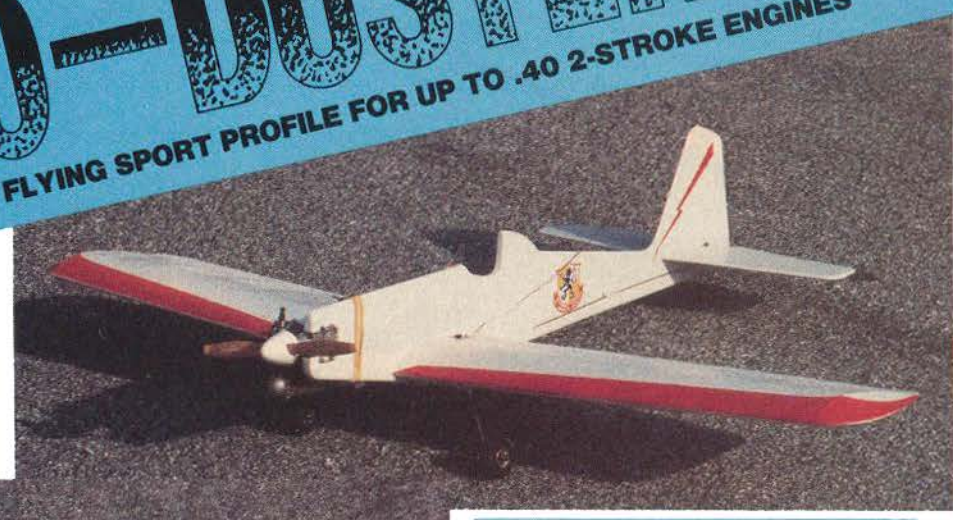
AERO-DUSTER

A QUICK BUILDING, GREAT FLYING SPORT PROFILE FOR UP TO .40 2-STROKE ENGINES

By
Fred Johnson



ABOUT THE AUTHOR

Fred Johnson has been building models for most of his 39 years. His interest in airplanes is extensive, and he has been a licensed private pilot since 1966, with ratings in both gliders and single engine land. Owning airplanes has been an adventure of the last eight years. In the arena of R/C models, he has been flying since the mid-sixties, including single channel through six channel proportional. In these years, many designs have evolved, with the central theme being simplicity of design and sport performance. An education in mechanical engineering and materials engineering has greatly enhanced Fred's ability to design aircraft using basic aerodynamics and mechanics. Having easy access to a variety of NACA and NASA airfoil data, along with considerable contact with the low velocity wind tunnel folks at Stuttgart, has made the job more fun than it would otherwise be.

The intent here is to have something that bores holes in the sky instead of your pocketbook, and not totally sacrifice the appearance. This airplane is a simple, easy to fly, minimum cost project which combines reasonable looks with near trainer flight characteristics. While the construction approaches the minimum part count possible, the flight characteristics allow very easy take-off and landings, making this a good first taildragger. A unique aspect of this type of design is the ability to visually assess the fuel level in flight, thus helping to relieve the danger of running out of fuel in flight. This airplane can be built in a short time, still be fun and desirable when complete, and helps fulfill the need for a .40 powered sport airplane with very good flight characteristics. Aero-Duster 40 is the larger version of the Aero-Duster series of aircraft, and may be the largest of this type that can be easily transported.

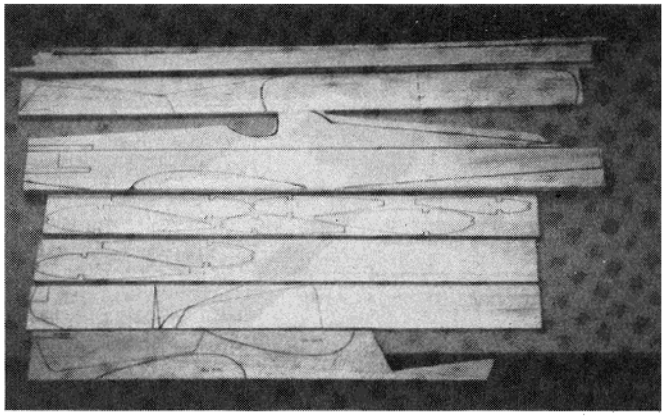
Proper mounting of servos to reduce the end travel stall and protect from large control forces results in the use of small servos for all functions, and a small radio system will facilitate the installation. The normal flight control forces in models of this size are very small, and even the smallest servo has sufficient power if it doesn't get beat up by vibration and stall at max travel. I have used a combination of Airtronics mini and standard size servos for the various prototypes. I used servo mounting tape, and I suppose that the little trays would also work if you were so inclined.

