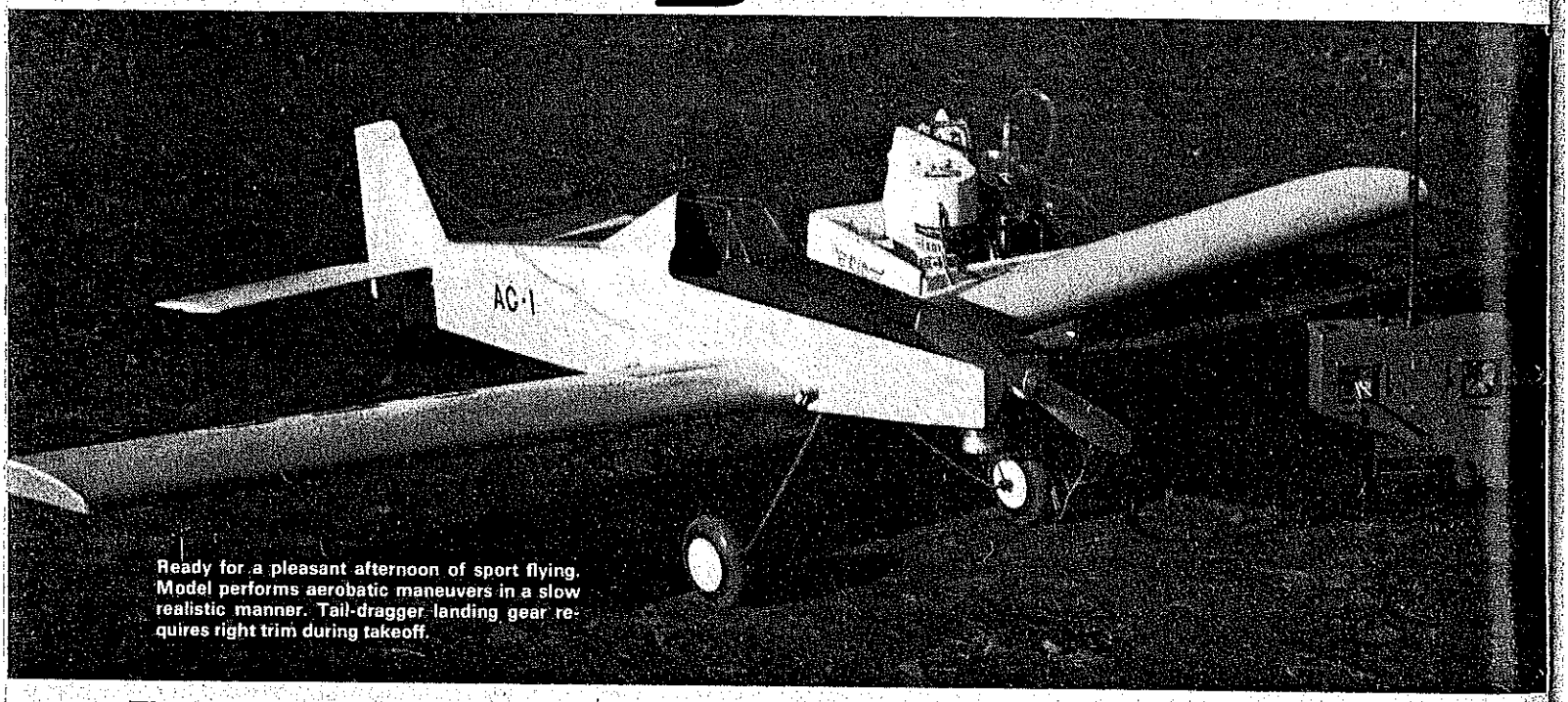
#227

AG-1 Agrivation



Ready for a pleasant afternoon of sport flying. Model performs aerobatic maneuvers in a slow realistic manner. Tail-dragger landing gear requires right trim during takeoff.

The generous area of this flat-bottomed wing 'cropduster' makes it an easy-to-fly trainer or sport model for 29- to 40-size engine and four-channel radio. ■ Clarence Haught

THUMBING THROUGH the catalogs and magazine advertisements one could logically conclude that an RC trainer should meet three criteria: 1) Employ only straight lines, 2) Be ugly, 3) Not resemble a real airplane. The AG-1 does comply with two of the criteria. Straight lines are used and it is ugly, however, it does resemble a real airplane, the AG-1 cropduster.

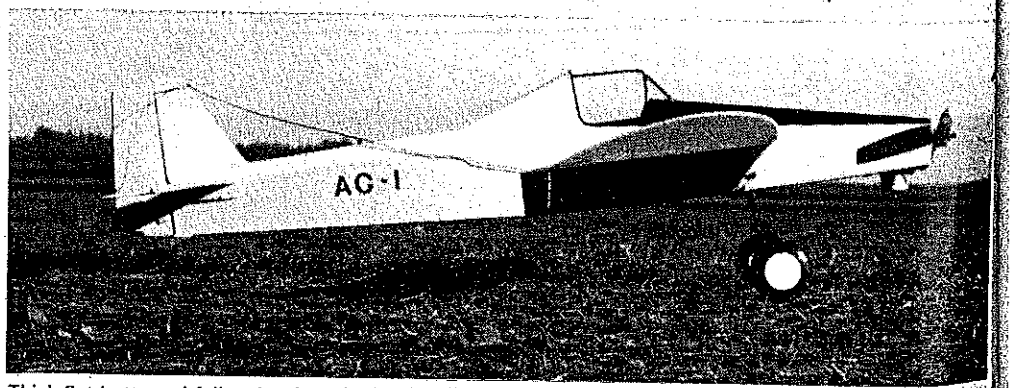
The AG-1 was developed in the early 50's—as a replacement for tired biplane trainers and Cubs adapted in the field for aerial application of insecticides and pesticides—by the engineering and agricultural divisions of Texas A & M University. Only one example was built and was unfortunately destroyed, but its influence is easily seen in the contemporary production agricultural aircraft to include the Cessna Agwagon, the Piper Pawnee, and the Snow. All are low-wing monoplanes employing high-lift wings, hoppers in front of the cockpit, turnover structures protecting the pilot, steep sloping noses for better visibility, and powerful engines. These designs can carry heavy loads economically, reducing ferry time, pilot fatigue, and maintenance costs. The back-to-the-basics designs of these specialty aircraft readily lend themselves to modeling.

