

# Build Your Own Spray Booth

Get a pro-style setup at a fraction of the cost

BY GEOFF GUZYNSKI



**Double duty.** When not in use as a spray booth (left), the area in the garage is wide enough to park a car in (above), or store woodworking equipment on wheels.



Once you've learned to spray a finish, you'll never pick up a brush or cloth again. First of all, it's quick: You can completely finish a large project in one day. Then there's the quality: Finishes designed for spraying dry quickly, so dust is less likely to settle in them. With practice, you can spray a finish that's so good it doesn't need rubbing out. But first you need a place to spray.

My shopmade booth is modeled after a commercial-style, cross-flow model, something I've wanted for a long time but could never afford. It cost less than a quarter of the \$4,000 to \$5,000 price of a commercial booth and didn't take long to put together.

## Good airflow determines the location

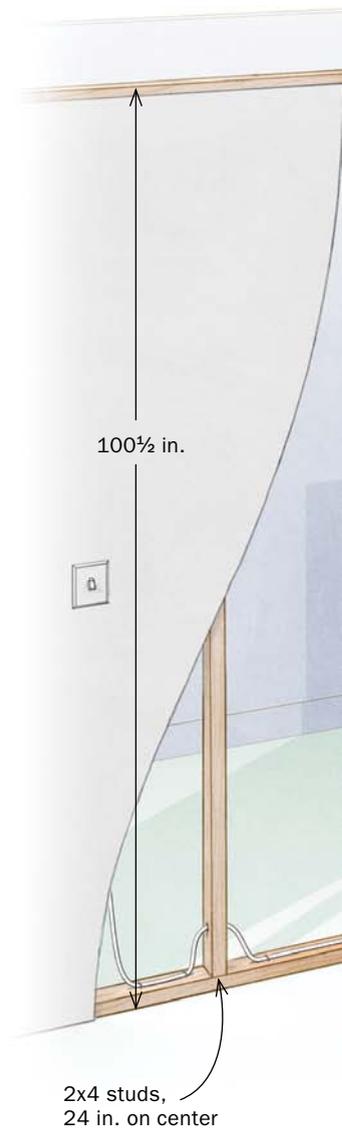
The first decision is where to build this large chamber. There are two considerations, space and airflow. I put mine in the back of my detached garage, and because the booth is 9 ft. wide, like a standard parking space,

there is just enough room to park a car in it. But even if you build the booth in your shop, it doesn't have to be wasted space because you can use it to store a lumber cart or any machinery on a mobile base.

You need a source for the large volume of fresh air to feed the booth. I simply open the garage door, directly opposite the booth. If you're pulling air from the house, you will need to open several windows or doors to supply the volume of air needed for good cross-flow. You'll also need an opening for the exhaust air at about waist height. This can either be an existing window or a hinged door cut in the siding like mine.

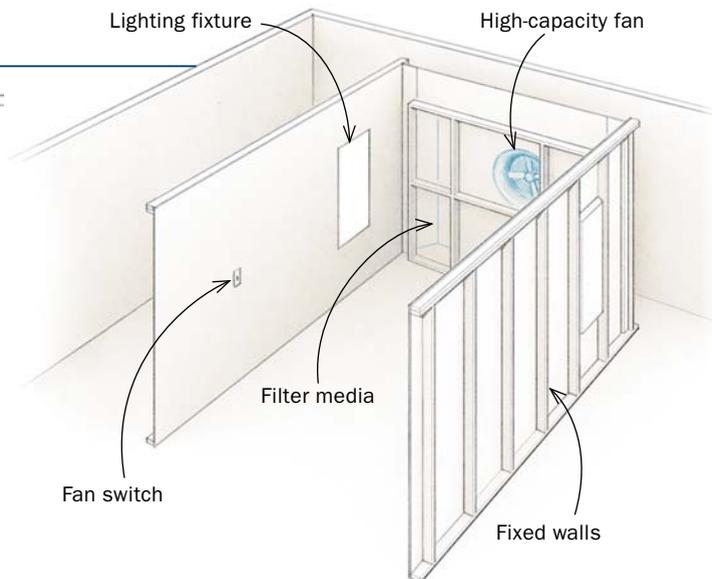
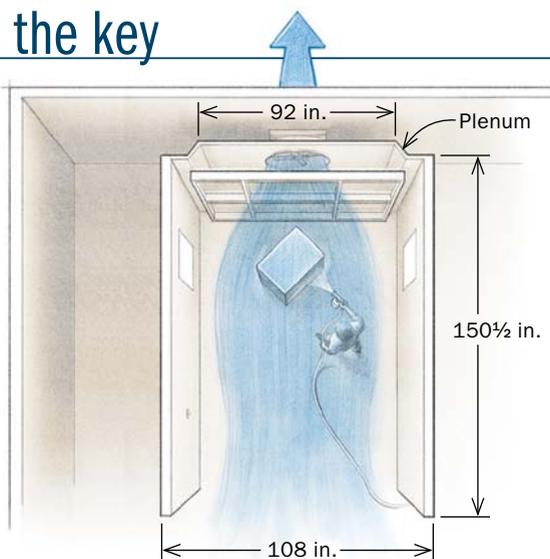
## A bellmouth improves the fan's efficiency