Construction:

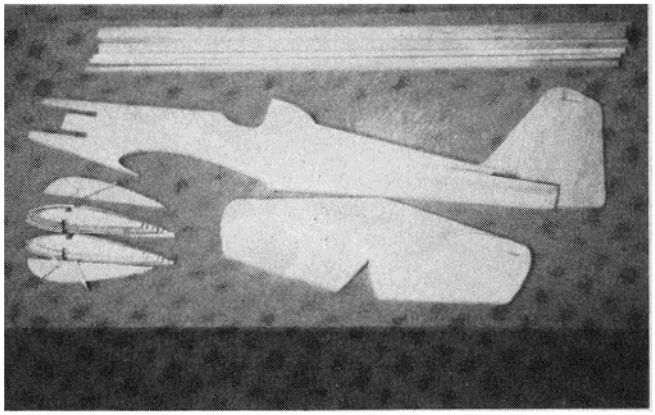
(Editor's Note: Due to the length of the construction sequence on the Aero-Duster 40, it is not being reproduced in this article. We have given you the introduction and the flying portion of the article; the complete construction article will be furnished when ordering the full size plans.)

Bill of Materials

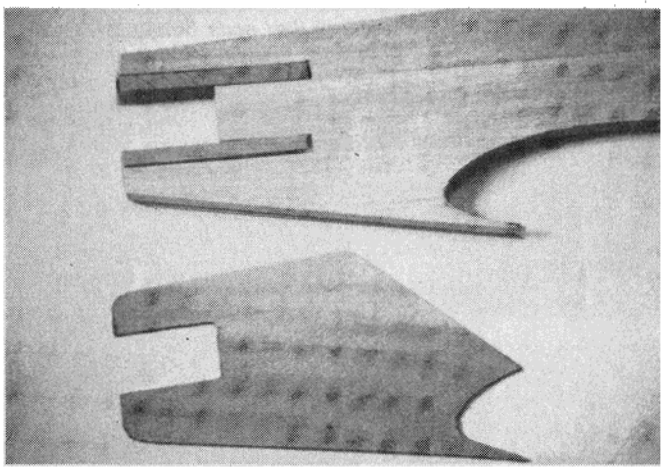
1 — .020" music wire
2 — 1/16" music wire
1 — 3/32" music wire
1 — 5/32" music wire
1 — 1" tail wheel
2 — 2¼" main wheels
2 — 6" landing gear blocks
2 — 1/4" x 3" x 30" sheet balsa
1 — 1/8" x 3" x 30" sheet balsa
1 — 1/16" x 4" x 30" sheet balsa
2 — 1/2" x 3" x 36" sheet balsa
8 — 3/32" x 3" x 30" sheet balsa
6 — 3/8" x 1/4" x 36" balsa spar
2 — 3/8" x 3/8" x 36" balsa spar
2 — 5/16" x 1¼" x 36" trailing edge stock
1 — 1/64" x 6" x 6" birch plywood
1 — 1/16" x 6" x 12" birch plywood
1/2 — roll of iron-on covering
1 — can spray-on epoxy paint
1 — yard 3/4" glass tape
1 — 3/32" O.D. x 12" aluminum tube
1 — 1/16" O.D. x 12" aluminum tube
2 — small control horns
1 — aileron horn fittings
1 — 3/8" x 1/2" x 12" maple motor mount
1 — 3/8" x 1/4" x 36" spruce
12 — mini flex hinge points
2 — 5/32" wheel collars
1 — 1/16" wheel collar
1 — roll servo mounting tape
1 — package landing gear straps
4 — 4-40 screws — shake proof nuts (engine mounting)
1 — 6 ounce square style fuel tank
2 — 1/16" threaded rod ends solder-on type
3 — 2-56 threaded rods, 12" long
5 — 2-56 clevis ends
1 — 6" section pushrod housing
1 — 4 channel radio with small servos
1 — .29 to .40 R/C engine



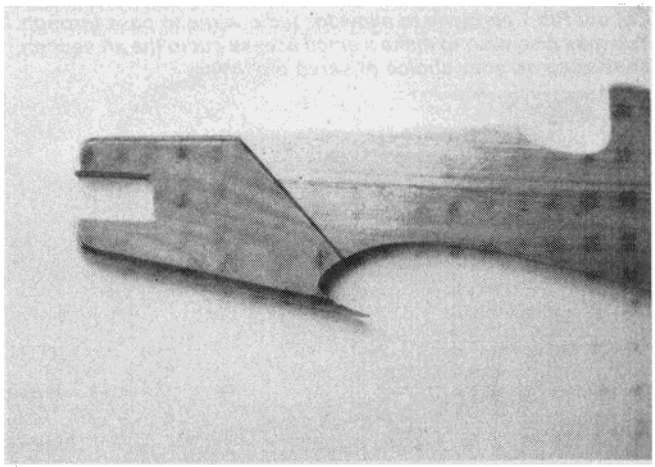
Parts layout on balsa stock.