The August 1966 issue of *Model Airplane News* featured a semi-scale control-line stunt version of the AG-1 designed by stunt expert George Aldridge. I built two of these excellent performing models when I was active in stunt flying, and it was the left-over stabilizer elevator assembly from one of those models that brought about the development of the RC version.

The original AG-1 had a thick, flat-bottomed wing of generous size which would provide the slow-flying docile flight characteristics so desirable in a trainer. The relatively long nose moment of the control-line version was retained, but the tail moment was lengthened to increase stability. The resultant model is easy to fly and will perform basic aerobatic maneuvers with ease. The original model is powered by a .40 engine and will fly very realistically on half throttle. A .29 engine would be quite adequate.

Beautiful loops are performed from slow level flight by adding power with the up elevator until "over the top," then cutting power to continue the loop. Rolls are of the barrel variety due to the high-lift wing and generous dihedral.

Being a tail-dragger, there is a tendency to veer left on takeoff. This is readily corrected by adding right rudder trim prior to



Thick flat-bottom airfoil makes it easier for the pilot to stay ahead of the airplane. Ship is responsive yet docile, slowing up for smooth shallow landing approach with little or no power.

starting the takeoff roll.

Landings are a joy due to the excellent slow flight characteristics of the flat-bottom wing. The resultant glide and approach are easily controllable. The ship will float if the approach is too fast and will hang on and on, using up lots of runway. The steerable tail wheel permits ground maneuvering. Some may question the advisability of conventional landing gear on a trainer, but it is not really that hard to get used to, and with the trend to "warbird" scale subjects it makes good sense to get used to this type landing gear.

Construction

Construction of the AG-1 is simple and straightforward. Firm balsa is recommended for greater strength. Weight is not particularly a problem due to the lifting capacity of the 667 sq. in. wing.

Begin by cutting fuselage sides, formers and doublers from balsa and plywood as called out on plan. The fuselage doublers are in two pieces in order to provide a firm seat for the firewall. Adhere doublers to fuselage sides with contact cement and proceed to join fuselage sides using the firewall and formers C and F. Allow to dry before bringing tail together, and joining to the ¼"-sq. tail post. Add remaining formers. Set the plywood fuel tank bulkhead and servo mounts on top of the fuselage doublers and provide rigidity to the basic structure.

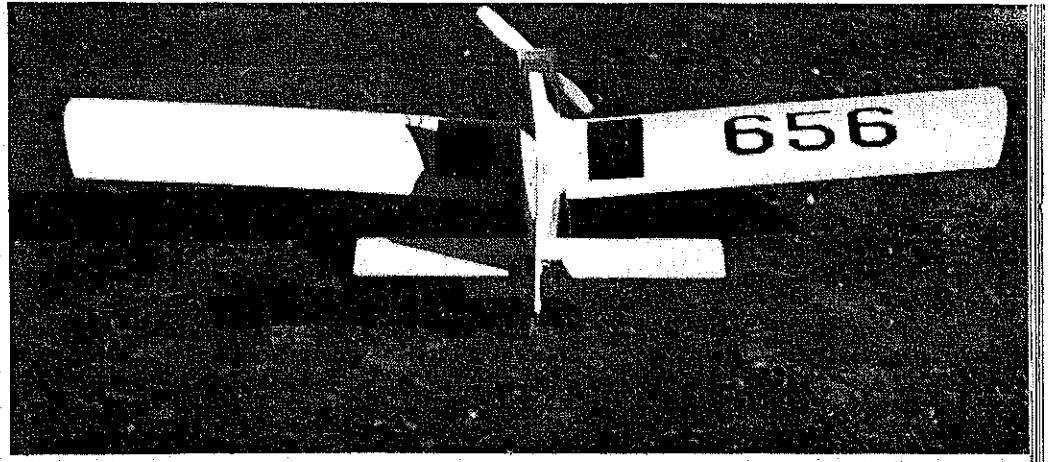
Fabricate tail surfaces from light, but not punky, sheet balsa. The stabilizer and fin are simply flat with rounded edges. Rudder and elevators have a tapering cross section with rounded leading edges. Join elevators with 3/32" wire joiner and hinge as shown. Install tail surfaces on fuselage with epoxy cement.

The fuselage top, both in front and behind the cockpit, is built up in place. Begin by cutting the angled side pieces oversize in width to allow fitting. Bevel the bottom edges and bond to fuselage sides and formers, allowing excess wood to extend above formers. When dry, sand down flush with former tops and add top sheeting. Sand to final shape when glue dries. Install cockpit floor and add ⅛ × ¼" filler pieces between formers D and E. The headrest is made up from ⅛" sheet and fitted behind cockpit opening.