The heart of any spray booth is the fan, which draws large volumes of air quickly past the workpiece, pulling away overspray and fumes. A household box fan is nowhere near powerful enough, nor are most whole-house extraction fans. The 24-in.-dia. propeller that I



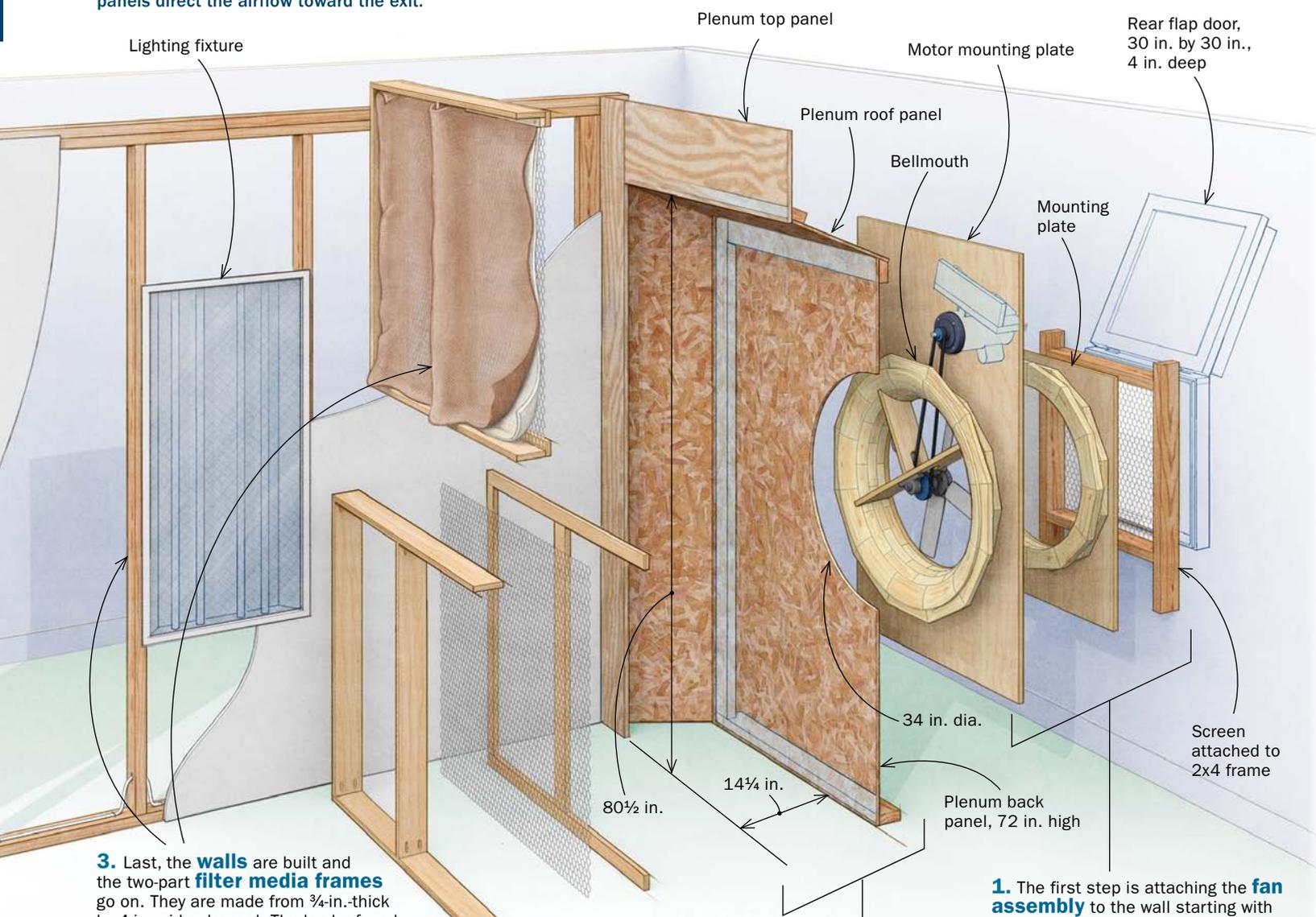
# Cross-flow is the key

A high capacity, 24-in. fan at the back of the booth expels the waste air through a flap door cut into the end of the building. Fresh air enters the front of the booth, picks up overspray, and deposits it on the filter before passing through the fan.



## ANATOMY OF A SHOP-BUILT BOOTH

A critical component of the booth is the plenum, which is the area between the back of the filter media and the fan. Its sloped roof and rear side panels direct the airflow toward the exit.



**3.** Last, the **walls** are built and the two-part **filter media frames** go on. They are made from 3/4-in.-thick by 4-in.-wide plywood. The back of each frame has plastic chicken mesh stretched across it to support filter media, which covers the front of the frame.

