FRANKLIN SPORT BIPLANE

By BILL GILCHRIST . . . Here is a two-inch-to-the-foot scale electric powered biplane that is sure to turn heads at the flying field. The Franklin Sport qualifies as a S.E.A.M. Golden Age Scale aircraft, too!

• The Franklin Sport was a small sport biplane manufactured by Franklin Aircraft Corporation of Franklin, Pennsylvania during the years 1930 and 1931. Seventeen of the Franklin airplanes were manufactured. I suspect that the depression of that era prevented a larger production. At least this certainly was the case with a number of other manufacturers. Twelve of the seventeen airplanes were the Sport "A" type, our subject model.

Full-scale construction was very typical for its time. The fuselage and tail feathers were welded 1025 SAE steel tubing. Wing construction was built-up ribs and solid Sitka spruce spars. The 22 x 10 x 4 Goodyear airwheels provided the shock absorbing. The aircraft was powered by a Velie M-5 engine of 55/70 hp. As I understand the history of that time the Velie engine assembly operation was closely associated with, if not part of, the Mono Aircraft Corp. of Moline, Illinois, manufacturers of the monocoupe.

The full-scale Franklin Sport upper wingspan was 26 feet and the lower wingspan was 24 feet. The wing chord was four feet which resulted in a wing area of 185 square feet. Full-scale cruising speed is listed at 85 mph and landing speed at 30 mph. At 2 inches per foot scale (1/6-scale) this works out to an upper wingspan of 52 inches, a lower wingspan of 48 inches and a chord of 8 inches. The wing area is 740 square inches or 5.14 square feet.

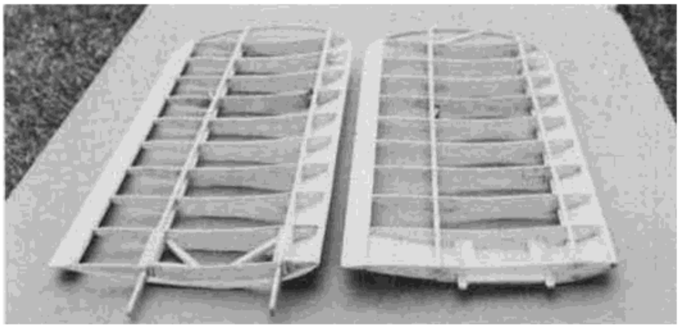
Sport "A" N10147 started out as NC10419 and carried serial No. 8. The original color scheme was orange wings and a black fuselage. N10147 was restored prior to 1963 and at that time was owned and flown by Robert L. Morris of Springfield, Ohio. The plane modeled here is the restored aircraft. The color scheme is horizontal flying surfaces in white along with the movable rudder. The fuselage and fin are Loening yellow with black trim as shown.

My radio control modeling has been involved with several biplanes. This goes back to the days of galloping ghost proportional. It is not at all surprising that my entry into the field of electric flight would involve a biplane. The reference material used for this effort was published in *Model Airplane News,* April 1963. The drawings and information were the work of Richard Anderson. My plans and information are from his efforts. I have preserved it through several moves always with the intention of using it someday. This also points up my strong love for things scale. This one just had to be built when I had the time.

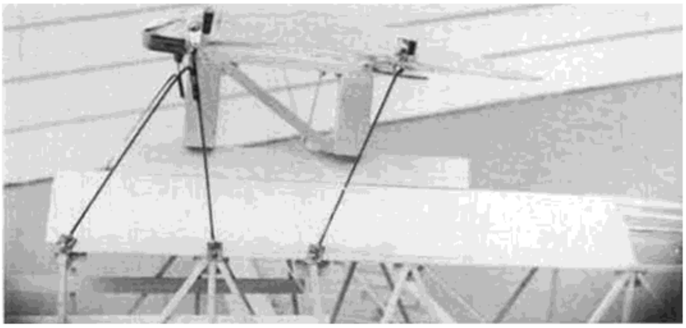
The model was designed with sport scale in mind. However, for those who might desire something more precise, the airframe construction is as scale as possible considering the difference between full-scale and the model. All dimensions are as accurate as they could be made. The only liberty taken with any outline is enlargement of the stabilizer

The Franklin Sport "A" at the local farm model airport. Lettering in circle on this side was not completed . . . Author sez "One's enuff!"

