



# Pea Pod Pusher

Dave Powell's Anderson-Greenwood AG-14

BY BUDD DAVISSON

Quite often, one of the driving factors in choosing a sport aircraft is trying to find something just a little “different.” Let’s face it, it’s fun to have people come up to you at the gas pump with the familiar “what is that?” look in their eyes. Dave Powell of Rogers, Arkansas, knows that look well, and even after he tells them his airplane is a 1953 Anderson-Greenwood AG-14, the questioning look doesn’t disappear: The AG-14 is one of those airplanes that’s about as far out on the

edges of aviation history as a flying machine gets, even though it’s not that old. Dave, however, didn’t restore the AG-14 because it was unique. He started the project because his father had worked for Anderson-Greenwood from the mid-1950s on, beginning shortly after the AG-14 era, and he liked the family connection. Plus, it was to be a father/son project.

Dave says, “The first project was just finding an AG-14. Only five were built, but two were supposedly somewhere

in the Houston area, where the company was originally located. It took a little sleuthing, but we finally found them separately owned by two close friends who had plans to restore them together. But they weren’t pretty.

“I talked one of them into selling me serial number five—the last one produced—and then set about trying to find all of it,” he says. “It was totally disassembled and about 75 percent complete and spread throughout bedrooms, his garage, and backyard.



BONNIE KRATZ



AARON LÜRTH

**Dave Powell**

**Powered by a 90-hp Continental driving a special Hartzell pusher propeller, the AG-14 is one of the most recognizable “waaszat?” airplanes in the United States. Far more people have seen a photo of the airplane than have ever seen a real one. There are four remaining AG-14 airplanes.**

It was a real scavenger hunt and most of it had been sitting outside in Houston’s corrosive atmosphere for the entire 30 years.”

Besides having been attacked by the elements for all of those years, the airplane had been abused long before it went derelict.

“The airplane had been flown a surprising amount, over 900 hours, and that was probably because it had a hole hacked in the bottom for a camera, so someone had been using it for aerial photography.

“All of the systems were missing and the instrument panel had been literally cut out and partially replaced with a fiberglass glareshield and new-style shock-mounted instrument panel. Hardly original! The interior was completely gone and the wing skins had been removed. Plus, just about everything we looked at had at least surface corrosion and some parts were far worse

than that. The parts that worried me the most were the spar carry-through extrusion, which had intergranular corrosion, and the damaged “fuselage” skins, all of which were stretched formed at the factory, so they were going to require some compound aluminum forming, which I know nothing about. At the time, I didn’t realize how critical the propeller was, being a super-rare Hartzell ‘Hartzelite’ pusher, or I would have worried about that too.”

When Dave got his rather bedraggled-looking treasure home and seriously evaluated what he had and what he was going to have to do, he realized the center-section spar could be a deal breaker. It was an extrusion that was made specifically for Anderson-Greenwood and, with the AG-14 being a certified airplane, he couldn’t just hog one out of billet on a CNC machine and call it a day. The feds wouldn’t let him.

“What made this project possible

and saved me an enormous amount of work, not to mention even more money, was that two different companies tried to revive the design in the ‘50s and ‘60s. I started tracking down the parts that had reportedly been built by those companies, which had been led by Ray Hubert in California. He had planned on putting the airplane back into production in the ‘60s and had actually made partial parts sets for 25 airplanes. His plans included renaming the airplane the *Space Coupe*. I tracked down his grandson, an A&P mechanic who had traveled through many states with the parts. When we finally talked, it turned out he had gotten tired of moving and storing the parts and had sold them. With his help I finally found the parts in Oregon, two owners later. When I talked to the owner he said he wouldn’t sell me just the parts I needed. I had to buy the entire batch, which was a lot of stuff, or get none of it.”

Dave knew he was in an extremely weak bargaining position. He desperately needed the parts and the seller knew it. He was almost afraid to ask the obvious question for fear the answer would be a staggering number.

