# GRUMMAN

# WIDGEON

## At last, Irwin Ohlsson's Sport Scale model of the beautiful Grumman Widgeon Amphibian

**By Irwin Ohlsson, Sr.**

Since my early youth, amphibious aircraft have held a special attraction for me. I recall my first attempts, some 64 years ago, to construct a Sikorsky S-38 model powered by two rubber band motors. Our home was only four blocks away from Echo Park Lake in Los Angeles, California, so I had an excellent test site.

The twin booms of the S-38 gave the rubber band motors enough length to pack in the winds to power the two counter rotating props. After several hull configurations, I came up with a double concave design and finally succeeded in getting it to take off from water. That was just the beginning.

Little did I dream some 18 years ago, when I built my first Widgeon, that this present model, my third one, would become reality and be presented here in RCM.

**Editor's Note:**

*Much time and effort has gone into bringing this magnificent model to our readers. The plans and construction photos are highly detailed and the building notes have been arranged to help guide the experienced builder. However, due to the complexity of this model, it is recommended for experienced builders/fliers only.*

*To help those modelers building this aircraft, we have comprised a list of manufacturers/suppliers where essential items such as fiberglass cowlings, spinners, counter rotating engines, etc., can be located. The list is located at the end of this construction article; we hope you will find it useful in successfully completing your own Widgeon.*

True Widgeons, the kind nature put here on earth, cannot perform like this bird. In the hands of an expert flier, it can perform maneuvers such as loops, rolls, spins, inverted flight, etc. However, I think the greatest enjoyment is the take-off's, landings, and touch and go's. Truly, a beautiful sight!

**Acknowledgements:**

At this time, I'd like to thank two special friends, Dan Lutz and Paul White for helping with the completion of this model. Shortly after I started this project (two years ago!), I became quite ill and was hospitalized for several weeks. During this time, Dan agreed to finish the construction and arranged with Paul to fiberglass and paint the finished model.

With the help of these two friends, this project has finally been completed. And last, but certainly not least, I'd like to

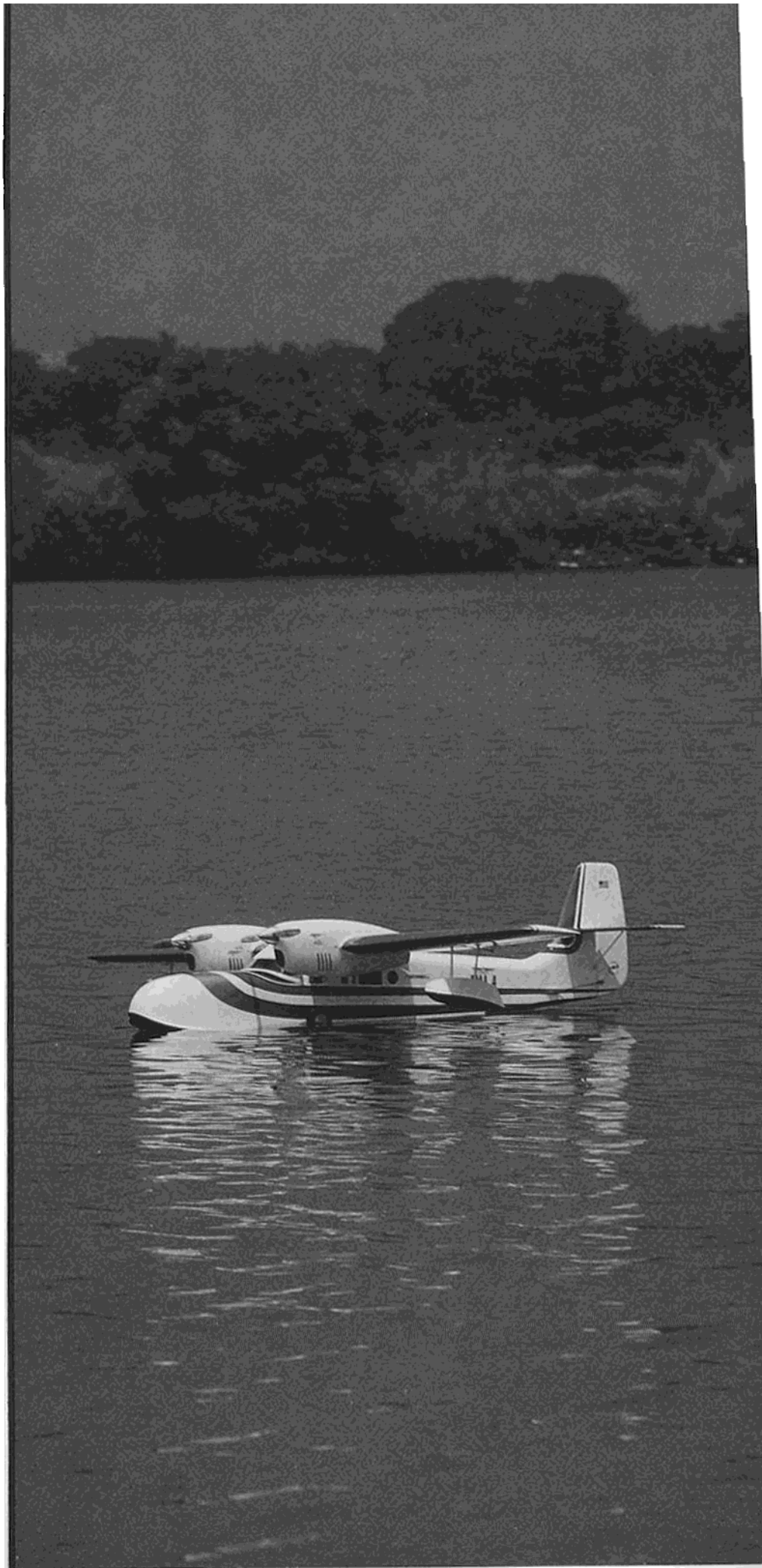
express a special thanks to Bob Sweitzer, a true artist, for an outstanding job on the plans, and for making the beautiful fiberglass engine nacelles and cowlings available.

Because of Bob's special talents, we are able to share this truly classic aircraft with fellow modelers around the world. Again, thanks to you all!