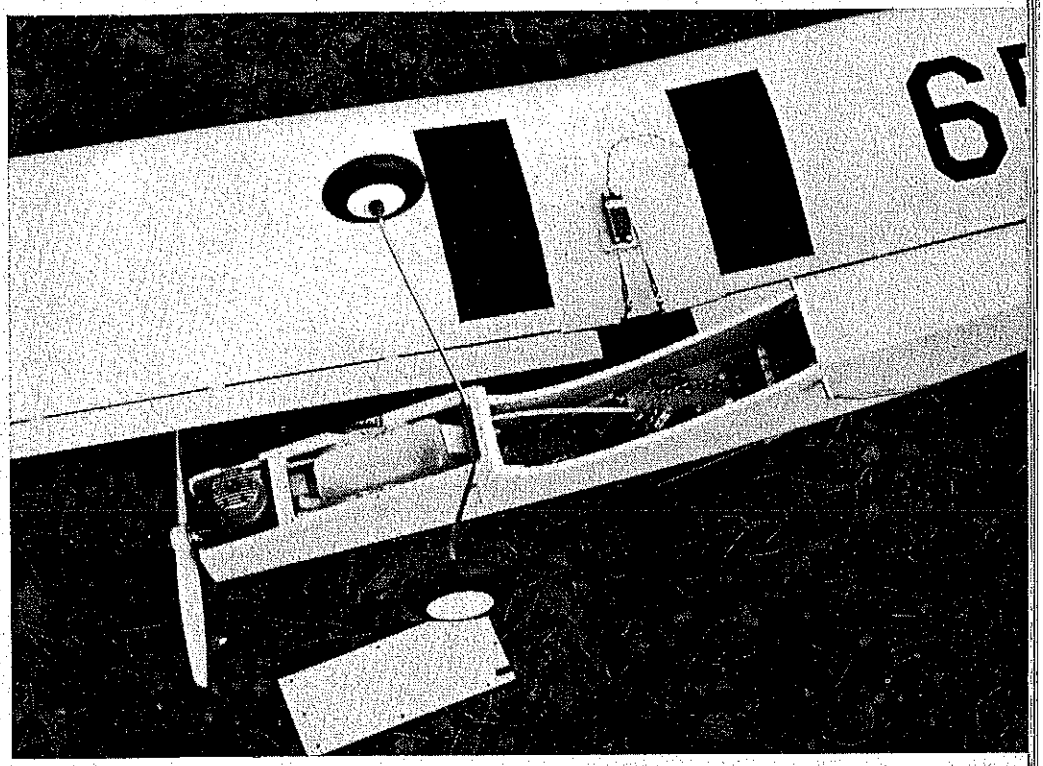
The turnover structure is simply soldered up from ⅛" brass tubing. It is adhered with epoxy and serves as a windshield support as well. There is a strong temptation to use this structure as a handle for moving the model, but as designed, it is not strong enough for this purpose.

Drill firewall for engine mount screws using your mount for a guide, and install blind mounting nuts. Be sure the thrust line is approximately as shown on plan. Don't be afraid of the inverted engine. They run fine this way, but are slightly more prone to flood. The smooth appearance of the nose is worth it.

Square up the nose with a sanding block,

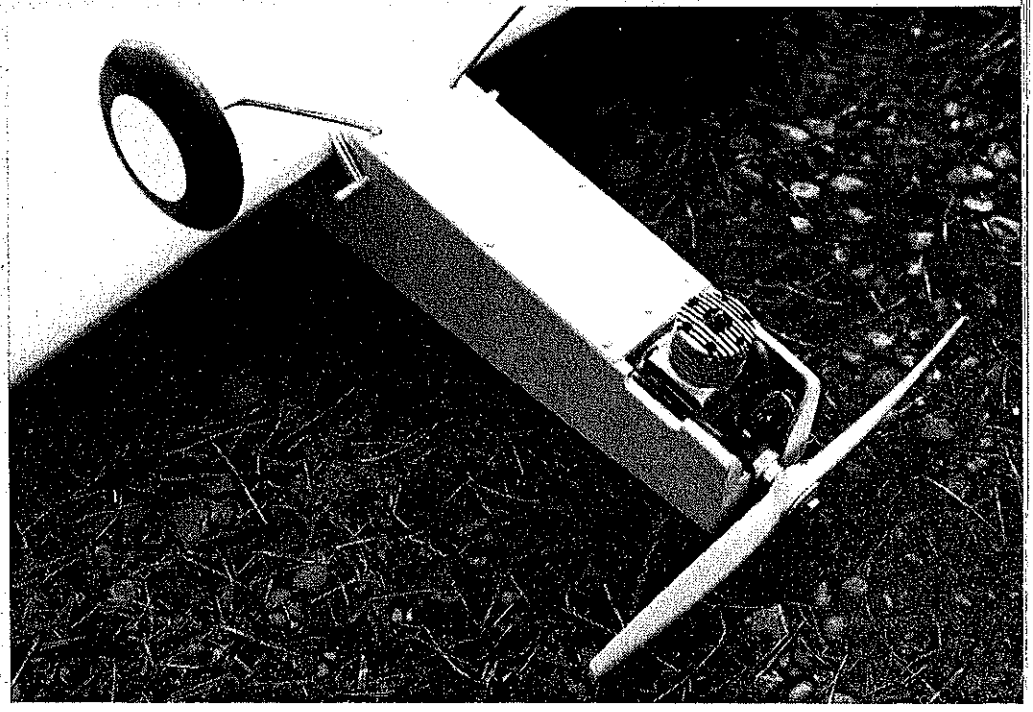


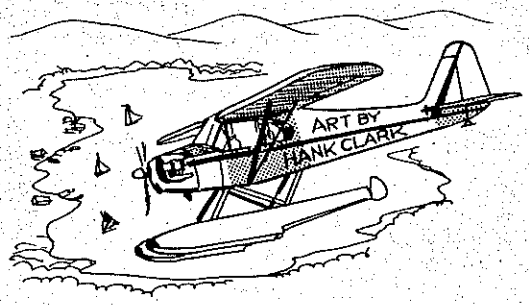
Generous dihedral assures stability. Ship responds readily to aileron control, does nice barrel rolls like an airplane, rather than axial rolls typical of pattern ships.



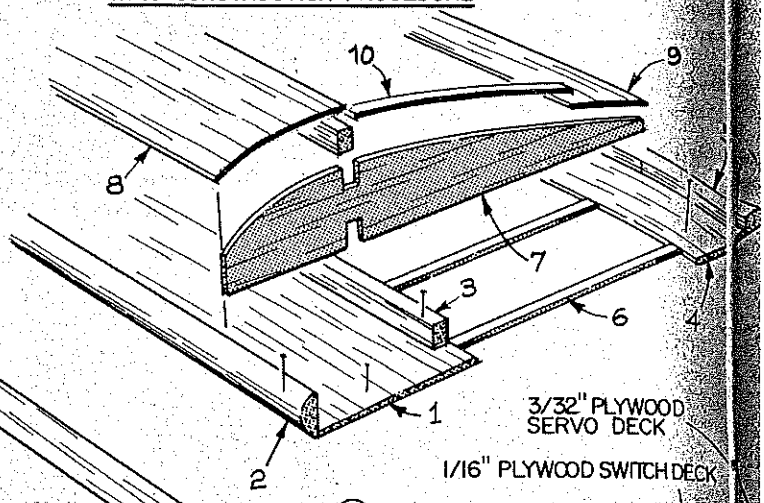
Typical strip aileron linkage is employed. The 1/16-in. plywood tank compartment cover has been removed in the picture—battery pack in compartment above tank. Talk about accessibility!

