

# *LIBERTY BELLE*

## *TURNS 60*

*by*  
*Tom Binkley*

In many endeavors in life, we enjoy a look back into the past. The model airplane hobby has a rich and well documented history. Let's look back 60 years to 1953. How were radio control models made sixty years ago? What kind of equipment guided them? What was it like to fly an R/C model in 1953?

Presented here is Liberty Belle, designed by Dick Schumacher, published in May 1953 Air Trails magazine. It was powered by a glow engine that had a dual needle valve arrangement for throttle control.

It carried six battery cells to power its vacuum tube receiver, which was suspended on rubber bands in the airplane's large cabin, protecting the fragile tubes from vibration and shock.

An escapement, similar in principle to the mechanism in a (non digital) watch or clock, powered by a twisted rubber band, moved the rudder to the right or left when the pilot pressed a button on the transmitter. Yes, the "controls" consisted of one button.

Early radio control models were developed from free flight models. Free flight models are designed to be inherently stable in flight; in other



words they can fly themselves. And although free flight models are a delight to fly and to watch, they can be problematic to retrieve.

So, in addition to the sheer joy of guiding the model around the sky, the radio control modeler hoped to impress everyone at the flying field by guiding his model to land at his feet! Think about how magical that must have seemed in 1953! It must have been the envy of those tired of chasing their models after every flight.

What was it like to fly a radio control model in 1953? It involved a measure of preparation to manage all the dry cell batteries and tube radio components the night before flying. Once at

the flying field, the radio control modeler would first wind the escapement rubber and fuel and prep the engine. The transmitter sat on the ground with a flexible cable going to a hand held control.

With radio system turned on and checked, he would start the engine, tune it to its best RPM and while holding the control in one hand, would launch the model into the breeze.

The model would climb gently under power for a minute or more until fuel ran out, then it would gently glide for another minute or more, while the pilot guided the model to make big, gentle turns to keep it nearby.

He hoped to land close to where it took off, but there was no flare as it landed, and sometimes it flipped over in the grass. A You-Tube video of a single channel escapement model flight can be seen here.

[www.youtube.com/watch?v=-zJabGF\\_XoI](http://www.youtube.com/watch?v=-zJabGF_XoI)



Like models today, Liberty Belle was constructed of balsa wood. The fuselage, a simple box, and the fin and stabilizer are all sheet balsa. The wing had rib and spar construction and was covered with light weight silk and painted with model airplane dope.

To build a faithful historical replica 1953 Liberty Belle, a purist would have to obtain an original type engine, no doubt by now quite rare and valuable. Finding a functioning early radio control system may be nearly impossible, and finding the needed batteries to power the system may also be impossible. Even the silk and dope for covering (not to mention the skill to apply it) are not likely to be found in your local hobby shop. But there is little doubt that building and flying a faithful reproduction Liberty Belle would be the ultimate retro R/C experience.

*Editor's Note - Actually there are several groups that specialize in resurrecting old model airplane designs. One that I am most familiar with is SAM, the Society of Antique Modelers, since I also edit and publish their membership magazine. Another would be the VRCS, Vintage Radio Control Society, which specializes in restoring and flying old Radio Control models and equipment. The most nearly impossible parts to obtain are the original batteries that are no longer made since the old ones have long since expired. Everything else is fairly readily available. There are also similar groups for old U-Control models but I don't have a link for them.*

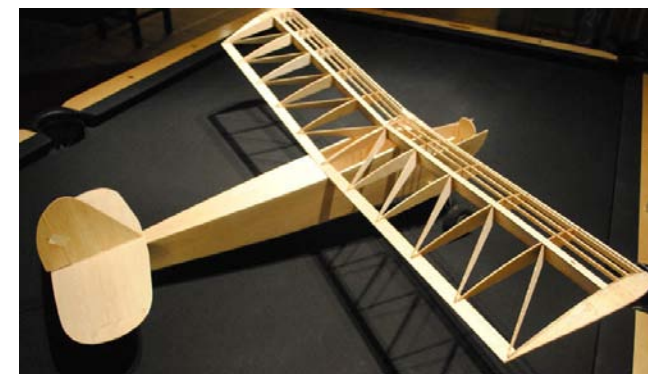
SAM -- [www.antiquemodeler.org](http://www.antiquemodeler.org)

VRCS -- [www.vintagercsociety.org](http://www.vintagercsociety.org)



For our Liberty Belle, we will use the technology we have today, including a clean, quiet, brushless electric motor, an electronic speed control, light weight rechargeable Lithium Poly-

mer battery, a micro receiver and a micro servo. These items are remarkably inexpensive, readily available and very reliable, simply a dream come true.



