

At a Glance

Specifications

Wingspan: 50 inches

Length: 32 inches

Wing area: 178.8 square inches

Wing loading: 23.76 ounces per square foot

Flying weight: 29.5 ounces

Power: L2210A 1,650 Kv motor; 3S 2,200 mAh LiPo battery; APC 7 × 6 propeller

Part 1: Design, tail group, and fuselage



The 50-inch Volmer VJ-22 is a scale model of a popular kit airplane that was designed in the 1950s. Photo by Charles Kennemore.

Flying from water is one of my favorite things about RC. There are few sights prettier than a silky landing on the mirrored surface of a mill pond.

I was contemplating this while I was flying my prototype Grumman Goose from the May 2012 issue of *Model Aviation*. That airplane was still going strong, but after seven seasons, it was time to think about a replacement "just in case."

The Goose is an elegant model of stick-framed construction. It wasn't a difficult build, but there were many parts, most of which were complex in shape. The resulting model is lightweight, but too fragile to simply throw in a trunk without care.

This time around, simplicity would be the order of the day. The design requirements were that it be scale, use a single motor, have a low parts count, could easily be cut by hand, and it needed to be durable. The resulting model has a 50-inch wingspan and is built from balsa and a little light plywood. For even faster building, a laser-cut kit is available from Manzano Laser Works.

The Sportsman Story

After a little searching, an unexpected subject popped up. The VJ-22 Sportsman was a homebuilt amphibian designed by Volmer Jensen in 1956. Volmer, well known in the sailplane and hang-gliding worlds, built the first Sportsman for himself as a means of accessing diving spots.

After fielding numerous requests, Volmer began selling plans to pilots who wanted to build their own waterplanes. Approximately 1,000 plans have been sold throughout the years, and more than 100 aircraft have been completed.

The qualities that made the full-scale Sportsman successful were aligned with the goals of my smaller project—it was inexpensive and easy to build. The full-scale Sportsman was designed around the rectangular wing of an Aeronca Champion or Chief. The fuselage lines are simple and smooth. A small motor housed in a simple cowl is perched on struts overhead and is out of the vicinity of the water spray.

Also attractive are the myriad modifications that full-scale builders have applied to their Sportsman aircraft. Most feature pusher-props while others are tractors. Tail feathers vary in shape, with some having T-tails. The standard configuration has hand-operated landing gear, but ski Sportsman can be found. And, of course, the paint scheme on every hand-built Sportsman is unique.

The fin and rudder have been roughed out. The extra bits at the corners will be sanded into shape later.

The fin has been sheeted with 1/16-inch balsa and the outlines have been sanded to shape.

The horizontal stabilizer is fitted into its slot in the fin, and the LEs and TEs have been shaped. The left-side former halves are glued to the vertical 02 keels.