**GRUMMAN WIDGEON**

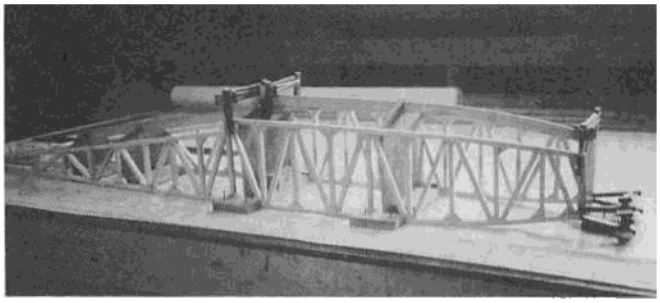
**Designed By:**
Irwin Ohlsson
**TYPE AIRCRAFT**
Sport Scale Amphibian
**WINGSPAN**
80 Inches
**WING CHORD**
11 Inches (Avg.)
**TOTAL WING AREA**
897 Sq. In. (Approx.)
**WING LOCATION**
Top of Fuselage
**AIRFOIL**
Semi-Symmetrical
**WING PLANFORM**
Double Taper
**DIHEDRAL, EACH TIP**
0 (Flap top — Tapered bottom)
**OVERALL FUSELAGE LENGTH**
62 Inches
**RADIO COMPARTMENT SIZE**
Ample
**STABILIZER SPAN**
30 Inches
**STABILIZER CHORD (incl. elev.)**
6¼ Inches (Avg.)
**STABILIZER AREA**
200 Sq. In. (Approx.)
**STAB AIRFOIL SECTION**
Symmetrical
**STABILIZER LOCATION**
Middle of Vertical Fin
**VERTICAL FIN HEIGHT**
11 Inches
**VERTICAL FIN WIDTH (inc. rud.)**
9 Inches (Avg.)
**ENGINE SIZE**
.61 2-stroke (2 req'd)
**FUEL TANK SIZE**
8-10 Ozs. (2 req'd)
**LANDING GEAR**
Amphibian/Conventional
**REC. NO. OF CHANNELS**
5
**CONTROL FUNCTIONS**
Rud., Elev., Throt., Ail., Flaps
**BASIC MATERIALS USED IN CONSTRUCTION**

| | |
|---|---|
| Fuselage | Balsa, Spruce & Ply |
| Wing | Balsa, Spruce & Ply |
| Empennage | Balsa |
| **Wt. Ready To Fly** | 288 Ozs. (18 Lbs.) |
| **Wing Loading** | 46 Oz./Sq. Ft. |

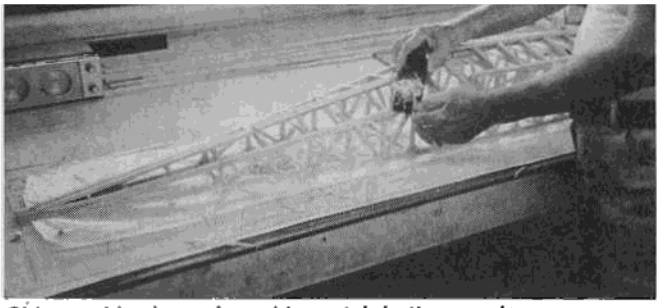


## CONSTRUCTION

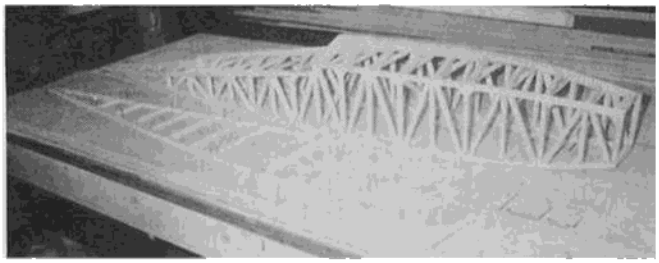
**Note: The following construction notes have been kept brief and are only intended to highlight the major phases of construction and to call attention to some areas requiring special consideration. Good luck, and we hope you enjoy building and flying your Widgeon as much as we have ours.**



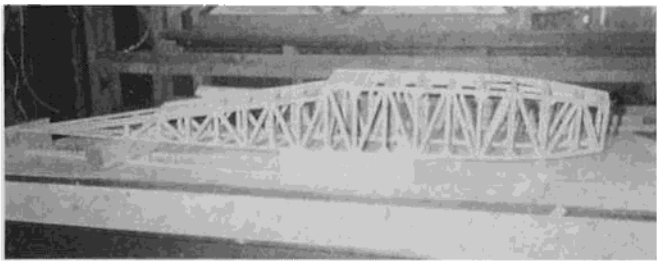
*Fuselage sides and keel in place, ready for cross braces and bottom pieces.*



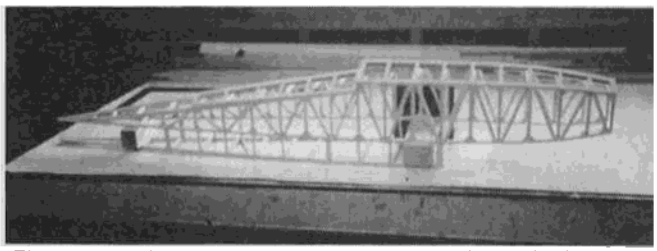
*Sides and keel are shaped to match bottom angle.*



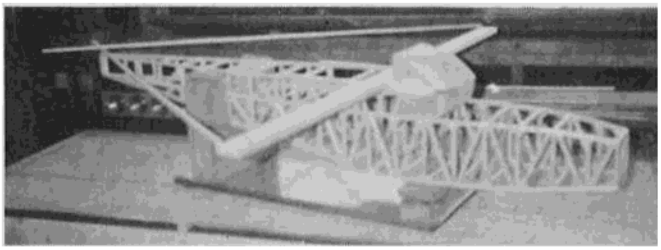
*The top fuselage frame is built directly over plans.*



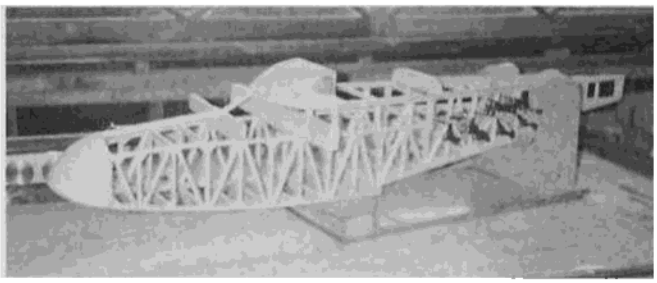
*The main fuselage is then blocked up, in position over the top frame.*



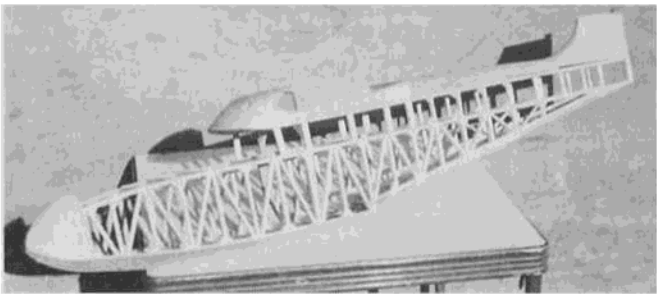
*The top fuselage frame is then joined to the main fuselage section using 5/16" sq. balsa supports, reinforced with 1/32" plywood gussets.*



