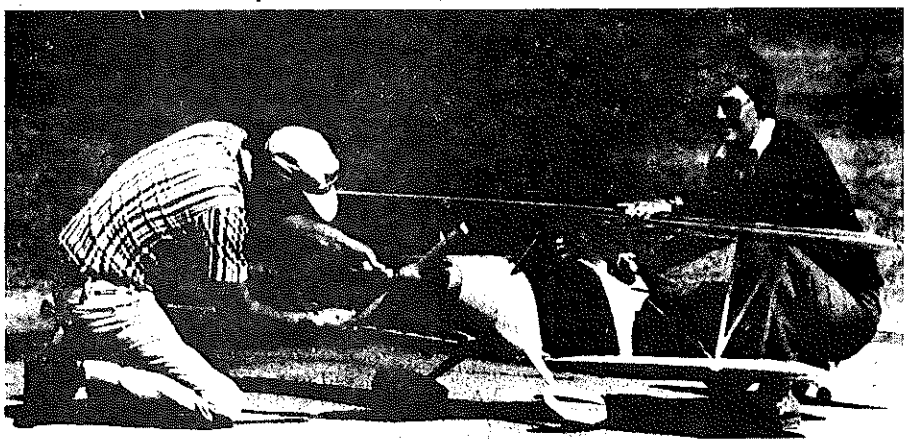
LIBERTY SPORT

2811

SCALE

By ROGER STERN . . . From out of the Dark Continent comes this two-winger, an excellent example of our concept of what a Mammoth Scale model should be. It's big (3-1/4" scale), relatively light (18-1/2 lbs.), and flies beautifully with a belt-drive-equipped .61. The best part of all is that it's a biplane!



Tense moment! The author's wife, Ann, lends a helping hand while he primes the engine in preparation for the first test flight. Flew perfectly, shaky knees notwithstanding.

• The "Big is Beautiful" brigade has overwhelmed the modeling fraternity in recent years and has even reached our remote little country of Zimbabwe.

After building scale models for radio control for the past ten years, and then seeing quarter-scale models flying in South Africa and England, I knew that I had to start building one as soon as possible. Not having access to kits or plans, I knew I had to design my own, so the first problem was what design to build. As a lover of biplanes, I knew it had to be a bipe, and of all the biplane kits that I have built and flown in the past, the easiest to fly and the most docile flier has been the Liberty Sport from Sig. So that made up my mind. At least I knew that I would have an easy flying model, if nothing else. And it certainly proved correct: the big Liberty is just a dream to fly.

A friend got hold of a DuBro prop driver for me, and with my trusty HP .61 Gold Cup for power, I could then decide on the size of the model. A true quarter-scale model of the Liberty Sport comes out a bit too small to cowl the motor, as a .61 sitting on a DuBro prop driver takes up a lot of space in the cowl, so I settled on the scale of 3-1/4 inches to the foot, which just fully houses the motor, although I did cut out a circle in the cowl for the head to aid cooling (the top of the cylinder head is just a little below the cowl).

The model is true scale, enlarged from the 4-views supplied in the Sig kit, with my own construction incorporated, although I did borrow quite a few ideas from the Sig kit. Once I got everything together and the plans drawn, it took about nine months to complete, which included nearly two months to paint it. (I spray over a weekend, one color a week, and there are seven colors on the model.)

Once completed, it was time to test fly. So as not to hassled by our entire club (all 70 members would have come out to see it), we decided to test fly it privately early one Sunday morning at our occasionally used glider field, which is really a polo field. Just my wife, Ann, and myself were present and I was naturally a bit apprehensive about the first test flight. Well, I needn't have been, as the first flight went off so well, it was almost an anticlimax. The following weekend I showed it to the club members and have since flown it considerably. To put it simply, the model flies terrifically, it looks and flies just like a real plane. The takeoff run is straight, with liftoff after about 20 yards. Aileron response is slow but adequate, full aileron control giving a fairly slow scale-like roll. Slow speed flight is excellent and it lands like a feather.

As I said, power is with an HP .61 Gold Cup motor on a DuBro prop driver, turning a 20x10 propeller. A tuned pipe is fitted which goes through the fuselage and comes out underneath, just behind the lower wing. My model also has a Harry Higley smoke unit fitted, which works extremely well as far as making smoke goes, but because a tuned pipe is fitted and the diesel oil used for the smoke is introduced into the pipe manifold, a loss of power results when the smoke is switched on, due to the supercharging of diesel oil into the motor. Nevertheless, sufficient power is still available to loop the model by slightly diving just before starting the loop. Full power is restored as soon as the smoke is switched off. The fuel I use is a 5% nitro mix and our altitude is 5000 feet plus, so a much more sparkling performance will be realized closer to sea level.

