

BUILDING AN



PAMELA KELLEY

Sometimes I think back to the days when we were building our Lancair Super ES and wonder how we found the time to build an airplane. Some mornings I wake up, open the bedroom curtains, and still expect to see the vertical stabilizer just outside our window. The luxury of coming home and actually being able to pull the car into the garage is something we're still relishing.

It's been two years since our first flight in our ES. My husband, Lon, was in the left seat, Wayne Williams (an ES pilot from El Dorado, Texas) was in the right, and I was in the back. The weather was crummy on January 12, 1998, cool, but not cold, low ceiling but flyable, and a Monday, of all days.

It was a thrilling ride, filled with the sound of the IO-550 roaring down Andrau Airpark's Runway 15, acceleration that didn't stop as we lifted off the ground, the rush of air through the four fresh air nozzles, the flash of strobes, and tears in my eyes. How did we do it? How did we find the time? How did we ever face up to the expenditures? How did Lon know this was the plane for us?

We make periodic pilgrimages to the Northwest for vacation, for the region's clear summer skies, mountains to hike, family to visit, and because the area is a Mecca for homebuilts. I was just getting used to the idea that we might be in the market for a homebuilt kit when we toured the Lancair facility in Redmond for the first time. We owned a 1968 Mooney with two other couples and had a stable flying base. Lon and his partners took care of the

**Ever wonder
how building an
airplane might
fit into your
family's life?
Here's a real-life
story about
building an
airplane . . .
from the right
seat occupant's
perspective.**

plane—one was an A&P, so annuals were no problem. The wives traded off keeping the books and paying the bills.

It was an ideal situation, but things change. The first was the plane itself. When it was 90° F or better, the Mooney struggled over Carbon County, Utah, and some of the headwinds around Albuquerque really slowed us down. One partner was thinking of buying a house in the country, and the other was dreaming about a homebuilt of his own. Then, in anticipation of family guests for our youngest daughter's wedding, our partners helped us build a roof over an "enlarged patio" behind our home.

The stage was set.

After some really serious discussions that involved money, time, and curtailing our outside activities, we were thinking seriously building an airplane.

Lon deserves a lot of credit. He didn't hurry the decision, nor was this going to be his project. If we were going to build a plane, it would be because it was something we both were committed to. We had enough money to get started, and we knew that we'd still be working our jobs. But one by one we disengaged from other activities, telling our friends that we'd be building an airplane and would be busy for a couple of years. It was hard at first, but that announcement gave us an immediate cheering section.

Why the Lancair ES? It appeared to be a good four-place airplane—room for another couple and baggage. We enjoy exploring the West, and the ES would give us a great traveling plane. With its bigger engine, we'd have more power and speed.

We ordered the tail kit, and it arrived in November 1994. We'd cleaned the garage and built the cradle for the horizontal stabilizer. I had the financial spreadsheets blocked in on the computer so we could build our airplane expenditures into the budget. Then I decided that this project warranted something special. I'd keep a photojournal of our progress. We'd take pictures for the FAA, and I'd keep a record of the building process. I'd note the hours we spent working, the construction progress, try to capture a "quote of the day," include any visitors, and record the weather.

AIRPLANE

A VIEW FROM THE RIGHT SEAT

We had gorgeous weather that fall. Working all Christmas break, our neighbors heard the air compressor running frequently. Really intrigued by what we were doing, our family and friends dropped in.

The epoxy pump doled out the correct ratio of hardener. On a 4-by-8-foot table (plywood sheet on saw horses) I unrolled the yards of fiberglass, measured 20-inch wide diagonal strips on the bias, and cut them out with my good sewing scissors. This was a priority project, right? I spared nothing. My quilter's roller cutter turned out to be perfect for cutting the BID (bi-directional cloth) sandwiches of fiberglass, epoxy, and the one mil plastic sheeting.

I stored the cutter in a mayonnaise jar with solvent until the plastic handle got gooey. Lon made an aluminum handle and I was back in business. A wallpaper seam roller took out the air bubbles. I wore a hardware store apron with a B-17 patch sewn on for luck; I had cotton glove liners and vinyl gloves, safety glasses for splash protection, and old clothes. I was enjoying the few skills that I could bring to the table.

The first of three 3-inch thick instruction manuals covered the tail and wings kit, so I started my first photojournal "Tail and Wings." We were airplane builders, the garage was our weekend workshop, the soup was simmering in the kitchen; we had begun.

