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Piel

Out

THE LONG ROAD
TO AN EMERAUDE

N905RS

SUMMER BREEZE

M-SQUARED'S LSA

DESKTOP MANUFACTURING

3-D PRINTING FOR HOMEBUILDERS

A high-angle aerial photograph of a Super Emeraude aircraft in flight. The aircraft is white with prominent red and yellow-orange stripes on its wings and tail. The registration 'N905RS' is visible on the side of the fuselage. Below the aircraft, a dense forest is covered in trees with vibrant autumn foliage in shades of red, orange, and yellow. In the upper left, a small farmstead with several buildings and a dirt road is visible. The overall scene is bright and clear, suggesting a sunny day.

IN DUE TIME

With patience and determination,
a Super Emeraude finally spreads its wings

BY GREG LASLO



FOR RICHARD SEMAN THE most challenging part of building his airplane was answering a simple question: *When's that thing going to fly?*

Never mind that time flies when you're having fun. Or that patience is a virtue. Or even that good things come to those who wait. In this world, the fledgling bird eventually needs to leave the nest.

No one knew that better than him. What he figured would be a five- or six-year project turned into a 15-year odyssey—a long, wandering journey of fitting a wood-construction Piel Super Emeraude into his life and his workspace—where the younger man in the pages of his builder's log is sometimes hard to recognize.

But he's quick to point out he's not an aircraft mechanic—or even a car guy—and certainly not an engineer. “I’m just a regular guy who was able to build his own airplane,” he said.

That means he had to do it through fits and starts, among distractions, and around delays. But along the way—and in return for his diligence—he found a way to get back into flying again and create an airplane that suited both his style and his ability: a low-and-slow cruiser that built on his foundation of woodworking skills and allowed him to grow new ones as the need arose.

In the end, he found that his most valuable skill was just an attitude for overcoming adversity. And with that, getting his airplane out of the workshop and into the air was simply a matter of time.

MODEL BUILDING

His journey started in 1989, when Richard made his first trip to Oshkosh for convention. “If you come up here, you can get really amped about building your own airplane,” he said. As it happened, a Piel Emeraude caught his eye while he walked the flightline with his son, Owen. “When I found out it was a wooden airplane, I said, ‘Hey, I think I can do that—that’s just a big model airplane.’”

Turns out, it was an airplane with an interesting heritage. Claude Piel designed the prototype CP30 in 1953, outfitting the original with a 65-hp engine. Built in Europe as both a homebuilt and a production aircraft, the design grew to incorporate a beefier spar, plywood covering, and more horsepower to become the CAP 10 aerobatic trainer, two of which were flown by the late French Connection air show team.

For the time being, though, Richard had to tuck the notion away in the back of his mind and get on with grown-up things. Indeed, his only practical experience in aviation until then was copiloting a 1944 Aeronca Defender that he'd owned in the 1960s with a partner. He'd balked then at paying \$20 an hour for a Cessna 150, and he had given up flying, started a marketing and design business, married his wife, Lorry, and raised Owen and his daughter, Amy.

But when he turned 50—seven years after that first sighting—he revisited the notion and decided it was time to get started. “So there I was, no pilot's license, no building experience, not much money, but just crazy enough to think I might pull it off,” he said.

What he did have was woodworking experience—particularly building cedar-strip canoes that he'd paddled throughout the Boundary Waters in Minnesota and the Quetico Provincial Park in Ontario. And he had a strategy. He'd make a piece each night or two, put it aside, and start on the next, trying to work on it daily and as many hours as he could each weekend—responsibilities permitting. “You really have to have the passion for building,” he said. “If it's



PHOTOGRAPHY COURTESY OF RICHARD SEMAN

not play, you can't do it. You can't look at it as work or you'll never get it done."

That's why, whenever a friend would visit the project and wonder how he'd get everything done—particularly the wings—in his single-car garage, he'd respond, "That'll be a nice problem to have." He figured, *when I've got one step done, I'll figure out a way to do the next part*. That, to him, meant progress, and it set the tone for his project.

The first step was the empennage. "You put it together, and it looks like the back end of an airplane, and you're passionate about moving along," he said.

Yet that enthusiasm was tempered with some early education. On the plus side, he was immediately relieved to find wood to be a more forgiving material compared to, say, metal—he would ultimately make almost every metal part at least twice before getting it right. "You can make mistakes with wood, and it's easy to repair them," he said. "If you're not happy with something you did with the wood, you can modify it."

