The Malmo Junior

An extremely versatile, 1/5 scale flier—both on wheels and floats—with a 40 . . . .

THE MF I-9 can be considered the "second generation" model of Bjorn Andreasson's original BA-7. The extremely simple construction, along with the excellent flight characteristics, evolved in the end into many variations, including a versatile military version, and the MF I-17 Safari. Bjorn Andreasson conceived the design of his two-place 75-hp homebuilt with an engineer at Convair, San Diego. After proving his engineering ability with the successful flight of the BA-7 in October 1958, he eventually returned to Sweden as head of the aircraft division of A.B. Malmo Flygindustri where his talents were concentrated on advanced light-plane designs. An improved version, the MF I-9 Junior, with a 100-hp Continental engine, was flown in May 1961. Subsequent versions included a float plane and snow-skis models, the improved MF I-9B trainer and the mili-trainer for the Swedish Air Force. A series of evolutionary changes in design finally emerged as the very versatile 200-hp MF I-17 Safari, flown by Count Carl Gustav Von Rosen for Ethiopian relief flights in 1974.

As a lightplane, the MF I-9 Junior was manufactured in Sweden and licensed for production in Germany by Bolkow as the BO-208. The design is enhanced by many unique features, such as a comfortable cockpit with a large one-piece canopy, and with shoulder-high forward swept wings to increase visibility and to allow greater payload variations with minor effect on C.G. location. Structurally rugged and light, the final result is a smooth-flying pilot's airplane capable of increasing its versatility as additional design improvements are incorporated. On the basis of these appealing features of the MF I-9, the scale version just has to be good. And it is!

Ready to taxi out, the pilot seems to be calling "clear" as he activates starter on the trike-geared landplane version. Color scheme is white with red trim, bordered with black edges.

For additional information about the various MF I models, a list of references has been included. *Air Progress* magazine, Ref. 1 and 2; and *Janes All the World's Aircraft,* Ref. 3, will provide specifications. Ref. 4 and 5 give background information and details for the MF I-17 Safari. Ref. 6 shows an RC version built in 1960.

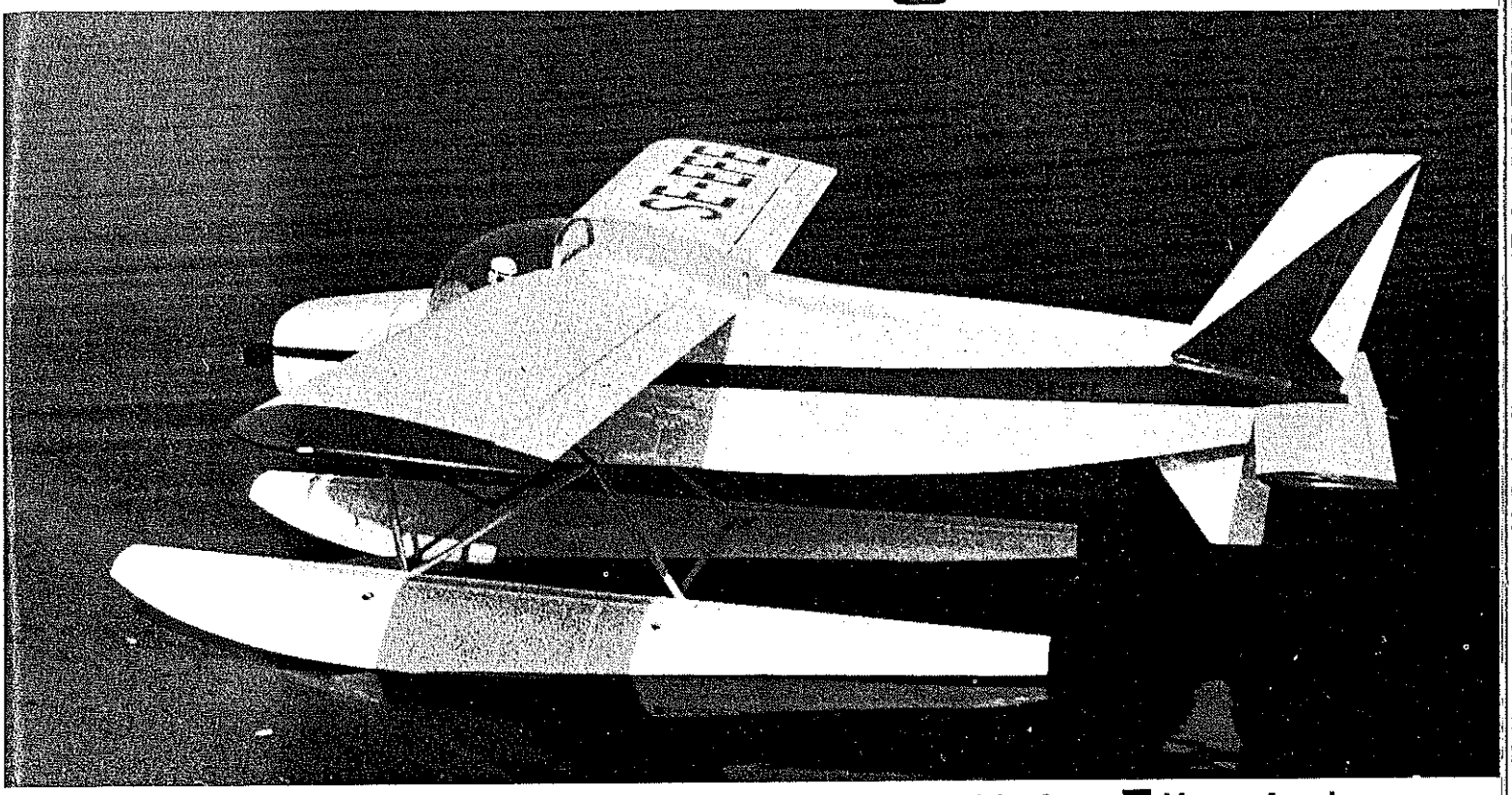
Our 1/5 scale model is responsive and exhilirating to fly. If you haven't tried flaps with effectively coupled ailerons, you'll enjoy the versatility they provide when flying slow or fast, and when landing or taking off—all very neatly with minimum effect on handling characteristics. For added flying fun, try floats. It's different. The floats are easy to build and attach to the landing gear fittings. With a minimum of effort we can now have the fun of a seaplane with flying characteristics similar to the land plane version—all for the price of one 5-channel system! As National CL Scale Champion for 1977, Ray L. Smith said after he flew the model, "Golly gee, this plane has real gusto, please don't take it away from me!"