Building the Tail Group

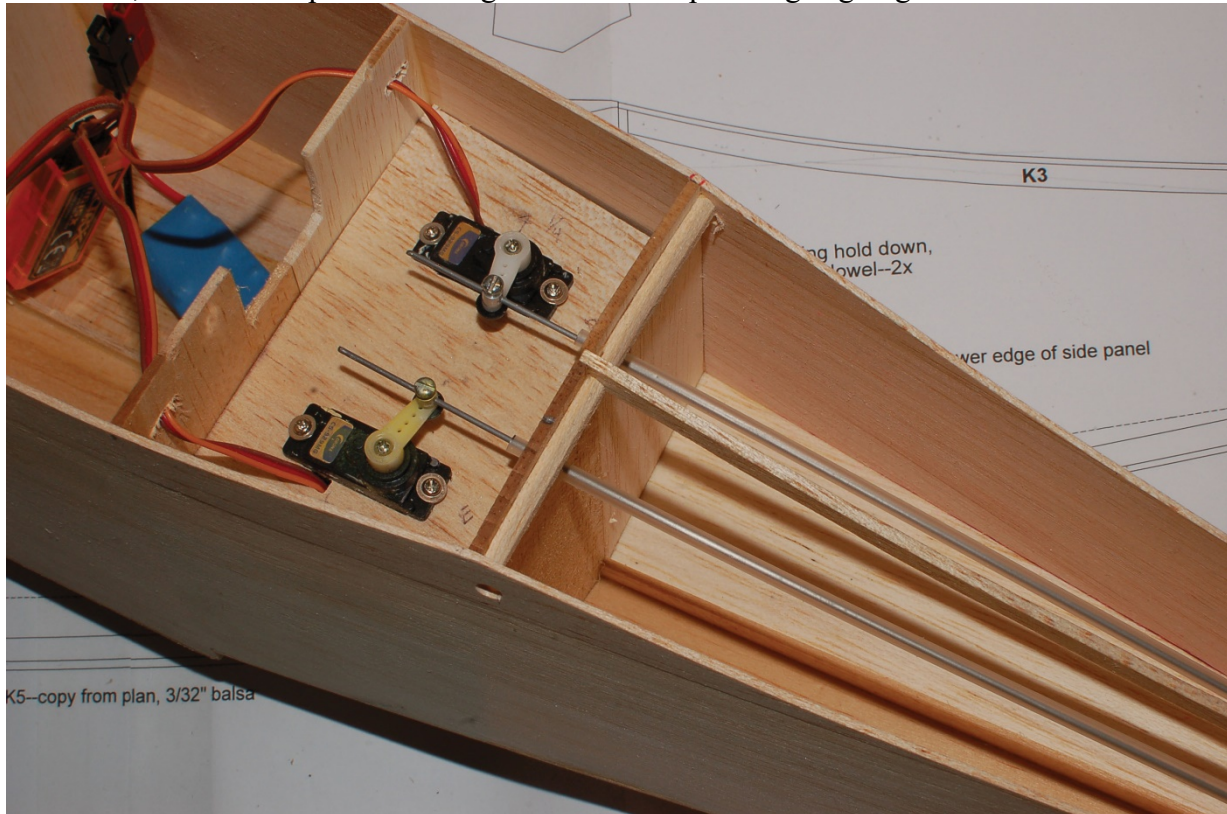
The plans show the original Sportsman outlines, but with one significant modification—the bottom of the rudder has been extended so that it functions as a water rudder. As with full-scale Sportsman fans, builders should feel free to customize their tail feathers as they see fit.

Get started by pinning the parts that make up the tail group outlines to the building board. The outlines are composed of simple strip-stock in three different widths. Don't worry about shaping the parts perfectly before assembly. Just make sure that the joints are tight and let the strips run long for now.

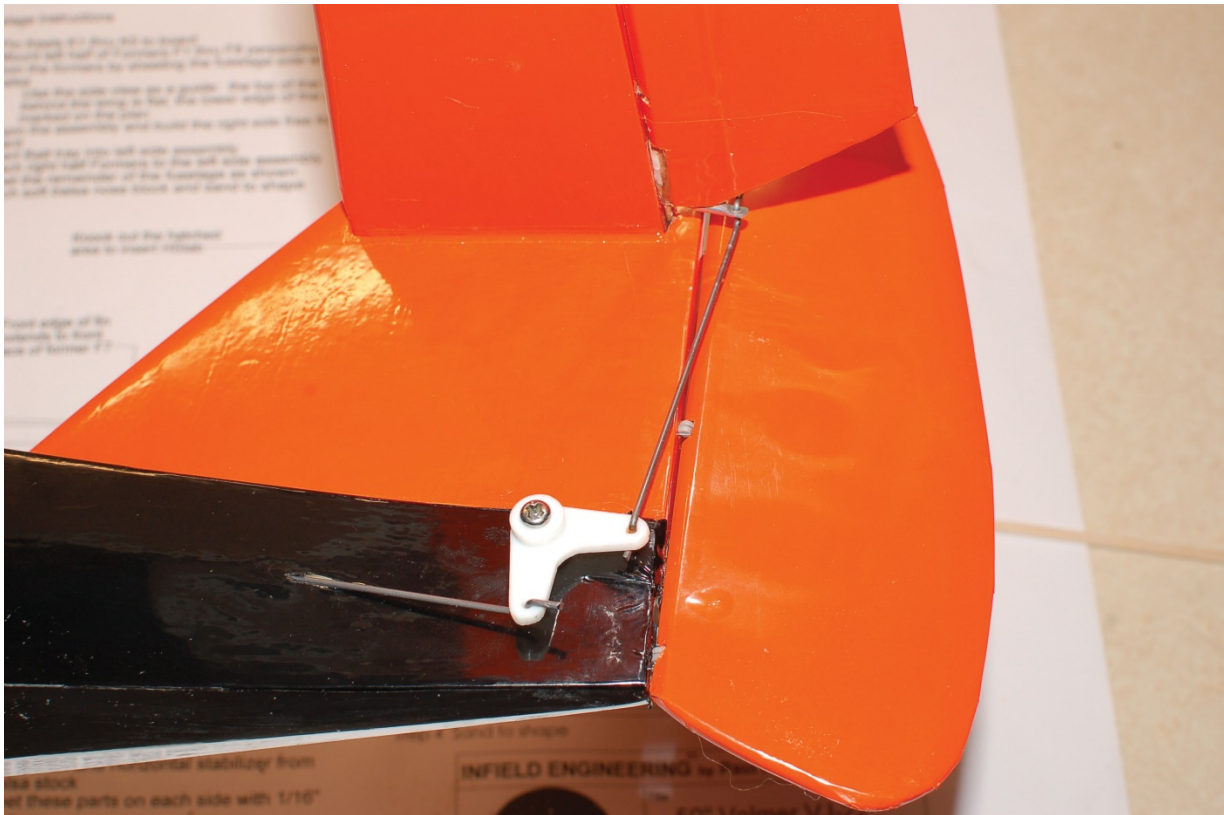
Note that the fin and the horizontal stabilizer are made from 3/32-inch balsa while the rudder and elevators are made from 3/16-inch stock. That's because the fin and stabilizer will be built out by sheeting them with 1/16-inch balsa.