The Franklin as it appeared in the September "Electric Power" column of *Model Builder.*



This view of the upper and lower right wings shows spar extensions required in the top wing and locator tongues required in bottom.



Step 1, rigging procedure: template positions center section of top wing while holes in end ribs receive spar extensions of wing panels.

one rib spacing on each side of the fuselage. (You would have never guessed it, if I hadn't told you.) The scale outline is shown, but I would strongly advise against its use for geared down electric power. My experience has shown that a small stabilizer just isn't worth the trouble it can cause. It is possible to fly a model with a scale stabilizer, but it isn't something associated with pleasure. It can result in continual damage to the model's undercarriage. Geared down electrics tend to fly nearer to scale speeds, and therefore do better with a slightly enlarged stabilizer.

The following design ideas helped put this ship together. First, the wing structure was made as light as practical, and the strength was provided by the biplane rigging. This means that all rigging wires and struts are functional, and the plane cannot be flown without them. This applies also to the stabilizer/rudder brace wires.

Second, the balsa sheeting used to simulate the fuselage front cowling also supplies the strength to support the ply bulkhead on which the motor and speed reducer are mounted.

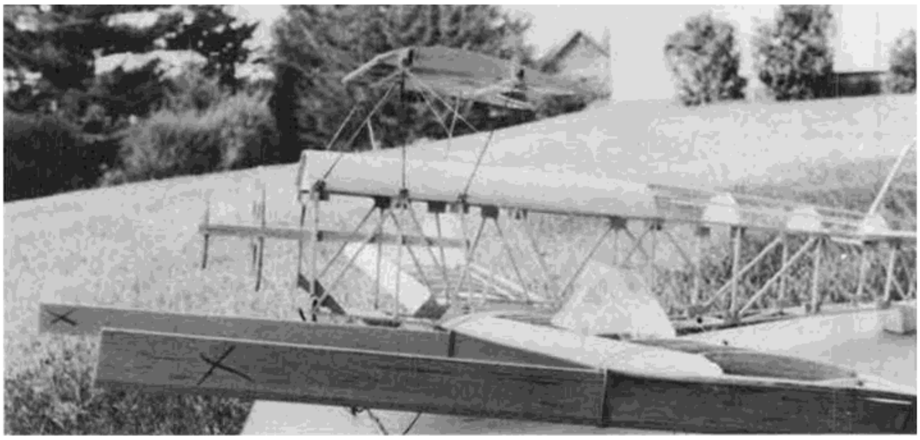
Third, instead of sheet doublers to provide fuselage strength, ply gussets are used at critical joints in the fuselage framework. Another concept that came out of this project was the attachment of the stabilizer with small screws and blind nuts (T nuts) in order to provide for adjustment. Once the rigging is in place, it is not easy to make changes in the biplane's wing incidences. This allows adjustment at the stabilizer for best flight trim.

The model was designed for, and test flown with, what is now called the Astro 15 standard flight system. In the meantime, Astro Flight, Inc. has been developing a 15XL with more power, more duration, and about four ounces heavier. Best flight trim with the new system may require some small adjustments. These are to be covered later.