To make things even easier, our 2013 Liberty Belle is built using a laser cut wing kit and components from Stevens Aero Model and it is covered with iron-on covering film.

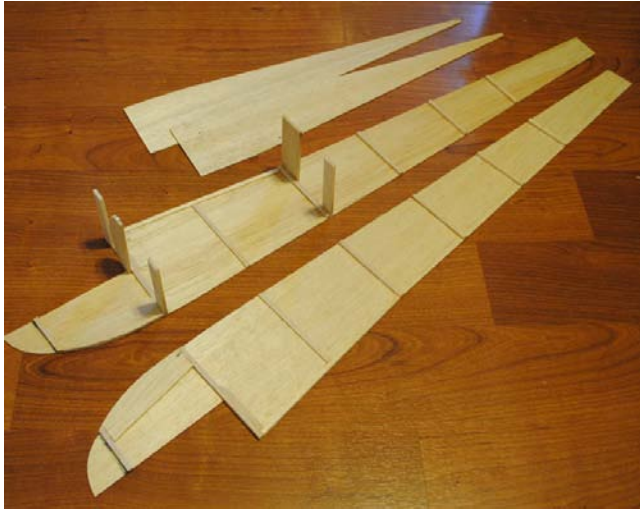
The motor is an SA Park BL 400 2200 kV brushless and the speed controller is a Castle Creations Thunderbird 18. A Hitec HS-55 servo operates the rudder via a torque rod. The model has a great vintage look and feel. Let's build one.

Construction begins with the wing. The Sport Stik wing kit is a perfect fit and is highly recommended. Just follow the excellent instructions with the kit, but do not include the aileron servo pockets, or the ailerons. The notes and details of the wing on the plan do not apply to the kit wing.

When completed, cover the wing with CoverLite, an iron on film, that is convenient, puncture resistant and has the pleasing look of doped silkspan. It requires an adhesive like Balsa-loc. Follow the instructions included with the



CoverLite. If you prefer, you can scratch build the wing on the plans, which is fairly true to the original, and requires little explanation for experienced model builders.



Next, make a fuselage “kit” by cutting the sides, top and bottom out of 1/16” balsa and doublers and bulkheads of 1/8” balsa.

Mark and pre-drill both sides together for 1/8” dowels. Mark and glue all doublers on sides, being sure to make both a right and left side. Glue the bulkheads first to one side, then the other.

Keep it straight and square! Glue torque rod guide tubing and the pushrod tubing of plastic or aluminum tubing, and a 1/16” balsa spacer to the tail end of one side, then clamp the fuselage tail together and glue. Again, keep it straight.

Make a firewall from 1/32” ply and drill motor mount holes and an air passage big enough for your ESC to pass through. Install the firewall paying careful attention to alignment.

Carefully glue the fuselage bottom in place, including the 1/32 ply parts in the landing gear area. Attach Velcro to the 1/32 ply battery tray, glue in place and then add cleats.

Cut the cowl slightly oversize from soft 1/16” balsa, moisten the top surface slightly with water to make it bend more easily, trim to fit and glue in place.



