



“TURBINATOR” TURBINE TRAINER

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The “Turbinator” was designed to offer a realistic turbine trainer. If you recognize 1950’s era jet fighters you will see a number of them have been captured in this design. The “Turbinator” will fly out and back into short fields that many others jets won’t attempt. Its slow flying ability is outstanding. Construction is all wood. The fuselage requires a little more effort than some others but I feel that you will find the end result makes it worthwhile. The engine is out of sight yet there is no expensive tailpipe required. A 12 to 14 lb. thrust turbine is recommended. A 12 lb. thrust Robart “Funsonic” turbine has been used in the 20½ lb. prototype with great success.

The wing plan shows the option of an extended wing. If your flying site is above 5,000 feet you might want to consider this option. Make sure you have the AMA required “Turbine Waiver” before flying your “Turbinator”. If you don’t have one, apply for it now. Application forms may be obtained from the AMA at www.modelaircraft.org. Go to membership Services, AMA Documents, Document 510D.

CONSRUCTION

FUSELAGE

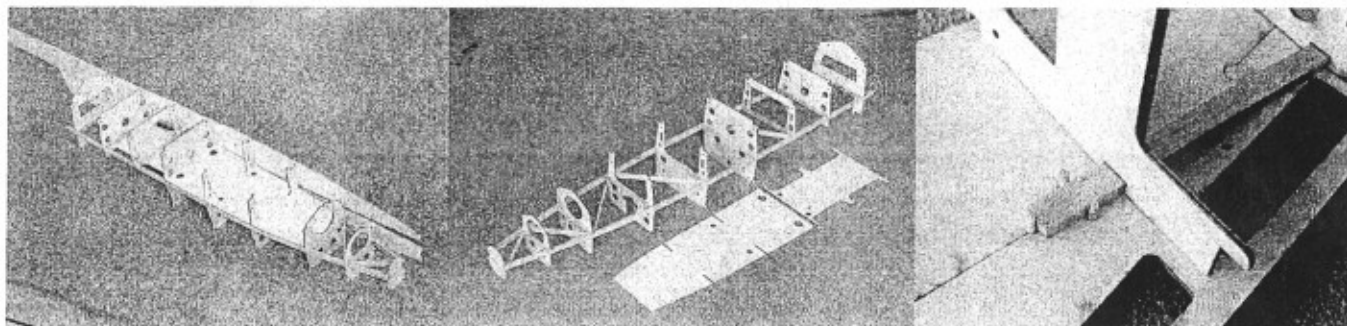
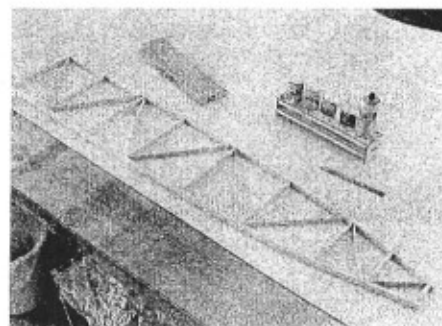
Cut out all the fuselage parts from the correct plywood. If you can obtain 4’x 8’ Poplar plywood the fuselage sides can be made in one piece. This may be available in some lumber yards or cabinet shops. Don’t use mahogany door skins. This material is heavy and not as strong as Poplar.

Build the crutch from 1/4”x 1/2” and 1/8”x 1/2” balsa over the shaded area of the top view. Be sure to place the diagonal braces as shown so the formers will fit against the crosspieces.

Glue formers F-1 to F-9 in place on the crutch. Make sure they are square to the crutch. Add the 1/8” plywood floors FF-1 & FF-2 to the crutch. FF-1 goes on the top and FF-2 on the bottom. Sand the edges of the crutch to match the formers.

Join fuselage sides FS-1 & FS-2 together. Place a straight edge from the front to rear split and cut about a third of the way through the plywood. Be sure to make one right and one left. Place the cut edge up on the edge of the workbench and slightly fracture at the cut line. The cut side is the outside. Only break enough to fit against the formers.

Add the 1/4” x 3/8” tapered top hatch edge stringer. Carve and sand or saw the angle in this stringer. Clamp this in place to hold the curve. Glue the 1/4” sq. hard wood rear stringers and front and top balsa stringers in place. Glue the 1/4” plywood WS-1 to the outside of each side. Align at the wing saddle edges. Add 1/8” ply SS-1’s to the inside at the tail. Cut an 1/8” dia. dowel into two 1/2”, eight 3/8” and six 1/4” lengths. Glue FS-3 to the outside surface using the dowels to position it. Use the length dowels as called out on the plan in all the 1/8” holes. Let the extra length extend to the inside surface of the fuselage sides.



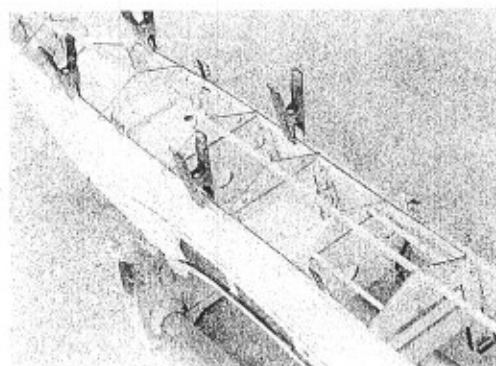
These are used to position the sides and end of the crutch.