By construction day 25, it was June. We closed out the horizontal stabilizer and made the elevators. The wing kit arrived, and we repeated the procedures on a grander scale—and on the patio, not in the garage.

The ES wing and spar extension measures 17 feet. It stretched diagonally across the patio from laundry

room's outside door. Because there was no chance of moving this assembly after we started, we decided to be safe rather than sorry. We replaced our old washer, and it arrived with a matching dryer. The airplane was clearly a priority now!

Photojournal Log: June 17-18, 1995 —Days 27-28

"Drilled and cleaned out the fuel probe holes and microed the plastic guides into place. Spend the rest of the weekend finishing off the rib micro fit and cap strips and then applying the 3 BID reinforcement. There was a lot of area to cover and I used the 20-by-20-inch pieces of fiberglass I'd cut quickly. I'll need to order 25 yards more on Monday. We started planning for next week. No guests this weekend, but the girls all called in to wish Lon a Happy Father's Day.

"Quote of the Day: Lon—I need to get out and do some approaches with Dave."

By this point we knew we'd taken on a big project. On our annual trip out West to visit family, we checked in at the Lancair factory in Redmond and got a needed boost. The finished planes looked beautiful! We toured their "custom panel" workroom. Seeing all those beautiful instruments and



Top - Pam tries out the specially contoured seats

Middle - Sanding flush the interior in preparation for the ensolite and headliner.

Bottom - All decked up for painting.

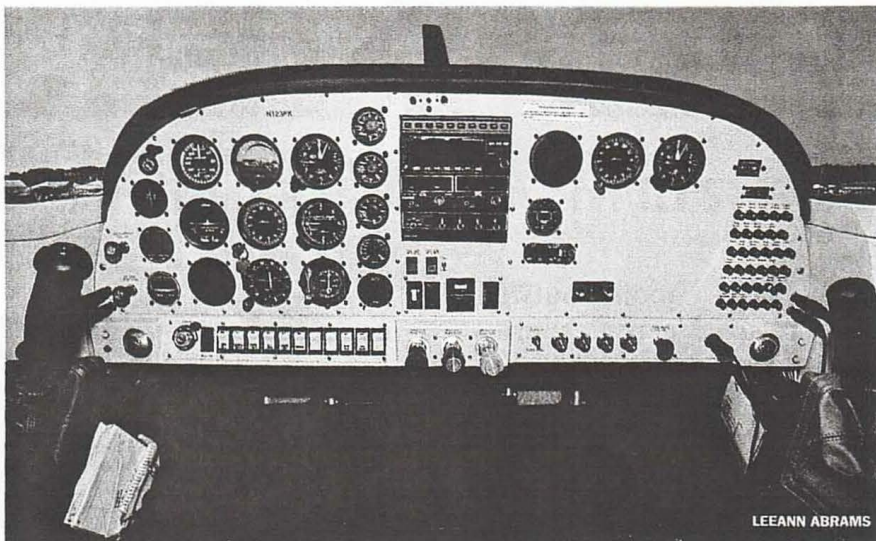
finished airplanes inspired us. We hiked in the Cascades and flew home in the Mooney, ready to get back to building.

By August we were closing out the left wing, and coating the gas tanks was the next big step. They had to be very clean, and the measurements for the bottom skin had to match the chambers of the tanks we'd made. We went over the measurements repeatedly. And it was hot. The first batch of epoxy coating exothermed in our pots before we could apply it. Using smaller amounts and an ice water bath for the reserve, we painted our tanks. They looked like gray porcelain sinks when we were done.

"Quote of the Day: Pam—Houston, we have gas tanks!"

Keeping the photojournals got me through the weekends that seemed to show little progress for our constant work. Some weekends I'd check off instructions and it would seem like we were really making progress. Other times it wasn't until I sat down at the computer and recorded what we'd accomplished that weekend that I felt some achievement.

There were bills to pay and record on the spreadsheets, and parts to order. We'd purchased a starter kit, but we needed other supplies and equipment—primer and painting tools for one. The lead shot for the wing close out had the folks at Carter's Country (ammo supply) thinking I was something of an Annie Oakley when I'd stop on the way home from work to buy eight 25-pound shot bags at a pop. I opened an account at Aircraft Spruce; if I faxed our order in on Monday, we'd have our materials by the weekend. By now we could see some real progress, and we ordered



Designed on a door, balanced on saw horses in their kitchen, Lon rearranged instruments until the final pattern was determined.

the fuselage kit from Lancair.