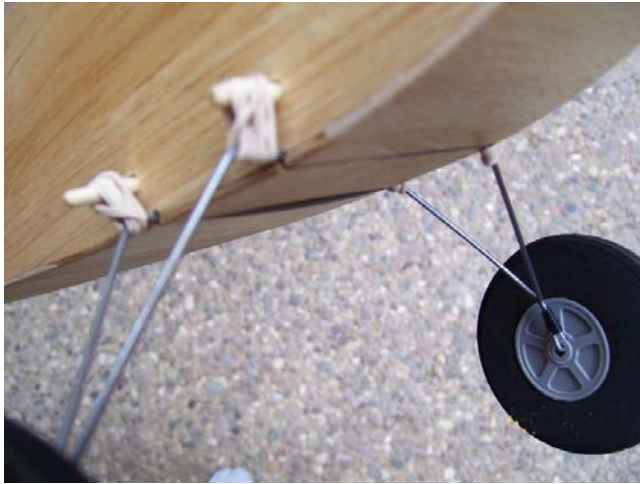
Cut out and assemble the stab. It can be made from the SA Sport Stik kit, or from scratch. Glue stab in place, aligning carefully with wing saddle.

Glue fuselage top into place. Cut fin and rudder out of 1/16” balsa, sand to shape and sand a bevel on the leading edge of rudder and trailing edge of fin for a hinge point. Glue fin in place, carefully aligned as viewed from above and from behind. It should be square to the stab.

Sand everything smooth with fine sandpaper and install 1/8” dowels. Finally, apply 3 coats of clear lacquer to fuselage assembly and (unattached) fin, sanding lightly between coats.



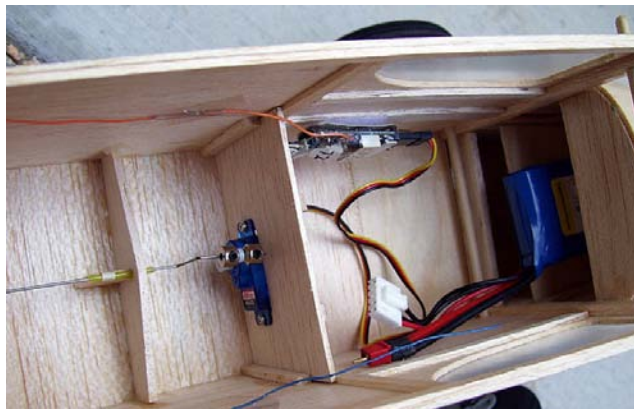
Bend both landing gear wires and join them with sewing thread and CA or epoxy. Better yet, bind with fine copper wire and solder. Install wheels and retainers and attach to fuselage with four #16 rubber bands. Windows and windshield are celluloid held in place with medium CA.



Test motor for forward rotation and install motor, EP-7060 prop and ESC. Since a free-wheeling prop creates considerable drag during gliding flight, arm the brake feature on the ESC.

Now you have to make a choice. The servo could be mounted to one fuselage side, operating the rudder via a standard push rod. This method is familiar, simple and trouble-free. And in fact, you could choose to install a second servo for elevator control.

Or, you could choose the original rudder-only torque rod system presented here. Install rudder with a clear tape hinge, making sure it moves freely.



The torque rod is actuated by a servo mounted in a bulkhead with its top pointed toward the tail. The cleats on fuselage sides enable you to trial fit the servo bulkhead and even remove it later.

Make your bulkhead with servo output shaft centered from right to left to align with tubing in guide bulkhead.

Install battery and receiver with Velcro. Install servo to bulkhead and install but do not glue bulkhead in fuselage. Make and trial fit the torque rod guide bulkhead, but do not glue it in place.

Next, a 36" length of .032 music wire can be inserted through the rear bearing just below the rudder and pushed forward to the servo area. Slide it through the guide bulkhead.

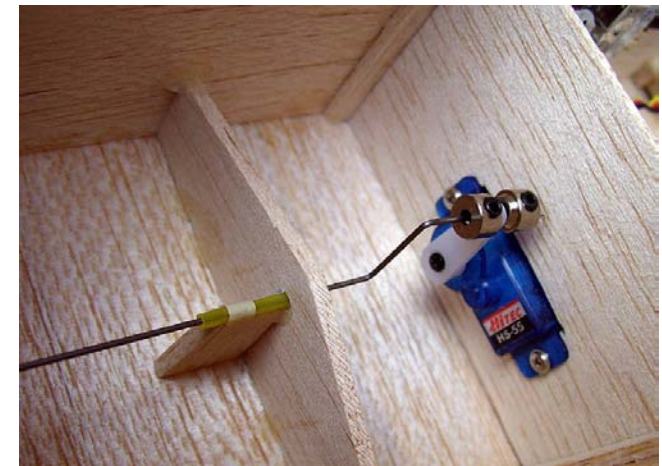
The wire and loose bulkhead can be pulled out of the cabin enough to bend in a "crank" to fit the servo arm. Install crank on servo arm with a small wheel collar on either side of the servo arm.