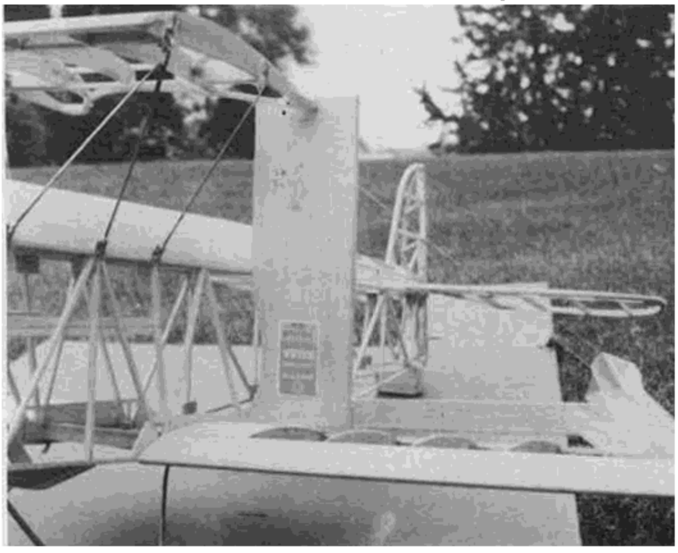
Another way to go would be to run a Leisure LT50 motor with a three-to-one gear reducer (Part No. 6003), and power it with a seven (or eight) cell Sanyo pack. In this case the prop you will need is an 11 x 7. This will give you a lighter system with a slightly slower speed range.

Because an electric powered model has the larger portion of its weight in the flight system (motor, batteries, and speed reducer) it is customary to fly them as a three-channel ship, without ailerons. This model takes this all in stride. As with all three-channel ships, large corrections on the final approach are *not* recommended.

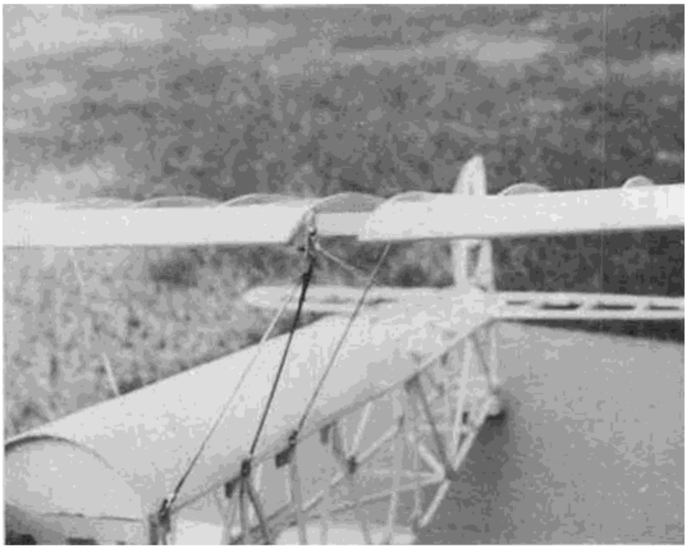
I have one request before we go into some of the building details. Most of us



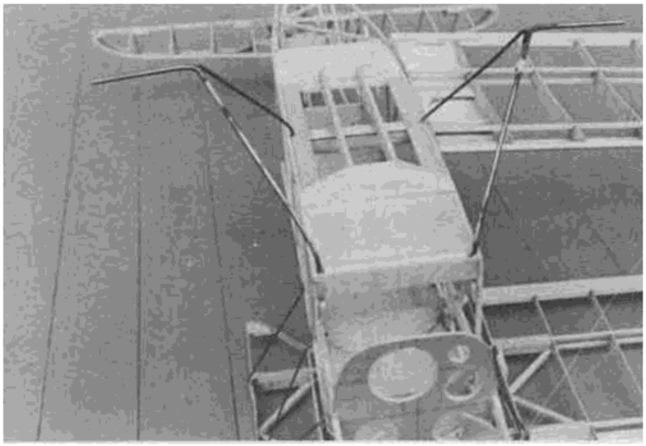
Step 3, rigging procedure: one pound bags of shot are used to stretch out the landing wires and straightedges are used to adjust wing incidence from root to tip.