In describing what I found during design/building/flying, I will point out my experiences, and offer you an opportunity to tailor the model to best fit your requirements. The following items are briefly discussed for your consideration.

Generally speaking, the dihedral may be increased, but to retain scale appearance the 1° scale dihedral was used, resulting in a neutrally stable configuration that offered more responsive maneuvers, but limited any hands-off flying. By increasing the model dihedral to 2° or 3° (corresponding to going from the scale ½-in. dihedral up to 1 or 1.5 in.) the lateral stability can be increased, but you have to accept a decrease in overall maneuverability. Some ways to counter the decreased maneuverability is to increase control surface area, or surface deflection, or flight speed—all within practical limits, of course. My combination is to have maximum practical deflection using scale areas and flying with a 10-in. diameter, 6-in. pitch prop, resulting in good low-speed control for low throttle settings, but offering reasonable high-speed flight at full throttle.

With the addition of flaps, both takeoff and landing occur at reduced speeds while still maintaining positive control. The flaps

or and Seaplane



engine. Aileron/flaps offer fine control you've never had before. ■ Harry Apoian

are effective throughout the complete range of throttle setting! Incidentally, flap deflection does not exhibit any unusual attitude changes. During landing or takeoff with flaps, the model is fully responsive. At takeoff, I found that lifting the nose wheel off first (i.e. rotate on the main gear) will help stabilize the takeoff roll. The negative caster on the nose gear may induce a shimmy that is divergent. Evidently, the full size airplane also experiences this, because subsequent Malmo designs show a positive castered nose wheel.

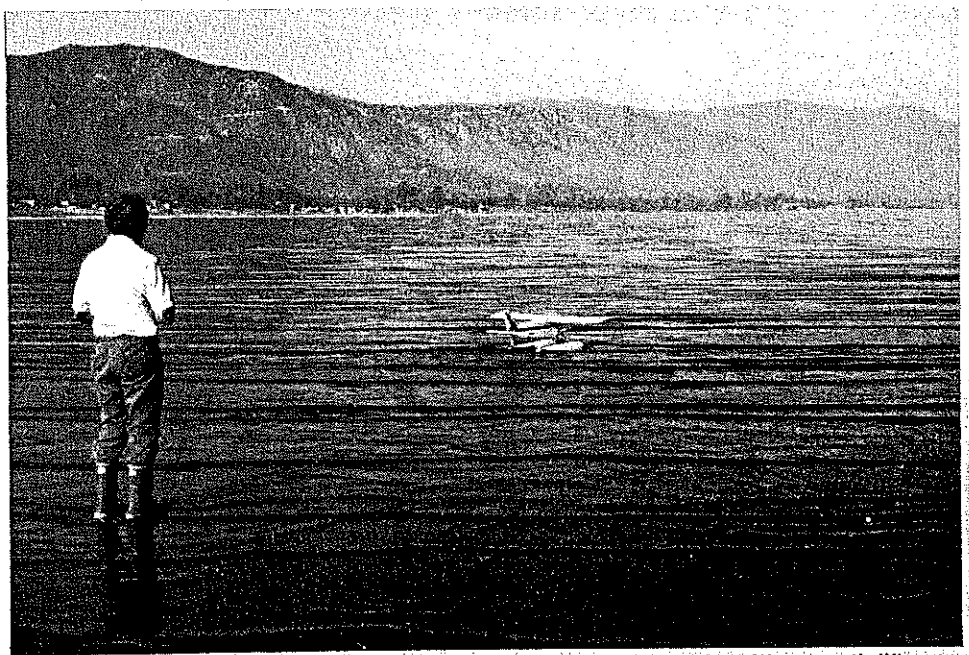
How does that giant-size bubble canopy grab you? Well, it did to me until I talked to Hi Johnson: "No problem, just make the giant size mold of wood, coat it with epoxy and sand it smooth, and I'll pull it for you in my giant size vacu-form!" Presto, a beautiful light-weight bubble that only needed minor trimming and detailing with the necessary hardware (including a pilot and seats). So it wasn't impossible after all! Write to: Hi Johnson Products, 11015 Glenoaks Blvd., Pacoima, CA 91331. (Phone 213–899–4312.)

He has the form and has agreed to supply the canopy for a nominal fee. In fact, it all worked out so well that only one ¼-in. bolt is required to lock both the removable canopy and the engine cowling in place.

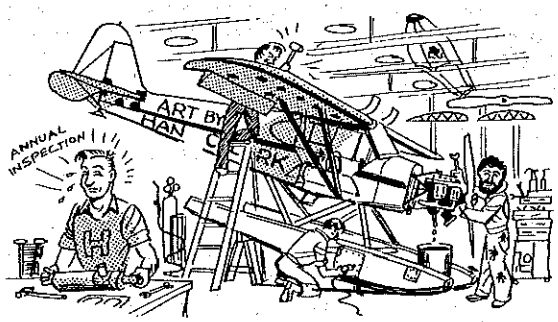
The same idea is used to attach the floats for the seaplane version. That is, by removing the landing gear, the float struts are installed into the fuselage, using the same fittings for both installations. The floats will increase the flying weight to 6.5 lbs. (versus 5.25 lbs. for the land plane) but you better believe it's worth it! The seaplane is a charmer. There's nothing like the fun of water flying to pacify you. The float construction is so simple, you'll not hesitate to build a pair.

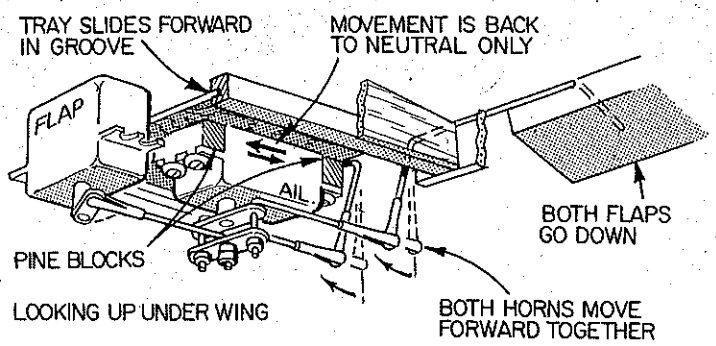
The best of all worlds, a fine flying machine with a great combo of eye-pleasing features: swept-forward wings, big bubble, raked fin, ventral fin, and true-to-life floats. Pictures were taken by Dr. W. Fisher and John Targos.