When the sheeting is in place, sand the outlines into shape then sand a radius at the leading edges (LEs) of all of the tail group parts and a taper at the trailing edges (TEs) of the rudder and the elevators. Join the elevators with a bit of music wire. Connect the rudder and elevators with your favorite hinges. I used 1/8-inch pinned hinges from Robart Manufacturing on the prototype.

Here, the left-side panel is curing while the hull planking is going on.



The servo tray, tail group servos, and control rods are in place.



A bellcrank isn't the stealthiest way to operate the elevators, but it is simple and effective.

Adding the Servo Tray and Tail Group Controls

Cut the servo tray from hard 3/32-inch balsa. Fit two servos of your choice into the tray. One will operate the rudder and the other the elevators.

Cut two rails from scrap balsa to span the width of formers F4 and F5 to support the servo tray. Glue the servo tray to the rails. Run a bead of glue all the way around the tray to make it watertight.

To keep the a hull watertight, I ran the control rods through a nylon sheath all the way from F5 to where they exit the hull at the tail. Epoxy was used to seal the nylon at the tail end. Lubricate the control rods with plenty of silicone spray to keep them from corroding.

Because the elevator is positioned high on the fin, linking it to its servo can be challenging. I opted to use a bellcrank system. This decision was driven largely by the fact that I had a bellcrank laying on the workbench, automatically making it the easiest solution.

Fiberglassing the Fuselage

Similar to boats, the hulls of waterplanes are sensitive to impact. Adding fiberglass to the forward hull can dramatically increase its durability.

To be honest, I was intimidated by fiberglassing when I built the Goose, so I skipped this step. I've regretted that decision. If you have concerns, the Sportsman is a simple project on which to learn. I'm sure that you too will find that fiberglassing is nothing to be afraid of.

Start by gathering your supplies. Fiberglass comes in many weights, but for a small job like the Sportsman, 1/2-ounce fiberglass cloth is a good choice. My model has two layers of 1/2-ounce cloth, with the weave of the first running parallel to the keel and the second layer biased 45°. The bias provides maximum strength.



Fiberglassing supplies include resin, fiberglass cloth, a squeegee, brush, and a mixing cup.



Fiberglassing the forward hull is cheap insurance for the part of the airframe that strikes the water—and whatever might be hiding in it!

There are also many types of resin. Your hobby shop might carry finishing resin or 30-minute resin. The slow curing time of these resins is what takes the scare out of fiber-glassing. You will have plenty of time to position the fiberglass and work out the wrinkles. If things get out of control, just pull off the wet layer and try again.

Small plastic cups are handy for mixing the resin. Small brushes can be used to spread the resin. The main tool is a squeegee. Credit cards work well, as long as there aren't any nicks in the edges. Paper business cards are also good, but I prefer using the rubber squeegees that come with cellphone screen-protector kits.