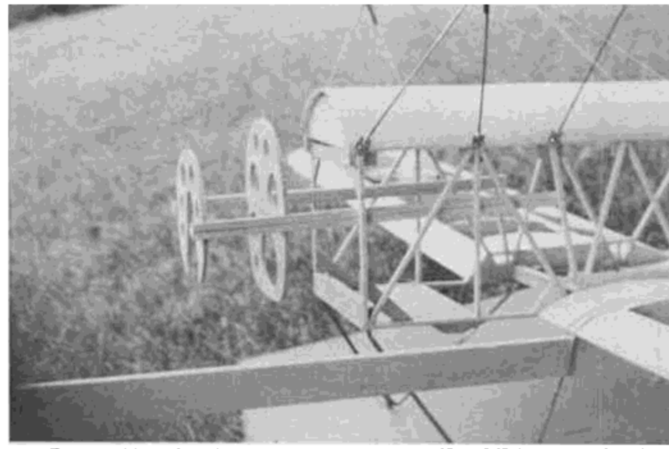
Step 2, rigging procedure: an L-shaped template (87 degrees) is used to adjust landing wire length for 3 degrees dihedral. Note shot bags.



Step 4, rigging procedure: upper wing spar extensions slide into the space between the center section's spars.



Fusełage hatch holds the rear landing gear wire in place on the bottom of fuselage. Metal tabs will hold front L.G. wire in place.



Forward bulkheads are held in place by 1/8 x 3/8 balsa sticks glued to fuselage framework. Full-scale thrust line duplicated here.

who build models for radio control have a habit of adding extra reinforcement, extra doublers, and extra glue to existing design plans. Please don't launch yourself into a big redesign and reinforcement program. The results of your effort are sure to be a model that is too heavy to fly well. The design as shown has held up well through all the hard landings and hard bumps of getting both the prototype and the scale model into flyable trim. The use of the 1/8 square spruce as longerons and wing spars is a direct result of the prototype testing.

A word about gluing. The use of cyanocrylate glue is recommended. I find myself framing the structure with the cyanocrylate and then reinforcing with Titebond after it is off the board. I don't always trust the closeness of all my joints to be the best for cyanocrylate. The use of excessive glue is not recommended. One application of Titebond on one side of the joint is as strong as will be required. Titebond is a must when gluing the 1/8 square spruce. It is a good idea to apply enough Titebond to the fuselage gussets to have a good fillet between the 1/8 square stock and the ply gusset.

(If you haven't given Satellite City's new Hot Shot a try, you absolutely should. Super T and Hot Shot will give you the fastest, cleanest, neatest fillets you ever wanted to see, and they are every bit as strong as the Titebond fillets mentioned above. wrf)