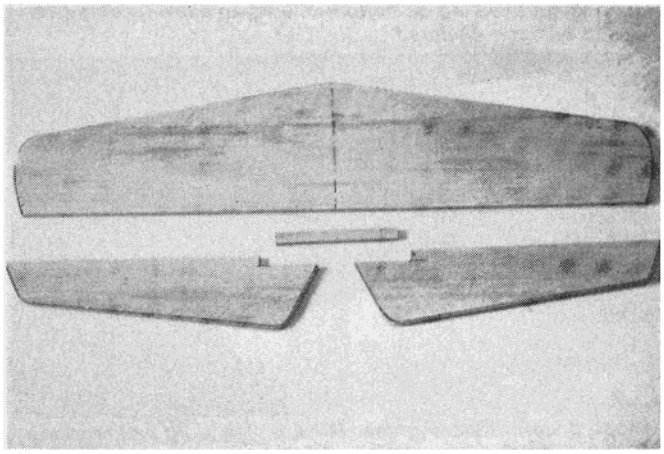
All balsa parts cut out, ready for assembly.



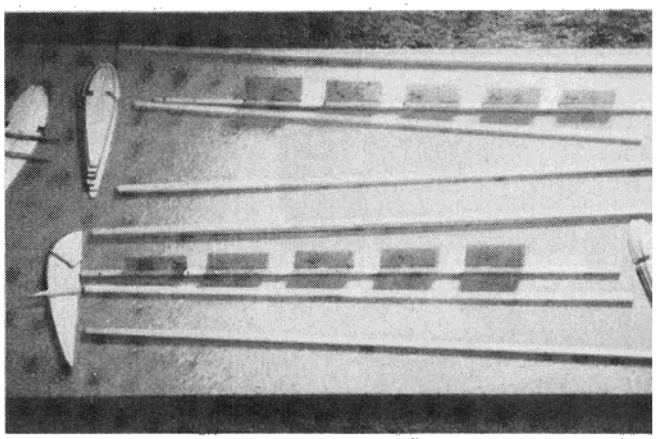
Engine bearers in place, ply doubler below.



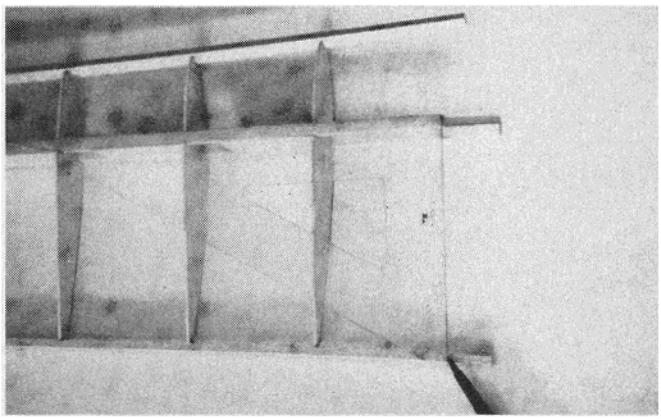
Doublers glued in place, start of sanding.



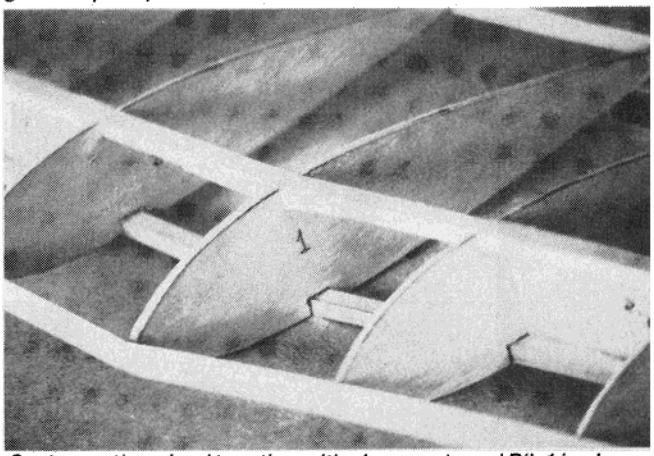
Horizontal tail and elevator ready to assemble.



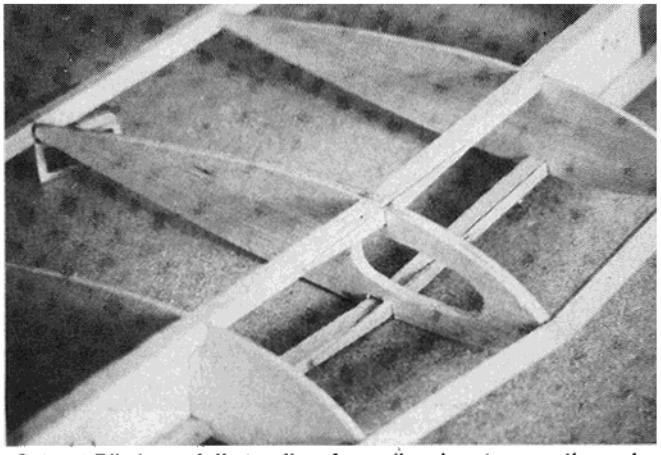
Wing ribs and spars ready to assemble (lower spars have webs glued in place).