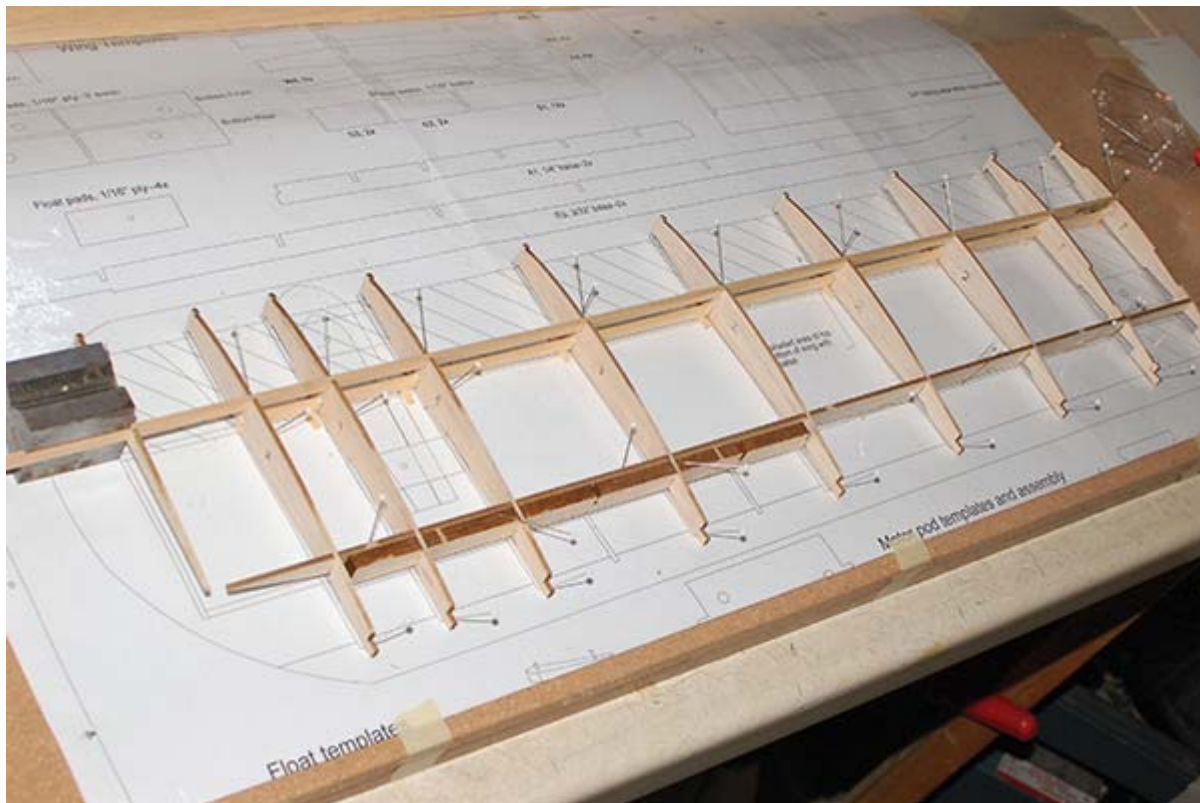
Get started by cutting a piece of fiberglass fabric that is an inch or two bigger all around than the area to be covered. Use a very sharp blade or the weave will run like mad. This whole forward hull can easily be done with one piece.

Drape the fabric over the hull. Now pour some resin from the cup onto the middle of the fabric. The resin will quickly soak through the fabric and into the wood. Use a brush or squeegee to spread the resin out toward the edges. Take your time and work a little in each direction.

Keep an eye out for shiny spots. These areas are too wet and need more spreading. Add resin as needed and continue to work from the center out until the entire hull is coated. Now use the squeegee to gently work out bubbles and to remove any excess resin. Pull carefully on any wrinkles while working the squeegee.

Now for the hardest part. Set the fuselage aside in a safe place and don't touch it until it is cured! It's easier to give this advice than to take it. I normally can't resist testing it too soon, but I'll discuss how to remove fingerprints later.