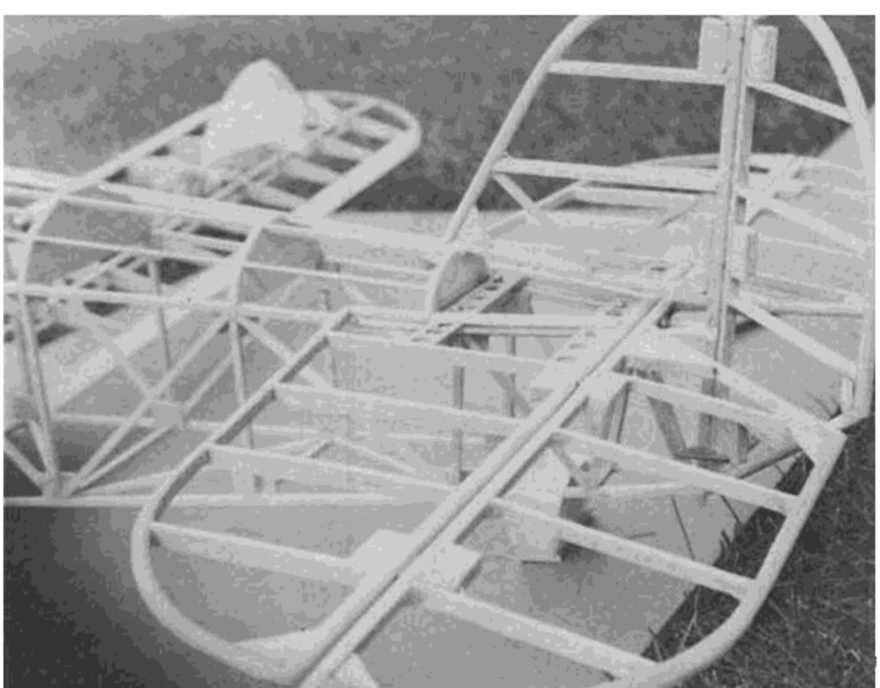
LAMINATED BOWS

There are two types of laminated bows called for on the plans. The wing tips and the bow for the upper wing center section are to be made from 1/32 aircraft ply cut into 3/16 wide strips. The strips should be cut across the grain of the ply for maximum flexibility. The bows for the stabilizer and rudder are made from strips of 1/32 sheet balsa. These strips should be cut parallel to the grain and the balsa should be as hard as can be obtained. As soon as Titebond is applied to the balsa strips they become flexible enough to conform to the necessary curve. One-thirty-second balsa sheet cut cross-grain does not produce a laminate stiff enough to make a good structure. If your 1/32 sheet is softer than you would like, one laminate of 1/32 ply in the group will stiffen the bow. If in the past you have made satisfactory bows out of strips of 1/16 balsa, go ahead and use your method. I started with the 1/32 sheet and have not tried other thicknesses.

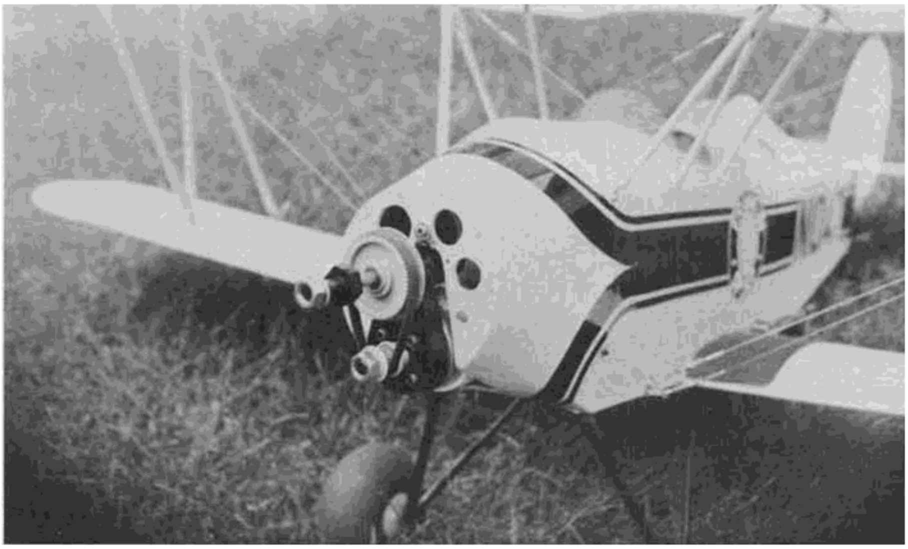
I have had good results with forms made from 1/4 ply, and also from any kind of composition board. To make the wing tip bows, a workable procedure is to cut out a half circle out of the ply with a diameter equal to the inside diameter of the bow. Cut out another piece from this board to equal the outside diameter of the bow. Now, cover the edges of the forms that will be exposed to the glue with wax paper. To make the laminated bow, apply Titebond to the surface of the strip ply and form them around the half circle. Press the outside diameter piece around the outside of the bow and squeeze the laminate into shape. It may be easier to cut the outside diameter piece in halves and press the halves into place. The forms can be nailed or clamped to the work table to hold them while the glue dries (overnight). Excessive pressure is not necessary.