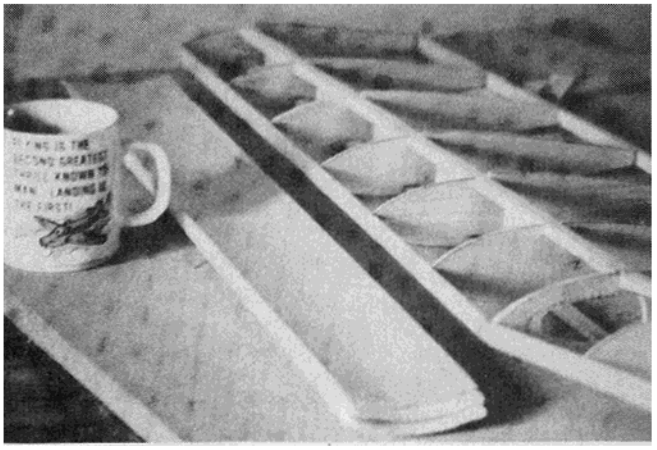
Ribs glued in place. All ribs glued to spars, but the top main spar has not yet been glued to the webs. Trimming of webs should be done carefully.



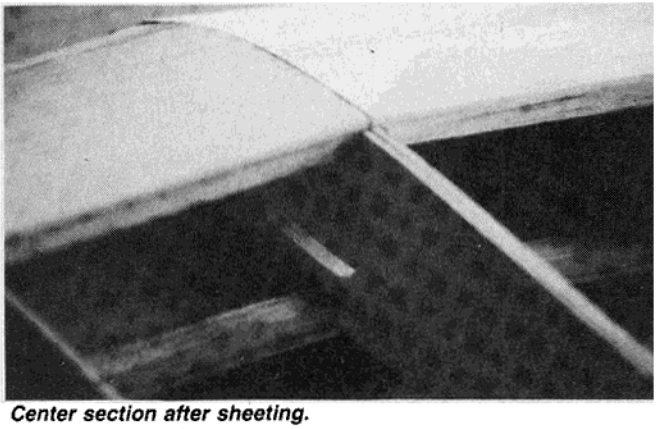
Center section glued together with ply gussets and Rib 1 in place.



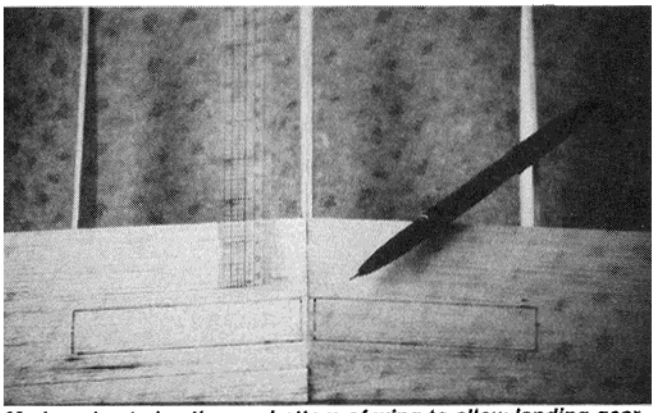
Cut out Rib 1 carefully to allow for radio wires to pass through. You may also wish to make a small access cut in the aft section, depending on your choice of servo mounting.



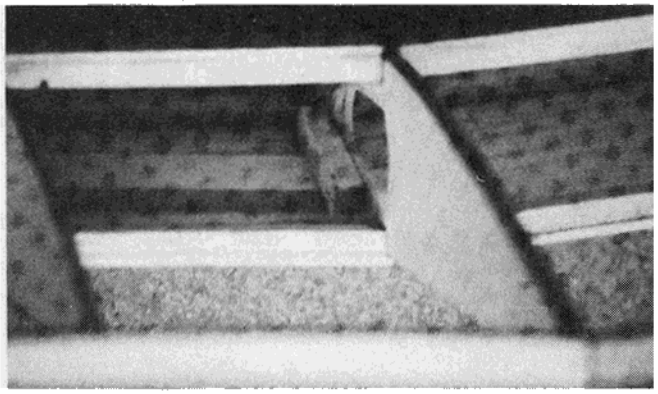
Sheeting pre-formed (around a 2 liter soda bottle), and wing ready to sheet.