Inverted engine gives no problems. Fuselage design provides self cowling effect. Tank compartment cover attaches with sheet-metal screws. Though 29-40 design, it's a bit overpowered by a 40.





WING CONSTRUCTION PROCEDURE



3/32" PLYWOOD SERVO DECK

1/16" PLYWOOD SWITCH DECK

(E) 1/8" BALSA HEAD REST

1/8" BRASS TUBING

1/8" BALSA DECK

(D) 1/8" PLYWOOD DASH PANEL

(C) 1/4" PLYWOOD BULKHEAD

450 MAH. BATTERY PACK ON 1/16" PLYWOOD DECK

(B) 1/4" PLYWOOD FIREWALL

TATONE ENGINE MOUNT

(A) 1/8" PLYWOOD NOSE BLOCK

NYROD CONTROLS TO THROTTLE

29 TO 40 ENGINE

1/8" PLYWOOD DOUBLER (ENGINE WALLS CAN BE LINED ALSO)

1/16" PLYWOOD HATCH WITH SCREWS IS ACCESS TO FUEL SYSTEM

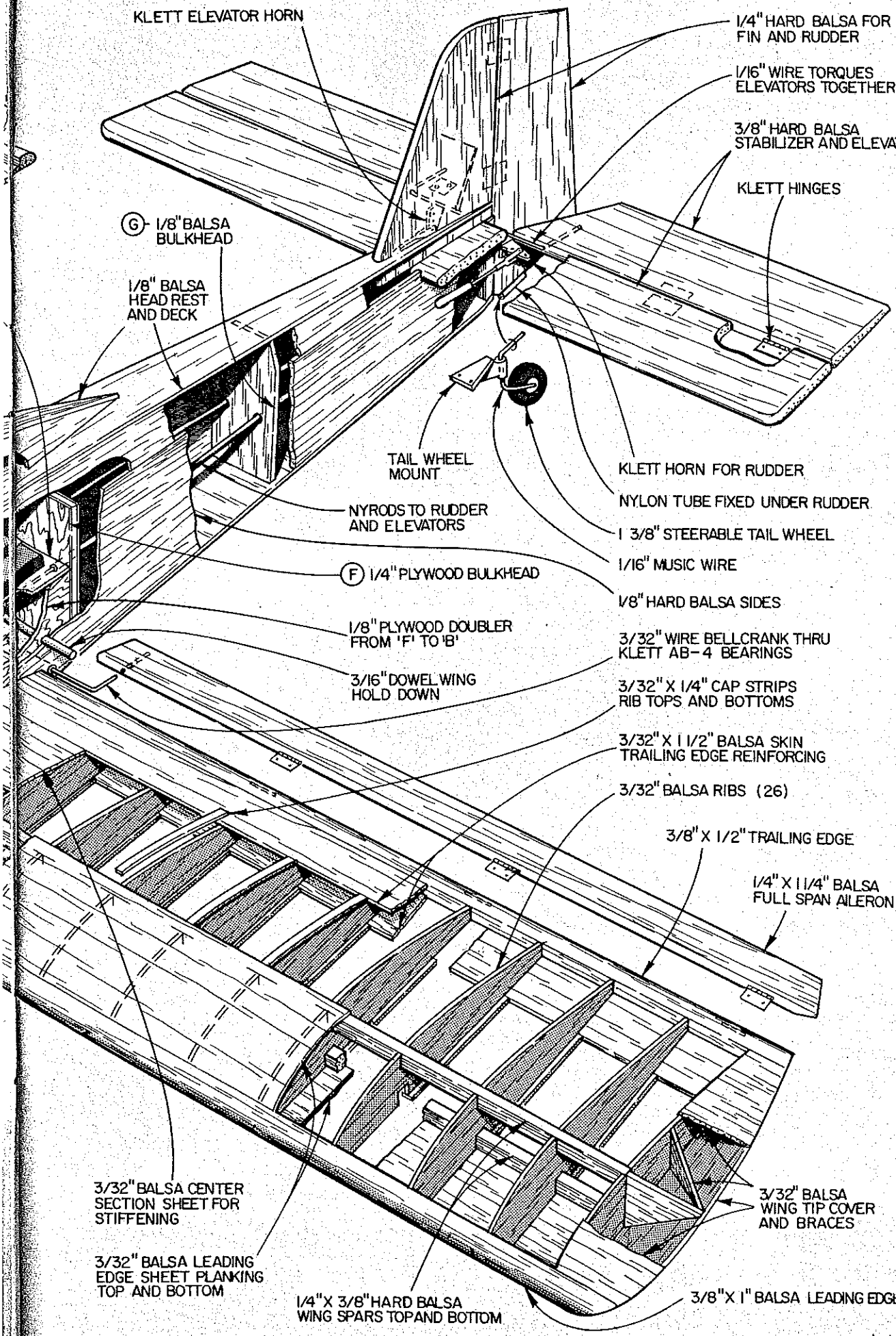
6 TO 8 OZ. FUEL TANK

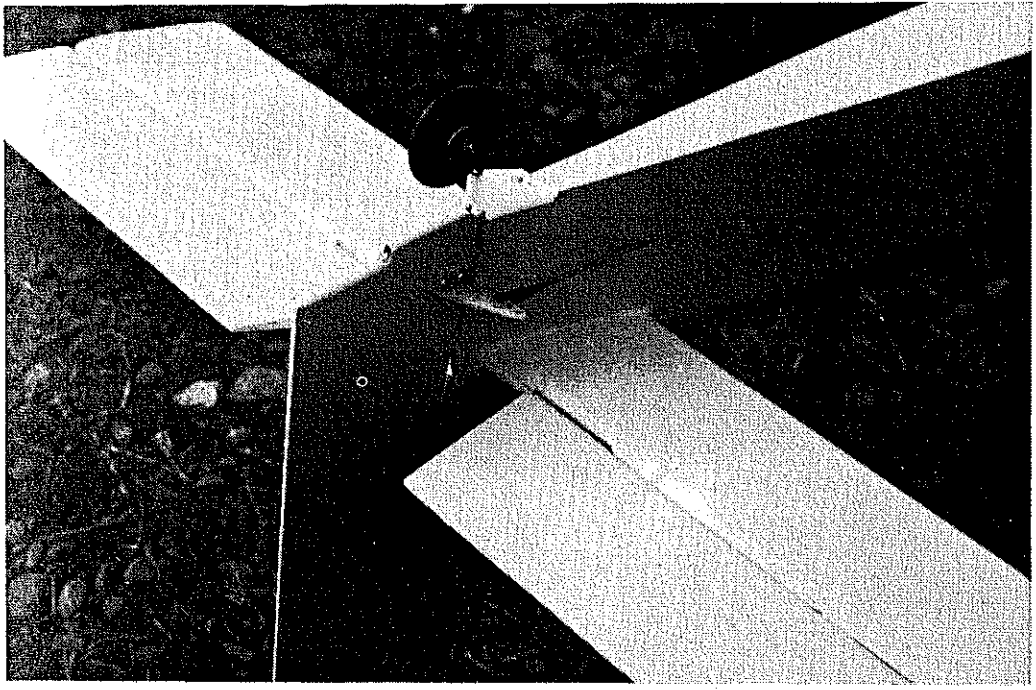
3/16" DOWEL HOLD ON FOR WING ELASTICS

5/32" WIRE LANDING GEAR SECURED WITH METAL CLIPS

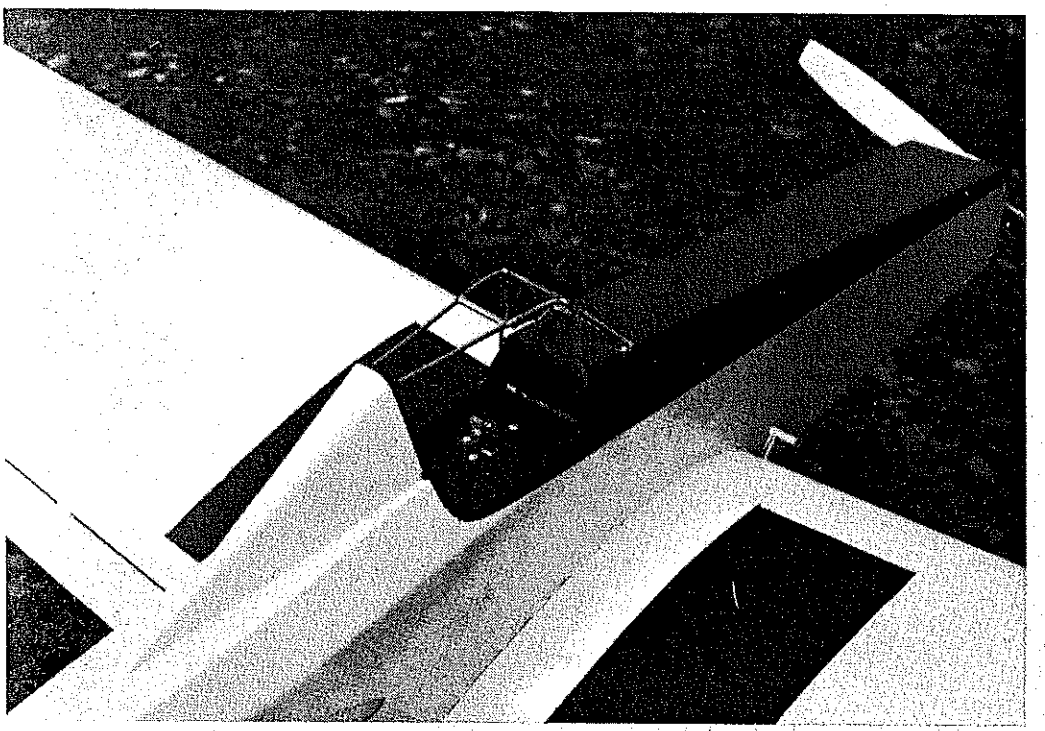
1/8" PLYWOOD SPAR REINFORCEMENT THRU CENTER SECTION

3 1/4" WHEELS


KLETT ELEVATOR HORN
1/4" HARD BALSA FOR FIN AND RUDDER