By Thanksgiving 1995—after 565 dual hours—we'd finished the wings and tail and stored them in our garage. I started a new chapter in our photojournal—"Fuselage."

As Lon backed the trailer up the driveway, I was impressed with the fuselage crate's size—two and a half sheets of plywood long! Where would we put all of this? We were so excited we opened the crate and the boxes just kept coming.

As I look at the pictures we took that night, it was our Christmas! Lon posed under the fuselage shell and looked through the "windshield." Surrounded by plastic bags full of parts and bolts and washers I held the main gear tires in my picture. Both of us were grinning like a couple of kids. By the time we finished accounting for and storing all the parts the house had shrunk. It was a parts warehouse; I only hoped I could find it all as we needed it.

We tore down the crate and used it to build the fuselage cradles. Separating the two wing tables and placing one of each side of the fuselage, we shimmed them to the right wing-support height. Out rolled the wing. Our "plane," as we now knew it, a fuselage and wings, just fit our workspace. The left wing without its wingtip ended at the laundry room door. The right wing reached clear

across the driveway in front of the garage door. We built an extension on the front of the garage to keep the rain off. Our neighbors cheered us on, which was a good thing; it was also a peculiar sight from the street.

Work progressed through the winter. A few times we had to figure the temperature into our plans and then we used heat lamps to hurry the epoxy. The ES

was on the cover of *AOPA Pilot* magazine that January with the headline "No assembly required." Lancair had announced plans to build a certificated version of the ES. That in time we could have purchased factory built ES never phased us. We were into building!

By February we were fitting the wing fairings to the fuselage. Our ES looked like a flying boat and we were getting plenty of exercise. Half the time Lon was on his back fitting the lower fairings or we were putting the flaps on or off, pulling the wings out or pushing them in. My sneakers were wearing out faster on the tops than the bottoms.

By April 1996, we were on our 94th day, carving away fuselage skin with the grinder to make way for the gear legs. The wings were back in the garage, and we modified the cradle so we could raise the fuselage and set up the gear. The checklist was moving along. We invited our flying club for a look-see and hamburgers. When people say they accomplish things with their friends' help, I know what they mean! Hearing all those "wows" and "you did this" was music to our ears!

Photojournal Log: July 4-7, 1996—Days 114-117

"It's Saturday night and Lon and I have been building our airplane

nonstop. Tonight we went out for dinner to give ourselves a treat for all the sweat in the past three days. With no sign of rain and a relentless sun beating down, we are building the vertical stabilizer under the back deck with two fans blowing on our heads! 96 degrees is pretty hot.

"We've had fun putting the vertical part of the tail together. The right side of the stabilizer went up first, got hysoled onto the fuselage, and became the backbone for the ribs and webs. The NACA scoop went on next and we will have cabin air—Lancair promises! Next we spread the comm antenna carefully vertical straight up the stabilizer and floxed it in place (to get the best reception.) Lon attached the cable and we took a picture for the book.

"I constructed the plenum chamber by myself. The NACA scoop is a new design to me: I would've installed it *backwards* and on the *outside* of the *front* of the plane. Instead it's a cut-out opening in the back of the plane with a 2.5-inch diameter hose transporting the air to the cabin via the cabin air duct. It'll pour fresh air over the front and back seat passengers. This idea better work, I'm going to need some cool air."

That summer we left Houston on an upbeat note and never appreciated our mountain hikes more. By August we were installing the windows, and by the end of September the fuselage was one piece, no longer a boat with a lid. Our project "out back" was clearly an airplane. More plastic sheeting and more priming and finishing work followed. In November, with a friend's engine crane—it's nice to have friends with engine cranes—we bolted on our Continental IO-550.

Don't ask me how we actually moved it to the engine mounts, but we used pulleys, ropes, and lots of guts! For days afterward I thought—how often does a wife hang a \$29,700 engine off the front of a fuselage with her husband, in the backyard no less?

The next day I called our insurance man to see about insuring our static display. We needed coverage.

I started the photojournal's next chapter: Engine and Systems. We now had 1,164 dual hours on the project and it was our 158th day. We started climbing the airplane interior learning curve. I spent a good part of the time inside the plane leveling the fuselage's irregular surface. All the perimeters of the windows, doors, and armrests needed building up first with BID, and then cork to provide a smooth sanded surface for the headliner and window frames.

AeroPlus, a Houston aircraft interiors shop, was recommended to us. We spent a Saturday there choosing the interior materials and had a lesson on how to finish off the fuselage interior and hang a headliner. It was fun, we saw many examples, and the owner, Joe Hernandez was patient.

