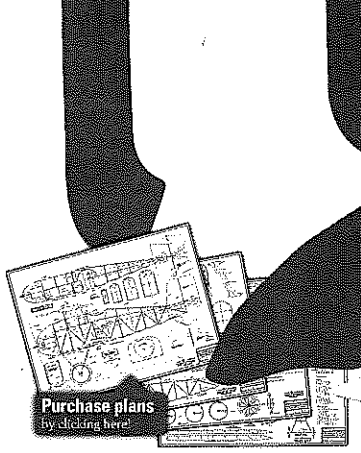
Staaken Z-1 Flitzer

Construct your own "homebuilt" biplane

by Pat Tritle | Photos by the author



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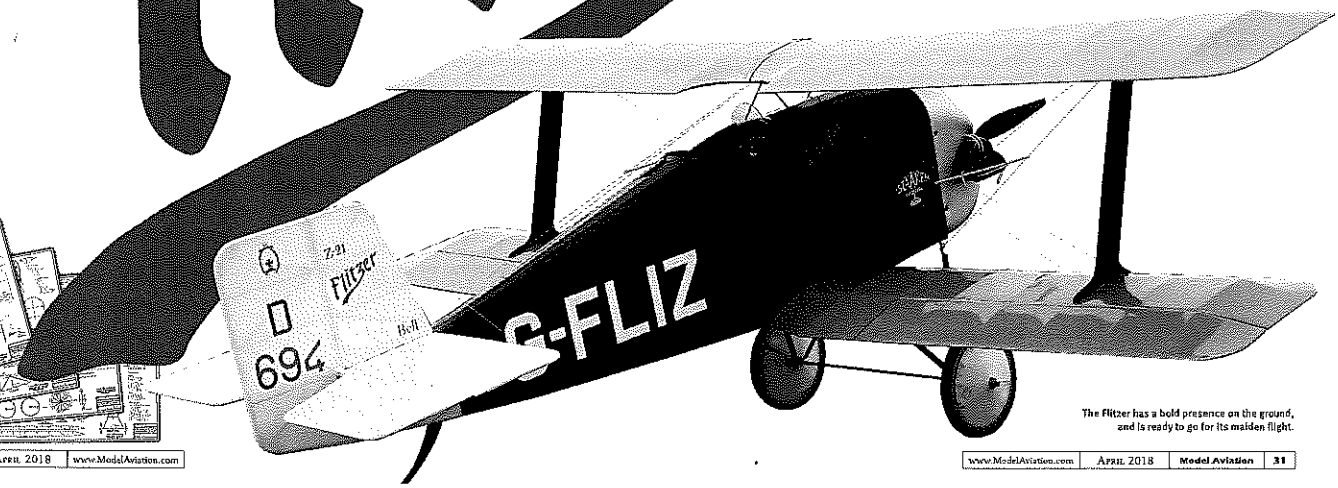


The Flitzer has a bold presence on the ground, and is ready to go for its maiden flight.

MATERIALS LIST

Wood

If a short kit is not used:

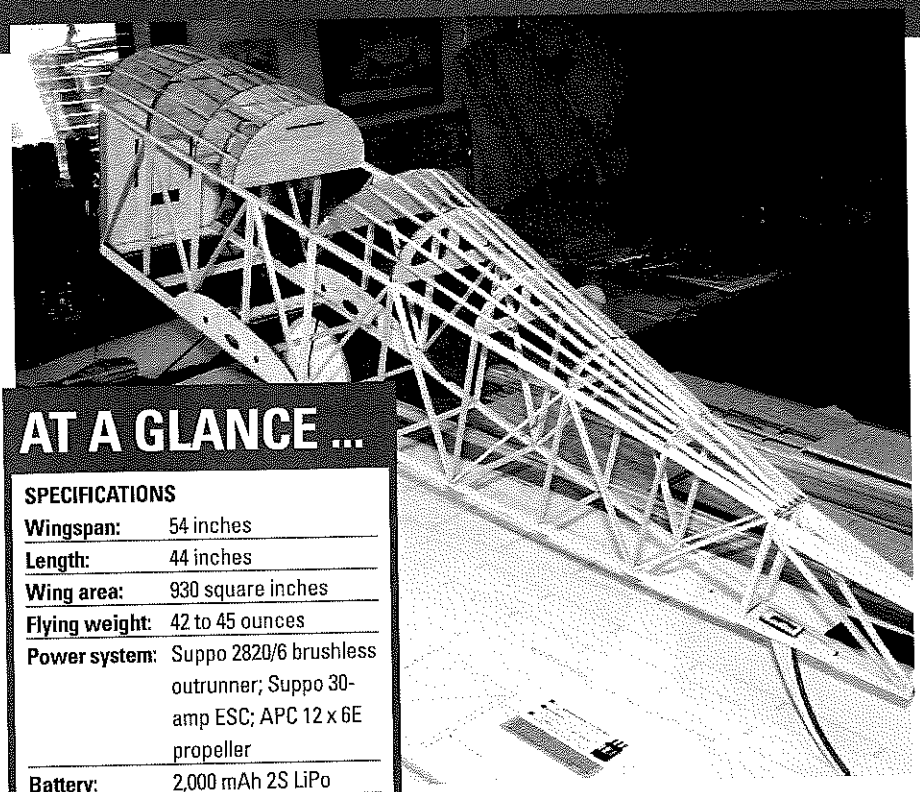
- One 1/16 x 12 x 24-inch birch plywood
- One 1/8 x 4 x 24-inch light plywood
- Two 1/16 x 4 x 36-inch balsa
- Three 3/32 x 4 x 36-inch balsa
- Five 1/8 x 4 x 36-inch balsa
- Two 3/16 x 4 x 36-inch balsa
- Two 1/16-square-inch x 36-inch basswood
- Twelve 1/16 x 3/16 x 36-inch balsa
- Three 3/32-square-inch x 36-inch balsa
- Eight 3/32 x 3/16 x 36-inch balsa
- Two 3/32 x 1/4 x 36-inch balsa
- Eight 1/8-square-inch x 36 balsa
- One 1/8 x 1/4 x 36-inch basswood
- Four 1/8 x 1/4 x 36-inch balsa
- One 3/16-square-inch x 36-inch balsa
- One 1/4-square-inch x 36-inch balsa
- Four 1/4 x 1/2 x 36-inch balsa
- One 1/4 x 36-inch balsa triangle stock
- One 3/8 x 36-inch balsa triangle stock

Metal

- .032 stainless steel safety wire
- Two .032 x 36-inch piano wire
- Two .093 x 36-inch piano wire
- One .125 x 36-inch piano wire
- Two 1/4 OD x 36-inch brass tube
- Two 9/32 OD x 36-inch aluminum tube
- One .015 x 1/4 x 12-inch brass strap

Miscellaneous

- Two 1/8-inch wheel collars
- Four 9-gram sub-micro servos
- One Suppo 2820/6 1,000 Kv outrunner motor
- One 30-amp ESC
- One APC 12 x 6E propeller
- Two 9-inch servo extensions
- One 11-inch Y harness
- CA hinge stock (Great Plains GPMQ3960)
- One .032 inner-diameter x 24-inch plastic tube (elevator pushrod tube)
- One round toothpick (rudder control horn)
- Heavy-duty nylon carpet thread (wing, tail rigging, and rudder pull-pull cables)
- Seventeen #2 x 3/8 sheet metal screws
- Seventeen #2 flat washers
- Four Du-Bro #158 landing gear straps
- One .015 x 6 x 12 evergreen styrene sheet

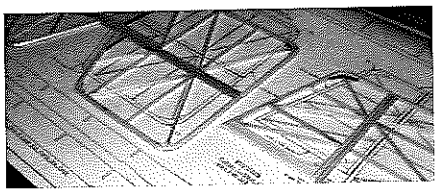


AT A GLANCE ...

SPECIFICATIONS

Wingspan:	54 inches
Length:	44 inches
Wing area:	930 square inches
Flying weight:	42 to 45 ounces
Power system:	Suppo 2820/6 brushless outrunner; Suppo 30-amp ESC; APC 12 x 6E propeller
Battery:	2,000 mAh 2S LiPo
Radio system:	JR XG8 transmitter; RG411B receiver; four Suppo SP-90 servos

The fuselage frame is completed with the addition of the aft top formers and stringers, bottom crosspieces, and tail skid mounting plate. The landing gear and tail skid are dry fitted onto the frame.



Vertical and horizontal stabilizer assemblies are built up then removed from on top of the plans and sanded to shape. The rudder and elevator have CA hinges.