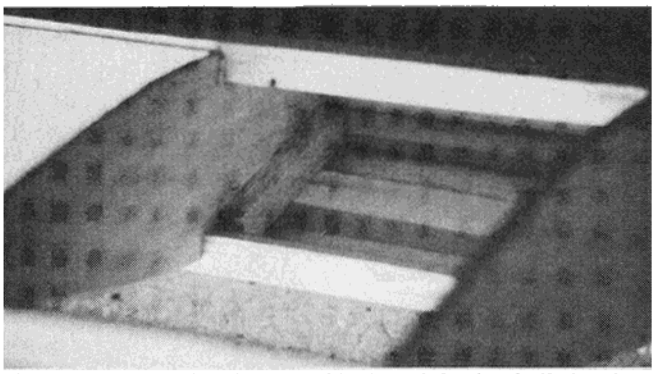
Center section after sheeting.



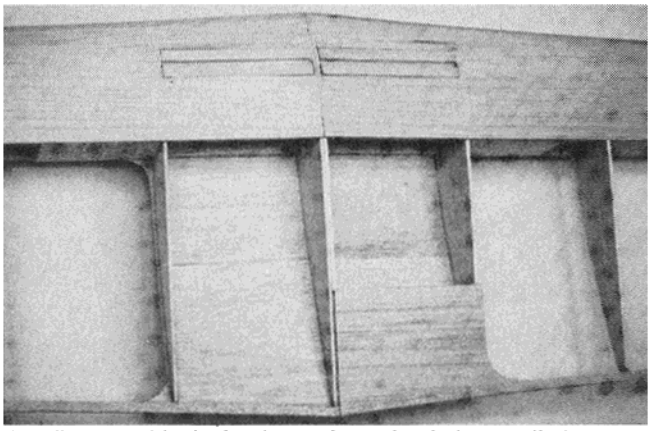
Mark and cut sheeting on bottom of wing to allow landing gear block to be flush mounted.



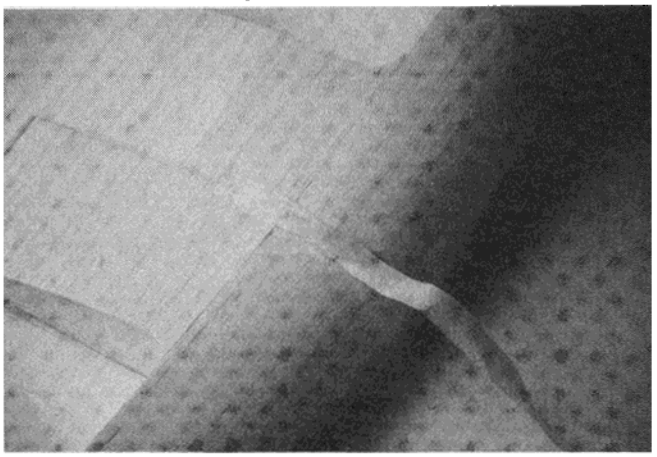
Landing gear block installed on left wing half. Note pine block glued to Rib 1 to take torsion load of wire gear. You may wish to use some epoxy and chopped glass to reinforce this area if you make lots of hard landings.



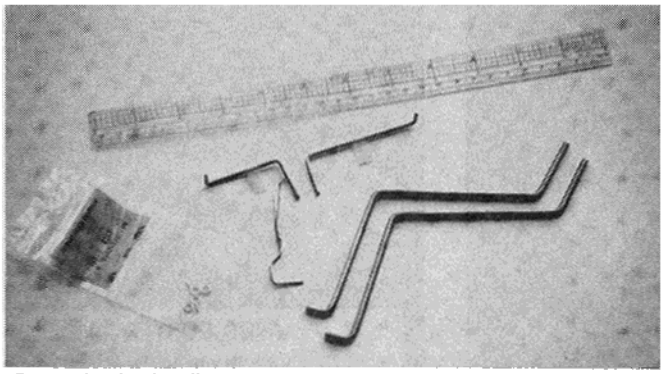
Outboard view of landing gear block on left wing half showing 3/8" x 1/4" balsa brace glued to Rib 2.



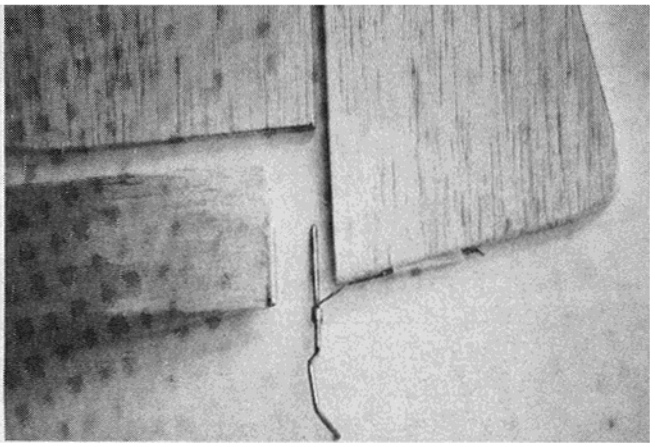
Landing gear blocks in place, aft section being applied.