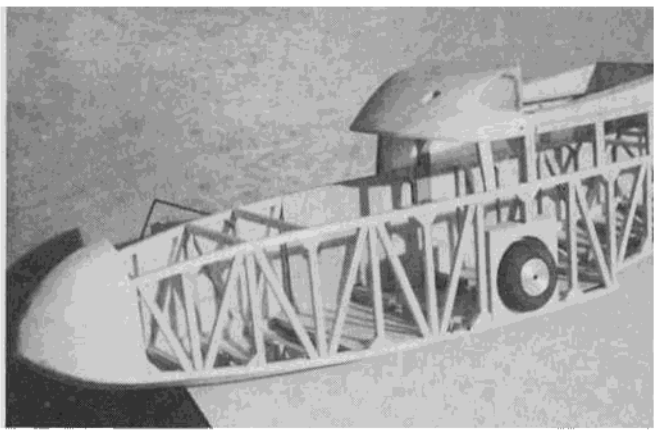
*Prior to gluing the top cabin block in place, it must be squared up with the frame to ensure that the wing will be squarely mounted.*



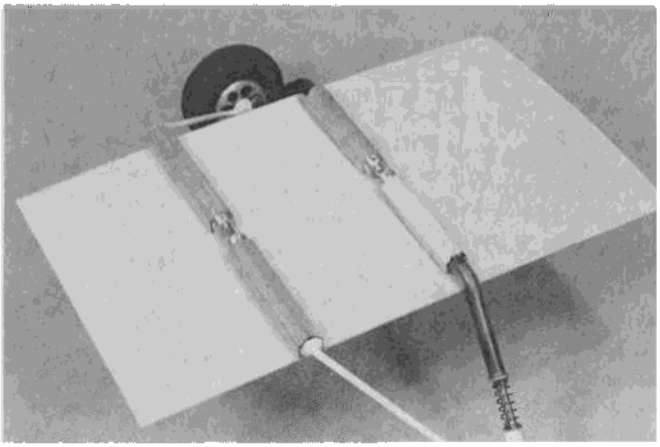
*The top cabin block must be supported in position while the cement cures. Then, add the balsa nose block and rear fuselage (turtledeck) formers.*



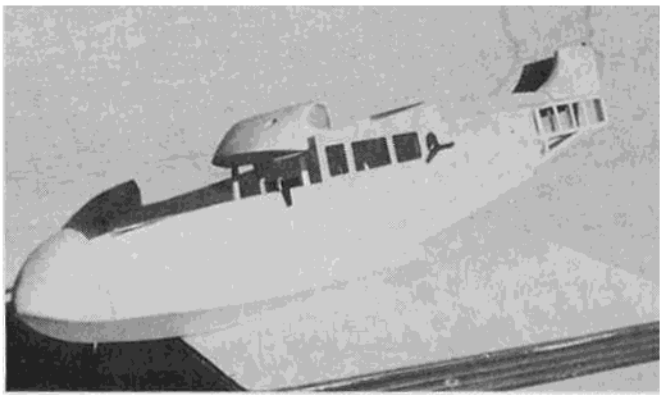
*Wing saddle blocks and 1/64" plywood turtledeck skin are now in place, as is the lower portion of the vertical fin.*



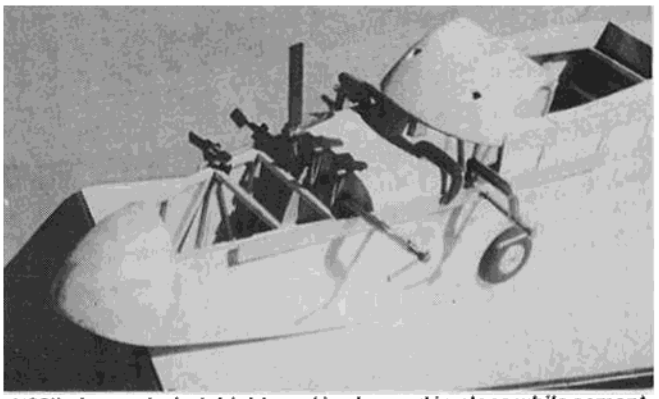
*Install cabin floor and landing gear blocks now. Balsa blocks are used as filler for "retracted" wheel location.*



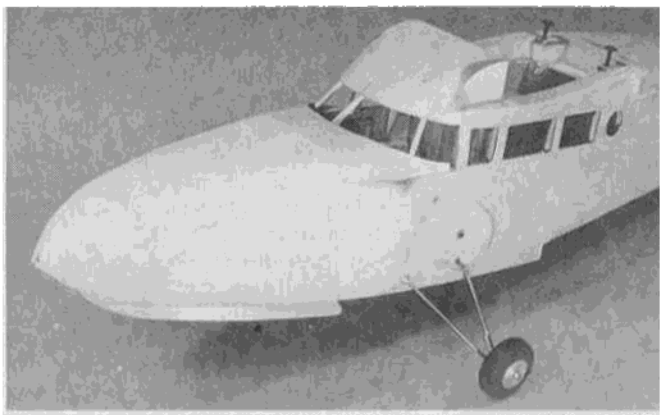
*Cabin floor/landing gear mount mock-up. Mounting blocks have brass tube running the full width, from outside to outside, with wheel collars in center to retain landing gear.*



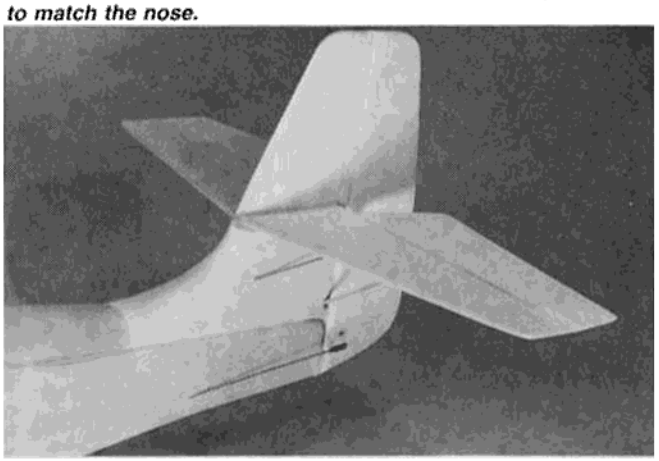
*1/32" plywood sides are glued in place. Don't let glue get into groove for windows.*