“I finally asked him how much and held my breath,” he laughs. “He came back with \$2,500, which I could hardly believe! Still, I kept my cool and offered \$2,000, which he took. I wasted no time grabbing my 8-year-old son and jumping on an airliner. We rented the biggest truck we could find and then spent a 12-hour day loading it. At the

**The view over the nose can be a bit disconcerting, since there's no nose out there to use when gauging the pitch angle. A quick glance to the side will confirm the angle. Not until helicopters went into regular production was there such an unobstructed view from a post-World War II aircraft.**



end, it was so packed that I was literally just jamming stuff inside the doors. I felt as if I had just won the lottery.”

This time when he arrived home with a treasure trove of airplane parts they didn't look as if they had been lying on the beach because they were all new old stock (NOS) and had been stored inside. Because of handling damage accumulated over the years (they changed hands three times) they may not have been pristine, but they were close enough.

“I had so much more stuff than I could use that it wasn't funny, but at least I had the critical parts that were going to be really hard to duplicate. I had two fuselage pods, one of them on its wheels, and about 40 spars, a bunch of booms, tons of castings, and some unmachined extrusions for the carry through. At the same time one of Dad's retired friends from Anderson-Greenwood told me he had the original pencil-drawn prints for the plane! So now I was set with both the parts and the prints and I was ready to move forward and get the airplane back into the air.”

He took his original fuselage down to get it soda blasted, then started replacing skins on the fuselage/pod. When he was finished, he had about

**With a special prop extension shaft, the ground-adjustable Hartzell's hub is seen in the shot of the Continental C-90 nestled in the back of the fuselage pod.**



**A pair of vertical stabilizers completes the end of each boom. Only one vertical stabilizer contains the rudder. The other fin is completely fixed.**

AARON LURTH PHOTOS



a fifty-fifty mix of new and old skins and the pea-pod fuselage was looking good.

“When I started this, Dad was a great help for about the first half, but then he got sick with cancer and we lost him, I was on my own, now wanting to see it fly in his memory. It was obvious that although it was a little airplane, it was a big job. Everything led to something else and each time I drilled out some rivets, I found more corrosion. By the time we were finished we had taken the wings apart down to the spars and built them up almost from scratch with all new skins.”

The wings were a special problem in that they were skinned with .016 aluminum, which is one thickness up from tinfoil, and is one reason all the originals were in such poor condition. Plus the wing construction itself was unique (see sidebar) and required some creative restoration to do it right. The spars, for instance, aren't your normal smooth-web-riveted-to-capstrips, but have vertical corrugations for stiffeners. Fortunately, he didn't have to replace any of the webs, but he came close.

“Oddly enough,” Dave says, “considering what a unique little airplane it is and how few were built, one of the hardest things to come up with was the oil-temp gauge. I had the part number, but had a terrible time finding one. Then someone told me he thought Stinsons used something similar so I got on the Stinson forums and came up with one that was rebuildable. Part of the problem is that it has a 12-foot



**Decades of outdoor storage in the Houston, Texas, area wreaked havoc on the original structure of the AG-14**



**A couple of shots of the structure of the AG-14 during its restoration. You can see the level of skin replacement needed on the fuselage pod.**

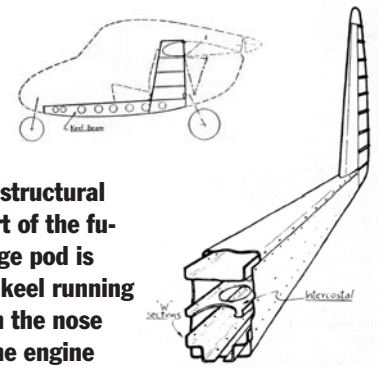
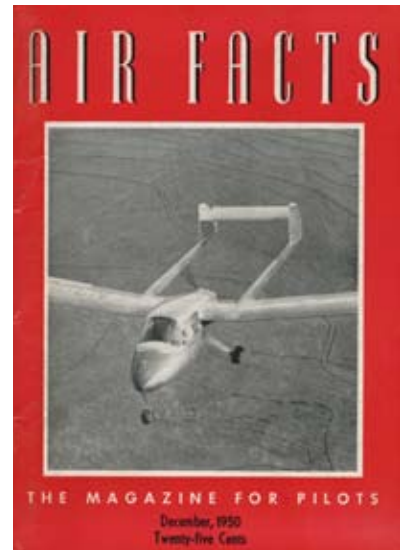
PHOTOS COURTESY DAVE POWELL