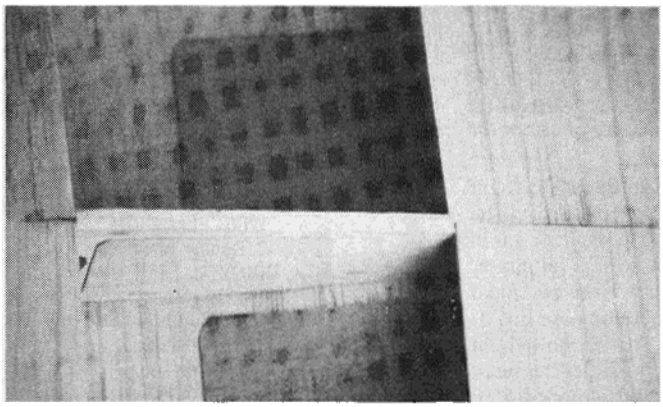
Fiberglass reinforcement applied to front top and bottom sheeting. (Epoxy in place.)



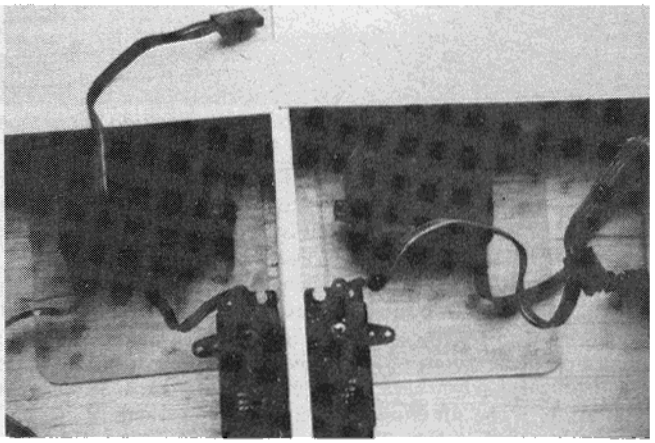
Bent wire for landing gear and aileron control horns (note that control horn for right wing is longer than left to allow servo linkage to be totally on left side of center thus avoiding exhaust from engine).



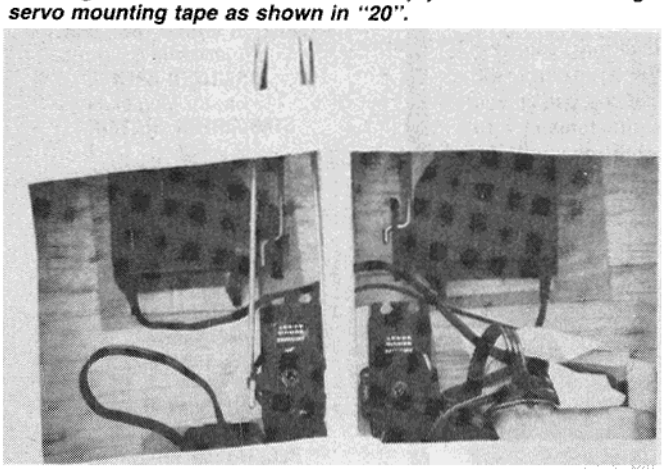
Tail wheel assembly with guide tubes in place.



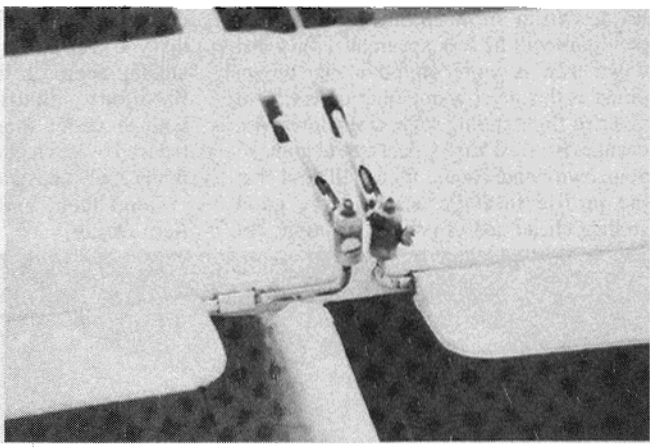
Plywood (use 1/64" or 1/32" thick) glued to Rib 1 and center top sheeting. Servos will be mounted to the ply reinforcement using servo mounting tape as shown in "20".