One last point should be made: Covering the model with polyester cloth. Details



Standing in the shallow water of Lake Elsinore, the author taxies out prior to one of those gentle lift-offs. The OS Max 40 fits the performance envelope like a glove. He lands it right wing low.





1/16" SHEET TOP C. SECTION ONLY

CANOPY BOLT

WING HOLD DOWN BOLT

VACU FORM CANOPY H-I-JOHNSON

C-2 1/4" BALSA FORMER UNDER CANOPY RIM

ALUMINUM CANOPY HOLD DOWN CLIP — JOINS TO C-1 CLIP

PINE WING BLOCK

PINE FUSELAGE BLOCK

D - 1/16" PLYWOOD BULKHEAD

3/8" SQ. BALSA

C-1

3/16" NYLON BOLT LOCKS COWL AND CANOPY AT ONCE

5 MIL. OFFSET PLATE METAL COWL WRAP AROUND

NEEDLE VALVE THRU COWL

BALSA BLOCKS FORM COWL TOP AND FRONT

O.S. 40F SR ENGINE ON METAL MOUNT

1/8" PLYWOOD NOSE BACK UP REINFORCING

A-1 1/8" PLYWOOD COWL FORM

B-1 & B-2 1/8" PLYWOOD FIREWALL WITH BALSA FILLER

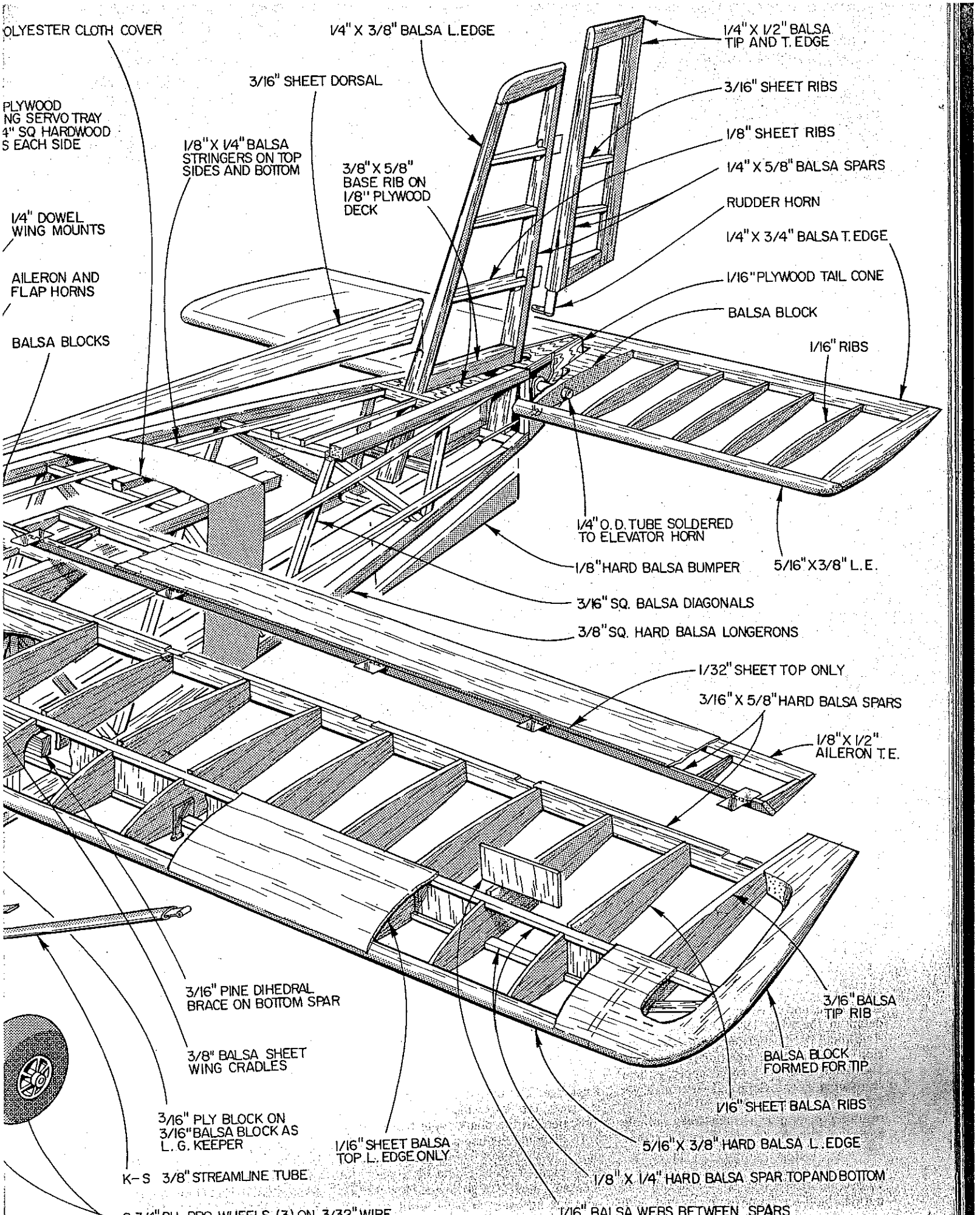
STEERABLE NOSE GEAR ON BRACKET

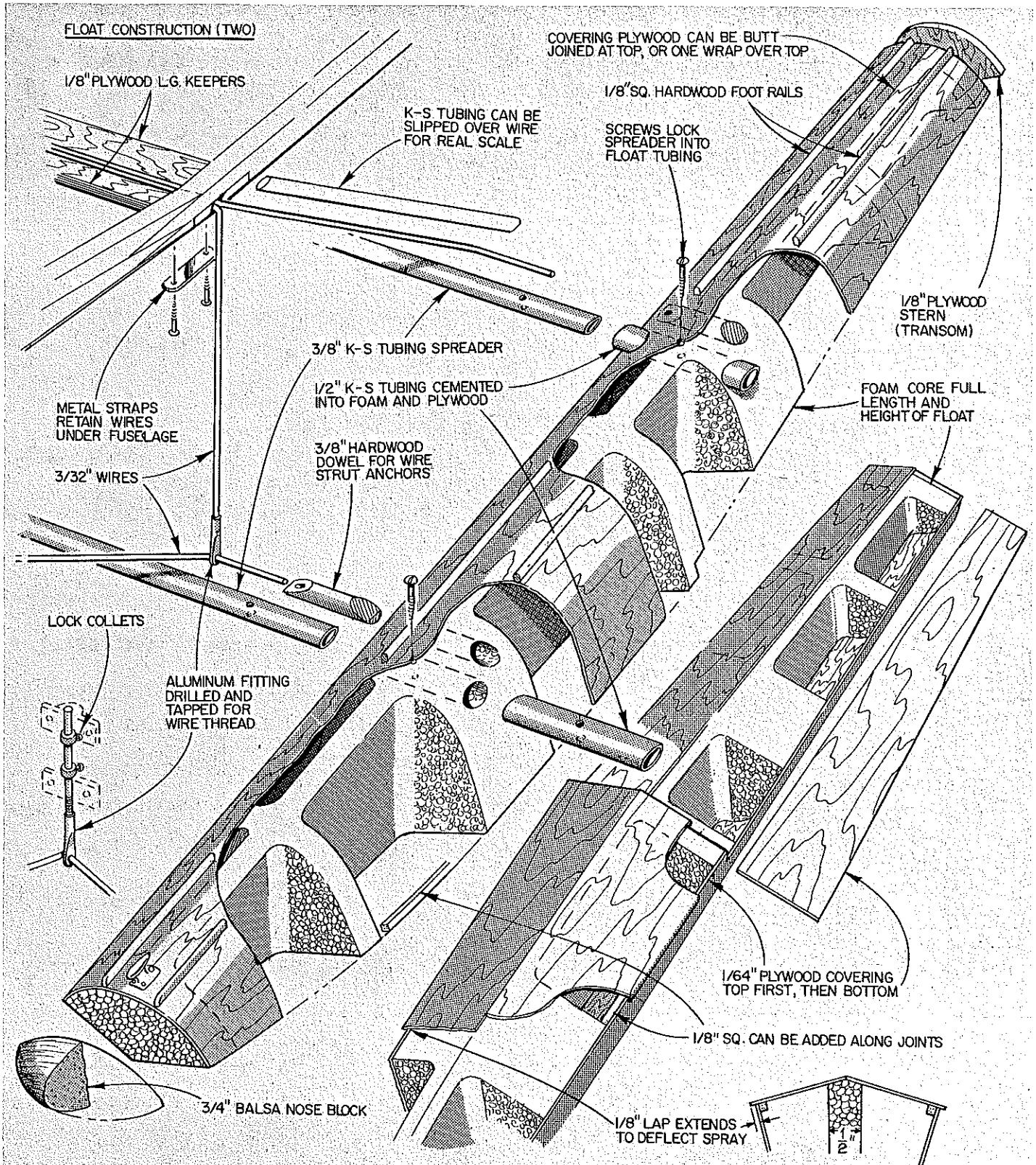
BALSA BLOCKS FORM BOTTOM ROLL IN TO FLOOR

1/16" PLYWOOD SERVO TRAY

1/16" PLYWOOD COCKPIT SIDES