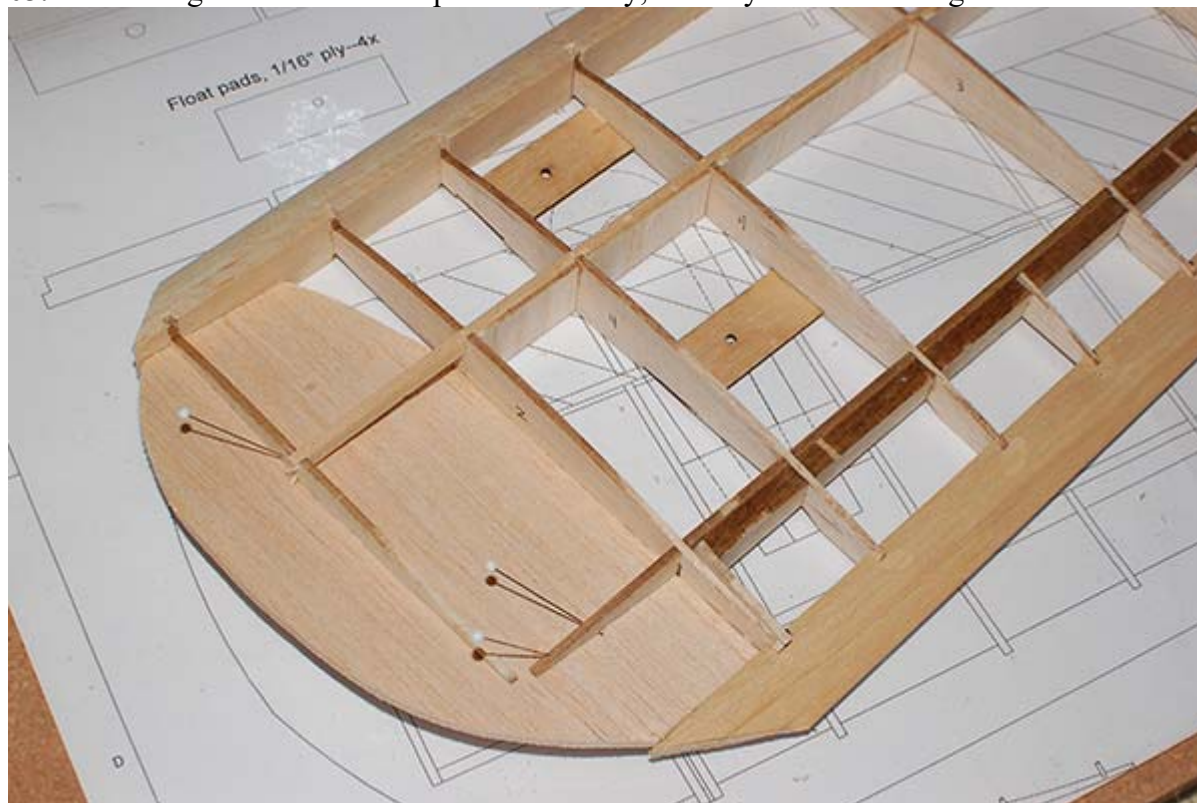
After it has cured, sand the first layer with wet 600-grit sandpaper to knock down any dust or debris. Then add the second layer of fabric on the bias. The more daring might do both in a single sitting, but if you are a novice, there is less risk in applying two separate layers.



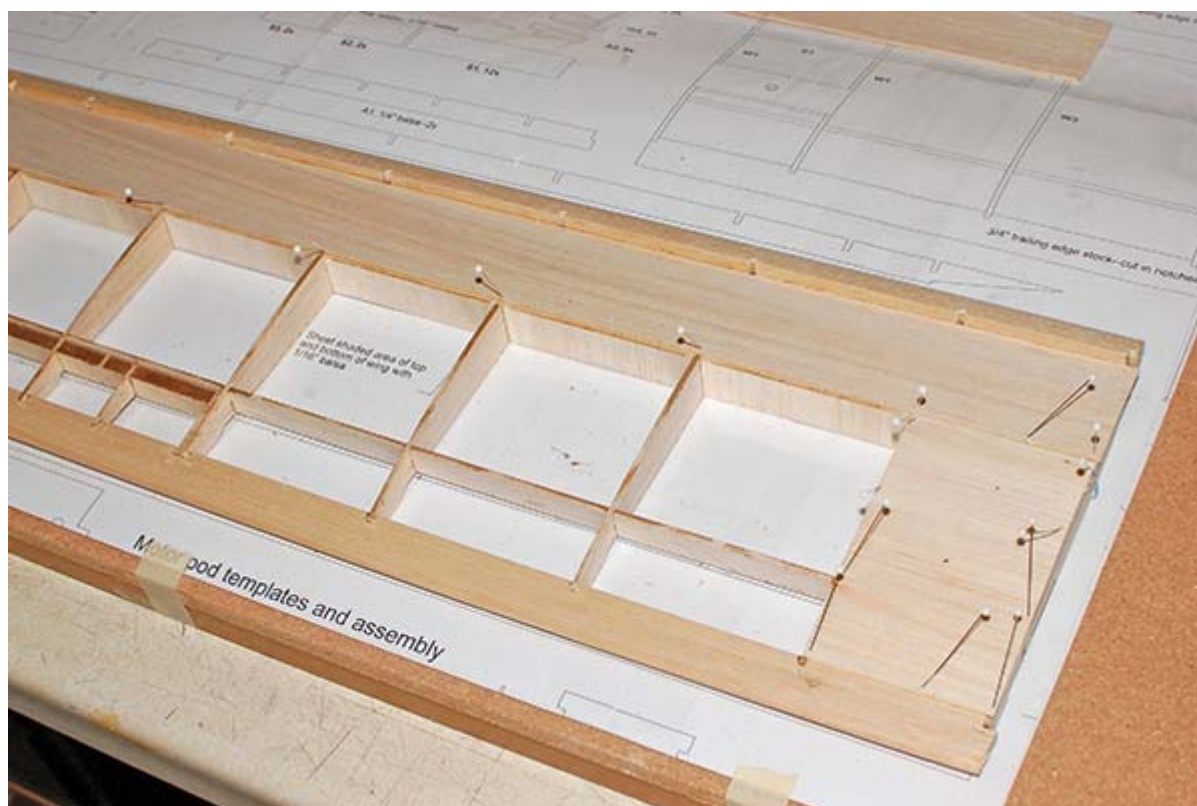
02. The spars and ribs are assembled square to the board.