Hold everything in place and operate servo to insure it all works well. When satisfied, glue guide bulkhead in place, but only spot glue servo bulkhead, so it can be removed if needed.

With servo centered and servo arm straight up, bend rudder end of torque rod to align perfectly with servo end (also straight up) and trim slightly long. Bend and install hairpin on rudder with a short 2/56 bolt and nut.

Make sure it all works freely. Take your time to get this right. Rudder should move 5/8" each direction. Trim excess wire if needed.

Attach wing with four #18 rubber bands and check balance, correct as needed.



## Before We Fly, Let's Talk

Without pitch control, (no elevator) test flying must be done carefully. In most R/C models pitch is controlled by thrust (throttle) and elevator. Pitch is also affected by the model's static balance and by the loss of lift that occurs while turning.

We normally compensate for these conditions and changes with our elevator thumb without even giving it a thought. But now that we have no elevator, we can not compensate for thrust changes, out of balance or the loss of lift caused by turning, so we need to approach first flights with knowledge and care.

First, the model must balance 2 1/4" back from the leading edge. With components located as shown, my Liberty Belle balanced perfectly. Move the battery or add weight to balance your model. If it is tail heavy, it will stall and dive and stall and dive... If it is nose heavy it will dive. If it is balanced, it will fly smoothly.

Second, manage throttle with extreme care. The SA Park BL-400 motor draws about 125 Watts at full throttle on 2S. Liberty Belle's ideal climb requires about 45 Watts. Too much throttle will result in too much speed and too much climb.

Too much climb may result in a stall and dive. Ease the throttle on for take off, only up to the needed amount of power and ease the throttle off at the end of the motor run. This is an essential skill. If your transmitter has a limiting feature for throttle travel, it might be good to program it. Use a watt meter to get an idea of how much throttle is needed.

Third, turns must be wide and gentle to avoid the need for pitch compensation.

That having been said, Liberty Belle is inherently stable, and capable of flying very well on her own. So, if she was built straight, with the correct down thrust and correct balance, with gentle application of throttle, she should climb gently under power and transition gently to a smooth, graceful glide.



Pick a calm day and a really large space for your first flight. Do a range check and check that rudder moves freely in the correct direction. An ROG takeoff has the advantage of keeping the model safely near the ground in case it displays any bad tendencies. A short test hop might be enough to reveal any such problem.

If she seems to want to fly straight ahead and climb gently, try a second, longer test hop. If all seems well, gently give her power and she should lazily but easily rise off the ground and gracefully climb skyward.



Climb high enough to ensure sufficient time to assess her glide. Make your turns big and gentle. Avoid turning too tightly or too close to the ground. Plan ahead for a straight-in landing.



There is no flare, but her glide is flat enough that it is hardly noticeable. Once you get acquainted with her, Liberty Belle is very pleasant and relaxing to fly and will thermal well with only rudder control.

## Related Ideas And Other Options

While flying the rudder-only Liberty Belle presented here, you will find yourself pulling back on the elevator stick on your transmitter. It doesn't do anything, but it is good for a laugh. However, that brings up another approach to the whole single channel genre.



Several years ago I built a single channel model from the 1960's. I equipped it with rudder, elevator and a throttled electric motor. After flying it "normally" for several years, I began flying it in the style of a single channel model, "vintage style."

Here's how -- Having determined the correct throttle setting for the right climb rate, (how many "clicks" of the throttle stick), just throttle up, hand launch and climb, for say 75 seconds, then gently throttle down and glide, using only your rudder. It's not hard to do.