The weight of the Liberty came out at 18-1/2 pounds. The wing loading is only 21 ozs./sq. ft., and this includes an on-board 4-Ah starter battery connected to the glow plug and activated when low throttle is selected. Also, the Higley smoke unit with its attendant fuel tank and extra servo to operate the unit adds to the weight. Over a pound of weight can be saved by omitting these two items.

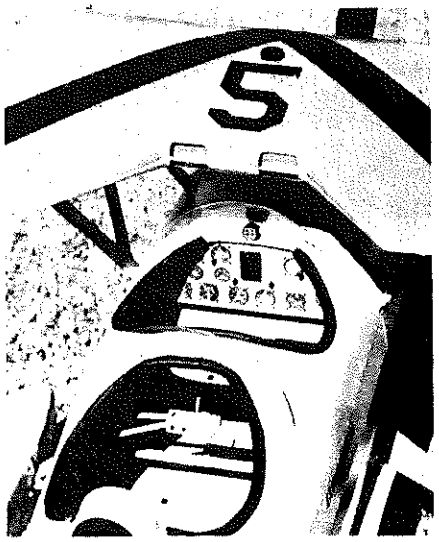
This model as presented was designed for a .60 motor with a reduction drive, not for a large chainsaw type motor. The only modification I would recommend if you want to use a larger motor is the substitution of hardwood for the fuselage basic framework and putting ply gussets at all joints on this framework. The wings are definitely already strong enough to withstand any size motor and all aerobatic flying.

As this is not a beginner's model and only experienced modelers would probably be building it, I will not go into too much detail on construction.

FUSELAGE

The fuselage is a basic box with sides built from 1/4-inch square and 1/4-inch sheet. Crosspieces are cut from the top view and the box made up. Do this part accurately, as the shape of the basic box determines the final shape of the fuselage. If this is bent or twisted, so will the completed fuselage be.

All the fuselage formers and firewall are fitted next, not forgetting to glue on



Detailed cockpit adds a nice touch, but the author admits the panel is not quite scale.

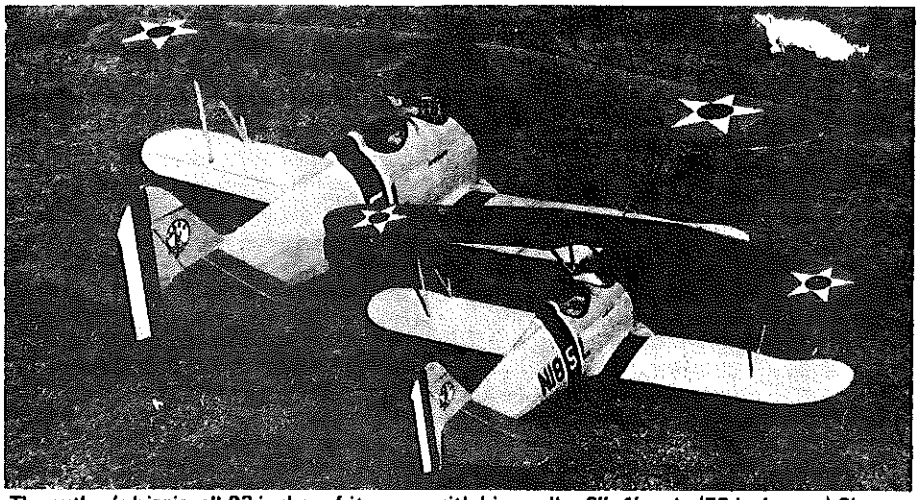
the 3/16 brass tube to F1 and F2 for the cabane struts. Next, all the stringers can be glued on. The position of all these can be seen on the fuselage formers drawn on the plans. The 1/8-inch sheeting on the front end and cockpit areas can now be done, but leave the sheeting off by the wing mount and tailplane area until the wings and tailplane are made.