1/16" WIRE TORQUES ELEVATORS TOGETHER
3/8" HARD BALSA STABILIZER AND ELEVATOR
KLETT HINGES
(G) 1/8" BALSA BULKHEAD
1/8" BALSA HEAD REST AND DECK
TAIL WHEEL MOUNT
KLETT HORN FOR RUDDER
NYLON TUBE FIXED UNDER RUDDER
NYRODS TO RUDDER AND ELEVATORS
1 3/8" STEERABLE TAIL WHEEL
1/16" MUSIC WIRE
(F) 1/4" PLYWOOD BULKHEAD
1/8" HARD BALSA SIDES
1/8" PLYWOOD DOUBLER FROM 'F' TO 'B'
3/32" WIRE BELLCRANK THRU KLETT AB-4 BEARINGS
3/16" DOWEL WING HOLD DOWN
3/32" X 1/4" CAP STRIPS RIB TOPS AND BOTTOMS
3/32" X 1 1/2" BALSA SKIN TRAILING EDGE REINFORCING
3/32" BALSA RIBS (26)
3/8" X 1/2" TRAILING EDGE
1/4" X 1 1/4" BALSA FULL SPAN AILERON
3/32" BALSA CENTER SECTION SHEET FOR STIFFENING
3/32" BALSA WING TIP COVER AND BRACES
3/32" BALSA LEADING EDGE SHEET PLANKING TOP AND BOTTOM
1/4" X 3/8" HARD BALSA WING SPARS TOP AND BOTTOM
3/8" X 1" BALSA LEADING EDGE



Steerable tail wheel arrangement uses standard hardware items and provides a positive response for ground handling. Two-wheel landing gear takes some getting used to if you've never flown one.