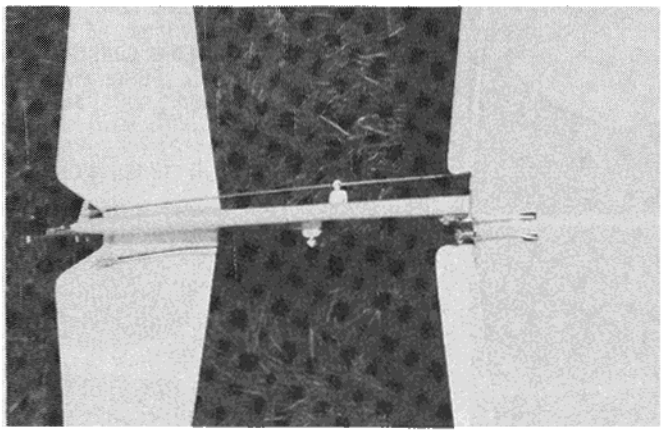
Trial placement of servos on mounts.



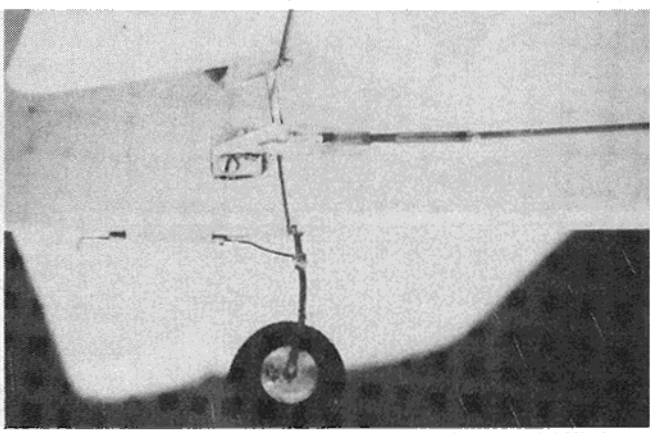
Radio mounting complete with pushrods in place.



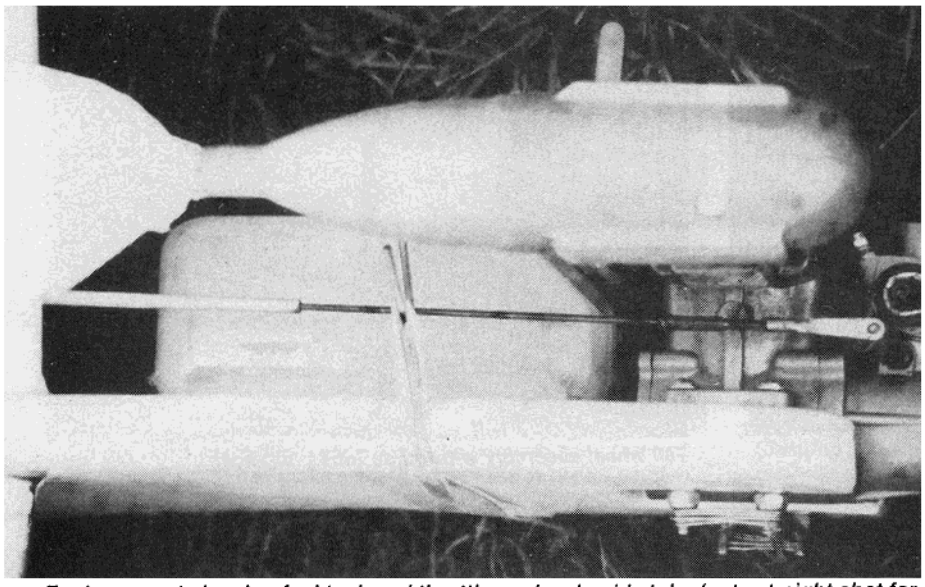
Aileron control horn hook-up.



Pushrod guides mounted to fuselage sides.



Tail wheel mount and rudder control. Note rod end on 1/16" piano wire and spring coupled steering of tail wheel.