The Staaken Z-1 Flitzer is a single-seat, open-cockpit, 1920s-style home-built biplane designed around the 65 hp Volkswagen engine. The Z-1, designed by Lynn Williams and produced by Flitzer Sportplanes of Aberdare, Wales, was supplied as plans for amateur construction, then in the late 1990s, was offered in kit form by Bell Aeromarine of Leicester in the United Kingdom.

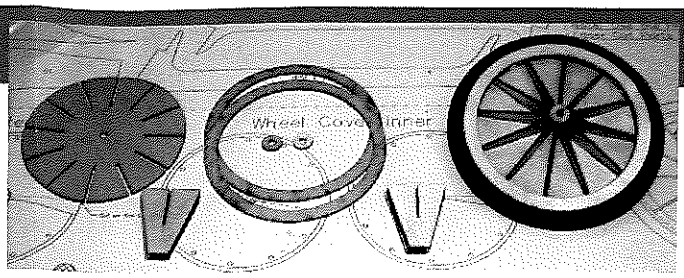
The Flitzer is a relatively small airplane with an 18-foot wingspan and an overall length of 14 feet, 10 inches. Its empty weight is 481 pounds and it has a gross weight of 752 pounds. Its performance is impressive with a maximum speed of 93 mph, a cruise speed of 85 mph, and a stall speed at 42 mph, with a climb rate of 710 feet per minute.

A 1/4-Scale Park Flyer

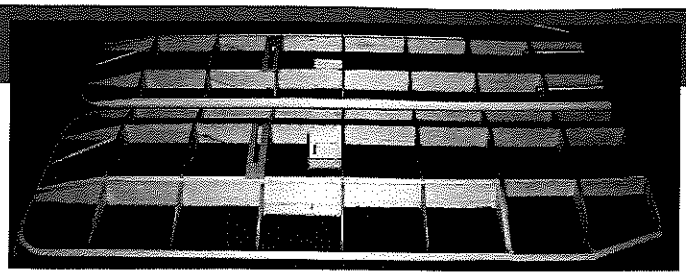
The small Flitzer is a perfect candidate to launch a new concept: large-scale park flyers. I've built several 60-inch wingspan park flyers throughout the years with good success. The key to success is minimal weight and wing loading that allow for slow docile flight. The Flitzer, although a rather large model, was built with the wing loading at 6.5 ounces per square foot. At that weight, the model is capable of very slow flight and, with its agile flying qualities, is actually well suited for flying in medium to large parks. As a 1/4-scale model, it also qualifies for Big Bird meets.

The Flitzer is an all-wood design incorporating stick-and-tissue-style construction in the fuselage and tail group with egg-crate-style construction in the wings. As biplanes go, rigging the wings is easy. The design incorporates inverted V-style cabane struts and I-type interplane struts. The design also features plug-in wings that are retained by screws and removed in pairs.

Control is four-channel RC with a servo each for the rudder and elevator, and one for each aileron. Power is



The 5.5-inch wheels are built up from 1/16-inch plywood with rubber tires. The wheel covers are cut from the plans and glued in place on the finished wheels.



The top wing is egg-crate-style construction and is built directly on top of the plans for quick and easy assembly.

supplied by a Suppo 2820/6 outrunner motor with a 30-amp ESC, an APC 12-6E propeller, and a 2,000 mAh 2S LiPo battery.

Before construction begins, cut out all of the parts using the provided patterns. For those not into scratch-building, a laser-cut wood pack and vacuum-formed plastic cowl are available from Manzano Laser Works. Because the only commercially available wheels are far too heavy for the Flitzer, the 5 1/2-inch wheels are included with the laser-cut wood pack.

Tail Section

Lay out the vertical and horizontal stabilizers directly on top of the plans, using the part numbers and wood sizes shown. When completed, lift the parts from the board and sand them to shape.

Cut the hinge slots in the locations shown. Make the hinges from CA hinge stock using the provided patterns, and dry fit them into the slots. Drill a #44 hole at the location shown on the rudder for the toothpick control horn and dry fit the horn in place.

Top Wing

If the laser-cut parts pack is used, assemble the A12/A12A main spar and A13/A13A rear spar over the detail drawings provided. Pin A6T in place on top of the plans. Align and glue A12 and A13 in place over A6T, using a couple of ribs to ensure proper spacing.

Fit all of the ribs in place on the spars and tack glue them in place. Align and glue the 1/4 x 1/2 balsa leading edge (LE) and 1/8 x 1/4 balsa trailing edge (TE) in place. Fit and glue the wingtips in place along with the 3/32-inch square balsa diagonal bracing. Laminate two A14's together and glue in place.