**2.** Then the **plenum** is built around the fan assembly. All parts are sheathed with 1/2-in.-thick oriented strand board (OSB), but any type of sheet good works fine.

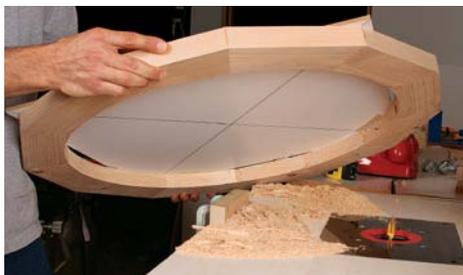
**1.** The first step is attaching the **fan assembly** to the wall starting with the mounting plate, the motor mounting plate, and finally the bellmouth. See p. 72 for detail.

# Build the bellmouth

To allow the air to flow smoothly to the fan, Guzynski recommends building a kind of funnel known as a bellmouth.



**Glue up the rings.** The fan housing is made from six rings. Each one has 12 sections butt-joined. That means each end is cut at 15°.



**Spin and rout.** Attach a piece of thin plywood to the back of the ring and drill a small hole in the center. Register the hole on a metal rod set in a wood block to rout the inside round.

**Rough-shape the curve.** Use the same setup to cut steps on the inside of each ring and an outside rabbet on the top ring (shown). This reduces the waste you'll need to grind away.