FUSELAGE CONSTRUCTION

Fuselage construction is started by building two sides directly on the plans. These need to be done carefully as they are the basis for the rest of the model. If you usually build the second fuselage side on top of the first, do so, as they need to be identical. Next, glue on the 1/8 and 1/16 ply gussets to the inside of each fuselage side (use Titebond). Left and right fuselage sides are required. When the gussets are dry, the 2-56 blind nuts (T nuts) can be located. Drill 1/8 diameter holes and use epoxy or model airplane cement to hold them in place and prevent their turning. The edges of the 1/8 ply gussets at the cabane strut area need to have their upper edges



This photo shows how the horizontal stab is secured with four 2-56 screws and blind nuts. This technique allows for decalage adjustments during flight tests. Fill with block when trimmed.



Installation details for the Astro Flight 15 motor with 10/15 speed reducer. Holes in forward bulkheads allow cooling air to flow through to battery. A 12v blower is used while charging.

Shows scale motor cylinders, hatch, receiver and power switch and charge jack locations.

sanded at an angle to provide clearance for the cockpit covering. Now, set up the fuselage sides and glue in the cross braces and fuselage bulkheads. Take time to check and recheck that the structure is straight and true. The vertical fin should not be glued in place at this time. I would advise finishing the stabilizer and covering its framework before putting the stabilizer in place, and then afterwards gluing vertical fin in place. The holding screws can be left out until the fuselage and vertical fin are covered for convenience in working around the stabilizer.

A convenient way to install the fuselage front end is to glue 1/8 x 3/8 balsa sticks as shown inside the fuselage framework with their center line at the full-scale thrust line. When the glue is dry, mount the forward fuselage bulkheads using the 1/8 x 3/8 cut out at each side of the bulkheads. The larger of the bulkheads is the motor mount so it should be square and true with the rest of the structure.

It is very handy to make the wiring installation before the fuselage is covered and the front is sheeted. There will be sufficient lead length with the flight batteries to allow for movement at final assembly to put the C.G. at the desired position. If the wiring is done before covering, the wire lengths can be held at a minimum. Short leads help reduce that unwanted weight build up as the model is being assembled.

WING CONSTRUCTION

The wing construction is pretty conventional. The trailing edge should be raised up 1/32 at the rear edge to provide the correct airfoil shape. For the lower wing sections, it makes things easier if the position of the slot is marked on the second rib (Rib 2). The tongue can be installed through the slot and glued into the position using the mark as a guide. Be sure to install the 1/16 ply ribs (Rib 1) in each wing section, the seventh rib from the root. The ply rib is a vital part of the strength provided by the rigging. The 1/16 ply ribs are also required for the outside ribs at the upper wing center section.

The least enjoyable task of building this model is cutting the holes through the ply ribs between the spars of the center section. This should be done before the 1/8 sheet balsa webs are glued in place. The webs provide the sides while the spars provide the top and bottom of a box to accept the upper wing spar extensions. Glue the basic structure well before cutting the holes. Work carefully with an X-acto saw, drill, and file. If the joints crack in the process, glue them back carefully and let them dry before finishing the job. When the holes are completed, the webs can be glued in place. The resulting box cavity should be cleaned of extra glue before the structure dries. The spar extensions should fit inside the resulting box with very little filing and fitting.

WING RIGGING AND WING STRUTS

On the plans are decimal dimensions beside each cabane strut and each interplane strut. These are the calculated dimensions from center to center of the wing hardware holes or to the blind nut locations in the fuselage. These should be used only as a guide. The final lengths must be those that produce a straight and true biplane structure. The cabane struts can be made up as shown. Their sheet metal ends can be adjusted by soldering to the required length, if necessary.

Temporary interplane struts from soft wire should be made up to the plan dimensions.

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Profile view of Franklin Sport "A" reveals dummy motor and cowl details. White lettering was made from thin white plastic sheet which was cut to shape and glued on with RC-56.

I have found the following rigging procedure to work very well without the use of extensive templates and jigs. The procedure should be done when the airframe is finished and before it is covered. After covering, the assembly operation should require only slight adjustment to obtain a straight and true structure.