03. The oblong holes in the float pads look funny, but they will set the alignment of the motor pod struts.



04. The LEs and TEs were made from shaped balsa stock. Plywood float pads and the wingtip panel are also shown.



05. The LEs and center section are sheeted top and bottom.

The theme of this second installment of the Volmer VJ-22 Sportsman build is perseverance. In the most obvious sense, perseverance is needed to complete any scratch build. From start to finish, this project should take an average builder a month or two to complete. That can be stretched out when competing

interests such as family and work need attention. Perseverance is what separates the projects that make it to maiden flight day from those that gather dust.

Sometimes, though, another dose of perseverance is needed to get beyond the maiden flight. This will be the subject of the last half of this article.

Building the Wing

The wing construction is based on a sheeted forward section and main spars joined by shear webs. When assembled, these parts form a rigid D-box.

Start by shimming the lower $1/8 \times 3/16$ -inch main spar with scrap $1/16$ -inch balsa then pinning the spar to the building board. Shimming in this way allows the spar to sit deeper into the rib notch so that the sheeting won't stick up higher than the back half of the ribs. Shim rear spar RS and aileron leading edge (LE) A1 with $3/32$ -inch scrap in the same way.

Now glue all of the ribs into place. They should stand perpendicular to the board except for the root rib. Tilt this one toward the wingtip by using the angle guide on the plans. This will set the dihedral when the wing halves are joined.

After adding the upper main spar and shear webs S1 to S4, prepare the LE and trailing edge (TE) parts. Shaped balsa stock was used on the prototypes. After marking these parts against the plans, notches were cut into each of them for the ribs. A razor saw or a scroll saw makes quick work of this. Glue these parts into place.

Complete the aileron by gluing in the riblets. Epoxy the plywood top motor pads in place. Make sure that the pads are in the proper orientations. The position and shape of the holes will determine the angles of the struts that hold up the motor pod.

Align the wingtip panel to the underside of rear spar RS and rib W5 and glue it into place. Now the upper LE can be sheeted with $1/16$ -inch balsa.

Unpin the wing and epoxy the lower motor pads and float pads in place. Add the bottom sheeting. After some sanding, the wing halves are ready to be joined.

Building the Wing Floats

The wing floats begin with $1/2$ -inch soft balsa pads at the top and the bottom. Shape the top of the upper pads so that they fit flush with the lower wing surface. The easiest way to do this is to cover the underside of the wing center section with 60-grit sandpaper. Sand the top of each pad side to side against the wing's underside until the pad is contoured to fit the wing's sheeting.

Next, connect the upper and lower pads with $1/8$ -inch carbon-fiber rods. Leave the upper rod ends exposed so that they can later plug into the float mounting plates in the wing. Sheet the floats with $1/16$ -inch balsa. After sheeting, trim the bottom of the float as shown on the plans so that it will lift the wing from the water as speed increases.