1/8" PLYWOOD L.G. KEEPER


OLYESTER CLOTH COVER
1/4" X 3/8" BALSA L.EDGE
1/4" X 1/2" BALSA TIP AND T. EDGE
3/16" SHEET DORSAL
3/16" SHEET RIBS
PLYWOOD
NG SERVO TRAY
4" SQ HARDWOOD
S EACH SIDE
1/8" SHEET RIBS
1/8" X 1/4" BALSA STRINGERS ON TOP SIDES AND BOTTOM
3/8" X 5/8" BASE RIB ON 1/8" PLYWOOD DECK
1/4" X 5/8" BALSA SPARS
RUDDER HORN
1/4" DOWEL WING MOUNTS
1/4" X 3/4" BALSA T. EDGE
AILERON AND FLAP HORNS
1/16" PLYWOOD TAIL CONE
BALSA BLOCK
BALSA BLOCKS
1/16" RIBS
1/4" O.D. TUBE SOLDERED TO ELEVATOR HORN
1/8" HARD BALSA BUMPER
5/16" X 3/8" L.E.
3/16" SQ. BALSA DIAGONALS
3/8" SQ. HARD BALSA LONGERONS
1/32" SHEET TOP ONLY
3/16" X 5/8" HARD BALSA SPARS
1/8" X 1/2" AILERON T.E.
3/16" PINE DIHEDRAL BRACE ON BOTTOM SPAR
3/16" BALSA TIP RIB
3/8" BALSA SHEET WING CRADLES
BALSA BLOCK FORMED FOR TIP
1/16" SHEET BALSA RIBS
3/16" PLY BLOCK ON 3/16" BALSA BLOCK AS L. G. KEEPER
1/16" SHEET BALSA TOP L. EDGE ONLY
5/16" X 3/8" HARD BALSA L. EDGE
K-S 3/8" STREAMLINE TUBE
1/8" X 1/4" HARD BALSA SPAR TOP AND BOTTOM
2 3/4" DU-BRO WHEELS (3) ON 3/32" WIRE
1/16" BALSA WEBS BETWEEN SPARS