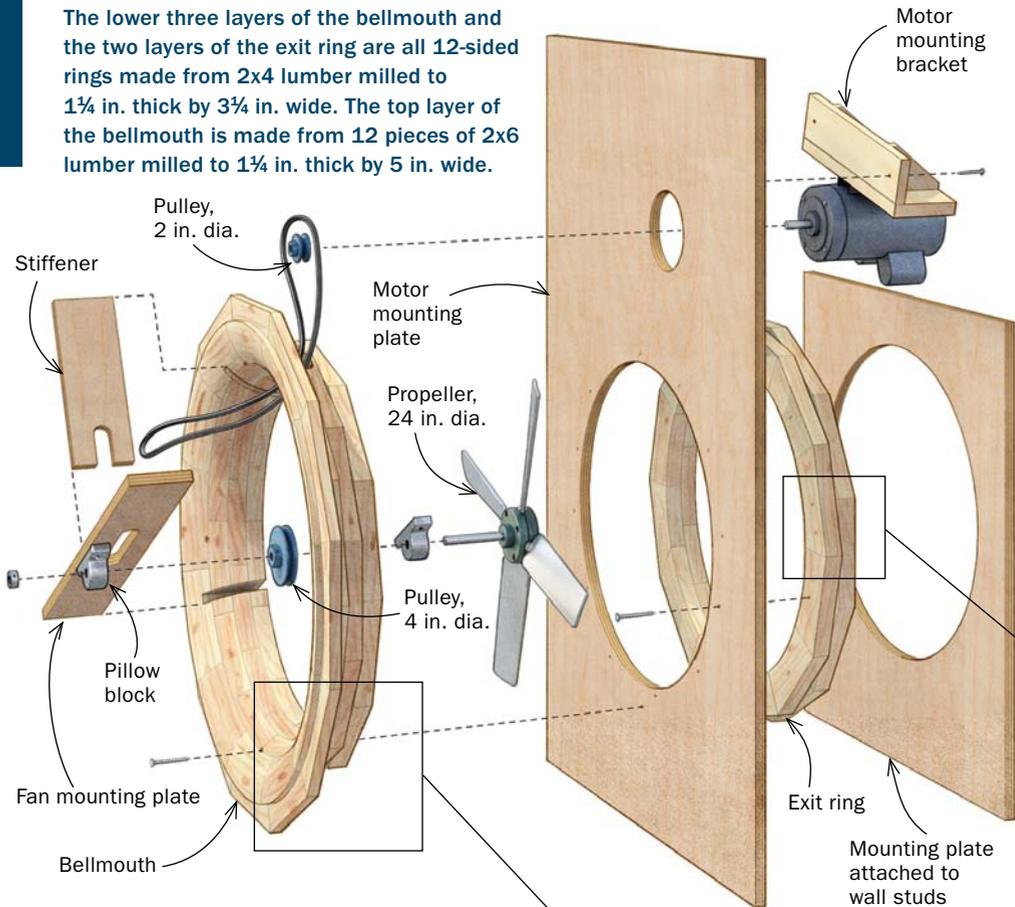


**Smooth the curve.** After gluing the rings together, shape the steps into a flowing bellmouth curve using an angle grinder. By attaching the pivot point to the end of a bench, it can be spun as the work progresses.



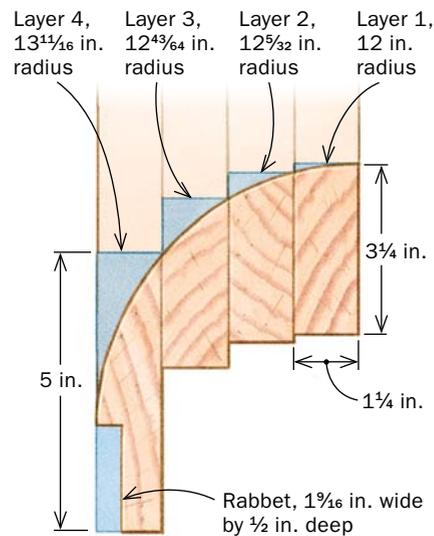
## BELLMOUTH AND FAN ASSEMBLY

The lower three layers of the bellmouth and the two layers of the exit ring are all 12-sided rings made from 2x4 lumber milled to 1½ in. thick by 3¾ in. wide. The top layer of the bellmouth is made from 12 pieces of 2x6 lumber milled to 1¾ in. thick by 5 in. wide.



### CROSS-SECTION OF THE BELLMOUTH

Each ring of the bellmouth is roughed out on the router table using a ½-in. straight bit. Multiple steps cut into the rings every ¼ in. or so reduce the work required to smooth the contours later. After you stack and glue the rings, fair the steps to a smooth curve using a grinder or rasp.