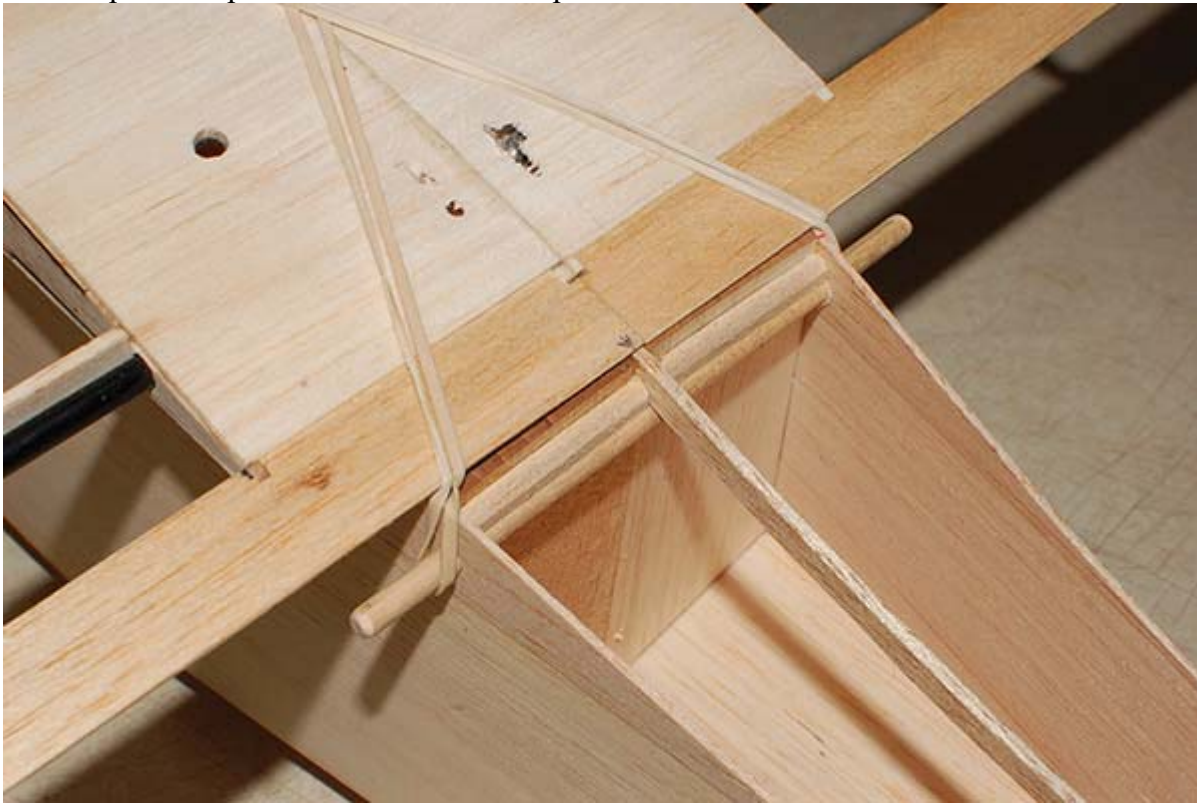
Seal the floats to make them watertight. A little fiberglass on their bottoms is also a good idea.



06. After shaping the upper float pad, the pads were joined with 3 mm carbonfiber tubing and the assembly was sheeted.



09. The pod is in place. The struts set the upthrust.



10. Old-school dowels and rubber bands hold the wing in place.

Building the Motor Pod

The Sportsman's motor pod is a box that sits on four carbon-fiber struts. Although simple in design, the exact placement of the holes and notches in the assembly will define the motor thrust angles and the geometry of the pod to the wing, if assembled as planned.

Start by attaching the little formers to the outsides of right-side former M3 and left-side former M4. These will be used later when the top of the pod is sheeted.

Epoxy firewall M2 between formers M3 and M4. When properly assembled, the model will have 2° of right thrust. Epoxy this assembly to plywood plate M1.

Attach a former M5 to the outer edge of M1 on each side. Now sheet between M5 and the little former on each side and between M3 and M4 with 1/16-inch balsa. The result will be a central motor housing flanked by a scoop on either side.

Cut the four 5 mm carbon-fiber struts to length and dry-fit them. If necessary, massage the holes in the wing and/or the pod with a small rat-tail file until the pod angles match the plans.

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11. The Sportsman is all ready for covering!



12. Maiden flight number one: Although fibreglassed, the Sportsman's hull was no match for a 60-penny nailhead.

Finishing the Assembly

In the spirit of tradition, I opted to use dowels and rubber bands as the wing attachment mechanism. Honestly, I like screws better, and that would be an easy modification, but the rubber bands have a certain old-fashioned appeal.

I ran a 1/4-inch dowel through the fuselage in front of and behind the wing as shown on the plans. A scrap strip of 3/32-inch square balsa was epoxied between each dowel and the adjacent former to transfer the load away from the sheeting.

Drill a 1/8-inch hole into the root wing ribs for a wing pin. Drill a matching hole in former F4 to receive the pin. Reinforce the area behind F4 with wood scrap. Epoxy a bit of wooden dowel into the wing hole.

Fasten the wing in place with four size 33 rubber bands. Stretch one rubber band on each side of the pod and run the other two diagonally between the dowels. Close any openings left in the top sheeting, and the framework is complete.