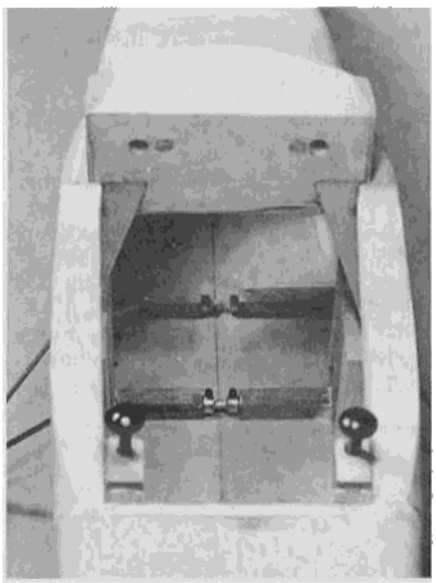
*1/32" plywood windshield cowl is clamped in place while cement cures. The balsa side blocks have also been added and shaped to match the nose.*



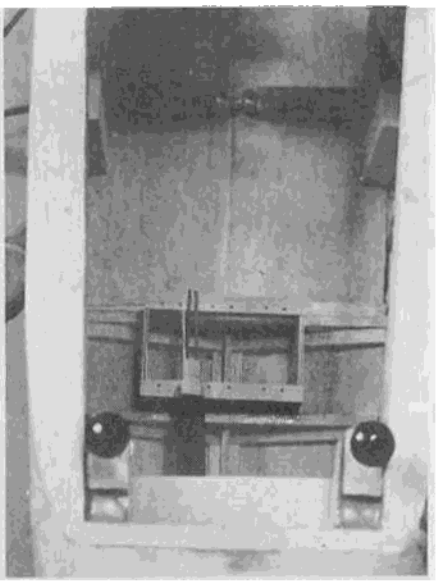
*The top nose block is now in place. Also, note that the 3/16" dowels used for the cabin braces should be inserted into F-2 and the top cabin block, and the longerons approximately 3/16"-1/4".*



*All of the tail pieces are built-up balsa, with balsa sheeting added.*



*Looking forward into cabin area. Note landing gear blocks and gear retaining locks on brass tubes.*



*There's plenty of room for the radio gear.*

The construction techniques used in building our Widgeon are from the time honored old school of thought, namely, built-up balsa, plywood, and spruce. The materials required for each phase of construction are clearly called out on the plans. Additionally, you will find numerous detailed sketches and building notes also located on the plans sheets.

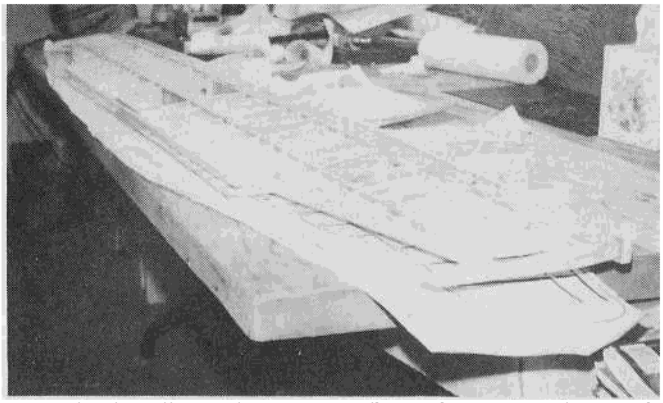
**Fuselage:**

The fuselage sides are built up from 5/16" sq. balsa framework, directly over the plans on sheet 3. Note that nearly all joints are reinforced with 1/32" plywood gussets.

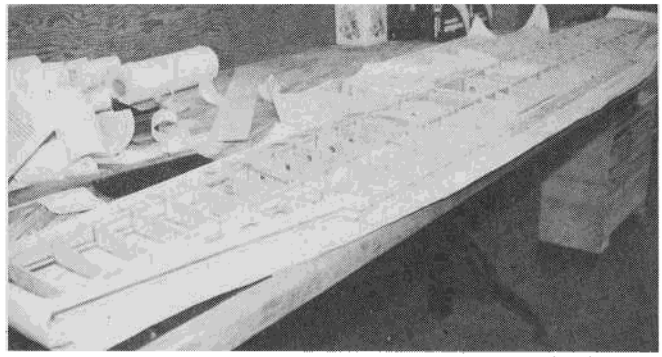
**Note:** As the first step in the fuselage construction, the four 5/16" sq. balsa longerons that are used to form the upper half of the fuselage must be notched to accept the .030" thick window material, + .015" clearance, or .045" total. The notch can be easily cut using a table saw. The depth of the .045" notch should be 3/16", and the cut should extend approximately 2" beyond the round windows. See plan sheet #1, section A-A for details. Remember, the notches will face outward, towards the 1/32" plywood skin, and be sure to make a left and right side.

Using 1/4"-3/8" plywood, cut out the fuselage construction templates and secure them upside down on a centerline drawn on your building board. Refer to the plans for the proper location of each station, A-F. Join the fuselage sides using the cross braces, then adding the keel and keel supports. **Note:** Don't forget to add the tapered 5/16" balsa filler pieces to the bottom of the fuselage sides to allow for the bottom angle. With F-1 installed and the fuselage sides joined together, the sides can be contoured to match the keel/hull bottom braces. With the hull bottom shaped, the assembly can be removed from the building board and the templates removed. The top fuselage frame can now be assembled and added to the main structure. Again, refer to the plans and building notes on sheets 1 and 3. **Note:** Be sure to cut all of the vertical cabin support blocks and 5/16" sq. top fuselage frame supports to **exactly** the same length (this will help when aligning the top and bottom frame assemblies).

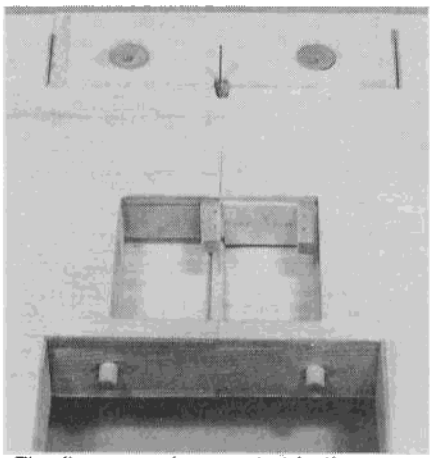
Make up the balsa nose block and drill a 1" hole from the back forward to accept lead shot ballast if required. (Do not drill completely through — see plans.) Contour the nose block to match the fuselage and



*The wing is built upside down on a flat surface so that the top of the wing is flat.*