Finally, fit and glue the 9/32-inch outside-diameter (OD) aluminum wing receiver tubes and 1/4 x 1/2-inch balsa rigging blocks in place. Remove the wing from the board and permanently glue all points of contact then sand to final shape. Repeat the process to build the other wing.

Bottom Wing

Assemble the A3/A3A main spar and A4/A4A rear spar over the detail drawings that are provided followed by the R3/R3A rib assembly. Pin SM1 in place on top of the plans. Dry fit all of the ribs onto the spars, pin in place over the plans, and tack glue all of the points of contact.

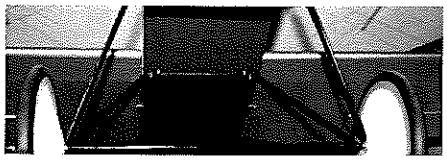
Align and glue the 1/4 x 1/2-inch balsa LE in place. Pin the 1/8 x 1/4 balsa TE in place, including the aileron, and glue at R1, R2, and R3. Fit and glue the wingtip in place followed by the 3/32-inch square balsa diagonal bracing. Align and glue A5 in place on A4 as shown.

Build the aileron while the wing assembly is still in place. Begin by sanding a bevel into AS using the R6 rib detail drawing for reference. Align and glue AR1 on AS and pin the assembly in place on top of the plans. Fit and glue all of the AR2 ribs in place, followed by the aileron tip. Finally, fit and glue A7 and the 1/16-inch-square bass wood diagonal bracing in place, flush with the bottom of the aileron.

Align and glue SM2, SM3, and A6B in place, and then fit and glue the 9/32-inch OD aluminum wing receiver tubes and 1/4 x 1/2-inch balsa rigging blocks in place. Remove the wing assembly from the board, cut the aileron free, and permanently glue all of the points of contact. Align and glue ASA in place on AS and sand to final shape. Finally, dry fit the aileron hinges in place. Repeat the process to build the other wing.

Fuselage Assembly

Begin by laying out the side frame directly on top of the plans, using the part numbers and wood sizes shown. Pin B1 in place then fit and glue all of the longerons and vertical and diagonal bracing in place. Align and glue PRG flush with the outside of the frame. Remove what will be the right-hand frame from the board and repeat the process to build the left-hand frame (except for the PRG).



The battery hatch clips into the fuselage on the bottom. The bottom wings are retained by brass tabs and secured with #2 sheet metal screws.

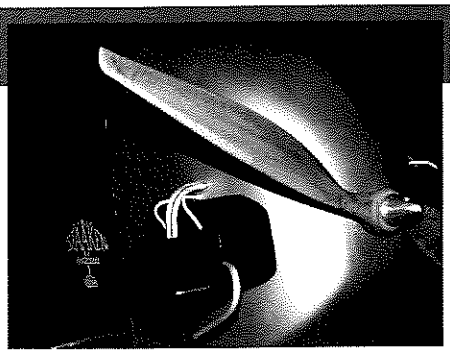
The first step in joining the side frames is to align and glue FWR and FWL together. Align and glue CMF and CMFa onto Former 2. Laminate CMRa between two CMRs then laminate the two LGMa parts in place on the LGM. Make two sets. Pin the LGM assemblies in place on top of the fuselage framing plans and align and glue the side frames in place.

Use squaring blocks to ensure that they're vertically aligned. Align and glue the Former 2 assembly and the rearmost Former 3 assembly in place. Align and glue the CMR assembly in place, followed by the CMR assembly and the front Former 3, Former 4, FWL/FWR, Former 1, and all of the bottom crossbracing ahead of Former 4.

Sand the bevel into the tail post using squaring blocks to ensure proper alignment. Pull the tail together and glue. Add all of the top formers and bottom crosspieces. Finally, glue all of the 1/8-square-inch balsa stringers in place.

Remove the frame from the board. Glue the tail skid mount assembly in place and sand the fuselage to shape. Assemble the tail skid and fit the shoe as shown and glue in place. Dry fit the skid into the mount.

Align and glue the two 9/32-inch OD aluminum bottom wing receiver tubes into the fuselage frame and add the wing



The dummy Volkswagen engine cylinders were carved from balsa blocks and details were added using an aluminum dowel and electrical wire. The propeller was wood grained and detailed for a nice, scalelike appearance.

retention tabs and support blocks. Make up the cockpit fairing using the provided pattern and glue it in place.