Trial fit the sides to the crutch/former assembly. Be sure the rear 1/8" dowel is against the rear and of the crutch. Glue the sides to the crutch and formers from F-6 to F-9. Pull the tail end together and with a piece of 1/4"x 1/2" at the tail post location clamp so they are even with each other and square to the crutch. Glue the remaining rear formers, F-10 to F-14, in place. Add the 1/8" balsa caps on top of the tailpipes. Glue the 1/4" ply MM-1 motor mounts to F-10 and F-11. Add the 1/4"x 1/2" braces.

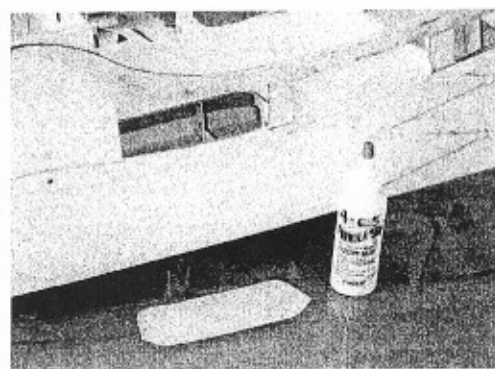
Pull the front sides together and glue to the formers and crutch. Be sure that the side splits are centered on the crutch. A large pin in the outside of the crutch at F-1 and F-3 will help. Add the servo rail supports SM-1's and SM-2 and 1/4" ply servo mounts. Pre-mount and remove the nose wheel steering and retract valve servos. These can be standard 40 - 50 in. oz. torque servos. Locate the front rails to fit the servos being used. Add the 1/2" sq. hard wood nose wheel retract mount rails between F-3 and F-4. Block sand the bottom from F-6 forward and glue FB-1 in place. Sand the edges to match the sides. Glue 7 1/8" ply tabs around the inside edge of FB-1 and fit and screw FH-1 in place.

Epoxy the 1/4" ply F-8A's and F-9A's in place as shown on the plan. Follow this by epoxying the 1/2"x 3/4" x 6" hard wood wing mount blocks and triangle braces securely in place. Cut away the crutch that passes across the air openings above WS-1. Bevel the air opening edges of FF-2 and glue the light cardboard ducts in place. Soak these with glue to make them pliable and they will easily conform.

Add the 1/4" sq. balsa top stringer. Bevel the top and bottom edges of F-4A and F-4B as shown on the plan. Glue F-4A in place



on top of F-4. Wrap the top edges of the fuselage between F-4 and F-9 with kitchen plastic wrap. Set hatch edges H-1 in place and clamp with .010" to

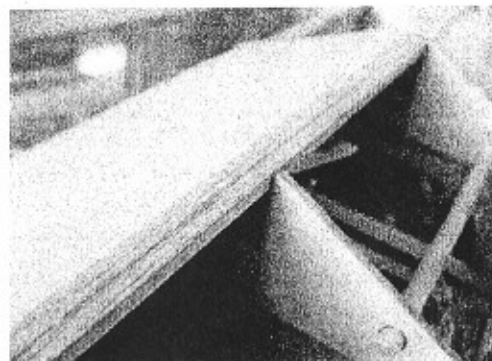


.015" spacers between them and the fuselage stringer. Doubled cardboard subscription offers as found in magazines works fine. Place a piece of plastic wrap over F-4A and glue F-4B in place. Do the same at F-9 and add F-9A. Glue the remaining hatch formers F-5A and F-6A's in place. Add the rear 1/4" dia. hold down dowels.

Adjust the holes in F-6A if dowel alignment is required. Use a sanding block to bevel the top stringer and match the top hatch formers to the fuselage sides.

I've tried a number of sequences to cover the top of the fuselage and found the following to work the best. First cover the top from F-1 back to the F-6A at F-9 and then the fin. Finally remove the hatch and cover from F-13 forward to F-9. The final section is the toughest and might be easier to do in strips rather than one piece on each side.

As above, cover one side from F-1 to the aft F-6A with 1/8"x 4"x 42" balsa. I run a bead of carpenters glue such as Sig's yellow "Sig-Bond" glue or "Titebond" along the top edge H-1 and the formers. Don't glue at F-9 and F-4. Pin the outer edges to the fuselage and glue to the top stringer with Pacer thin Zap. When this has dried trim



of

the edges and sand the top so the opposite side over laps the first, see photo. Slice through the covering between F-4A and F-4B in a couple of spots so the separation line can be found later. Glue the second side in place like the first. When dry cut and sand to match the sides and bevel the top edge to meet at the center. Cut between F-4A and F-4B and remove the hatch. Glue the covering to F-4A and B and F-6A.

Build and cover the fin. Glue the $1/4" \times 1/2" \times 14\ 7/8"$ hard balsa tail post in place. Be sure it is square to the fuselage from the side and front. Do this on a flat surface and with a level and square to assure proper alignment. Join R-7, 8 & 9 together over the plan. Glue the R-2's together at F-13 and the tail post. Add R-1 and tip rib R-6. Be sure that R-6 is square and in line with the centerline of the fuselage. Also, that the rib slots in R-1 are on the same side as the one in F-13. Slide the remaining ribs in place and glue. Again, be sure they are square to the tail post. Add the leading edge assembly and $1/8" \times 1/4"$ spars. Cut $1/2"$ square balsa hinge mount blocks and glue in place.

Cover the fin from the spars to the tail post with $3/32"$ balsa. Let the covering overhang the tail post by about $1/8"$. Be sure the fin remains in alignment. Now cover the front of the fin with $3/32"$ soft balsa. Use the pattern on the plan and soak with 50/50 water and ammonia mix if required. Fit it so the front edge sits in the middle of F-13. Cover one side and trim the front to follow the airfoil contour. Let the second side overlap this. Trim this to form a sharp leading edge. It will be final shaped later.