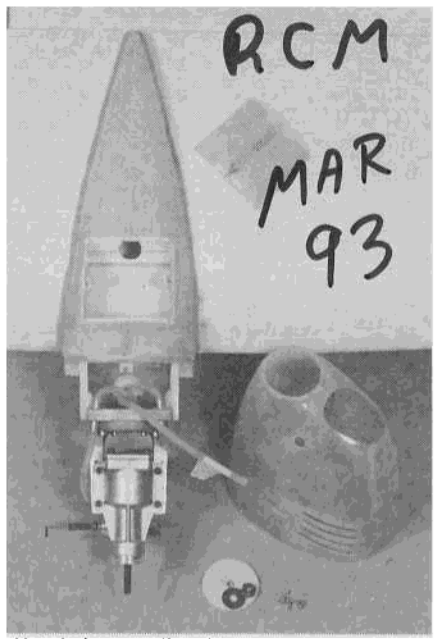
*A paper tube will be inserted into holes in ribs to allow easy installation of servo cables. Shear webs run full span on both the front and rear spars. The engine mounts are tied into the main structure.*



*The flap servo is mounted in the center section and operates the flaps through a control horn. Note 3/4" dowels for wing hold-down bolt holes.*

glue in place. Add the 1/32" plywood bottom skins, and the forward and aft step caps. Make up the two F-5 balsa wing saddle blocks and glue in place. When making up the cabin block, drill two 3/8" dia. holes completely through from back to front. These holes will be used later to drill the wing, then plugged with balsa. After shaping, the cabin block can be glued in place. Next, install the 1/64" plywood turtle decking from F-9 to F-10.

At this point, you must decide if you are going to use the optional "retracted" landing gear location. If you are going to




*Hatch in nacelle allows easy access to throttle servo. Note hole for servo cable. Four screws retain the engine cowling.*

use this option, you must fill in the surrounding area with balsa, then relieve the area where the wheel will be bolted in place. At this time, the 1/32" plywood flooring, and the main gear mounting blocks should be fabricated and installed in the fuselage. The steerable tail wheel/water rudder bracket should also be installed prior to adding the fuselage side skins. (See landing gear details on plans, sheet 1 and 3.)

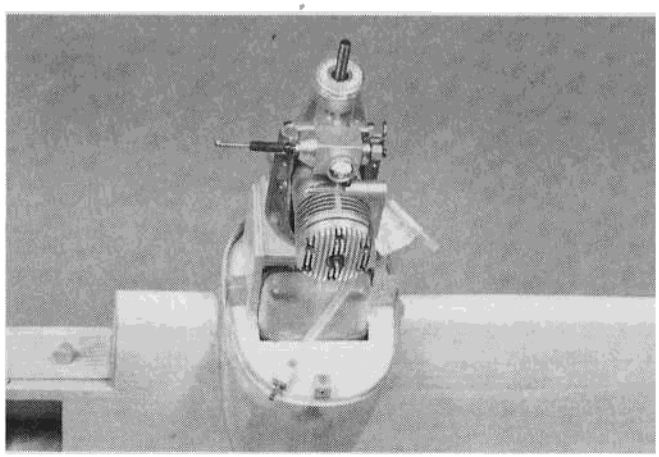
**Note:** Prior to installing the fuselage side skins, a piece of .030"-.040" Teflon can be inserted into the window openings. This will help prevent the glue from filling the notches when the sides are glued in place. Then, after the glue has dried, the teflon pieces can be easily removed, leaving an unobstructed groove.

**Note:** Sand the plywood on both sides prior to installation. Use #350 grit paper. Also, use an aliphatic resin glue for all plywood and hardwood joints to balsa.

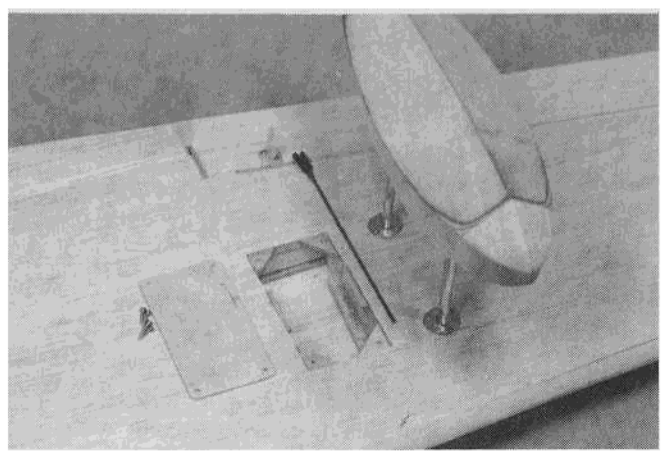
Install 1/32" plywood fuselage sides to the framework from the point indicated on the nose section, aft to the first vertical brace behind the second step. This aft section was left open until after the vertical fin base was assembled, shaped, and installed on the fuselage.

After the installation of the horizontal stabilizer and the top portion of the vertical fin, this section of the fuselage is also sheeted with 1/32" plywood. The last section to be sheeted with 1/32" plywood is the short, front windshield cowl. A 1/2" balsa block shaped to the section shown (Station G) on plans, sheet 1 was used for attaching the plywood. **Note:** Clamps and braces will help hold the plywood in place while the cement cures.

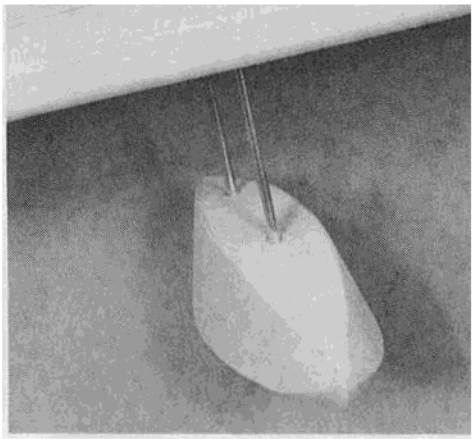
The last major item for the fuselage construction is shaping and installing the balsa block that fits between the nose block



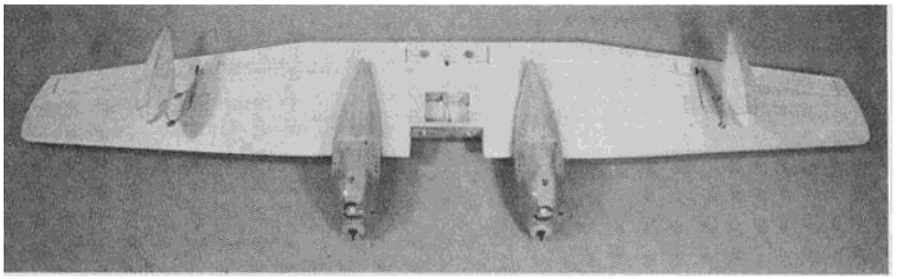
*A very clean engine installation set-up.*



*With the aileron servos mounted outboard, you have a clean, direct control installation. Note float attachment to wing using plates and screws.*