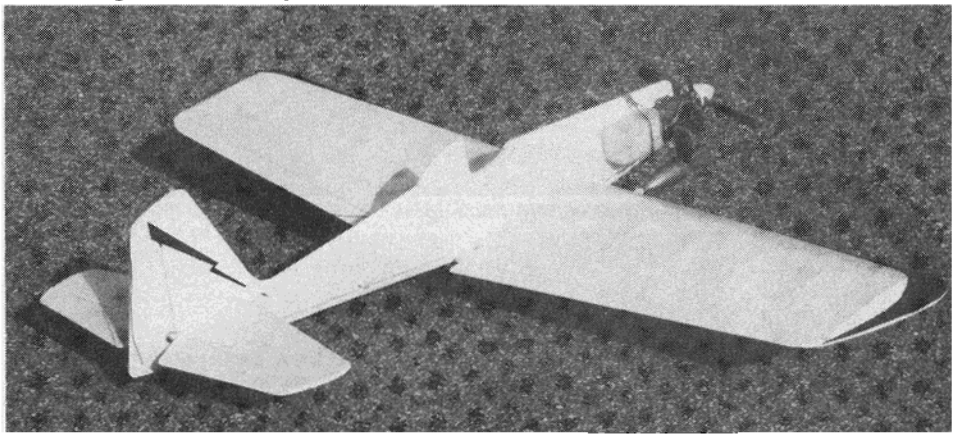


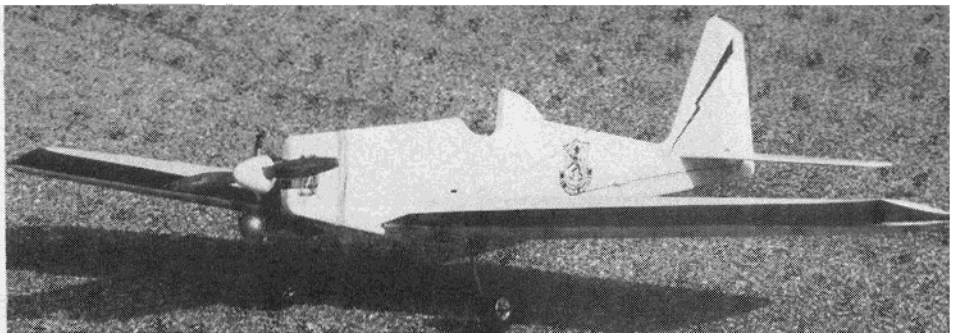
Engine mount showing fuel tank and throttle pushrod guide tube (note straight shot for servo pushrod).

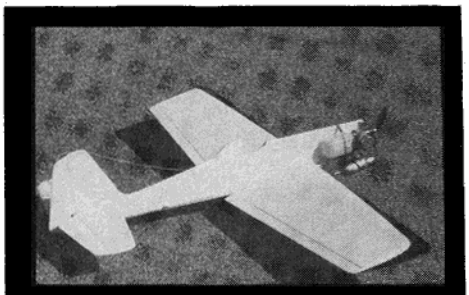
Flying:

Check out the operation of the control surfaces and assure yourself that all is well prior to flight. Start with all surfaces set at neutral. I find that with a powerful engine, some down elevator is desirable. I have had to balance the wing to compensate for the off center engine mount. Add the power on the first flight slowly to get a feel for the taxi and take-off. The lift from the wing will make it want to climb out with vigor and you may want to hold some down elevator and use down trim. As the throttle is eased back, the climb will be less apparent. I find that down trim is more effective than down thrust as this gives a smoother transition to inverted flight during rolls, and allows trim changes for slow flight. Feel free to come to your own conclusions. You will find that the profile fuselage acts to give good straight ahead taxi & power transition, but you may want to add right thrust for flight performance. Make small changes. The nose should not fall off to the right or left in slow flight to stall if the trim is on target. Full throttle will give no turn, but rapid power changes will torque the nose due to the low power loading. Trim to slow flight prior to landing approach and let the beast glide in on lower power with a modest flare to landing. Relax the back pressure at touchdown, and steer to roll-out. Touch and goes are just a throttle up away. If you choose to fly in windy conditions, I suggest that you keep power and speed up during the landing approach then cut the power and flare only slightly, as the tendency to bounce under these conditions will be reduced by this technique. (I know it sounds funny, but it has worked well for me.)

Good luck, and have fun with your Aero-Duster. □







AERO-DUSTER 40

Designed By:
Fred Johnson
TYPE AIRCRAFT
Sport (Profile)
WINGSPAN
54 Inches
WING CHORD
10⅝ Inches (Avg.)
TOTAL WING AREA
572 Sq. In. (Approx.)
WING LOCATION
Low Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL EACH TIP
2½ Inches
OVERALL FUSELAGE LENGTH
40 Inches
RADIO COMPARTMENT SIZE (In Wing)
(L) 8" x (W) 8¼" x (H) 1⅝"
STABILIZER SPAN
21 Inches
STABILIZER CHORD (incl. elev.)
5¾ Inches (Avg.)
STABILIZER AREA
115 Sq. In. (Approx.)
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7¼ Inches
VERTICAL FIN WIDTH (incl. rud.)
5¾ Inches (Avg.)
REC. ENGINE RANGE
.40 2-stroke
FUEL TANK SIZE
6 Oz.
LANDING GEAR
Conventional (fixed)
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rudder, Elev., Throt., Ail.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply & Maple
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	60-70 Oz.
Wing Loading	15.1-17.6 Oz./Sq. Ft.