Wire Parts

Bend all of the wire parts to shape using the full-size patterns provided. Tape the front and rear landing gear struts in the mount beams and solder the axle in place. Wrap the joints with 24-gauge copper wire and solder again. Remove the landing gear and make up the front flying wire retainer hooks from .032-inch diameter stainless steel safety wire and solder in place.

Build up the top wing mount assembly by laminating CS1 and CS2s. Use the joiner tubes to ensure proper alignment. Fit the cabane struts into the fuselage, dry fit the wing mount onto the struts, and make any necessary adjustments.

Installing the Servos and Drive System

Set up the servo mounts in the fuselage as shown. Mount the rudder servo on center and the elevator servo on the right side. Run in the elevator pushrod guide tube and support it at the front, and each of the uprights using a pushrod stand-off and at the back at PRG. Dry fit the vertical tail and run in the pull-pull cables. Mark the location where they exit the fuselage on the plans. Align and glue the servos into the wings using silicone caulk. When dry, run the extension leads out through R1.

Build up the motor mount box and reinforce MM using $^1/_4$-inch triangle stock. Mount the box on FW and reinforce it with $^3/_8$-inch triangle stock.

I also hardened the wood with a coat of thinned epoxy resin on the inside and outside. Mount the motor, connect the ESC, and test run it to ensure proper direction of rotation.

Covering

Before covering begins, build up the interplane struts as shown. Fully assemble the model before covering. Test run all of the systems to ensure that everything fits and aligns properly, and that the power and control systems are all working correctly.

Because the goal is to keep the Flitzer lightweight, I recommend covering it with Coverite Microlite. Avoid the use of materials such as MonoKote or UltraKote because the excessive shrinkage will crush the somewhat lightweight structure.

Before covering begins, give the frames a final detail sanding to remove any remaining flaws. You can also scallop the formers between the stringers to provide a smoother cover job. After the frames are covered, apply the graphics as desired.

Final Assembly

Mount the landing gear and glue the tail skid in place. Glue all of the hinges in place then fit the bottom wing onto the joiner tubes. Using the wing for reference, align and glue the vertical and horizontal stabilizers in place. Fit the top wing panels onto the center section, dry fit the wing assembly onto the cabane and interplane struts, and check the alignment. When satisfied, glue the struts in place with 15-minute epoxy and allow the assembly to fully cure.

Rig the wings and tail section using heavy-duty nylon carpet thread or bead wire. Drill .025-inch diameter holes in the struts and rigging blocks per the plans. The front flying wire is attached to the landing gear strut with the wire hook. Drill the vertical and horizontal stabilizers and add the rigging as shown. Both the front and rear bracing is done in one continuous loop.

Build the wheels per the plans and mount them using $^1/_8$-inch wheel collars and add the $^3/_{32}$ x $^1/_4$-inch balsa landing gear fairings. Mount the cowl and add the desired dummy engine detail, windshield, cockpit combing, and any other details to suit.

Build up and mount the battery tray as shown, followed by the battery hatch using the detail drawing provided. Balance the model at the point shown using the battery location to your best advantage. And finally, set up the control throws as shown and your model is ready to fly.

Flying the Flitzer

The Flitzer is without a doubt the most honest and gentle biplane I've ever flown. The first flight was made using a 2,000 mAh 2S LiPo battery that provided a solid, scalelike performance. The model cruised nicely at half power with a comfortable reserve.

The takeoff was made into a gentle breeze with a shallow climb to altitude. To my surprise, no trim was required, and despite the massive ailerons, the Flitzer exhibited absolutely no adverse yaw. The model also turned equally well on rudder or ailerons alone.

With the controls set up as shown, and with the dual rates on, input was crisp and precise with no tendency to overcontrol. At the same time, the controls never felt mushy. The stall was a non-event, breaking right down the middle, and after the nose dropped, it immediately began to fly again.

Landing is easy, but because it's a biplane, there is a need to carry some power on the approach. The approach is slow and gentle, with solid control response all the way to touchdown. I did shoot a few touch-and-gos and found that both three-point and wheel landings are equally effective.

I also tried using a 3S 2,200 LiPo battery, which provided more reserve power, but with the added power, it proved a little tricky finding a "happy" cruise power setting. The model was sensitive to changes in power as well. I wouldn't call it "twitchy," but it was not nearly as gentle a flier with the 3S battery. The choice of battery is best left to an individual pilot. And with that, the only thing left to do is enjoy the ride.

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