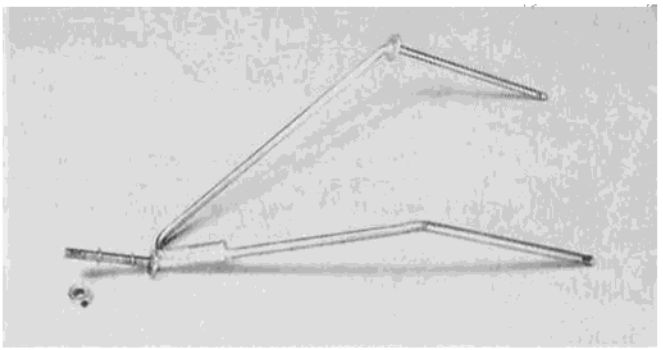
*Tip floats have a foam core that's sheeted with 1/32" balsa, which is then glassed.*



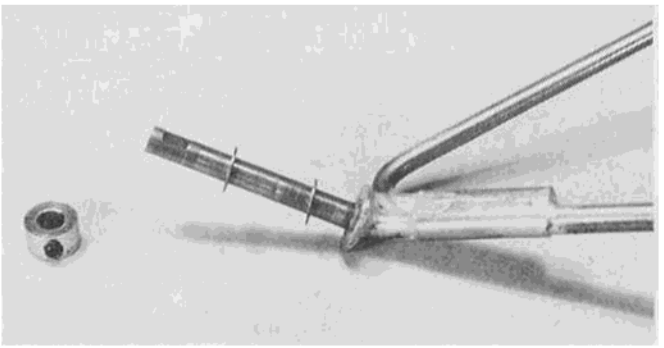
*The completed wing assembly, ready for glassing.*

**Empennage:**

The upper portion of the vertical fin, the horizontal stabilizer, the rudder, and elevators are all built-up structures using a balsa framework, and then sheeted with 1/16" balsa. Plywood inserts are used at each control horn location and hardwood inserts are installed in the stabilizer where the two support braces attach (see plan sheets 1 and 2 for details). **Note:** The top portion of the vertical fin, the horizontal stabilizer and the fuselage/lower vertical fin are all tied together by the tail post when they are epoxied in place.



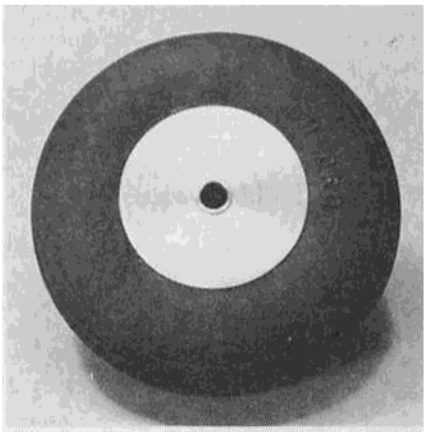
*The landing gear is made up from 3/16" and 5/32" diameter wire, silver soldered together.*



*Brass tube is used for the solder joint instead of soft wire. Very strong. Note flat ground for wheel collar retaining screw.*

*Flats are also ground on the ends that insert into the fuselage.*

and the windshield cowl. With this completed, the fuselage can be set aside while the tail pieces are assembled.

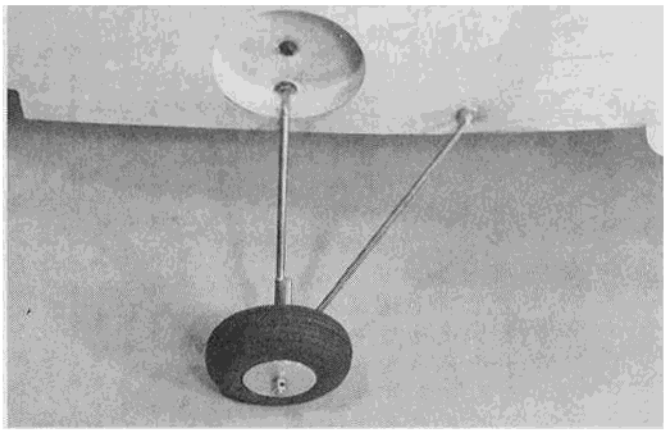


*Aluminum covers were made up to give that "special" touch to the Du-Bro wheels.*

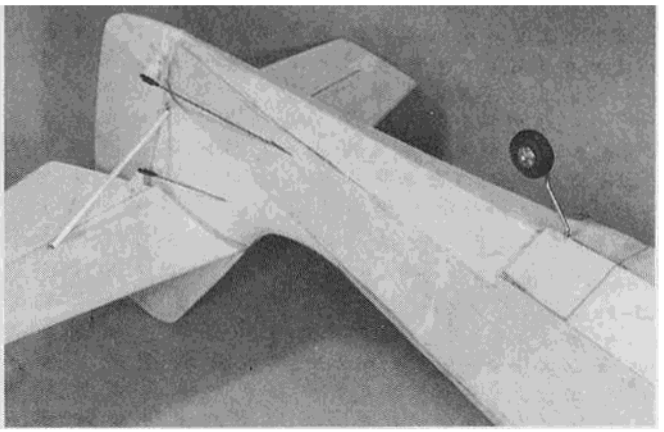
**Wing:**

The entire wing is built upside down over the plans, with its top surface flat. The ribs are all cut from 1/8" balsa and the spars are all 3/16" sq. spruce with 1/8" balsa sheet shear webs utilized full span on both the front and rear spars. On my original Widgeon, a single aileron servo was mounted in the center section and operated the ailerons via pushrods and bellcranks.

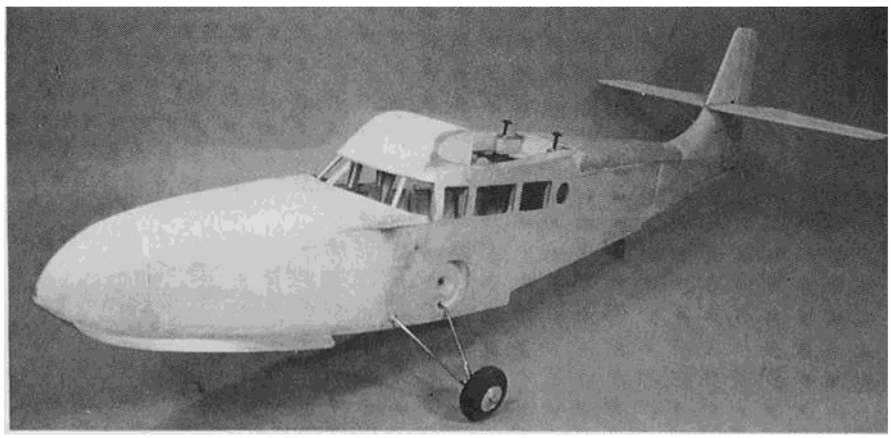
However, when Dan built this new wing for me, he elected to use a servo for each aileron, mounted in the wing where the aileron bellcranks are shown on the plans.