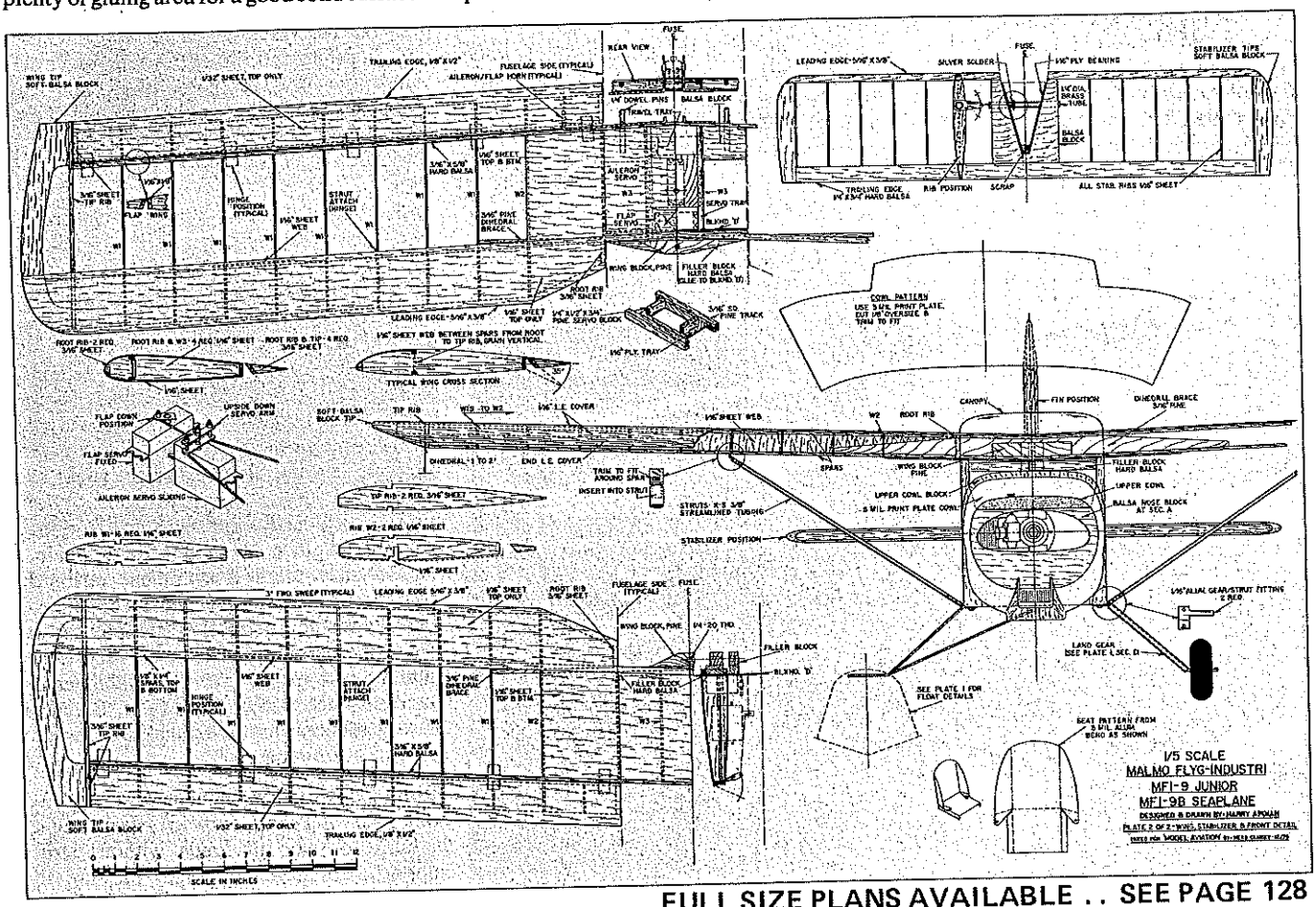
about using and covering were discussed in detail in the May 1976 issue of *Model Aviation* (1914 Blackburn, land/sea version). The polyester covering (be sure it is 100% polyester) is easy to apply, is heat shrinkable, easy to dope and very tough, yet light and inexpensive. It is well worth a try, resulting in a nice wrinkle-free, durable covering with the texture of real airplane fabric.

Construction Notes: It is basically the normal built-up framework covered with the polyester cloth and painted with butyrate dope. However, there are some special requirements for building and assembly that will be described in detail.

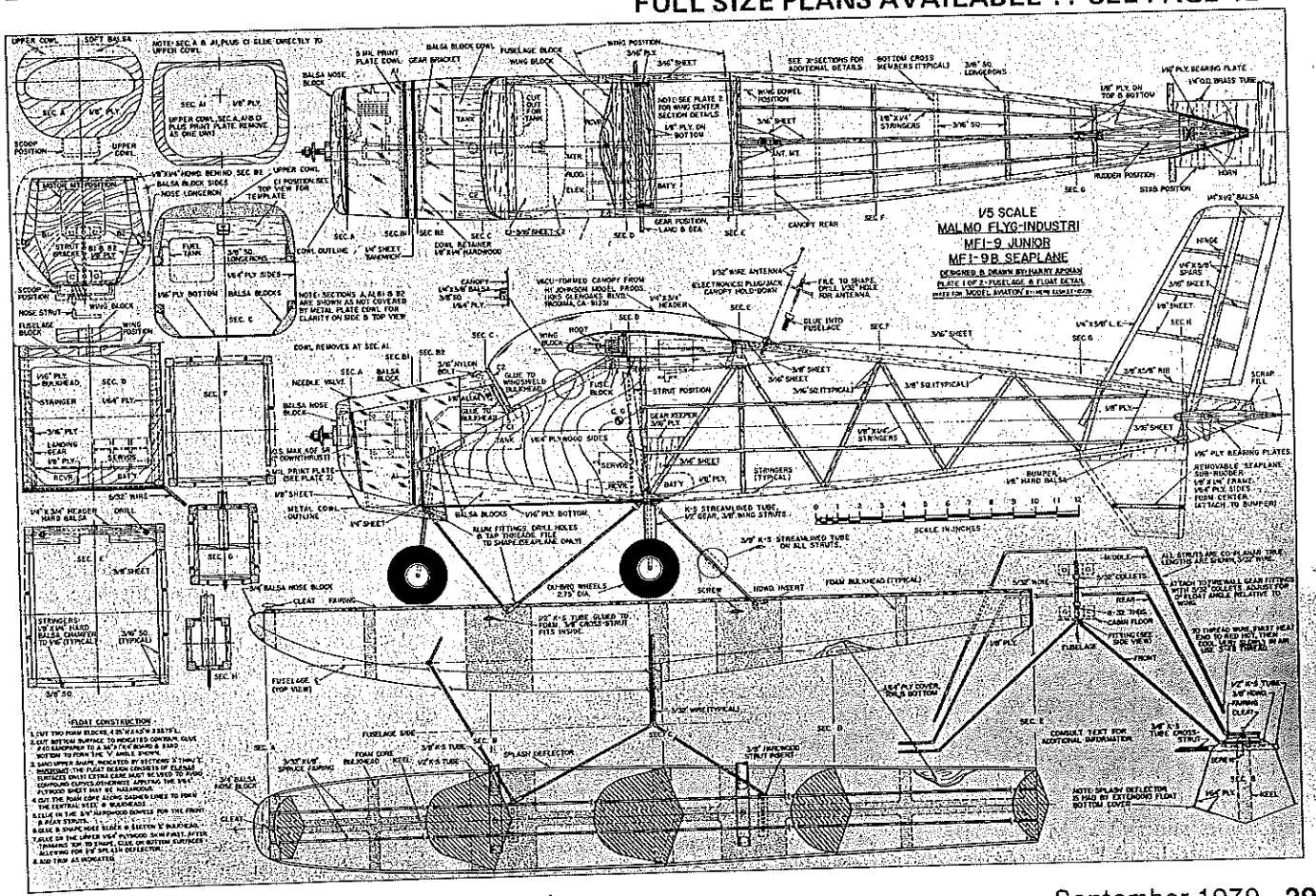
Fuselage: The normal truss-type structure is used; the two sides are laid up as indicated on the plans. Note that 3/16 × 3/16 diagonal members are recessed 3/16 in. below the 3/8 × 3/8 longerons (refer to body cross-sections E and F) to allow for recessing the ⅛ × ¼ stringers. However, do not glue stringers in place until ready to cover. You'll need the open spaces to install and adjust the controls, and for miscellaneous other reasons! After the covering is applied, the recessed stringers will give a more realistic outline, effectively simulating the actual aluminum skin/stringer structure.