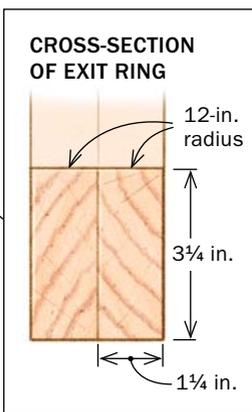


# Add the fan

A mounting plate holds the fan in the center of the bellmouth.



**Find the center line.** The first step in attaching the fan-mounting plate is to find the center line of the bellmouth (left). Use a template to mark the sides of the two mortises for the mounting plate (above). You need to offset the mortise by the distance from the center of the fan to the bottom of its mounting bushings (see **Attach the fan**, below).



chose, combined with a 3/4-hp motor, has far more power than even the largest whole-house fans.

Air doesn't flow smoothly around sharp corners, so I created a funnel-shaped opening known as a bellmouth to hold the fan. Using remilled, dry construction lumber, I made two 12-sided rings for the exit ring and four for the bellmouth. Because the rings get progressively larger, the segment length is different for each ring. The largest ring is made using 2x6 lumber but the rest use 2x4 lumber.

Since I lack a lathe that can handle 30-in.-dia. turnings, I mounted each ring on a sheet of scrap plywood with a center pivot hole and spun it on the router table to turn the narrowest part of the ring from faceted to round. I used a straight bit, adjusting it to cut reference notches at several points through the thickness of each ring. The notches make it easy to know how much material to remove when smoothing the bellmouth after all the rings are glued together.

Glue up the exit ring and the bellmouth one layer at a time, offsetting the butt joints. Once it's dry, fair the bellmouth. I used an angle grinder but you could use a rasp. Leave final smoothing of the exit ring that will be adjacent to the fan blades until after a dry-fit because the tip clearance should be less than about 1/8 in. for maximum efficiency.

Carefully cut dados in the bellmouth for the jack-



**Cut the mortises.** Use a handsaw to define the mortise's sides, then drill out the waste with a Forstner bit and clean up with a chisel.



**Attach the fan.** With the fan-mounting plate and its stiffener in their mortises, place the fan's jack bushings on the plate so the fan is centered in the opening, and mark the location.



**Belt hole.** Drill an elongated hole in the bellmouth for the fan belt to pass through.

## SOURCES OF SUPPLY

### GRAINGER.COM

3/4 hp motor. Guzynski used one from an old contractor saw, but you can buy one for \$300 (No. 5K117) or a totally enclosed fan-cooled one for \$370 (No. 6K123).

24-in. fan, No. 3GTG4, \$130

30-in.-wide roll of filter media, No. 6B835, \$64

### ROBOTMARKETPLACE.COM

5/8-in.-dia. keyed jackshaft (SH-x-1000 VW)

Pair of 5-in.-bore SBPP pillow block bearings (No. MB-SBPP202-10); 2-in.-dia. and 4-in.-dia. A-series pulleys with 5/8-in. bore. Guzynski needed a 2:1 ratio because the motor is 3,450 rpm and the propeller is 1,725 rpm.

A-series belt, No. VB-A62

Lumber, drywall, screws, lighting, about \$350

Abrasives for angle grinder: Weiler 36 grit (No. 30828) and 80 grit (No. 30832)

# Finish assembling the fan

It is easier to do this on the floor of your shop than on the wall of the booth.



**Set it on the floor.** Place the mounting plate on the floor followed by the exit ring, the motor-mounting plate, and the bellmouth.

shaft mounting plate and stiffener. Attach the fan and cut the belt-access hole in the bellmouth so that it is roughly in line with the pulley.

Screw the exit ring to the mounting plate that you'll later screw to the wall. Then screw the motor-mounting plate to the exit ring, and the bellmouth to the plate. Check the clearance of the fan blades and, if necessary, adjust the opening size or fan placement. Now stretch the belt tight and mark on the motor-mounting plate the location of the motor's pulley. From there, cut a circle for the front of the motor and attach a stand to the back side of the motor-mounting plate to support the motor.