The Maiden Flight

As maiden flights go, my expectations for the little Sportsman were basic. The model has a simple wing with low wing loading, and there was nothing unusual about the design. But through no fault of the model, a successful flight was a long time coming.

Attempt Number One

Sometimes accidents just happen. After losing our club pond, the first attempt was flown off of the club runway. The model had enough power to scoot along the AstroTurf, and it seemed that flight was upon us—until a raised nailhead brought things to an abrupt stop. After flipping upside down, a ragged gash in the hull revealed that the forward formers were shattered and the battery tray was loose.

Although disappointing, sometimes accidents do happen. The odds of hitting a raised nailhead in our 400-foot runway were low, but when fate strikes, the odds feel like 100%. The best that can be done is to pick up the pieces and try again another day.

Attempt Number Two

Pride goeth before a fall. A record wet winter delayed the next attempt, but in its wake, flying sites for the Sportsman had popped up everywhere. The Sportsman was introduced to a nearby seasonal flood plain, where it took to water like a proverbial duck. Water handling was excellent, and the flying conditions were ideal.

As throttle was increased, the Sportsman gathered speed with purpose and lifted cleanly. The climbout was steady, and all went according to plan as a bank to the left began. It made several fast circuits, along with a little trimming, but everything seemed okay until the power was reduced. The Sportsman instantly pitched up to the vertical, stalled, and then dropped straight toward the water.

Could that have really happened? The Sportsman was easily recovered, so I tried that maneuver again. As before, as soon as power was removed, the previously docile aircraft stopped in its tracks then tipstalled. That left me in a quandary as I contemplated what a high-speed water landing of an unfamiliar aircraft was going to look like.

I needn't have worried. A few minutes later, a wisp of smoke exited the aircraft and it was no longer responsive. After several shallow, unpowered corkscrews, the Sportsman settled on the surface of the water like a feather. The trek through the chest-deep, 50° water was stimulating.

A post-mortem revealed two ego-checking errors plus a new discovery.

1. I failed to properly measure the center of gravity (CG). Although this should have been simple on a rectangular wing, I was careless and didn't pay attention.
2. The hull leaked. Although I checked for leaks before the hull was damaged on the first maiden flight attempt, I didn't check my work after the repairs. The water leak exacerbated the tail-heavy CG condition and eventually wetted the ESC, resulting in its failure. Overconfidence in my repair skills created this problem.
3. The windmilling propeller created a great deal of drag high above the CG. A fellow builder explained this to me after having a similar experience with a different model. It turns out that turning the propeller brake on significantly reduces this drag as well as the pitch up. This was a learning experience for me. I would have thought that the windmilling propeller presented less drag than a stationary propeller, but that is not the case. By the way, a stationary propeller and a feathered propeller are not the same thing.



13. Maiden flight number two: A leaking hull and faulty CG made for an unpleasant experience.

Attempt Number Three

The third time is the charm. More than a year went by before the Sportsman made it back onto my workbench. By that time, the sting of failure was gone, but the lessons learned were still fresh. They were written on a Post-it note that was stuffed inside the fuselage.

After replacing the damaged electronics, sealing the hull properly, and correctly adjusting the CG, the Sportsman took a trip to Lake Sonoma in Geyserville, California. As before, the water handling was very good and a check showed that the water was staying on the outside of the hull.

After lining up into the wind, the Sportsman gamely jumped off the water and gently banked into the first circuit. Some minor trimming followed, and then it was time for the moment of truth.

While passing high above, I cut the throttle to zero. The Sportsman rose gently up by approximately 1 foot but continued onward. I later added a little upthrust to remove this tendency.

The rest of the outing was completely routine. Takeoffs were clean, with the sturdy floats helping to pop the fuselage out of the water. Dead-stick landings tended to bounce, but adding a little power resulted in some nice, long touchdowns. The high wing configuration is better for patrolling the lake than for an aerobatic display, but the Sportsman can handle basic loops, wingovers, and Cuban 8s.

This project is now in the win column. The downloadable plans incorporate the lessons that I learned along the way. The goals of being simple, durable, and fun were achieved, and some unexpected challenges were thrown in. All it took was a little perseverance!



14, 15. The third time was the charm as the Volmer VJ-22 Sportsman takes flight at Lake Sonoma in Geyserville CA. Photo by Charles Kennemore.



SOURCES:

Manzano Laser Works

tomj@manzanolaser.com

www.manzanolaser.com

RCGroups: 50-inch Volmer VJ22 Sportsman

<https://bit.ly/2CRZpy2>



The Volmer VJ-22 Sportsman cruises the lake. Photo by Bingo Kohlmann.
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