The last piece is from F-9 to F-13. If you have the right consistency $1/8"$ balsa sheet each side can be done in one piece. If not use $3/4"$ to $1"$ wide

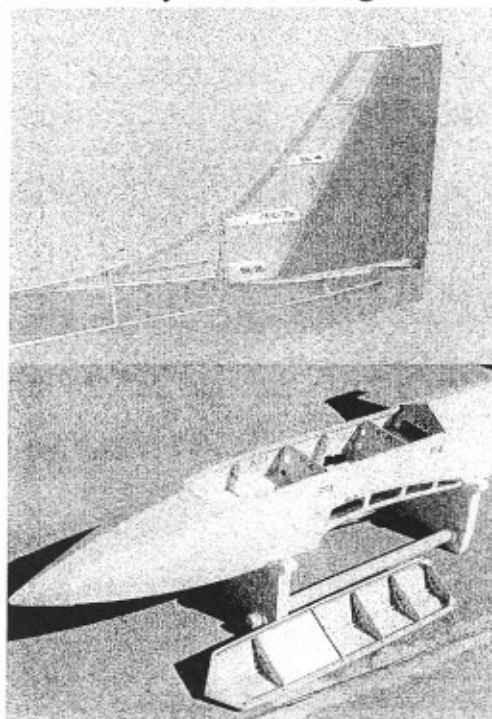
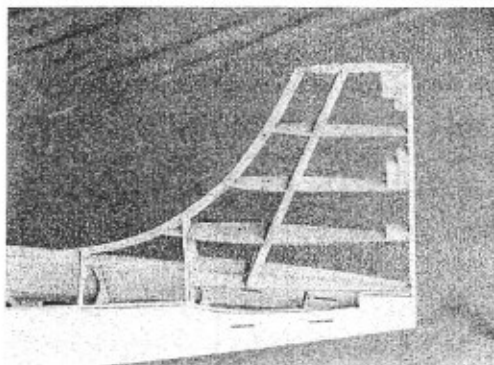
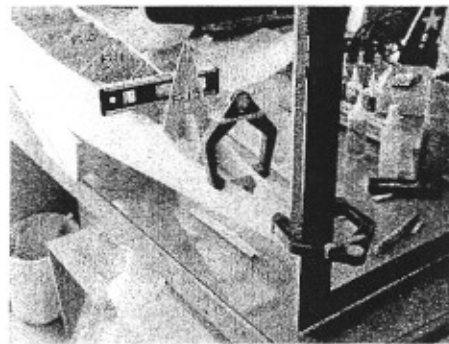
strips. Overlap the top joint as was done on the forward section.

Rough cut the nose block to shape. Hollow it and add 8 to 10 ounces of weight. Glue it in place. Carve and sand to final shape. Glue $1/8"$ ply tabs to the inside edge of FB-1 as shown. BH-1 is screwed to these with #2 x $3/8"$ flat head screws. Shape

hardwood blocks or plywood and epoxy in back of F-4A and on top of F-4B for a #6-32 screw and T-nut to hold the hatch in place.

Cut the $1/4" \times 1/2"$ balsa rudder leading edge to length. Sand a taper in it to match the airfoil. Mark the Robart Hinge Point locations and drill $3/16"$ diameter holes at these points. Slide this between the overhang at the tail post and transfer drill holes into it. This is much easier to do before the surfaces are completed.

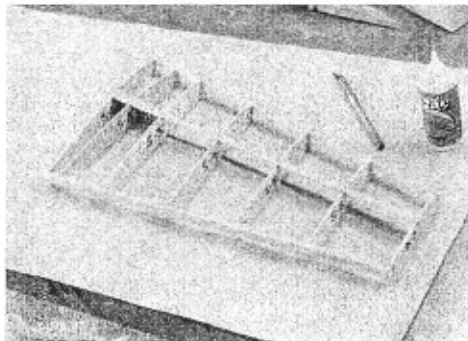
The inlets remain to be installed but the completed wing is required to do this.



STABILIZER, ELEVATORS AND RUDDER

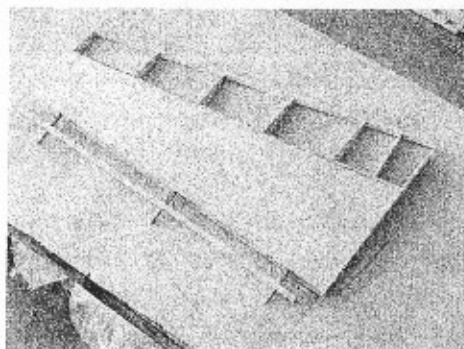
Pin ribs S-2, 5, & 7 in place on the plan. Glue the $1/8" \times 1/4"$ balsa top spar into the ribs. Place S-AG into the slot in S-2. This sets the angle of rib S-1. Slip the remaining ribs into place under the spar and glue. Add the $1/4" \times 1/2"$ hard balsa trailing edge and $1/4"$ sq. balsa leading edge.

Remove the assembly from the plan and add the bottom spar. Sand the top of the trailing and leading edges to conform to the ribs. Do not remove the rib legs yet. Make $3/32"$ balsa sheets that will cover from the center of the spar to the leading edge and to the trailing edge plus $1/4"$ extra. Run the wood grain along the leading and trailing edges.