Cockpit turnover structure is fabricated from brass tubing soldered together. Switch location is conveniently out of the way—windshield keeps oil away. Williams Brothers' pilot is added to avoid strange empty-looking cockpit during low fly-by's. Wing rubberbands in place.

taking note of the small angle back. The installation of former A completes the "self cowling" engine compartment. Cut the tank compartment cover from 1/16" plywood and attach it with #4 ¼" sheet metal screws, bearing directly into the plywood fuselage doublers.

Bend up the landing gear from 5/32" music wire and attach to former C with sheet metal clips or J-bolts. Drill fuselage for wing attachment dowels, but do not install permanently until after basic finish is applied. Take care in locating the rear dowel to avoid possible interference with the aileron linkage.

At this point the radio gear should be temporarily installed in order to route control rods for throttle, elevator and rudder. I prefer Nyrods or the equivalent, however, ample room is available for even solid pushrods if you prefer. When using nylon pushrods, be sure to secure the outer housing at both ends and in the middle in order to insure that servo movement is accurately transferred to the appropriate control. Flexing of control rods can lead to costly accidents. When you are certain that the control system is properly installed, remove radio gear and install bottom fuselage sheet cross grain. Note the plywood reinforcement beneath the tailwheel bracket.

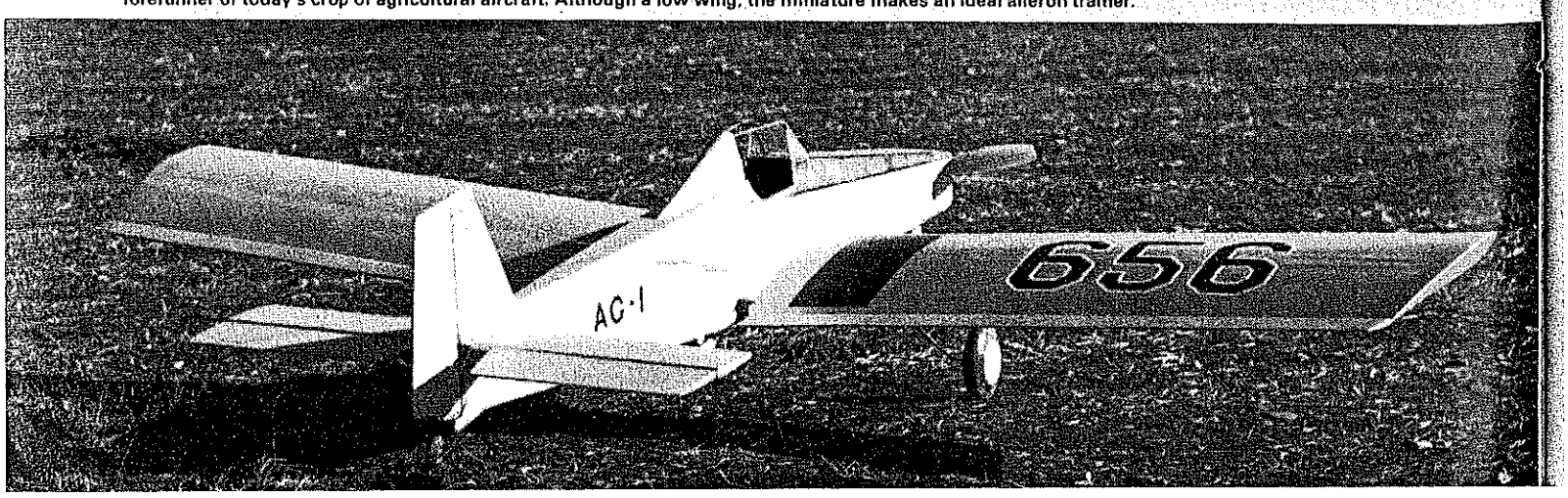
Wing construction can be greatly simplified if you have access to foam cutting equipment. However, the built up version goes together quickly and without complication. Begin by pinning down ⅜ × 1" leading edge stock set on edge. To this, glue the 3/32 × 3" bottom leading edge sheet. Lay down 3/32 × 1½" trailing edge sheet and secure the ⅜ × ½" trailing edge cap.