First, install the upper wing center section using a template to position it to proper incidence relative to the cockpit covering. This is best done before the cockpit holes are cut and windshields installed. Make the necessary adjustments to cabane struts and solder the end brackets.

Second, install the lower wings into the fuselage slots. Use tape to hold in place for the next step. Make up templates to place against the fuselage sides and set the lower wings at the required three degrees dihedral.

Third, install temporary landing wires from the solder lugs "S" at the front of the center section down to the solder lugs on the top of the lower wings. Stretch the landing wires by placing approximately one pound weights on each of the lower wings. Bags of shot work very well. Adjust the landing wires to proper length to produce a three degree dihedral angle and constant incidence of the wing from root to tip. The dihedral can be checked with the templates against the fuselage sides and the incidence can be checked from root to tip with two straight edges held to the bottom of the wing section by rubber bands. Sight along the straight edges from beyond the wing tip and make adjustments to the landing wires until the straight edges are parallel.

Fourth, install the upper wings into the upper wing center section.

Fifth, install temporary interplane struts made from soft wire so that they can be adjusted by bending, etc. Using a piece of scrap balsa as a measuring device, install and adjust the rear interplane struts to produce the same distance between the T.E. of upper and lower wings on both sides.

Sixth, install temporary front interplane struts. Check incidence of upper wings on both sides from root to tip, and make adjustments to front interplane struts as necessary. At this point, just measuring the length needed for the diagonal interplane struts should be sufficient.

Make up interplane assemblies to be installed later. I used .012 diameter braided control line wire for rigging and No. 2 turnbuckles. The turnbuckles are somewhat expensive, but do allow small adjustments after rigging is completed. However, the job can be done without them. I use a piece of 1/16 diameter aluminum tubing 3/8 inch long to secure the ends of the rigging. Install the tubing over the wire and then feed the wire through the hole in the solder lug and back inside the tubing. The rigging wire can be adjusted for tightness by pulling on the free end and sliding the tubing down close to the loop. To secure, permanently crush the tubing with pliers. In my experience, so far, I have not had such a joint come loose from bumps, hard landings, etc. If turnbuckles are used, secure them with soft wire according to the manufacturer's recommendations. They like to unscrew themselves at the least excuse.

COVERING

There are several good possibilities. I used Fabrikote Lite because it was new at that time and simulated full-scale fabric. The wings were done in the Fabrikote Lite natural white color. The fuselage and rudder fin were Fabrikote Lite in the yellow color. (White would do as well as color dope was applied.) The fuselage was given one coat of clear dope, one filler coat in the areas that are metal cowling on the full-scale, followed by one coat of clear and three coats of Sig yellow dope. The last coat was thinned somewhat. One more application of the talcum powder and dope mix used for filler would have been an improvement, as would one more coat of yellow. My use of regular Monokote as trim is easier than masking and painting. If you are building for scale competition, the painting and masking is a must.

Covering the bottom surface of undercamber wings seems to be a little tricky with any covering material. With Fabrikote it is perhaps a little less so. The secret seems to be in the amount of shrink (heat) applied to the bottom surface. Sealing around the edges of the wing structure as the material is applied to the bottom surface is all the shrink necessary. Now seal the material to the lower surface of each rib using the sealing iron, but be careful to apply pressure and heat only at the rib surface. This method results in a tight covering that conforms to the undercamber surface. Too much heat and you could end up with a flat bottomed airfoil.

DUMMY MOTOR AND NOSE COWL

In order to simulate the Velie M-5 engine and the nose cowl, I recommend a structure built up on a round disc of 1/16 ply and a pentagon shape made from rectangles of 1/16 balsa sheet. The pentagon is shown dotted in the front view. The cylinder wells are 3/4 x 1 x 3 balsa blocks glued on the face of the pentagon structure. By using a fair amount of cutting, trimming, and ingenuity the nose assembly can be made to fit the fuselage front and clear the motor and speed reducer. The lower two cylinders were cut in half to clear the motor. When you arrive at this point in the construction, I would suggest you write me at Route 1, Oskaloosa, IA 52577. I will be glad to share the information I have for additional source material and sketches showing how I built up the motor cylinders from balsa sheet and manila folder stock. These details are too lengthy to be included here.