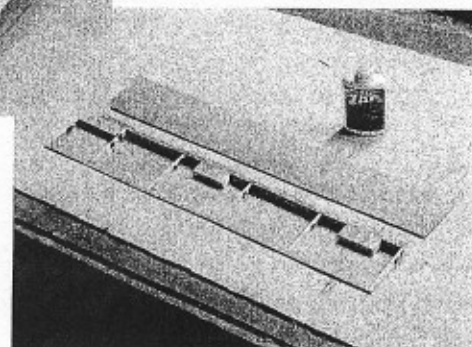


Glue the top rear sheet in place and then the front sheet. Do not remove the extra sheet that extends past the trailing edge. Place back on the rib legs often to be sure the surface isn't having a twist built into it. Add the 1/16" balsa webs to the front of the spars. Run sq. hinge blocks.

Remove the rib legs and sand the ribs shape. Cover the rear and front with extended trailing edge covering sand the to the width and angle that will slide rudder, mark the location of the Robart Large Hinge Points on the elevator leading edge and drill 3/16" dia. holes. Slide these in place on the stabilizer and transfer the holes into it. Once this is done cut the overhang off and sand flat. Now the completed elevator should align correctly with the stabilizer. Cut the 4 elevator and 2 rudder coverings from 3/32" sheet balsa. Glue the angled leading edge to the front surface of an elevator sheet. Add the ribs and hinge blocks and ply control horn mounts. Sand the open section smooth and glue the top sheet in place. Sand the leading edge top and bottom at an angle for up and down travel. Add the 1/8"x 1/4" tapered hard wood trailing edge cap and sand them even with the top and bottom surfaces. Repeat this for the rudder. Add the soft balsa tips and carve and sand to shape. Don't permanently hinge the control surfaces at this time. I recommend that the stabilizer and control surfaces be fiberglassed and ready for paint or covered in film before they are installed

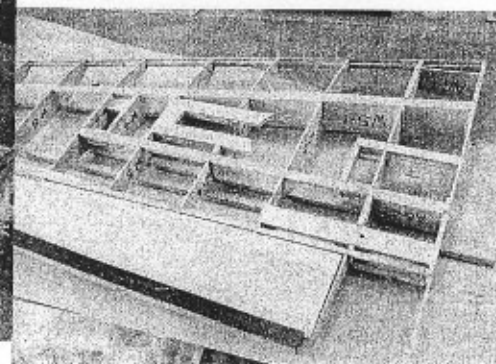
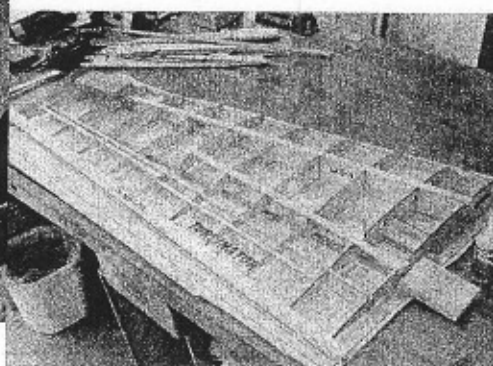
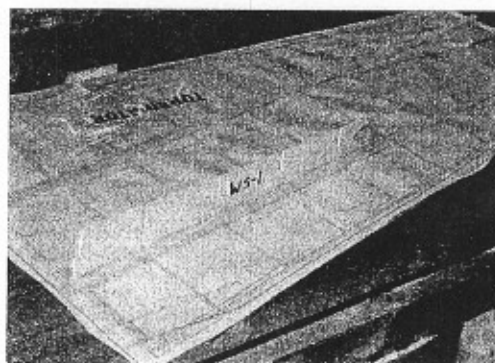


the grain vertically. Add the 1/2" and leading and trailing edges to 3/32" balsa. Before removing the 1/4" x 1/2" elevator leading edge between the overhang. Like the



WING

Tack glue, tape or pin the 3/8" square rib shim to the plan at position one. Glue the 1/4"x 1/2" hard balsa or spruce spar to the bottom, edge with no rib slots, of WS-1. Glue the plywood doublers to ribs W-1, 2, 4 and 5. Be sure to make one right and one left set. Pin the spar and WS-1 assembly to the plan. Glue all the ribs except W-1 & W-6 to the spar square to the board. Be sure that W-2 is in line with W-2 on the plan. Move the rib shim forward under the ribs to position two. This will put a twist in the wing, washout. There are two positions of the rib shim because at position two the spar lifts off the plan at the tip. Roll paper or use plastic tubes, see plan, for aileron and



air line conduits. Tack glue W-1 and DG-1, 2 and 3 in place. These rest on the plan and are trimmed to the ribs later. Make sure W-1 is flat and at the proper angle. Check with a straight edge. Add the top 1/4"x 1/2" spars, rear 1/8"x 1/4" spars and the leading edge 1/4" square balsa. I use a grooved 3/4" square hardwood, straight, strip to keep the trailing edge tips of the ribs aligned.

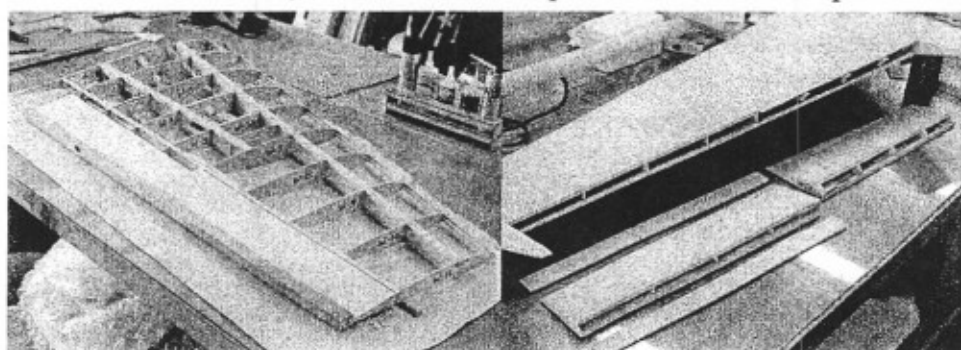
Remove from the plan and add all the bottom spars and 1/8" balsa leading edge cap. Sand the edges of the cap to match the ribs. Glue WM-1 and the inside balsa block in place followed by LG-1 landing gear mounts and triangle hard wood braces. Drill a 3/16" dia. hole through the hole in WM-1 and the balsa block above it. Add W-6 and W-6A. Use a long sanding block and be sure the ribs are even and there are no high spots. Check the leading edge to