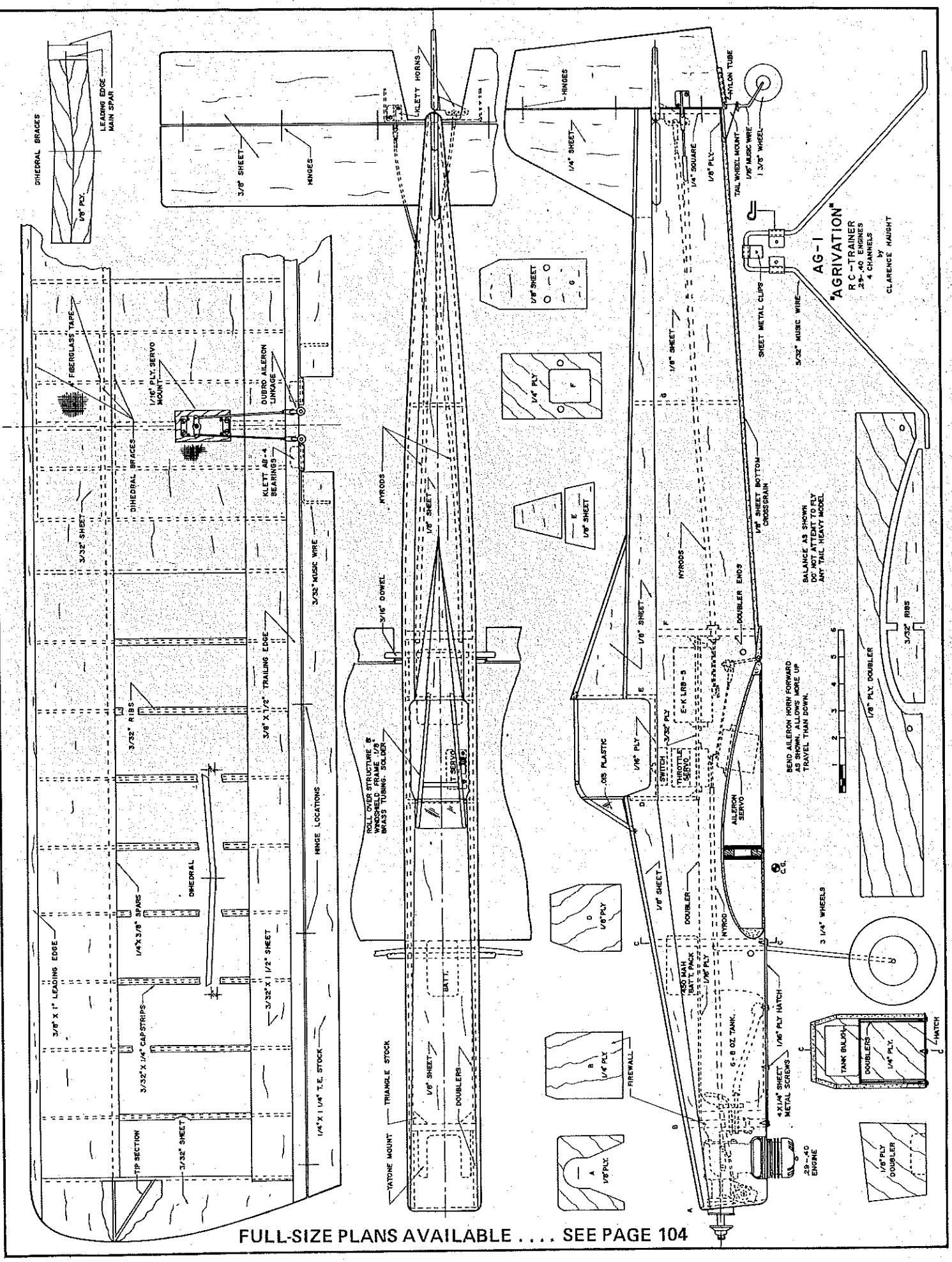
Join leading and trailing edge sub-assemblies with 3/32 × ¼" capstrips at rib locations and 3/32" sheeting at center section. Glue ¼ × ⅜" bottom spar to leading edge sheet. Allow to dry before fitting ribs. Omit center ribs for now. Install top spar and trailing edge sheeting. When dry, remove from board, reverse plan and build right wing panel in same manner.

Bevel leading edges, trailing edges, and spars with sanding block and join wings with plywood dihedral braces. Allow to dry

Continued on page 84

Simple blend of straight lines provides ease of construction with semi-scale appearance. The real AG-1, after which this model is patterned, was the forerunner of today's crop of agricultural aircraft. Although a low wing, the miniature makes an ideal aileron trainer.





FULL-SIZE PLANS AVAILABLE . . . . SEE PAGE 104

other guys like us. A newsletter is being published that is rapidly growing into a mini-magazine. It concentrates on the type of information that is so darned hard to come by.

If you are interested in the QSAA, send me a double-stamped, large self-addressed envelope, and I'll send you a copy of the first newsletter.

Remember, Big is Beautiful! (The QSAA motto.)

SOME SUPPLY SOURCES

Kits

(J-3, Champ, Citabria, Mr. Mulligan, several others)
Bud Nosen Models
P.O. Box 105
Two Harbors, MN 55616

(Several WW-I types)
Aerotec Model Engineering Co.
Box 116
Lincolndale, NY 10540

Engines

Quadra 2.0 cid, converted chain-saw engine, ignition. (Most hobby shops can order.)
Five Star Specialties, 3125 Wilkins Way, Carmichael, CA 95608
EWH Specialties, Inc., 607 E. Abrams, Suite #10, Arlington, TX 76010

MRC-Suevia 25cc, (1.5 cid glo) Schnuerle ported. (Most hobby shops can order.)
MRC, 2500 Woodbridge Ave., Edison, N.J. 08817

MOKI 25cc glow. (Most hobby shops can order—imported by Polks Hobbies.)
Five Star Specialties (see address above)

Webra .90, OS .80, Fox .78, Profi .76, order through your hobby shops

Plans and parts

(Specifically designed for large engines—also many parts, accessories, and Quadra engines and accessories.)
¼, 1/3rd Pitts & Kraft Super-Fli
Big Art's Models
20620 Emmett
Taylor, MI 48180

J-3 Cub, 9-ft. PBY, Stinson Voyager, others
Sid Morgan Plans
13157 Ormond
Belleville, MI 48111

Fairchild PT-19, specifically for Quadra, by Jim Folline
Lee Tuylor
329 C St.
Roseville, CA 95678

Curtiss Hawk P6E, Stinson Reliant SR9
Barrons's Scale Classics
1213 Holly Spring Lane
Grand Blanc, MI 48439

Bob Holman Plans
P.O. Box 714S
San Bernardino, CA 92402

Old Time Plan Serv. (John Pond)
P.O. Box 3113
San Jose, CA 95156

Lee Taylor, 329 C St., Roseville, CA 95678.

RC Technique/Myers

continued from page 13

can be operated in any position.

Jerry Jarvis, of M.E.N., has a hint for car, boat, and helicopter drivers, with regard to limiting the maximum current drawn. Add a flywheel to your starter. Then, when you spin up the starter before engaging the belt, the flywheel will store up some energy that will give to the internal combustion motor just at the time of peak energy demand. This takes some of the strain off the battery and gives you a stronger starting jolt.

Storage: Gel cells store well. I've been telling you to recharge your nickle-cadmium batteries *once a month*, whether you use them or not. Vince Calouri, of the Boeing "Hawks", told me just last month of a talk given to the Hawks by the Boeing battery expert (whose name I carelessly forgot to write down). At any rate, the message was: Put a little load on the battery, just before you recharge it, for optimum results. Exercising your RC system for a few minutes will be sufficient. Then recharge. Now, back to gel cells. Stored at room temperature, a fully charged gel cell will drop to half its capacity in about nine months. That's pretty good! So, recharge your stored gel cells *twice a year*, whether you use them or not. Failure to keep them fully charged leads to sulfation of the plates, which permanently reduces the battery capacity.