We watched his team working on new interiors and then came home to our "hangar" and started work. I remember being scrunched up in the baggage compartment and breathing through a facemask as I carefully sanded the cork filler. When I had my headliner pattern ready, I cut the material with extra allowance for the curves. Then Lon and I carefully glued it up.

Someday (maybe) I'll write a book on how to do your airplane's interior. Joe Hernandez taught us so many tricks of the trade. I feel we did a good job, but the last window frame was the most perfect. We'd reached the top of the learning curve. Joe made our leather seats, cut the foam to fit our bottoms, and carved the back seat bench to our design so our passengers would not roll into each other.

Valentine's Day 1997 brought a dozen red roses and a surprise letter from the FAA—our registration number would be N123PK. I felt a rush of happiness followed by tears of joy. For a husband to build an airplane with his wife and expect it to proceed like a job at work is unreal-

istic. It takes the pre-plan, the agreement, the teamwork—and the roses!

There was so much emotion involved with this project. We based all our daily decisions on the ES's construction. But there was always the nagging question: After investing all our time, sweat, and money, would it really be the airplane we wanted? It was a gamble at best, and a trial by fire. Operating under these parameters we certainly got to know each other better. Lon demanded my best and it was hard for me to admit that we'd have to redo some of my work. My ego took some hits, but I kept focusing on getting this plane in the air, sitting in my right seat, and seeing the beautiful West unfold before me as we flew to Oregon.

Lon was working on the panel frame and arranging the instruments. By March, two saw horses held a door for a tabletop in the kitchen. The panel was under construction during the week. We sanded the primer on the fuselage on weekends and finished the interior. By April the ES was on its gear, the interior was nearly finished, and the window frames installed, despite an argument that almost undid me. It must have been the contact adhesive, or maybe it was the slope of the fuselage, but a window frame with an outside curve and an inside curve cannot be made out of a single piece of plastic framing material. It just doesn't lie down into the curves. That was our second big argument.

From March until Memorial Day, our construction hours consisted of sanding, filling, and sanding again, readying for the paint. I have sincere respect for my random orbital sander. I've since learned that some homebuilts remain in "getting ready to paint" limbo for years. We didn't spend years and we might have spent more time, but if we'd dragged this process out over the summer, I might have lost it. I was getting pretty tired of this "pregnancy," and Lon was really missing having



Pam and Lon pose in front of their homebuilt Lancair ES.

an airplane to fly since we had sold the Mooney.

The push now was to transform our patio into a clean, ventilated paint booth. The fellow at the paint store loved our dimensions and eagerly filled our order. We chose Honda "heather mist," and the Honda dealer tried to sell us a companion Accord! We knew composite airplanes need to be painted a light color, but cream or white were not going to do it. We wanted a metallic fleck that would gleam like a P-51 in

the sun and complement Texas' beautiful blue skies. Our blue stripes break into a rolling surf near the cowl and a proud Star of Texas rides the waves. At Sun 'n Fun approach would call us "silver low-wing." HighTech Signs, the same shop that does the logo for the Houston Rockets, laser cut my design, and a picture of our plane is on their bulletin board. It was their first brush with aviation, and they loved to hear the progress report during my lunch-hour visits.

Photojournal Log: June 6-9, 1997 —Days 211-214


"These four days are blurred together into four long days of painting. The weather held—in the high 80s with partial cloud cover. We ended up calling in for an extra vacation day on Monday. We just weren't done."

About the painting saga, that we worked hard will suffice. The fuselage is too big to cover at once. Then there was the second color for the stripes and the detail work. The belly went okay, but we weren't happy with part of the tail and re-did the back half of the plane. We're talking two compressors in tandem to pressure the sprayer, with me mixing the paint, Lon applying two base coats, masking, then the design and two clear coats. We learned a lot about flashing and dribbles. The light was good for some of the "shots" and could have been better for others. In quick summary, one Jurassic bug snuck into our paint booth and it's now permanently preserved between the paint and the clear coat.

In July, we hit the Oregon Trail flying commercial—they lost our luggage! We stopped in Las Vegas on the way home. (Lon kept me going with some fun stuff, too.)

Despite a great vacation, I had some kind of mental deterioration afterward. I was having a hard time

LEANN ABRAMS



getting back to the plane. I flew home for my mom's birthday, then to a nephew's wedding, and then I puttered around the house for a couple of weekends while Lon worked on the panel. I was drifting, and not in the direction of helping get the ES finished. Still, we had some fun with the panel. One night we plugged in our headsets, put the antenna out the window, and monitored Houston Approach from the kitchen.