On the minus side, because he was using plans, he'd assumed more complexity; most drawings, the Emeraude especially, aren't as well-notated or easy to understand as a quality kit. And with the French airplane, he had an additional learning curve: the drawings used metric measurements instead of English units. But he quickly grew to appreciate that. "Learning to work in metric is wonderful," he said. Everything is on a scale of 10, so there are no 1/64 or 1/32 measurements to figure.

But the project also had to be as thrifty as possible; he would be putting those kids through college, after all. One of the few extravagances he allowed himself came out of bare necessity; no kidding, he didn't have room in his shop for both an airplane and a table saw. "So I ordered a spruce kit from a guy in Calgary," he said. "He cut all the wood and labeled it—here are all your cap strips, your longerons. That was really helpful."

STEP BY STEP

With the tail feathered, he could start on the fuselage and wings. Each step served as building blocks of learning toward what it takes to make an airplane. "It's like eating an elephant: You do it one bite at a time," he said.

The fuselage required lofting the plans onto a long piece of brown wrapping paper on his worktable. He drew each measurement out until he had landmarks to build matching sides of the airplane. Then he aligned those and inserted diagonals and cross-bracings, and with a lot of plumb bobs to ensure everything was square, he built the fuselage truss.

Of course, he was using 8-foot wood pieces, and forming full-length longerons required scarf-joining short pieces together to make longer ones. He'd cut the ends of the strips at a sharp angle—a ratio of about 12 to 1, run to rise—and glue them together under compression. "I have quite a C-clamp collection," he said.

He'd use the same technique on the wing spar, but first he had to build the ribs for the airplane's elliptical wing. Indeed, some prospective builders see that wing as a knock on the design, he said: Nearly every rib requires a separate jig.

Not to worry. "I had full-size rib plans with the plans, so I just put wax paper down on top of them and built [the ribs] like you do a



Door cutout saved for forming acrylic glazing



Cedar strip canopy fabrication

model airplane," he said. "It took me a month of part-time work in the evenings to build all the ribs; if they were all the same size, like a Hershey-bar wing, I could have done that in two weeks. But two weeks is meaningless in a 15-year project."

At the advice of other builders, he also explored changing the wings' angle of incidence. The plans indicate they tilt up 4.5 degrees, but owners who built "Super Emeraudes"—with engines of 100 hp and larger—said that makes the airplane prone to climb and requires considerable nose-down trim.

Knowing his limitations, he asked engineers and even EAA's Tony Bingelis, who'd built two of the design. Tony wrote back that he'd suggest a 2-degree angle. Richard appreciated the advice; the airplane flew hands-off on its first flight. Of course, he also cherishes that letter.

KEEPING AT IT

Staying motivated on long builds

The deal was simple: Richard Seman could build his Super Emeraude, but his wife, Lorry, said he couldn't fly it until their kids, Amy and Owen, were out of college. "I knew what I was getting into when I started it," he said. "Well, I sort of did."

Indeed, he figured he'd signed up for a five- or six-year project. Little did he know it'd take three times as long to finally finish, and by that time, the kids were out of grad school.

Not that he's complaining; you can't lose your family life over an airplane—and you've got to be able to make tuition payments. Still, the hardest part was answering the question of when he'd finally be finished, and he followed the advice of another member of Chapter 45 who said to tell people he's "flying it on Tuesday"—just don't tell them *which* Tuesday.

The secret, he said, is to assume the attitude at the beginning that the project is play; if you think it's work, it's work, and you're going to dread it. Instead, he enjoyed shop time as much as flying. As a Pittsburgh native, he remembered spending a Super Bowl Sunday in the garage building fuel tanks while Owen and friends watched the Steelers in the house; in spite of the cheering upstairs, he bets he was having more fun.

And it helped to share that passion with other builders. The old-timers at his chapter played an invaluable role, as did those members of the Emerauder Yahoo group. Not only did they all share advice, but they also kept him focused as they provided advice that helped him move forward.

He also appreciated what he couldn't do, in particular metal work. Fortunately, he had an EAA chapter member who could finish-weld the parts he'd fabricate in his garage. "You do have to have resources to help you with the things you aren't familiar with," he said.

In the end, he said, he's just a regular guy who managed to build an airplane. He did the best he could and found help when he needed it. Ultimately, he said, the most important skills are just sticking to it until there's nothing left to do and knowing that success comes from learning from failures.