From the cabin area forward use 1/64 plywood sides and 1/16 plywood on the bottom (i.e. the cockpit floor). Soft balsa filler blocks are used to form the nose section contours. These are glued to bulkhead B. Make bulkhead B by gluing ⅛

plywood faces to the ¼ balsa center core. This will give a light but thick bulkhead with plenty of gluing area for a good solid surface to hold the engine and nose gear fittings. Do not block in top surface of nose. This is left open and will be covered by the balsa top of the removable cowling. Note that cowling bulkhead B1 is shown dotted for clarity and has the exterior contours of bulkhead B with



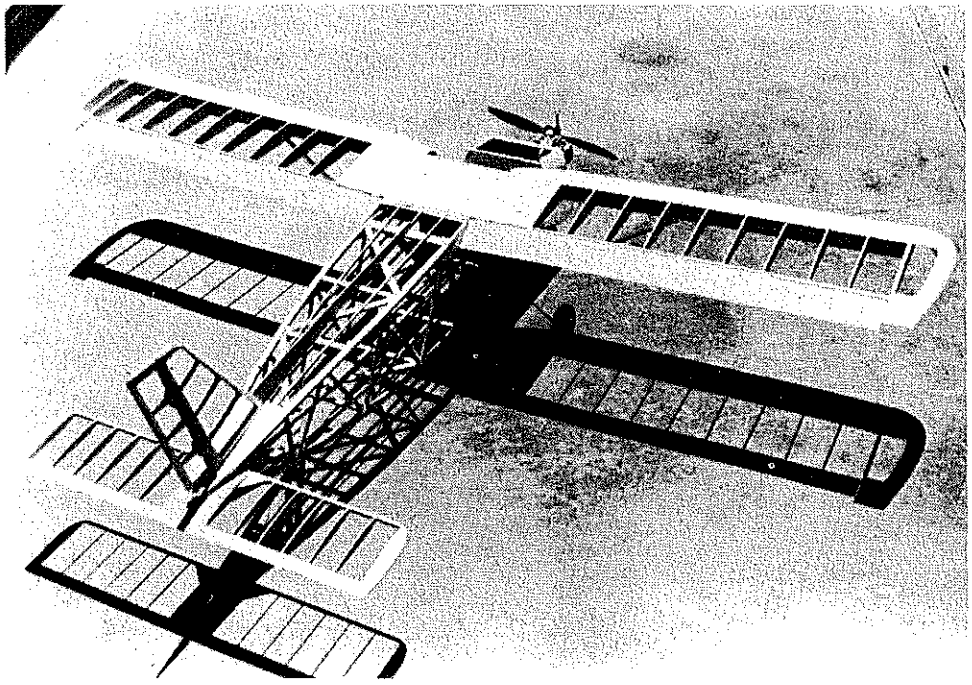
FULL SIZE PLANS AVAILABLE . . SEE PAGE 128



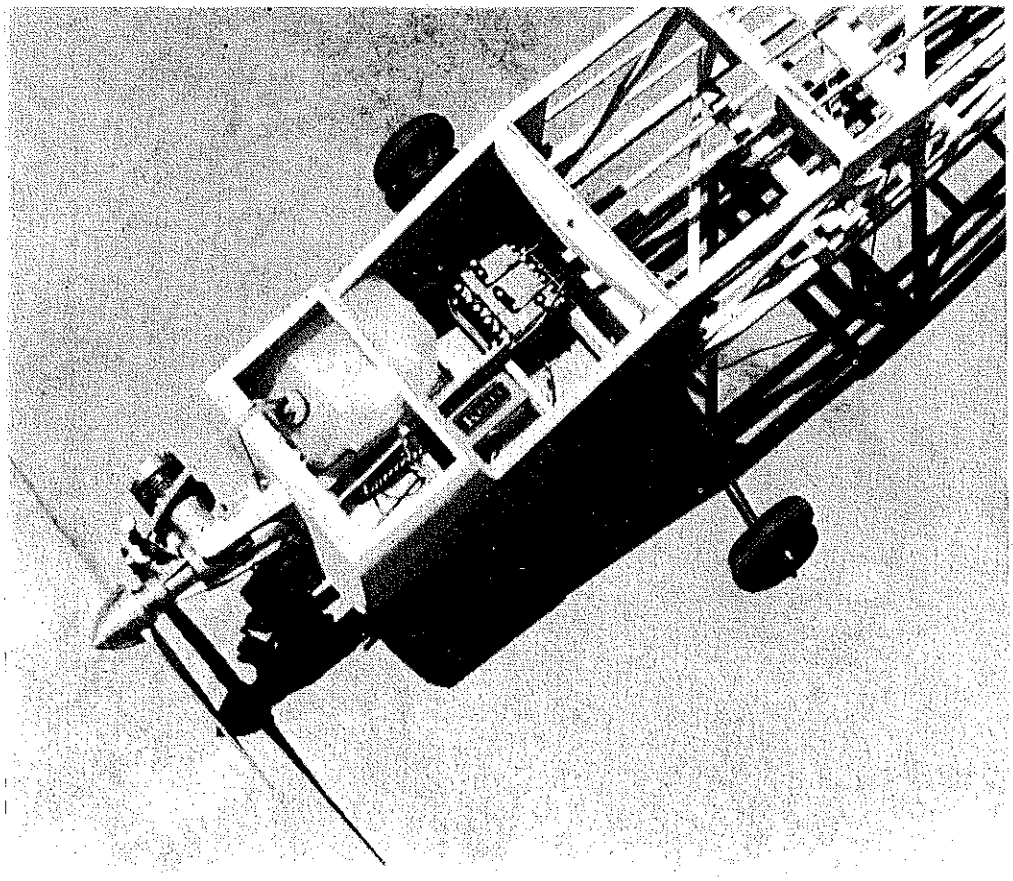
the center cut out, thus leaving a ½ inch "ring" for clearance around the engine. Bulkhead B1 is the back end of the cowling, mating with the front side of bulkhead B.