Just make yourself push the transmitter stick from the side rather than having your thumb on the stick. That keeps you from "cheating" and using the elevator. But, if you have a bad landing approach, for example, you still have an elevator. And, you quickly discover that rudder control is all you need for pleasant, relaxed flying.

Here's an appealing option. BMJR sells an E-36 timer that operates your motor for any number of seconds, up to several minutes, and it can be set for any throttle setting. That would eliminate the danger of over powering the model. The use of such a timer will more realistically imitate the limited run time of a vintage glow engine, although more dependably.

Operation is simple, push a button on the side of the fuselage and the motor starts, hand launch the model and the motor runs for a set time and then stops. This option results in a true rudder-only model.

Another interesting possibility is to use a modern 2.4 transmitter that is controlled by just a button. Press once for right turn and twice for left. A quick "blip" changes throttle setting and a "kick up" elevator is even possible.

See Phil & Shaun's Single Channel R/C website below for a wealth of information, inspiring pictures, videos and details on a very cool encoder. This is the most authentic option, back to the one button.

### **In Conclusion**

You could build Liberty Belle with rudder and elevator, fly and enjoy it as a normal three channel model, and once familiar with it, fly it in the single channel style mentioned above. In fact, once tested and trimmed the elevator servo could even be unplugged to fly as true rudder-only.

A second option is a timed motor run, rudder only model using an E-36 timer. Simple, authentic fun. Or try a push button, rudder and throttle model, with a digital encoder in a vintage transmitter. Very cool and authentic! Finally the throttle and rudder model as presented here using R/C gear you already have on hand.

Any way you build and fly her, Liberty Belle can take you back in time and put a smile on your face. We have great hobby with a great heritage!

2013 Liberty Belle  
Wingspan -- 40"  
Wing Area -- 290 sq. in.  
Length -- 32"  
Weight -- 414g, 14 5/8 oz.  
Wing Loading -- 7 1/4 oz./sq. ft.  
Radio -- Hitec Eclipse 7  
Receiver -- Corona  
Servo -- Hitec HS-55  
Motor -- SA Sport Park BL-400 2200kV  
Power -- 45W  
Prop -- GWS EP-7060  
ESC -- Castle Creations Thunderbird 18  
Battery -- Hyperion HP-LG325-1100 2S  
Duration -- More than 20 minutes

Sources; [www.stevensaero.com](http://www.stevensaero.com)

[www.stevensaero.com/StevensAero-SPORTstik-GWS-Slow-Stick-Sport-Wing-and-Empennage-Kit-350in2-40in-Speed-300-SAK-STIKV2-p-18450.html](http://www.stevensaero.com/StevensAero-SPORTstik-GWS-Slow-Stick-Sport-Wing-and-Empennage-Kit-350in2-40in-Speed-300-SAK-STIKV2-p-18450.html)

[www.stevensaero.com/SA-Sport-Park-BL400-2200KV-A2212-6-Brushless-Outrunner-Motor-SUPA2212-6-p-19644.html](http://www.stevensaero.com/SA-Sport-Park-BL400-2200KV-A2212-6-Brushless-Outrunner-Motor-SUPA2212-6-p-19644.html)

[www.stevensaero.com/Castle-Creations-Thunderbird-18-Brushless-Electric-Speed-Control-ESC-CSETB18-p-16277.html](http://www.stevensaero.com/Castle-Creations-Thunderbird-18-Brushless-Electric-Speed-Control-ESC-CSETB18-p-16277.html)

[www.stevensaero.com/Hitec-HS-55-Sub-Micro-Servo-JR-RCD-Z-Plug-HRC31055S-p-16461.html](http://www.stevensaero.com/Hitec-HS-55-Sub-Micro-Servo-JR-RCD-Z-Plug-HRC31055S-p-16461.html)

[www.stevensaero.com/Push-Rod-Tube-for-1-32in.-Music-Wire.-SUL-S98117-p-16639.html](http://www.stevensaero.com/Push-Rod-Tube-for-1-32in.-Music-Wire.-SUL-S98117-p-16639.html)

[www.bmjrmmodels.com](http://www.bmjrmmodels.com)

[www.singlechannel.co.uk](http://www.singlechannel.co.uk)