Put another way, he summons Henry Ford: "Whether you think you can or you can't, you're right."





But that's getting ahead of things. He still had to build the box spar and, in fact, solve that "nice problem to have" that he always anticipated. His solution was to rent an old storefront near his home that had space for a 30-foot-long table and a wooden floor that allowed him to secure fixtures with screws. "I actually got a heck of a lot of work done in that rented space," he said. "I was paying rent, so I was down there every night and got it done."

Again, he lofted the dimensions of the 26.5-foot box spar onto the tabletop, attached blocks to shape the wing's dihedral, and laminated five 10 mm pieces of plywood to create the beefy center section, staggering the scarf joints with each layer and using West System epoxy for bonding. From there, he tapered the spar down to four, then three layers of about 20 mm thick at the ends.

With the spar done, he could assemble the wings, and he did that vertically. The wing has a slight washout, so each rib is

canted at a slightly different angle. "You just slip the ribs on, and that washout comes out to be perfect," he said. "You do have to do a little bit of sanding here and there." It's not difficult, he said, but it is tedious clamping, measuring, and squaring each one.

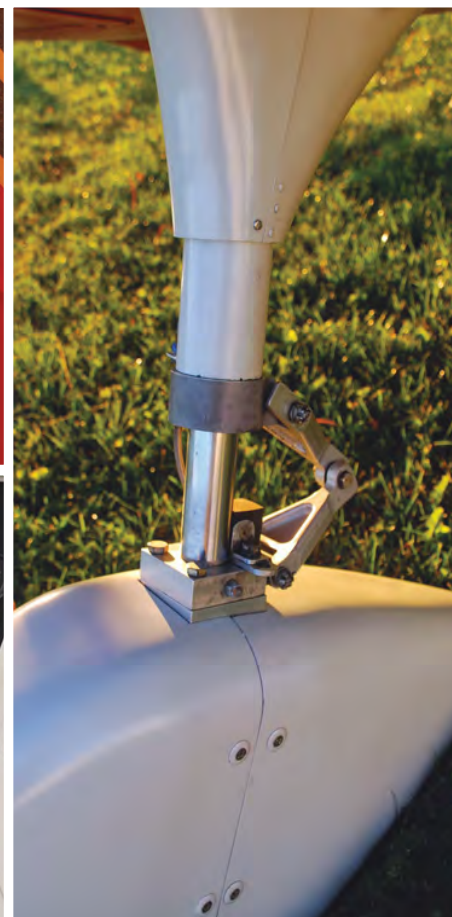
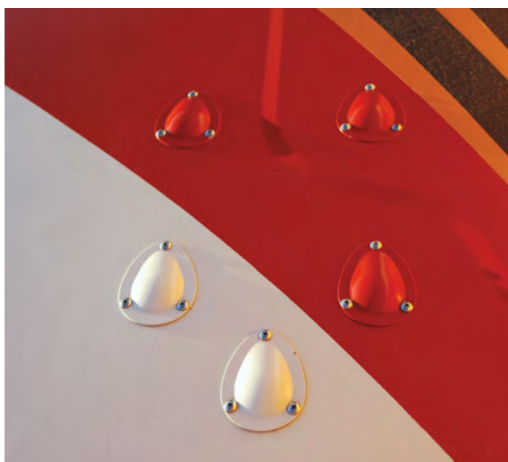
Next he covered the wings' leading edges with plywood. That layer thins from 2.5 mm at the wing root, to 2.0 mm, then 1.5 mm at the tips, which allows the wing to flex under in-flight loads. But while the first section covers the innermost three ribs, the remaining pieces are fit between ribs, each scarf-jointed into place—and on both the top and bottom of the wing. Then he could finally build the ailerons. Because of the wings' washout, their trailing edge has a taper, so they're made in position on the wing. Armed with full-size drawings for the aileron ribs, Richard carefully angled each vertical component so the surface carved a nice line once the laminated spruce trailing edge was attached.

GROWING CLOSER

With the airframe constructed, he would assemble the Emeraude in the 25-by-25-foot "deluxe man cave" he'd erected in his backyard (to Lorry's specifications). Yet as he finally approached the home stretch, he'd have to master new skills that allowed him to finish the project.