LANDING GEAR AND HATCH

The landing gear wire is formed to fit into slots (made from ply boxes) in the fuselage bottom. The front part of the gear (1/8 diameter music wire) can be held in place by screws and metal tabs to prevent the gear from falling out of the slot. The rear part of the gear (3/32 diameter music wire) fits into a slot 1-1/2 inches to the rear of the lower wing L.E. The hatch structure holds this part in place. When the hatch is removed, the L.G. can be removed if desired. This makes access to the wiring, R/C equipment and battery a little easier. On my first scale model I put the flight system fuse in a clip inside the fuselage. If you are flying mostly for fun, the fuse should be on the outside where it is accessible.

EQUIPMENT INSTALLATION

In this model the Astro 15 motor and the speed reducer are far enough forward to result in a C.G. close to the desired location. This means the flight battery will ride far enough back in the fuselage to allow the wiring harness to be installed well ahead of the front cockpit. I would suggest that the servos be mounted so that they are accessible for service through the rear cockpit. I have had good results with the flight battery mounted between two rails of 1/4 x 1/2 balsa. The battery is secured by rubber bands (No. 64s) looped over the top and held by large screws driven into the rails. This arrangement allows for a little movement when hard knocks occur and saves other structure. Position the flight battery so that the plane balances just slightly nose heavy at the C.G. position shown.

The Sanyo cells used in the 15XL system come in groups of six with their cases glued together in a straight line. I resoldered the 12 cells into a package three cells high and four wide for use inside this fuselage. In all my electric models I have provided large ventilation and weight reducing holes in the front bulkheads. Also, I provide air baffles inside to direct the air flow during flight back past the motor, through the fuselage, and endwise through the battery pack. Some feel this is not all that effective in flight, but I feel it is a must to cool down the flight batteries while charging in hot weather. I use a blower fan placed over the front of the fuselage to blow cooling air past the battery pack as in flight. It may be less expensive and troublesome this way than rotating two sets of batteries. In cold weather (45 degrees Fahrenheit or less) the blower fan is not needed.

FLYING

During the test flying of the scale model I experienced radio problems in the form of "glitches" while in flight. If the plane had not had good stability it would not have survived.

Takeoffs are a snap once you get the hang of it. The plane usually wants to go to the left a little at the start, so you might want to anticipate with a little rudder. The wing incidence arrangement allows the plane to hold out well just above the ground on landing. Remember to keep the nose down and approach the landing with good gliding speed. Biplanes seem to want to set themselves up in a nose high glide which results in a hard bump instead of a soft landing if it is not corrected as you enter the lower speed air close to the ground.

Flying the ship is a pleasure. This is the big reason I stayed with it through prototype to scale model. Make the first flights with about 3/4-inch rudder throw on each side and about 1/2-inch elevator throw each way from neutral. The ship should climb out without much help at the controls. Be rather gentle at first till you get used to the ship. Its three channel acrobatics are quick enough to satisfy most fliers and easy to do.

If you are installing the 15XL system in your plane, the upper wing incidence should be set at 2-1/2 degrees instead of the 3 degrees shown, and the lower wing should be set at 1/2 degree instead of the 1 degree shown. This amounts to a 1/16-inch drop at the center section L.E. The dimensions for the cabane struts should be front: 5.521 inches, center: 4.939 inches, and rear: 4.934 inches. A template to determine the upper wing incidence should be 4-1/8 inches long, 3-7/32 inches wide at the front, and 3-5/32 inches at the rear. The lower wing slot should be lowered 1/32 at the forward end from the position shown.

I had hoped that my Franklin Sport scale project would have brought forward more facts about the full-scale ship. I would be pleased to hear from anyone who knows about its present status, ownership, or from anyone who has seen it recently. I hope you get as much pleasure from building and flying this model as I have. •