be sure it is straight. If it is bowed I clamp a straight edge such as a 1" square aluminum tube or angle to the front of the leading edge cap. Once it is covered the wing will stay straight when the straight edge is removed.

Cover the bottom with 3/32" sheet balsa. I prefer to cover the bottom of the ailerons and flaps with separate pieces of balsa. I make up sheets that will fit from the center of the main spar to the flap and aileron. A second piece is made to fit from the center of the main spar forward. Sand these smooth so a minimum of sanding will be required later. When the bottom is covered, in whatever manner preferred, add the flap and aileron end ribs W-2F, W-7A, flap hinge mount blocks and 1/8" aircraft ply control horn mount plates. Glue the 1/4"x 1/2" hardwood flap servo mounts into W-1 and W-2. So that locations can be found later pierce a hole through the bottom covering at the corners of the servo openings, retract openings and through the wing mount block. Finally add the vertical grain 3/32" balsa webs between top and bottom main spars.

Cover the top of the ailerons and flaps. I use a second grooved strip to assure a straight trailing edge. The groove is angled and wide enough to clamp the two 3/32" sheets together at the trailing edge. See the photo. Be sure not to glue this in place.

Before covering the rest of the top of the wings fit them together at the root to check that the rib angles produce the correct dihedral, 1 3/4" under each tip. Sand the ends if required for a good match. Make sure the 1/4"x 1/2"



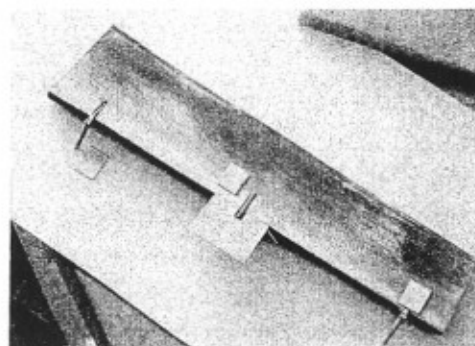
hard wood joiners and WJ-1 fit properly. Cover the top of the wing from the center of the main spar to rear 1/8"x 1/4" spar. Do this with the wing on the plan and washout strip in place. I use "Sig-Bond" or "Titebond" on the ribs and rear spar. Put the pre-joined sheet in place and tack it in a few spots to the main spar with thin CA glue, Zap. Pile about 4 inches of model magazines on the wing. Before the

glue has time to dry insert the hard wood joiners and remove. This is to wipe away any beads of glue that will prevent them from fitting in later. When dry remove from the board and glue the sheet to the main spar with thin Zap.

The leading edge can be covered in the air. Once the main top sheet is in place a box is formed with it and the vertical spar webs that hold the wing twist permanently. The leading edge is glued to the main spar. When dry I put an 1/8" diameter tube in the glue bottle and run a bead of glue on each rib. Start at the middle of the leading edge and pull the sheet down to the 1/8" leading edge cap and glue with thin Zap. Work one rib at a time from root to tip gluing the covering to the cap. Make sure the sheet covering is on the ribs. Use pins to hold it if required. When dry cut and sand off excess sheet to form a flat surface for the 1/4" balsa leading edge. Glue the leading edge in place and carve and sand to shape. Sand the trailing edge flat and glue a tapered 1/8"x 1/4" hard wood strip on it. Sand the top and bottom surfaces to blend the two. You should have two identical, straight, wing panels. Rough cut the wing tip blocks to shape and glue in place. Carve and sand them to final shape.

Before removing the flaps route a 3/16" wide and deep groove for the large Robart Hinge Point flap hinges. A motor tool and routing attachment make this easy. If one is not available they can be cut with a model knife. The inboard groove is into plywood so will take a little more effort. Cut the grooves the length of the hinge. Note that the hinge line is forward into the wing. This is to allow the flap to swing down below the wing and create a slot between the wing and flap. When gluing the hinges to the flaps use a gauge to make sure all the hinge pins are the same distance from the flap.

When the slots are completed cut the flaps and ailerons off the wing. Sand the rear of the wing flat. Leave the rib extensions on ribs W-3 to W-7. Extend the top covering in the area of the flap with hard 3/32" sheet. Cap the back of the wing with 1/8" balsa. Cut and fit a strip of 1/16" balsa in the top corner of the flap overhang. Sand the front of the flap to form a shape that can be covered with soft 1/16" balsa. Sand the front of the ailerons to the angle shown and cap with 1/8"