That started with the canopy, which he chose to fabricate instead of buying—a \$1,200 proposition, not including shipping. Still, by the time he finished, he figured he would have saved money with the store-bought option. "I did swear a lot," he said. "But I've got a neat airplane now with gull-wing doors. I'll never have a Mercedes 300 SL, but I've got an airplane that looks like one."

He built the form for the canopy using a familiar cedar-strip canoe technique. He strung 1/4-inch by 3/4-inch strips laid side to side from the windscreen bow to the turtledeck, completely enclosing the cockpit. He covered top and bottom with fiberglass





cloth and epoxy to create a reinforced shell, and then cut out the windows and doors.

Once he had the airplane at the airport, his chapter had an oven big enough to heat 4-by-7-foot sheets of acrylic to 350 degrees, so he covered the mold with a wool blanket while four friends stretched the hot plastic over it. Not surprisingly, this took several attempts to get right. But once he did, he repeated the process with the door molds, and then built up those door frames with laminated sassafras strips.

While that was more or less right in his wheelhouse, given his canoe experience, attaching the gear required help from experts—in this case, his brother and nephew, who owned a fabrication company. The gear legs are repurposed oleo-pneumatic nose gear off an Aero Commander, which he purchased from his wood source for \$500; conveniently, they fit the gear-attachment bracket from the plans almost perfectly. Almost. And that didn't save him many headaches. He had to machine and shim the gear legs to stay

perpendicular to the ground; because of the wing dihedral, they naturally want to point outward. He also had to adapt his Matco brakes so they fit the gear forks. He even wondered whether he should have used the spring gear included in the plans—until he flew the airplane. “It’s like having Velcro on the tires,” he said. “It’s so forgiving.”

Fortunately, installing an engine wasn’t so complicated. In fact, the powerplant was his other splurge, and it came as a happy accident—at least for him. The O-235 Lycoming originally powered a Grumman Yankee. Hit by a Bonanza at its long-term tie-down spot, the airplane caught fire when its tubular aluminum wing-spar fuel cell ruptured. But the firewall did its job in reverse, and he acquired the complete firewall forward assembly, including all accessories, exhaust, and electrics.

Admittedly not a “gear head,” he chose to use the whole package for simplicity’s sake. That said, he had the sedentary engine’s pitted cam replaced, new jugs added, and a Sky-Tec starter installed—all part of a “major repair,” he said. Now, he said, it’s almost a brand-new engine. And while he would eventually like to carve a wood propeller, he chose to pair the Lycoming with a metal McCauley climb prop, which gives him 1,000 fpm climb-outs with two people on board, cruise of about 110 mph at 2250 rpm, and fuel burn at about 5.5 gph. His stall speed indicated is around 45 mph, clean or dirty, thanks to an ingenious trim tab on his elevator that moves with each addition of flaps, so he barely has to fiddle with the trim wheel.

Finally, after covering the airplane with the Poly-Fiber process, forming the cowlings, wing roots, and wheelpants with blue foam, extending the panel about four inches to accept deeper-than-1950s gyro instruments, and painting the airplane in a plastic-sheet “paint tunnel” he’d erected in the workshop—complete with fresh-air breathing system—he was finished. He trucked the Emeraude to Rostraver Airport on a chapter member’s trailer and stored it in another’s hangar. “You really establish some nice relationships with EAA people who are very helpful,” he said.

On December 11, 2011, the Emeraude passed its inspection, and Richard became a test pilot. He’d earned his private certificate—in a Cessna 150, of all things—seven years before, and he’d kept current in a club that owned an Aeronca Champ. He’d also flown 4.5 hours in other Emeraudes, so he knew what to wish for on his first flight.

“I was nervous as hell until I got it 50 feet off the ground,” he said. Then he found it flew just like the others. With assistants reading him his first-flight test card from the ground, he was free to fly—even hands-free. “It is a sweet-flying airplane,” he said. “It’s awesome.”

All told, he put about 6,000 hours into the build, and he invested a nice Cessna 140’s worth of coin into it. But it’s been worth the wait. “After going through all that work, I am 100 percent happy with what I have,” he said. “I don’t wish I had built something else.”

He’s flown more than 225 hours in the airplane, from Trenton, New Jersey, to Oshkosh, but mostly to pay back favors and win new fans to the wooden design. “I’m just having a heck of a good time,” he said. “I’ve got a heck of a lot of buddies out of this.”

In that sense, his patience and persistence paid off. And as for the fun, it turns out he now has a new way to spend his time. *EAA*

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