/4" slot in the bottom wing sheeting where the aileron NyRod exits the wing.

Cut the dihedral brace from 1/8" birch ply and then cut the brace slots in both wing panels. Sand the root of each wing panel at the appropriate angle so that there will be a good joint when the panels are glued together at the dihedral angle. Epoxy the brace into one of the panels and let cure. Insert the yellow inner NyRod into the blue outer Nyrod in each wing panel and couple them in the middle where they will be connected to the aileron servo. Glue the wing panels together by applying epoxy to the root of the panels and the dihedral brace and then pushing the wing panels together (do this with the yellow NyRods in place). Block each tip up by 1⅝" to achieve the proper dihedral. The root of both panels should be flat on the building surface. For added strength, the center 6" to 7" of the wing can be reinforced with fiberglass cloth and polyester or epoxy resin.

Trial fit the wing into the fuselage and trim the wing saddle as necessary to ensure a good fit. With the wing perfectly centered, mark the location of the two wing dowels on the wing leading edge and drill 1/4" holes in the leading edge for the dowels. It is important that the holes in the leading edge

ABOUT THE AUTHOR

This is Mike Pastro's third design to be featured in RCM. Mike wishes to thank the following people who helped make this project a success: Kerry McAllister for his proficient test flying and "pit crew" support; Rip Kirby for the flight photos and for his help in the "pits"; Manfred Aust for some of the static photos; Ian and Sara Chapman for their assistance in doing the cover photo; Bob Holman; The Canadian Forces Snowbirds Flight Demonstration Team; and, of course, his wife Kim and two sons, Steven and Bryan, for being so understanding about this whole model airplane "thing."

line up perfectly with the holes in F4! Epoxy the dowels into the leading edge.

Place the fuselage upside down and fit the wing into position. Using a 3/16" bit, drill through the bottom of the wing and into the hardwood wing blocks inside the fuselage. Tap the wing blocks to accept 1/4-20 diameter nylon wing bolts.

Fabricate the wingtips from 1/2" balsa or laminated pieces of 1/4" balsa. Glue these into position and carve/sand to achieve proper rounding.

Final sand the wing in preparation for covering.

Finishing:

Cover the aircraft with your favorite iron-on covering and paint the fake intakes to match. Install the pilot and other cockpit details and then glue on the canopy using an appropriate clear drying adhesive. I fabricated most of the decals from MonoKote trim sheets but used a permanent marking pen and stencil to do most of the lettering (I covered the ink with clear self-adhesive trim to ensure that it would stay fuelproof). Using this method I was able to faithfully reproduce the Snowbird markings.

Final Assembly and Preflight:

As shown on the plans, fabricate a simple bracket out of 1/16" aluminum to connect the Perry pump to the engine and then bolt the engine to the engine mount. Connect the fuel line and pump tubing as per the manufacturer's instructions. Install the muffler and screw on a 1/16" aluminum air deflector as shown on the plans to prevent ram air from entering the muffler.

Install the radio gear and retracts and complete the linkage assemblies. Adjust the flight control linkages so that the following throws are achieved: 1/2" up and 1/2" down for the elevator and 3/8" up and 3/8" down for the ailerons.

Fill the fuel tank and balance the aircraft at the Center of Gravity shown on the plans. Don't be afraid to add nose weight! This model handles its weight very well but, like any aircraft, will not fly if tail heavy. Also balance the model from side to side and add weight to the light wingtip as necessary.

To help take-offs, adjust the nose gear so that the bottom of the wing will be at a slightly positive angle of attack.

Flying:

With an all-up weight of 8½ lbs., my Tutor Jet routinely takes off from our upward sloping grass field in approximately 75'. I am using an ASP 46 engine and a Master Airscrew 10 x 6 pusher prop. Any good .40-.46 engine should fly the model well (I recommend a .45 or .46 if retracts are used).

The flat bottom airfoil, wingtip washout, and dihedral make this model very stable. It can fly and land very slowly, yet has good high speed performance and maneuverability. Loops, rolls, and inverted flight are easily performed but hammerheads, snap rolls, and so forth are not possible due to the absence of rudder. Not many full-scale jets can do these either! As mentioned earlier on, rudder control could be easily incorporated for those interested in snap rolling their Snowbird.

When taking off, remember that this is a pusher-prop aircraft and, like a jet, there is no propeller wash over the control surfaces to make them respond at low speed. Let the model build-up sufficient air speed before applying up elevator. The rest of the flight is very similar to a conventional sport aircraft — only better because the model looks like a real jet!

CANADAIR CT-114 TUTOR

Designed By:
Mike Pastro
TYPE AIRCRAFT
Pusher Prop Sport Jet
WINGSPAN
60 Inches
WING CHORD
9½ Inches (Avg.)
TOTAL WING AREA
570 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
1⅝ Inches
OVERALL FUSELAGE LENGTH
46½ Inches
RADIO COMPARTMENT SIZE
(L) 3" x (W) 6½" x (H) 4"
STABILIZER SPAN
24⅞ Inches
STABILIZER CHORD (incl. elev.)
5⅜ Inches (Avg.)
STABILIZER AREA
133 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Vertical Fin (T-Tail)
VERTICAL FIN HEIGHT
6 Inches
VERTICAL FIN WIDTH (incl. rud.)
8⅞ Inches
REC. ENGINE SIZE
.40-.46 2-stroke
FUEL TANK SIZE
10 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4 (5 w/Retracts)
CONTROL FUNCTIONS
Elev., Throt., Ail., Nose Gear
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Foam
Empennage ..... Balsa
Wt. Ready To Fly . 112-144 Ozs. (7-9 Lbs.)
Wing Loading ..... 28-36 Oz./Sq. Ft.

Safety Tip:

While I have never encountered any significant problems operating pusher prop models I must caution that they are different than conventional aircraft and must be handled accordingly. The propeller tends to pull air through it so extreme care must be taken when adjusting the carburetor. As with any model aircraft, exercise caution and good safety practices at all times such as keeping spectators well back of the flight line and wearing safety glasses when starting engines.

Conclusion:

If you are fascinated by jet flight and want to duplicate it in model form without getting into ducted fans, seriously consider building this model. It is easy to construct, looks scale, and has great flight characteristics while employing a simple 2-stroke engine and propeller.

Formation flying anyone? □