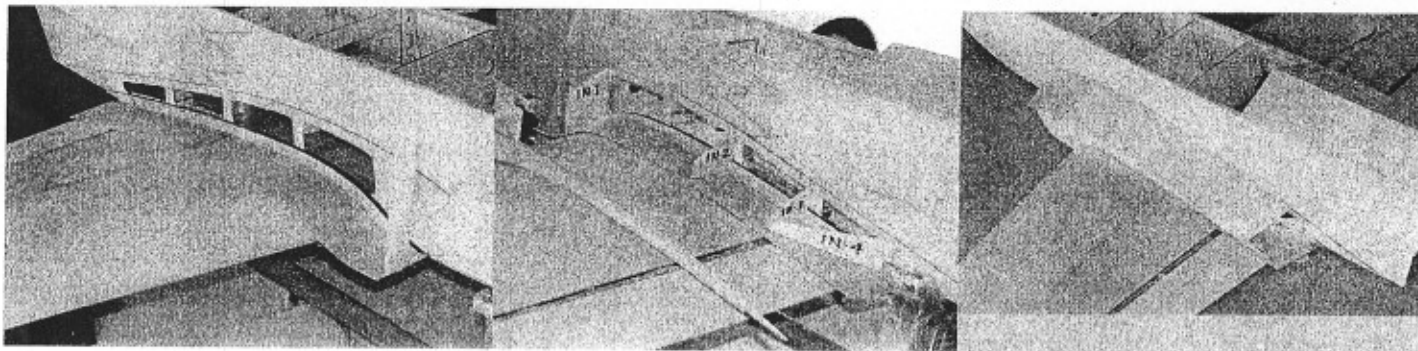
balsa. Cut slots in the wing and ailerons for large flat DuBro hinges. Don't permanently hinge any control surfaces until they are ready for paint. Cut the openings for the servos and retracts. Mount and then remove the retracts and servos. Shim or cut away the servo mounts so the top of the servo is even with the wing skin. If desired the wings may be covered with Ziroli fiberglass and Pacer Z-Poxy before joining.

Join the wing panels with epoxy and the hardwood joiners. Cut off the front at W-1 along WJ-1 and then epoxy the 1/2" dia. wing mount dowel in place. Cap with WJ-2 and sand the edges to match the wing. Re-enforce the wing joint with 4" wide fiberglass top and bottom.

INLETS

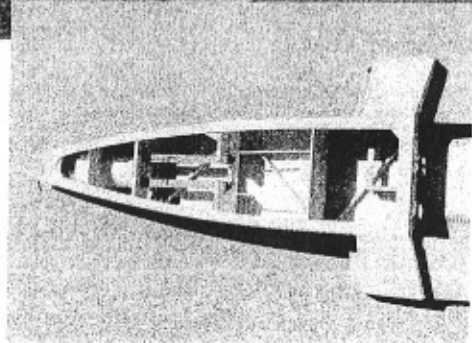
Fit the wing to the fuselage. Adjust the location of the front dowel hole as required to get a good fit to the fuselage with the 1/32" ply. wing saddle in place. When satisfied square the wing to the fuselage by obtaining equal measurements from the wing tips to the tail of the fuselage. When it is square tape the wing in place and drill 3/16" diameter holes through the existing holes in the wings into the hard wood blocks in the fuselage. Tap the hard wood blocks with a 1/4 -20 tap. Coat the tapped hole with thin Zap and let cure completely. Then re-tap the hole. If you don't think this is sufficient 1/4 -20 T nuts can be installed in the blocks. Drill out the hole in the wing so a 1/4"x 2" long bolt fits, a letter F drill, .257", is best here.

Cover the top of the wing with thin plastic. Drop cloth plastic is good. Wrap around the leading and trailing edges and out about 10" on each panel. Hold in place on the bottom with masking tape. Cut and fit the 1/32" plywood wing saddles in place. Leave them a little long, about 1", at the rear. Make sure the wing bolts to the fuselage properly with the wing saddles in place. Use 30 minute epoxy to glue the wing saddles to the fuselage. Hold the in place to the wing mount blocks with masking tape. Bolt the wing in place. Turn the fuselage over and



place magazines on the wing saddles to hold them to the wing.

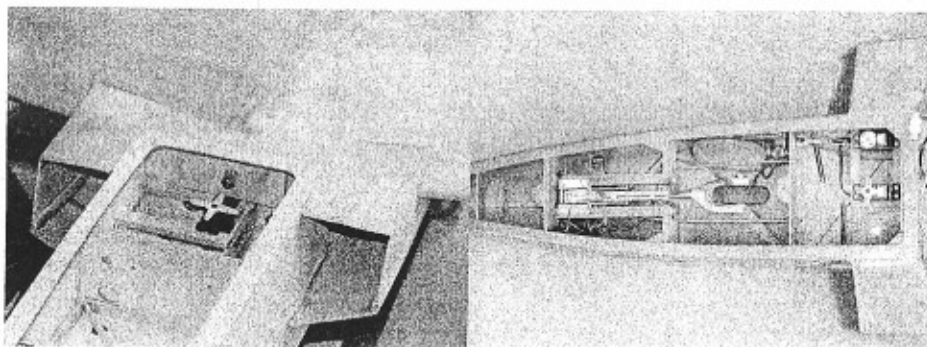
When cured tack glue IN-1, 2 and 3 in place. Permanently glue IN-4 at the angle shown. Glue balsa inlet sides FS-4A to FS-4, make right and left. Taper the edges as shown and glue in place to the wing saddle. Trim off the wing saddle so that about 1/4" overhangs the trailing edge of the wing and IN-5 overlaps it. Cover the top of the inlet with 1/8" balsa. Remove the temporary IN-1, 2 and 3 formers as the top is covered. Turn over and cover the bottom front of the inlet.



Un-tape the plastic from the wing and tape it to the front of the fuselage. make the front fuselage to wing fairings. With the wing still in place mount the stabilizer. Be sure it is in alignment when viewed from the front and top. Measure from the trailing edge of the wing to the ends of the stabilizer for equal distance. Fill in above the stabilizer with pieces of 1/4" balsa.