*The finished assembly installed on fuselage.*



*Steerable tailwheel is easily removed and replaced with a water rudder. Note the diagonal braces to the horizontal stabilizer.*



*The completed fuselage assembly, ready for glassing.*

*Small opening at rear of nacelle allows moisture, etc., to be removed.*

To get the servo extension wires out to the servos, a series of holes about 5/8'' dia. were drilled in the ribs and then lined with a paper tube. This allowed the cables and connectors to pass easily through the wing.

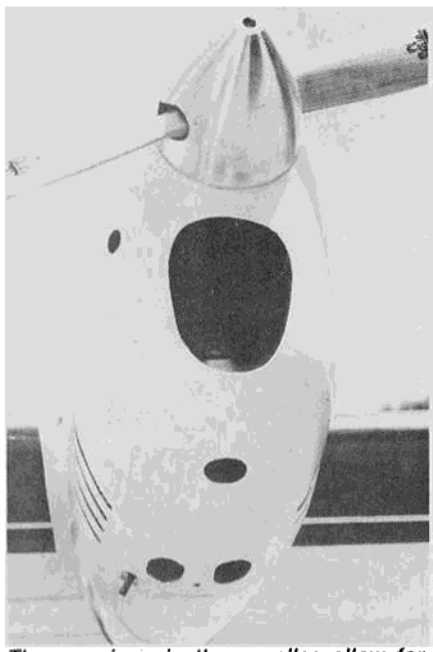
The plans show the bellcrank set-up, but both systems worked very well, so the choice is up to you. The flap servo is mounted in the center section and operates the flaps through a heavy duty control horn set-up, similar to that used for split elevators. This keeps things very simple and provides positive flap action. A small hatch provides easy access to each of the aileron servos, and the flap servo is open to the inside of the cabin area, making for easy set up and adjustments.

To accommodate the attachment of the wing to the fuselage, a pair of 3/8'' dia. maple dowels are inserted into the wing leading edge, and into two pieces of 3/16'' plywood glued back to back. The dowels fit into the cabin block that was drilled prior to installation. At the rear, two 3/4'' dia. holes are drilled in the wing center section and then fitted with pieces of 3/4'' hardwood dowel which are epoxied in place. These dowels are then drilled to accept the 1/4'' x 20'' x 2½'' nylon wing bolts.

The plans show two options for flap and aileron construction, solid or built-up. Again, the choice is yours, but whichever style you select, try to keep them light, and don't forget the plywood inserts for the control horns. See details on plans, sheet 1 and 2.

**Engine Mounts/Nacelles:**

The plywood engine mounts/fuel tank

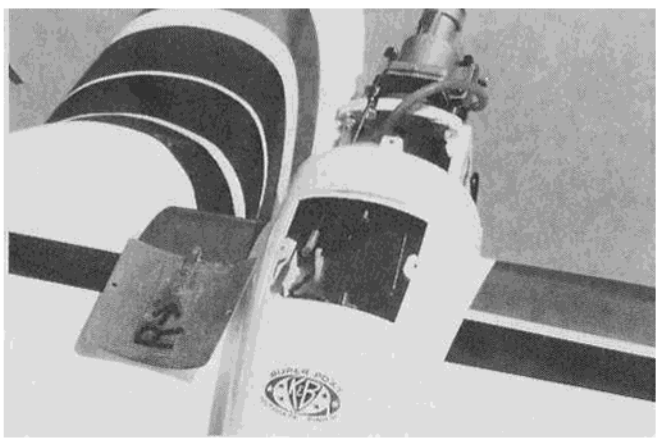


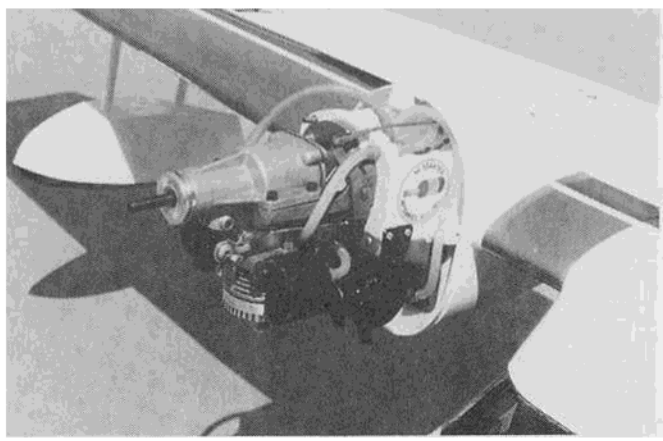
*The openings in the nacelles allow for cooling air, glow plug access, carburetor adjustment, and exhaust outlet. Beautiful TruTurn spinner.*

boxes are built into the wing during assembly and are tied into the main structure as shown on the plans, sheet 2. The fuel tank boxes will accommodate 8-10 oz. slant type fuel tanks, with adequate room allowed for some foam padding around the tanks. For mounting the engines, radial type mounts are used, and the engines spaced in or out as required to fit the cowlings.

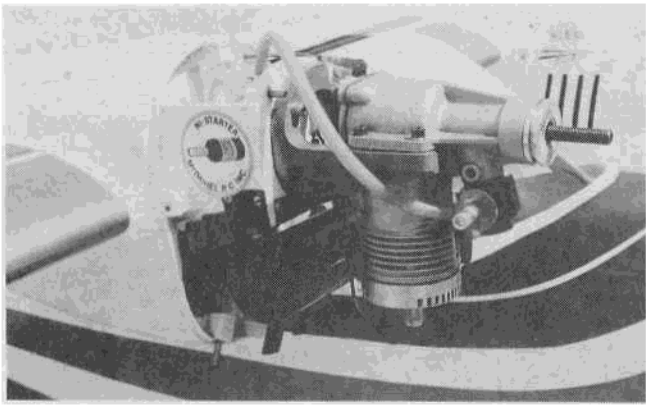
To provide adequate support and gluing surface for the nacelle mounting, a pair of 3/4'' balsa supports are shaped and glued to both the wing and inner surface of the nacelles. The throttle servos are located in the nacelles above the fuel tanks and operate a special bellcrank linkage to the throttles.