The cowling sides and engine opening in front are made of balsa and glued to the ⅛ plywood bulkhead A, which is now glued, along with bulkhead B1, to the balsa upper cowling block. The cowling sides and bottom are planked in and sanded to shape. The finished, removable cowling is covered with 5-mil aluminum sheet (offset print plate), cut to the pattern indicated on the plans. This gives a cowling that simulates the sheet aluminum used on the full-size plane.

After gluing in the main gear plywood gussets, install the nose-gear hardware, tank, front and rear wing attachments, radio gear, the miscellaneous fittings and other parts. Make sure there is enough room to move the battery forward or rearward by as much as 3 to 4 inches from the normal C.G. location for the final trim requirements. Do not, however, move the receiver, because plugging and unplugging the wing servos may be awkward if it is relocated. Only after building and fitting the wing and tail, should the fuselage be completed and the stringers added. The dorsal fin is glued on after covering the fuselage and prior to doping.



Above: The interesting cross-piece and stringer arrangement pops out in this traditional ready-to-cover shot. Below: Spacious nose allowed this compact, all-forward mounting of radio equipment.



Tail Assembly: The vertical surface is made from soft balsa, except as noted. After sanding to shape, attach hinges and control horn. Fit rudder to fuselage, but do not glue in because the horizontal surfaces have to be fitted and glued in first.

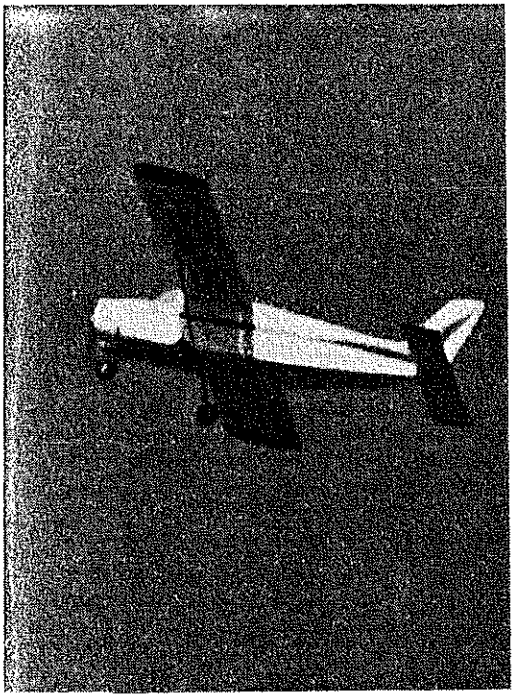
Build the floating stabilizer with medium balsa and insert the center block (hard balsa). Fit as indicated but do not glue in the control tube/horn. Next, cut the two 1/16 plywood bearing plates to shape (refer to plans) and slip over control tube. After fitting satisfactorily into fuselage, glue the assembly in place. Next, glue the rudder in, but be sure there is sufficient pushrod clearance in all directions with all combinations of surface deflection (double check this extra carefully). There is very little clearance, so get it right! The stabilizer is glued in place and covered later. Be sure there is adequate surface travel to allow for any final trim adjustments.

Wing: Construction is unique for two reasons. The wing has 3° forward sweep, and it is built to take all loads without strut support. For added strength be sure to include all shear webs (root to tip) and for extra strength make the dihedral block from hardwood, not plywood. After building the basic wing structure, and before applying any sheeting, install the aileron and flap servos and the associated hardware, such as hinges, dowel pins, and the wing hold-down block. Don't forget to glue in hinge fittings for the wing strut. As shown on the plans, the flap servo, which is mounted rigidly at the wing center section, positions the aileron servo by sliding the aileron servo tray fore and aft. This action allows for aileron movement with the flaps deflected. (Note: for added fun flying, try a slight upward deflection with the flaps sometime!)

The flaps and the wing tips are made from soft balsa and contoured to the desired shape. At the wing root, the shorter rib next to the fuselage is merely sanded to the approximate shape indicated. Finally, the medium balsa leading edge and center sheeting is glued on and rough sanded.

Now is the time to mate fuselage and wing to get a good positive fit. Try aileron and flap operation to be sure there is no binding, during assembly onto the fuselage, during operation after mating, and also during removal of wing and the hold-down bolt. No binding under any circumstances!

Before covering, the cockpit canopy should be fitted with the wing in place, on the fuselage. Note that the canopy frame and the front bulkhead C1 are properly mated with the fuselage "instrument panel,"



and with the balsa frame around the cockpit sides, and behind the seats. There is no canopy structure aft of the main wing spar because the canopy will be held firmly in place by the screw in the front, the wing center section, and the plug for the jack at the rear. Trim the canopy with aluminized tape to simulate the hinges and bracing.

Floats: The float is relatively simple to make because all the surfaces are planar. The balsa nose cap is the only compound curved surface. Using 1 lb./ft.^{3} expanded foam, cut the float to the outlines indicated on the plans. The cross-section is contoured to the shapes shown by the section views on the drawing. The shaping can be done easily by gluing #60 sandpaper to a good, straight 40-in.-long 1×4 piece of pine. If done with reasonable care, sanding the soft foam with the pine board will assure that all surfaces are planar. By cutting the foam away as indicated, the material that remains will form a central "keel" with ½-in.-thick bulkheads to which the 1/64 plywood is glued.