FINISHING

Sand and prepare all the surfaces for finishing and paint or cover with film. Final hinge all the control surfaces. Install the control system, retracts, brakes and turbine. Make



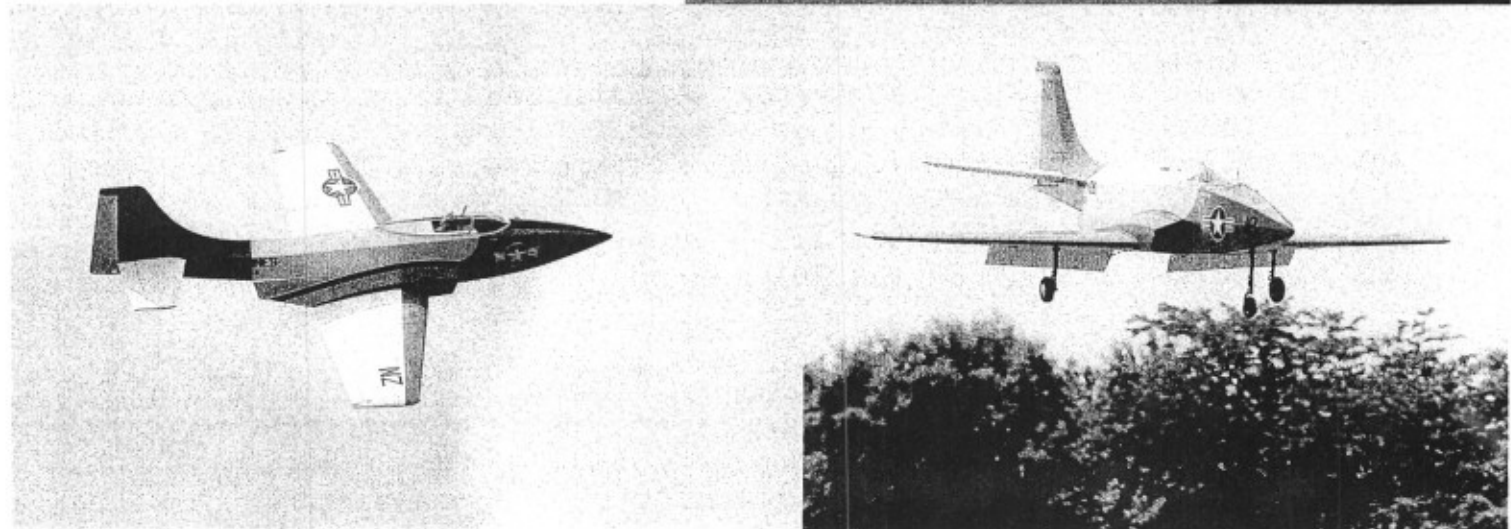
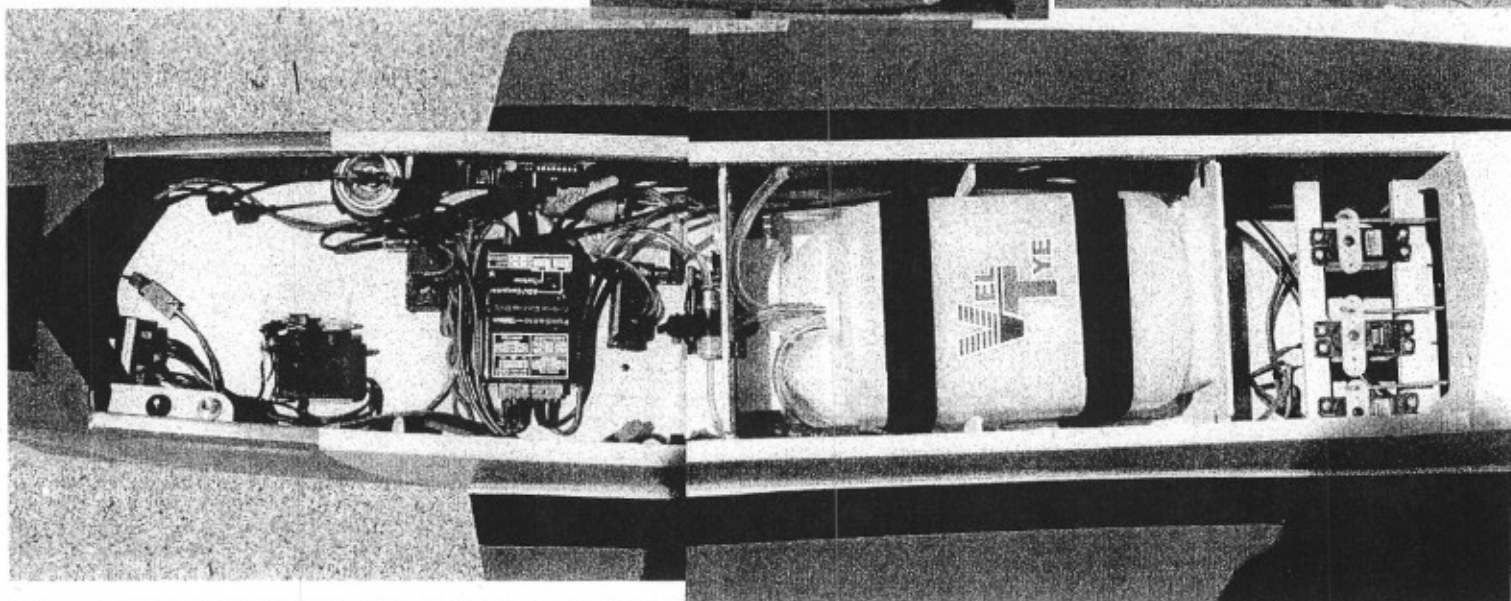
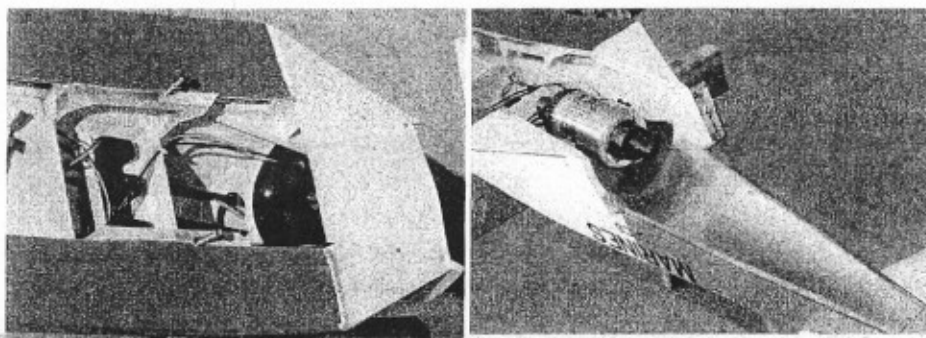
and screw the aluminum heat shield and aluminum engine cover in place. Set control throws as shown. Balance 7" back from the leading edge at the fuselage. Place the receiver battery and weight as required in the nose to obtain this.