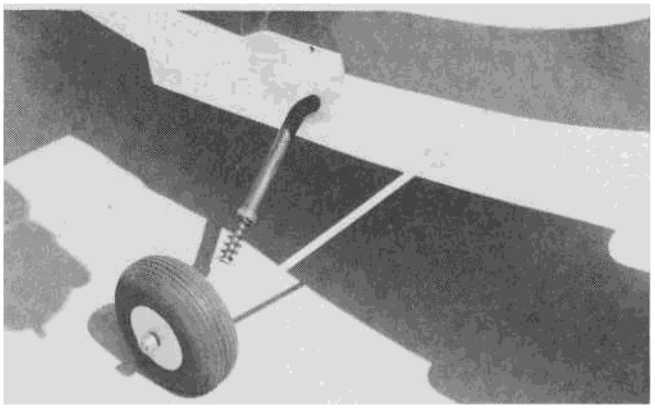
The throttle servos are easily accessible through the hatches in the nacelles. The engine cowlings are held in place with four screws and are easily removed for access to the engines. The mufflers for our model were custom made to fit within the cowls and required quite a bit of engineering. **Note:** Our previous Widgeon had external





*LEFT: Easy access to throttle servos. RIGHT: Custom made bellcranks transmit servo operation to the throttles via short adjustable pushrods. Note custom built muffler with header.*





***LEFT: Special mufflers are securely mounted to the plywood engine mount; and, best of all, they fit inside the cowls. McDaniel's Ni-Starters on each engine. RIGHT: We dressed up our landing gear to "look" more realistic.***

mufflers mounted through the cowls, which also worked very well.

To help ensure reliable inverted engine operation, we also installed the McDaniels Onboard Glow System for each engine.

**Tip Floats:**

The tip floats are made up from foam blocks which are shaped to the outlines shown on the plans and sheeted with 1/32" balsa, then glassed with 3/4 oz. glass cloth. The struts are bent from 1/8" music wire and attached to a piece of 1/8" plywood imbedded in the float. The struts are then covered with K&S Streamline Tubing and installed into the attachment points in the wing. See details on plans, sheet 2.

**Spray Rails:**

At this point, the airframe is basically complete with the exception of installing the spray rails to the forward fuselage section. Two methods of attachment are shown, but the easiest is to simply cut a groove in the chine to accept the .032" aluminum spray rail. The groove should be about 1/2" deep, angled as shown in the drawing. Next, drill 1/4" dia. holes along one edge of the aluminum, about 1" apart over the length of the rail. Fill the groove with epoxy and insert the rail. The epoxy will flow into the holes and securely lock the rails in place.

**Landing Gear:**

Both the front and rear main landing gear wires are bent to the shapes indicated on the plans, sheet 3, with all of the bends made cold. With the gear in place, the wheel spacing (tread) is approximately 16". To join the landing gear wires, use 5/16" dia. o.d. K&S Brass Tubing. Insert the 3/16" dia. wire and flatten the tube. This section will now accept the 5/32" forward wire also, and the assembly can be soldered together using Kester Silver Solder, Part #82-5000-0005. **Note:** Install the landing gear wires in the fuselage while soldering together. This will hold them in alignment during the soldering operation.

**Engines:**

For power, we installed a pair of K&B .61 engines, the right engine having a clockwise rotation and the left a counter clockwise rotation. With these, we used a pair of right and left hand 11 x 7½ propellers from JZ Products.

The spinners are Tru-Turn 2" dia. units, also set up for right and left propellers.

**Radio:**

Control for our new Widgeon is provided by an Airtronics Spectra PCM 7-channel system using two aileron servos, two throttle servos, two elevator servos, and one servo each for rudder and flaps. The plans show the approximate component location we used on our model. Just be sure to keep the equipment up and out of the bottom of the hull, just in case some water gets inside, and as far forward as is practical.

**Finishing:**

To provide the beauty and durability that we wanted, we glassed our entire aircraft using K&B glass cloth and resin. **Note:** Use 3/4 oz. cloth on the entire model, plus an extra layer of 2 oz. cloth on the bottom of the hull and center section of the wing.

Next, came the K&B Superpoxy primer, followed by white, with blue and red trim. With the windshield and side windows cut to shape and glued in place, our Widgeon was ready to go.

**Flying:**

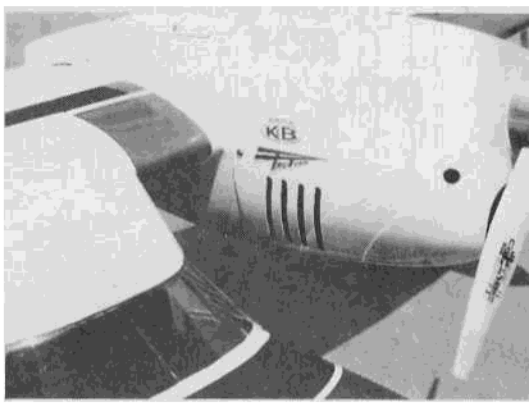
With all the equipment installed, the completed model should balance at the point indicated on plan sheet 1. If necessary, add lead to bring it into balance.

Be sure the engines are fully broken-in and properly adjusted. Most twin engined crashes occur when you lose an engine due to overheating and/or poor carburetor adjustments.

**Note:** The following are comments by Joe Bridi, the pilot of the prototype Widgeon.

***Flying Notes***
***By Joe Bridi***

*In April 1974 when I was first asked to fly the Widgeon, I was a bit apprehensive about taking on such a task. I knew there would be problems with a scale flying boat on its first time out. Upon arrival at the flying site, I had an opportunity to acquaint myself with the aircraft, checking the control, radio installation, and the construction. It was built very well and the resemblance to the scale seaplane was impressive. Everything looked like it was in order and we proceeded in tuning the K&B 40 engines for dependability.*




***Cooling air is exhausted out through the louvers in the sides.***

*The first take-off was a disaster. We found that we had about 3° positive incidence in the wing, which was scale, but didn't work well on the scale model. Fortunately, the aircraft was not damaged and we were able to shim the t.e. of the wing and reduce the incidence angle.*

*Our second attempt was successful and the Widgeon flew very well. The size and weight however, seemed to be too much for the K&B 40's. So, for the next time out we replaced them with Kraft 60's, which is now an RJL 60. This power seemed to be just the ticket for a well performing seaplane. Although not scale maneuvers, the Widgeon does excellent rolling, looping, and spinning acrobatics, all with precision and ease, and it had no bad tendencies when performing in the air.*

*Take-off was a cinch providing the engines and radio were working well. I tried flaps on take-off and landing and finally determined that on take-off I didn't need flaps, and used about 10° for landing. This seemed to work about the best for me. On landing, the model's speed should be kept up a little; if it gets too slow it tends to porpoise a little.* ***Caution:*** *If full flaps are applied, the nose will rise too high for a safe landing attitude, so don't use more than 10°-15°.*

*I always try to keep full power on while flying. If you throttle back too much, you can have engine failure. I would always keep power on until it was ready to land.*