Before covering with plywood, be sure to glue in the hardwood sleeves and the streamline aluminum tubing for the float struts and attach points. Then, install and sand to shape, the nose block, the bulkhead at the step and the rear bulkhead. Use contact cement to glue on the top plywood first and then glue the bottom forward and aft surfaces (allow ⅛ in. excess for the splash deflectors). A little touch-up sanding is all that's necessary, since the plywood is relatively smooth. After applying the miscellaneous trim, the float is ready for painting.

Covering: The model is covered with 100% polyester cloth. A detailed description for covering with 100% polyester is given in my Blackburn Monoplane article in *Model Aviation,* May 1976. The material costs about $1.75/yd. (45 in. wide), weighs 1.2 oz./sq. yd., and comes in a variety of colors.

Basically, the polyester is attached to the pre-doped structure (3 medium coats on the balsa wood) by laying the polyester on the structure and applying acetone which fuses the material to the pre-doped wood. Because the polyester is stretchable and heat shrinkable, the result is a wrinkle-free and tight surface. It is imperative that a sharp razor is used to cut excess material. Don't dry to sand—it won't! Instead, use the iron at extra-hot to melt and fuse any fibrous edges together.

After applying two coats of clear butyrate dope, spray on one or two coats of silver to seal pores and to form an opaque surface. With the silver as a base coat, applying the colored dope is easier. You'll get a tough, fuel-proof covering that will add strength to the structure.

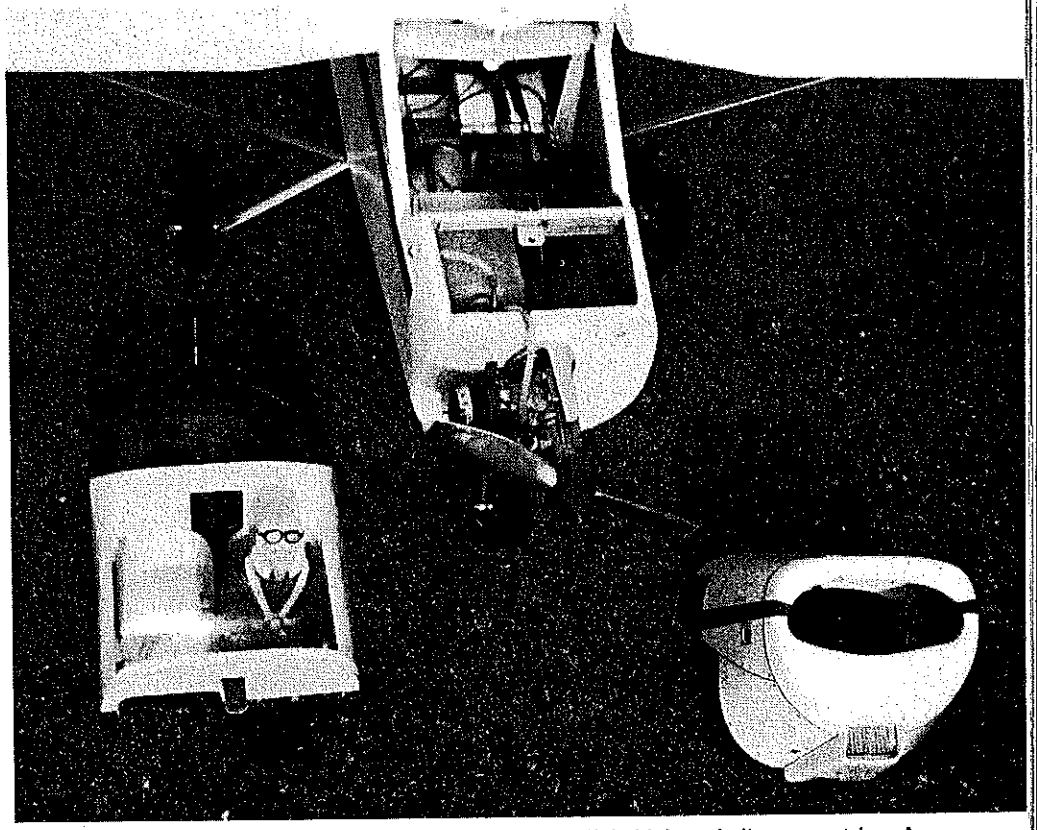
Flying: While the Malmo MF I-9 is a docile flier, a few pointers may add to your enjoyment. Although the finished model weighs 5.25 lbs. with the O.S. 40 Schnuerle and five servos, it flies nicely. During takeoff (with or without flaps down), the nose wheel should be off the runway as early as possible to reduce "hunting" caused by the forward canted nose wheel strut.

For best flight characteristics, try different pitch props and diameters; I use a 10 × 6 which offers good flight speeds, and with flaps down, the model's landing speed can be substantially reduced.

The seaplane version flies nicely with the floats. The takeoff weight will increase to 6.5 lb., but the performance is only marginally affected. The floats are 10% larger than scale, which added to water stability and handling. However, for windy weather, it is advisable to have a steerable rudder on one float for added water handling capability.

Conclusion: For me, the MF I-9 project was educational and challenging. Educational because the research and background information pointed out how the design progressed, and how the design modifications improved flight characteristics. Of the various configurations from the very first plane to the final military version, the best practical one was chosen for a model. The challenge was in adapting construction and modeling techniques to produce a replica of the full-size plane that is just as realistic and just as practical.

The reward? Satisfaction that you can do it! Satisfaction in knowing you "made out!"



Cowling, canopy, and installation details after covering. A ¼ hold-down bolt secures wing. A threaded aluminum hold-down bolt fitting on front bulkhead in cockpit used to hold canopy and the engine cowling. Servos now under pilot—nose gear steering problems. Also, battery has been moved aft—since earlier photo—because of C.G. problems. Split cowling is a very nice feature.

References

1. *Air Progress: Aug./Sept. 1964:* "We Fly the Bolkow 288 Junior"
2. *Air Progress:* Sept. 1966: "From Home-built to Military Fighter"
3. *Janes All the World's Aircraft,* 1963-64, 1967-68
4. *American Aircraft Modeler,* December 1974: "Sweden's Greatest Aeronautical Export," by Tom Henebry
5. *American Aircraft Modeler,* December 1974: "Swedish Hocus Pocus," by Monty B. Groves
6. *Air Trails Model Annual* 1960 "America's Newest Most Exciting Home Built! Andreasson BA-7," by Blakie