If you have not had any turbine operating experience it is wise to gain the aid of someone who has this knowledge. I can tell you it is very intimidating to the inexperienced. Once it is understood a turbine is easier to operate than a glow or gas engine. I used a 50 ounce DuBro fuel tank in my prototype "Turbinator". This gives me 6 minutes of mixed ½ to full throttle flying with the Robart "Funsonic" 12 lb. thrust turbine. My Airtronics transmitter has a timer and I use it for every flight.

Flying the "Turbinator" is a real pleasure. Many have flown mine and all agree that it is a good one. This is my first turbine powered model and I had no problem adjusting to the thrust lag that is present on turbines. It isn't a problem at all.

Fly your "Turbinator and enjoy it.
I'm sure you will.

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TURBINATOR materials list needed to build with short kit

FUSE

(2) 1/4 x 1/2 x 42	balsa	crutch
(3) 1/8 x 1/2 x 30	balsa	crutch
(2) 1/4 x 1/4 x 36	balsa	fuse top stringer
(1) 1/8 x 1/4 x 24	balsa	fuse nose stringer
(2) 1/4 x 3/8 x 36	basswood	fuse top side stringer
(2) 1/8 x 3/8 x 24	balsa	fuse rear side stringer
(2) 1/4 x 1/4 x 30	balsa	fuse nose bottom stringer
(2) 1/4 x 1/4 x 36	spruce	fuse rear stringer
(1) 1/4 x 1/4 x 30	spruce	fuse rear stringer
(2) 1/8 x 4 x 42	balsa	fuse top sheeting
(2) 1/8 x 4 x 30	balsa	fuse top sheeting
(2) 1/8 x 3 x 30	balsa	inlet top sheeting
(1) 1/4 dia. x 12	dowel	hatch
(1) 1/8 dia. x 12	dowel	inlet & crutch
(1) 4 x 4 x 2 1/2	balsa block	nose

WING

(2) 1/4 x 3/4 x 36	balsa	leading edge (LE)
(2) 1/8 x 5/8 x 36	balsa	LE
(2) 1/4 x 1/4 x 36	balsa	LE
(4) 1/4 x 1/2 x 42	spruce	main spar
(4) 1/4 x 1/2 x 24	spruce	mid spar
(1) 1/4 x 1/2 x 36	spruce	mid spar & servo mounts
(2) 3/8 x 3/8 x 42	balsa	washout shim
(4) 1/8 x 1/4 x 36	spruce	rear spar
(4) 1/8 x 1/4 x 36	balsa	flap & aileron spar
(2) 3/16 x 1/4 x 36	spruce TE stock	TE
(3) 1/8 x 1 x 36	balsa	flap & aileron caps
(8) 3/32 x 4 x 42	balsa	sheeting
(8) 3/32 x 4 x 36	balsa	sheeting
(1) 3/32 x 4 x 30	balsa	spar web
(2) 1 1/4 x 1 x 10 1/2	balsa block	wing tip
(1) 1/2 dia. x 5	dowel	wing front center

STAB & ELEV

(1) 1/4 x 1/4 x 36	balsa	LE
(2) 1/8 x 1/4 x 36	balsa	spar
(2) 1/4 x 1/2 x 36	balsa	stab & elev caps
(1) 3/16 x 1/4 x 36	spruce TE stock	TE
(2) 3/32 x 3 x 36	balsa	sheeting
(4) 3/32 x 4 x 36	balsa	sheeting
(1) 1/4 dia. x 6 1/2	dowel	brace
(1) 1/2 x 1 x 18	balsa	tip blocks

FIN & RUDDER

(1) 1/8 x 1/4 x 15	spruce	TE rudder
(1) 1/4 x 1/2 x 16	balsa	LE rudder
(1) 3/32 x 4 x 32	balsa	sheeting rudder
(1) 1/8 x 1/4 x 30	balsa	fin stringer
(1) 1/4 x 1/2 x 30	hard balsa	tail post
(4) 3/32 x 4 x 30	balsa	sheeting fin
(1) 1 x 1 x 8	balsa	top block