Connectors: If your gel cell has tabs on it, like some of the Astro Flight batteries in Fig. 1, then Radio Shack has a push-on connector for it that can be installed on the wire with just a pair of pliers. I'd give you the part number, but they change too fast, so just look around among the blister packs, or ask them for help. Molex connectors can sometimes be found in auto parts stores. Fig. 6 shows another alternative. Concepts Unlimited, 36C Carlough Place, Bohemia, NY, 11716, is distributing the Anderson Power Products kit shown. The connectors mate with those on the Gelyte battery distributed by C.U., and are UL and Canadian standard certified. The contacts wipe together, as recommended by both battery manufacturers, and the shells are color coded and keyed on the sides so that you can assemble just about any kind of special plug you might want. Use them as substitutes for wire nuts when installing electrical fixtures, if your local wiring code permits, and simplify the job a lot. No more holding up the fixture with one hand while you try to turn the wire nut with the other! They also work well for making connections in your car, like CB (cuss, cuss) or stereo. See your dealer first.

What else can I tell you about gel cells? Keep them cool. They operate in a range from -40°F to 140°F. The trunk of your car gets up to 140°F in the hot sun. That temperature hastens self-discharge of *all* kinds of batteries.

Gel cells are rated at a 20-hour rate. The reason is that they yield the greatest capacity at that rate. Your starter motor draws a lot more than that, but only for a short time, so don't worry about it. Charge your gel cell as soon as you get it, because there's no way of knowing when it left the factory (fully charged) or how it was stored in the interim. Capacity will increase during the first few charge/discharge cycles. A gel cell is considered to be expended when its available capacity, measured at the 20-hour rate (C/20 = .3 amps for a 6-amp-hour pack) drops to half its original value.

George M. Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.

Agrivation/Haught

continued from page 18

thoroughly. Fit center ribs, cutting out sections as needed. Install leading edge sheeting and center-section planking. Shape sheet wing tips, as shown by typical section. Cap tops of ribs with ¼ × 3/32" strips. Sand wing structure, rounding leading and trailing edge members to final shape.

Cut ailerons from ¼ × 1¼" trailing edge stock and sand to shape. Install 3/32" wire horns in Klett AB-4 bearings and hinge to wing. Horns should be bent forward as shown to insure more up aileron travel than down. This is necessary to insure smooth entry into turns with a high lifting airfoil. Fabricate plywood servo doubler to fit the servo to be used and install as shown. Cut out planking to accommodate servo. Standard Du-Bro aileron linkage is recommended.

This completes the basic structure. Give all components a final sanding and proceed with your favorite covering and finishing procedure. The iron-on coverings are satisfactory, but I prefer the more traditional methods. I suggest fabric for the wings—either ironed-on Coverite, or doped-on silk or Silron, and doped-on Silkspan over bare wood parts. Silkspan is easily applied with a 75% thinner-25% dope mixture, brushed through the paper after preparing the wood by application of two coats of clear dope,

sanding after the first coat only. Approximately five additional coats of dope, thinned only enough for brushing, sanded lightly between coats, will provide an excellent base for color coats. Color may be either dope or epoxy enamel.

Installation of windshield, wheels, tailwheel assembly, engine, tank, and radio, completes the model. Band on the wing and check for alignment. Trim wing saddles, if necessary, to level up wings. Check balance point as shown on plans and add weight, if required, to bring ship into balance. Model can be slightly nose-heavy, but not tail-heavy. Anchor ballast securely. Check control travel and neutral settings with trim set in center. Be sure controls travel in proper direction. Go out and dust a few crops!

RC Scale/Wischers

continued from page 21

hardened epoxy can then be finished by sanding.

Since considerable force is required to drape the heat-softened canopy material over the form, a means is required to anchor it to the work t' 'e. Stretching the material is similar to force needed to stretch a sheet of rubber. We usually drill ¾" diameter holes into the bottom of the form and epoxy 1½" long dowels into the holes, set flush with the bottom. One end of a 1 X 2" pine board is fastened to the dowels with wood screws. Its other end is clamped to the work table, providing a rigid mount for the form so that it is suspended in air away from the table. Forms with deep compound curves demand the most rigid mountings, because the canopy material must be stretched in two directions. The work table should be moved close to the oven that will be used for heat softening the plastic, to shorten the time from oven to form.

The sheet of transparent plastic is prepared by cutting to size with a saw. Plexiglass cannot be cut successfully with a tin shear because it will crack in unwanted directions and any edge notches will be a starting point for a tear when being stretched. Its dimensions should be 3 or 4" greater than the mold size because we need to drill holes along two edges. Wood grip strips are bolted to opposite sides of two edges of the plastic to provide a means of applying a uniform force during forming.

The wood strip should be held firmly to the plastic with C clamps while slowly drilling through to prevent cracking as the drill penetrates. Bolts and nuts are then assembled and tightened securely. Using ¾" sq. wood strips, the #10 bolts should be on 3" centers for maximum security. For thinner wood, use more bolts. The assembly is then suspended in the oven by means of screw hooks threaded into the wood.

Plexiglas should be heated in an oven temperature of 250° F. It is not ready to stretch until it sags considerably in the oven. While waiting for the material to soften, the form needs to be heated with a hair dryer or heat lamp. Without this preheating of the form, we have found that plastic hardens too rapidly when it comes in contact with a cold form and a complete canopy cannot be formed. If this should happen, the plastic can be returned to the oven for a second attempt. It will return to its original shape unless torn or mutilated severely. Gloves or mittens should be worn as the bolts become very hot. The stretching should be done in one swift motion downward, wrapping the plastic completely around the mold so that the hands meet beneath the mold. The hardening takes place in a few seconds, so lose no time in transferring the plastic from oven to form.

If the canopy has no compound curves, as in a simple curved windshield, the process is much simplified. The form can be a sheet of aluminum, bent to shape around a large wood dowel or rolling pin. The form is placed in the oven with the plastic balanced at its crest, and theat will cause the plastic to neatly wrap itself around the form. Removed from the oven and cooled, it is ready for trimming.

After forming, the excess material is best removed with an abrasive cut-off wheel in a Dremel tool. We have found this to be the safe way of cutting without damage. Small changes can be made by sanding. We have had no success with scissors which