WINGS

Most of the ribs are made from 1/8 square balsa with the nose section from 1/8 sheet. A jig is made up from two pieces of 1/8 ply, one being the base with the construction drawn on; the other has the rib outline cut out. The two pieces of ply are clamped together with a sheet of plastic in between to keep the ribs from sticking to the jig. The ribs are then made inside the cutout, one by one. I started building the ribs, two a day, while I was still drawing the plans and by the time I was ready to build the wing, all the ribs had been made. On the plans, only ribs W3 and W4 are shown built up, as all of these can be made from the same jig. In the prototype, I made ribs W1 and W9 also in the jig by lining the inside of the jig with a strip of 1/16x1/8 balsa, so that each rib was made thinner for the center section sheeting. The only thing to remember here is to trim the upper and lower rib strips by 1/16 inch so that the spars can still fit through.

The spars also have to be made up before the wing construction can commence. The main and rear spars were cut to length and then 1/8 balsa vertical grain webbing glued in as per the front view on the plan. (The plan shows the spars as being 8mm and 6mm front and rear, which are the sizes obtainable here. One can substitute 3/8 and 1/4-inch respectively.) The wing tips must also be made before general wing construction can commence. These are laminated from four pieces of 1/16x1/2 balsa. Soak the wood in warm water for a while and bend around a series of pins stuck in the plan around the inside line of the wing tip. Using white glue, laminate all four strips and leave to dry, preferably 24 hours. Tips made in this way are extremely strong and light and look very scale-like after covering.

Now the wings can be constructed. Slide the ribs over the spars and pin the spars to the building board by packing the main spar 1/8 inch and the rear spar 1/4 inch. Construction is quite straightforward and I won't go into detail here. Do not forget the 1/8 square diagonals, as they really stiffen up the entire wing considerably and add very little weight. For the aileron hinges, I used 5/32 plywood hinges with 3/32 dia. brass tubing inserted as a bearing; 3/32 dia. aluminum tubing is glued on the rear of the aileron leading edge, and 1/16 steel wire is used as a hinge pin. The hinges work very well with this method and are much stronger than the standard nylon type. Another advantage is that the pin can be removed at any time, thereby releasing the aileron for covering, painting, or even repairing.



The author's biggie, all 93 inches of it, poses with his smaller 2"=1' scale (57 inch span) Sig Liberty Sport. Surprisingly, both are powered by HP .61's . . . shows what a belt drive can do.

The bottom wing is built as one piece, with a flat center section and dihedralled outer sections. The top wing has detachable outer panels using steel rods and brass tubing, just like glider wings. The steel wing rods are glued in the outer panels through the plywood pieces, W12 to W15, and strengthened with packing pieces. The brass tubes are glued between the top and bottom members of each spar, the gaps being filled with scrap spar material. The rods and tubes are glued in while the wings are pinned to the board so that everything is lined up perfectly. Note: When the model is finished, the center section of the top wing is a permanent fixture on the fuselage and the outer panels just plug in. No other method is needed to keep the top wing in place; the rigging wires and "N" struts are sufficient to keep the panels from coming out under all flying conditions.

TAILS

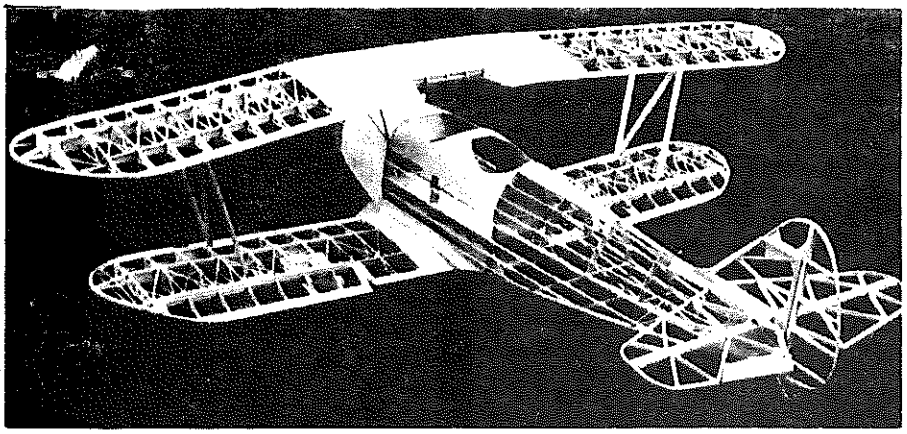
The rudder outline and tailplane tips are made in the same way as the wing tips. The rest of the construction is quite straightforward. Hinging is done with conventional nylon hinges. Make sure that there are at least four hinges in each elevator and four in the rudder. The scale trim-tab on the left elevator is functional and assists the servo in moving the elevators. Construction is quite simple and details are to be found in *Radio Control Modeler*, February 1979, "Big is Beautiful" by Dick Phillips. Both elevators are separate, not being joined together at the center and the pushrod has two Kwik-Links coming out at the rear, one to each elevator. Ensure that the pushrod has guides along the fuselage so that it cannot move sideways.