Labor Day weekend I stripped the interior out of the plane and weighed each piece for the record. We did nut plates for the strobes and wingtips, cracked one of the lenses (and ordered a new set), and installed and wired antennas. I floxed in the ELT bracket; we wired the position light. By Monday night, with 24 work hours added to the record, I ended Day 231 with a good cry. I was pooped.

Days 232 and 233 were another 14 hours of work. It was above 90 degrees with high humidity and no wind. Lon worked relentlessly. We floxed in the boost pump bracket and it cured right up. Then we finished off the front seat footrest.

Our flying friends Will and Jinny came over with a homemade apple pie made with Michigan apples they had just picked and flown home to Houston. Our friends were really encouraging us now. Mooney partners Betty and Dave came to see the plane and took us out to dinner. Will and Jinny gave us a ride to our flying club outing, and we took our albums to show everyone our latest progress.

By Day 238 we were making flight-ready installations, and the instruction manuals were getting lots of check marks. Sunday night I went through all the manuals and at each "flag" noted what we needed to do finish that part. The list ran 31 items, starting with "Grind space in the stern post for the anti-collision light wires and trim tab" and ending with "Brakes—install fittings and secure all lines, make flight ready."

By the end of October it was a little cooler and we were methodically working down the list. As we were installing the cabin door, Lon surprised me with news of a November trip to Paris! End of the "Fuselage" photojournal—620 dual hours, Day 240.

The next photojournal was "Assembly and Flight." The excitement (tension) was building. We installed the panel; it was tight, but it fit. We were connecting things now and going through an enormous amount of wire. I let everything go around the house and my body showed up for work five days a week.

We were getting ready to move the wings and prop to Andrau Airpark. With dollies underneath and the fuselage supported with blocks, we removed the gear and lowered the fuselage and fully installed engine onto two dollies. To get it off our patio we had to roll the nose into the garage and then swing the tail out onto the driveway. The tail just cleared the roof and the horizontal stabilizer just made it past the gutter spout. We were prepared to saw down the corner of the garage if needed!

My emotions were close to the surface as the fuselage rolled down the driveway on December 6, 1997. Lon was directing the move and I felt a few tears rolling down my cheeks. With neighbors helping, we winched the fuselage onto the trailer and tied it down. Before dawn on Sunday morning we drove to the airport with flashing lights and an escort of neighbors to protect the horizontal stabilizer. Our wing tables, wings, and gear were already in the hangar. As we carefully jacked up the fuselage and pulled out the trailer, we bolted on the gear. The guys slid the wings into the fuselage and we bolted them down.

During the next four weeks we put our plane together. Checklist after checklist was detailed; prop, wingtips, rudder, elevators, ailerons, flaps were installed; more wiring and hookups to the panel were

made. We crawled over the ES like ants invited to a picnic. The house had been emptied; the drawers of hardware in the garage were empty. The slings hanging in the garage were empty. With the gear gone we could now vacuum Lon's study. On a chilly Saturday we brought out the front seats and our friends Marie and Greg came for engine start. With a "thumbs up," the prop spun, the engine roared—our bird was alive. We celebrated with hamburgers.

By December 27 we were doing fast taxies, checking for leaks, inspecting all the systems, going over all our lists again and again. Weight and balance measurements were certified. We calibrated the gas tanks two gallons at a time. It took all day, but when we were done, one more instrument was up and running. A FAA inspector came out and gave us our flight limitations. We drilled four little holes in the tail and riveted on our Builders Registration plate: Lonny and Pamela Kelley—we were cleared for flight after 1,873 dual hours—Day 272.

We sent "First Flight" announcements to family and friends with a picture chosen from a "day in the sun photo op" on the field. How could we ever thank our friends who had experienced this with us, our neighbors who had brought over a couple of cold beers on those tired Sunday nights, and our kids who indulged our dream and looked forward to our visits?

After completing flight testing, all we did in 1998 was fly—160 hours in all: Florida twice, Colorado, Cape Cod, and all around Texas. We visited our kids, friends, and my folks. Building this plane has been one of the most rewarding experiences of my life. How many projects can a husband and wife share that result in something as amazing as an airplane? I can see into the wings when we're at altitude. I can imagine the air going across the engine and through the oil cooler. And the plenum chamber works. We have lots of cabin cooling air. ♦