## Build the rest of the booth

My fan is 24 in. dia. and my wall framing is 16 in. on center, so I carefully laid out the location so that I would only have to cut one stud. The fan can be up to 8 in. off center in the booth if necessary. Since the exhaust flap is in a gable end, I didn't add a header because the studs are not bearing the weight of the roof.

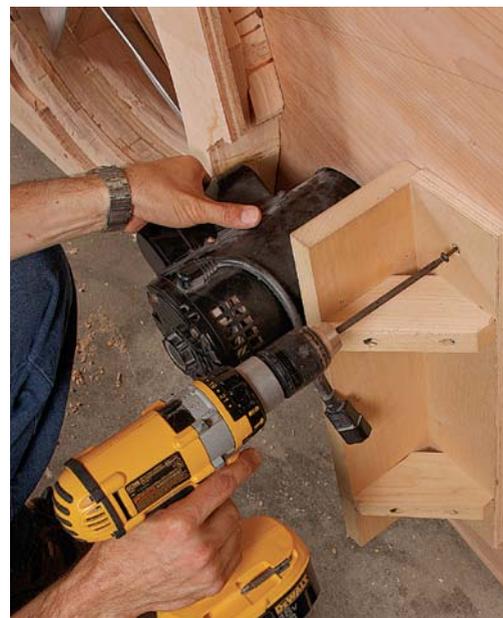
Attach the fan unit to the wall in stages. Next is the plenum, the area that forms a kind of lean-to at the back between the fan and the filters. To build the back wall of the plenum around the fan, I fastened a 2x4 bottom plate to the floor, 1/2 in. behind a



**Check for clearance.** For maximum power, you want the fan blades to be no farther than 1/8 in. from the sides of the exit ring. Now screw down the jack bushings.



**Locate the motor.** Pull the fan belt tight and draw the curve on the motor-mounting plate. This is the rough location of the motor pulley and hence the motor.



**Mount the motor.** Drill a hole in the motor-mounting plate a little larger than the diameter of the motor. Attach the motor to its stand, pull the motor until the belt is tight, and screw the stand to the back of the motor-mounting plate.

# Assemble the booth

It is easiest to work from the back forward.



**Ring the exit.** Attach the mounting plate with the exit ring to the 2x4 studs that surround the exhaust air opening.



**Add the motor.** Screw the motor-mounting plate to the exit ring. The front of the motor and its pulley protrude through the plate.



**On goes the fan.** Attach the bell-mouth and fan to the motor-mounting plate with long screws.



**Add the sheathing.** Sheets of 1/2-in.-thick OSB form the back of the plenum.



**Finally the filters.** Filter material (to catch the overspray) is attached to two frames that stack one on top of the other in front of the fan.

plumb line from the face of the bellmouth, then completed the frame and covered it with 1/2-in.-thick oriented strand board (OSB). Use screws so the assembly can be removed easily for fan maintenance. Then screw the angled side and top walls of the plenum to the front. Put foam gasketing where you might have air leakage.

**Filter media, lights, action**—The side walls and ceiling are simple partition walls, framed 24 in. on center to save lumber. The two filter media frames stack on one another and are screwed in place so they'll be easy to change.

I made an insulated, hinged exit door for the outside of the building that I prop open when I'm ready to spray. I added a screen to keep fingers out of the fan and a flap to prevent wind from blowing in through the exit door when

the fan is off, and blowing dry overspray off the filters onto the workpiece.

The booth pulls a constant flow of air past the project between 1 and 2 ft. per second, so overspray has almost no chance to roughen a finish. In warm, dry weather, I leave the garage door and the exhaust door open when I'm spraying. When it's 50°F or less, I open the doors, spray for a few minutes, then close them most of the way and let the furnace reheat the shop.

With the generous lighting, I can see defects and judge coating thickness much more reliably now. Add the ability to finish year-round, and you can understand why the booth is so valuable. □

## Online Extra

To read and learn more about spraying solvents, risk versus reality, go to [FineWoodworking.com/extras](http://FineWoodworking.com/extras).

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