GENERAL ASSEMBLY

Now is the time to start putting things together. The lower wing is attached to the fuselage with two 3/8-inch wooden dowels in the leading edge going into holes in former F2, and two 1/4-inch nylon bolts threaded into hardwood blocks at the trailing edge. When doing this, glue in the 1/32 ply wing seat so that it seats properly on the wing. With the lower wing in place and the model set up at 0°, glue the tailplane on also at 0°. Build the fin onto the fuselage and with rudder and elevators temporarily hinged, install the control system. I used a solid pushrod for the elevators and cables for the rudder. Now is the time to finish the fuselage sheeting at the wing mount and tail end and also to complete the wing fairing, which I did with 1/2-inch sheet balsa and micro balloons.

The hardest part comes now, and that is fixing the center of the top wing and the cabanes onto the fuselage. Bend the 5/32-inch steel wires as per the plan with only about a 1/2-inch length going into the tubes on formers F1 and F2. Attach the top of these four cabane wires to their 1/8 ply plates and position them between the ribs in the center section of the wing. With the lower wing in place and the fuselage packed up until the lower wing reads 0°, adjust the top section of the wing until it lines up at 0° and is straight in all directions. Now tack glue the ply plates in place. Recheck, with the outer panels of the top wing in place, that all is square and correct. When you are happy that this is so, glue the ply plates properly and strengthen the joints with strips of balsa. When this is done, bend and solder the 1/8-inch steel diagonal braces to the cabane. By springing apart the cabanes, the whole unit can be taken off the fuselage and the center section of the wing can now be sheeted, top and bottom. The rigging wires will be attached via 1/16 cotter pins, so put the pins in place through small plywood brackets before sheeting the bottom of the wing panel. This top section of the wing is only epoxied in place on the fuselage after covering and sealing and just before painting. Only after it is glued in place, are the wood fairings around the wires glued in place. This also applies to the aluminum plate sections on the rear of the wing. These are made and contact cemented in place after filling, just before painting.

With the wings in place and set up correctly, the "N" struts can be made and fitted. These are cut from 1/4-inch



Completed structure shows very light construction. Ready-to-fly weight is just 18-1/2 lbs., with on-board plug battery and smoke system. Some beef-up required for chainsaw type engines.

plywood, carved to a streamline shape, and slotted on the ends to fit over the brass pieces epoxied in the wings. Small bolts and nuts can be used to attach the 'N' struts, but I use a method of clipping them in place as per an article in *Radio Control Modeler*, April 1978, titled "N Strut Attachment," by Robert F. Meyer. Either method will work, and I do recommend the clipping method as it is easy, positive, and quick to assemble and take apart. Don't forget to put the rigging wire attachments in the wings, which are 1/16 cotter pins epoxied through plywood pieces in the appropriate places. These need to be strong, as the rigging wires are functional and must withstand the strain of flying and landing loads.

The undercarriage is soldered up from two pieces of 3/16 dia. steel piano wire with plywood filling between the two wires and fiberglass cloth wrapped around and resined in place. The axle pieces are separate pieces of 3/16 wire bound and soldered in place. The undercarriage unit is bolted to the fuselage with five bolts and blind nuts so that it can be taken off for transportation, etc. The wheel spats are constructed from sheet, laminated as per the plans, and bolted to a bracket which is soldered on the lower end of the undercarriage.

The cowl is made from fiberglass. I made a wooden plug and got a fiberglass mold made from it, so I can get further cowls made and could possibly supply them to anyone wanting one. The cowl is held in place with four self-tapping screws screwed into aluminum brackets which are mounted on the firewall.

If you want to use a tuned pipe as I have done, make a hole through the firewall where the pipe will go through and fit ducting around the pipe to protect the inside of the fuselage and radio gear, and also to channel cooling air to cool the pipe. Don't forget to have an air exit by the pipe exit for the cooling air to come out. If an ordinary exhaust is wanted, exit it out the bottom rear of the cowl as in the full-size Liberty Sport. Incidentally, with the tuned pipe fitted, do not forget to put a couple of coats of resin on the inside of the air ducting. This acts as an insulation and stops the wood from burning.

COVERING AND FINISHING

The open areas of the fuselage and wings were covered with a nylon material called "Air Art" which was doped on and then heat shrunk, after which it is doped and painted in the normal way. The tails were covered with silk, but as the model came out slightly nose heavy, the slightly heavier and stronger Air Art could have been used. I would imagine that the various types of Coverite would be equally as good. I have no experience with Coverite, but judging by the reports I have read, it is excellent material. All the sheeted areas were covered with K&B 3/4-oz. cloth, with two coats of K&B resin brushed on and sanded. This gave the sheeted areas a perfect finish. I did extra detailing such as rib stitching (small bits of cotton glued to the ribs) and rib tapes (heavy weight tissue cut with pinking shears). Rivets were blobs of five-minute epoxy, and panels were represented by typing paper stuck in place with dope.

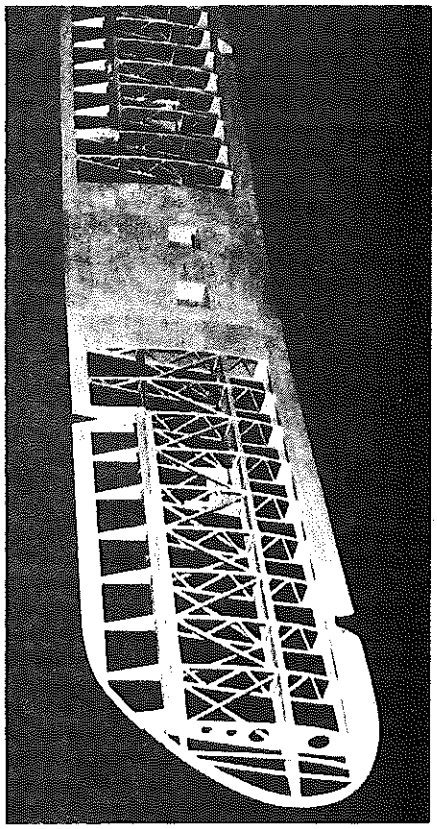
The model was sprayed with polyurethane paint, seven colors in all, all masked off and sprayed outdoors with a spray mask (polyurethane is highly toxic). The M.A.D.A. badge on the fin was hand painted, using paint in a drafting pen for the outlines, then filling in the colors by brush.

The rigging wires used are Proctor 1/4-scale streamline wire which is actually flat steel wire, which looks really effective. The ends were ground slightly narrower and soldered into Kwik-Links, using a fixed link on the bottom and a Kavan turnbuckle link on the top end. Do not forget to slot the dowel spreader bar and thread the wires through before you solder both ends. The Kavan turnbuckle links enable you to attach the rigging easily on the field, tensioning them and locking the turnbuckles with the nuts provided. The entire model can be assembled at the flying field, complete with rigging, in under 15 minutes. The rigging wires on the tail surfaces and at the center of the cabanes are permanent fixtures and can be soldered in position on their cotter pins. The tailwheel assembly is a C.B. Associates unit. The steering springs are not assembled to a double rudder horn as shown in the instructions with the tailwheel, but instead are attached to a "U" shaped aluminum bar bolted on the bottom of the rudder, which is more scale-like according to the photographs of the full-sized Liberty Sport.

FLYING

When I had finished the model, I set it up on the bench and checked all the rigging angles again and also the C.G. position, which is on the leading edge of the lower wing (F2 position). As I said, mine is a bit nose heavy and that includes the on-board battery and smoke unit, etc., so I decided to fly it at that C.G. position. The prop I use is a Top Flite 20x10, which gives me 5,700 rpm on the pipe, which is more than enough power to fly the model.

Takeoff is straight and true. The tail comes up within the first couple of feet and the model is easy to steer straight along the runway. Lift it off gently at about 20 yards and climb to a safe height before turning around. I have flown it off tarmac and grass with no takeoff problems at all. When flying, use rudder and ailerons together when turning, as this gives a more realistic turn. The model flies just like a full-sized airplane. Loops, rolls, and stall turns, it does with ease. At a wing loading of 21 oz. per sq. ft., it lands light as a feather and has no tendency to drop a wing at all. Keep the throttle on at least half for the approach, as there is plenty of drag in a model of this size. Throttle back completely at a couple of feet altitude and glide it in to a three-pointer with the motor just ticking over. With this model it's easy. •



Just so you'll know what you are getting into, here is a view of the completed lower wing. Built-up ribs are made in a jig . . . not difficult, but tedious. Text explains all.