**“How bad do you want to restore this airplane?” Thanks in part to a family tie (his dad worked for Anderson-Greenwood), Dave Powell was very motivated to save one of the five airplanes built before the Korean War put a halt to production. All-new skins were required on much of the airframe.**



BONNIE KRATZ



**The structural heart of the fuselage pod is this keel running from the nose to the engine mount. Bolted on the outboard ends of the back of the center section are the two booms, which feature this novel structure.**



capillary tube that runs from the panel and back to the engine, so the tube is always in danger of being damaged.”

Even the engine, which is a C-90 Continental, is unusual because the prop is pushing rather than pulling the airplane so the thrust bearing in the case is different and Continental made an engine just for the purpose, a C-90-12P. Fortunately, the changes are fairly minor. Included in the original purchase were boxes and boxes of what looked like engine parts, but when Dave started cleaning them up he found more than half of them, including the case halves, were badly corroded. He was, however, able to piece

together one good engine. Even more fortunate was the prop’s condition: It was rebuildable. If it hadn’t been, he would have been in a world of hurt.

“The prop is a phenolic-coated, Hartzell, ground-adjustable model set up for pushing. You might as well call it the ‘mystery prop’ because, when I called Hartzell about it, they said they’d never made such a thing. I told them I was looking right at one of their stickers on the blades and they still said they had no records of any kind on it. Finally, they found their absolutely oldest employee and asked him about it, and he remembered the prop clearly. I had no way of knowing how to inspect these

phenolic-coated blades for internal delamination and neither did any of the prop shops. He solved that for me. He said to take a quarter and tap, tap, tap your way down the blade listening for a change in the way it sounded. It sounds a little silly, but if you think about it, if there’s a delamination there will be a void or discontinuity and it won’t ring the same.

(Editor’s Note: The coin tap method for void/delamination detection is one of the oldest nondestructive testing [NDT] methods in use. The use of the term “coin” is a bit of a misnomer. A quarter or even half dollar often doesn’t have the mass needed for effective inspection. Many composite component manufacturers specify that a disc-shaped tool or ‘coin’ is to be made out of brass round stock, with the edges slightly chamfered so the edge will not mar the finish of the material being tested. In a quiet environment free of



### On Designing and Building a 1940s Pusher

When Marvin Greenwood and Ben Anderson, along with their partner, Lomis Slaughter, left Boeing right after World War II, they headed straight back to Houston where they set up a company to design and build little airplanes. During the war they had all learned a lot, as engineers, and had some ideas they wanted to incorporate into their new design. Chief amongst those features were visibility, safety, and comfort. This is what led them to the pusher configuration.

With no need to have an engine out in front, the fuselage could be any shape they wanted, so they lowered the instrument panel and mounted the nose gear on a keel assembly that projected only slightly out in front of the crews' feet. Then they positioned the wing in a shoulder position so the pilot could turn his head and see both over and under it. There wouldn't be a production aircraft with that kind of visibility until helicopters became commonplace.

By running most of the landing-gear loads through the keel and a load-bearing frame around the door, it allowed them to make a huge door. So anyone, regardless of height, could just back up to the seat and sit down. There was no climbing on board at all. Plus the door-to-door distance of 44 inches makes it a full 4-1/2 inches wider than a modern C-172.

Then, with the engine behind, although the noise was still there, the firewall went from floor to ceiling with no windshield to interrupt it, so upholstery and carpeting could do an effective job of keeping the decibels at bay.

Everything is not, however, all sunshine and roses with a pusher configuration, especially on a bird this size. CG limitations and the desire to keep the size and weight of the airplane to a minimum meant that the firewall is right up against the main spar and the engine is sitting almost mid-chord in the wing. This necessitated some clever structural engineering that saw the center section and the wing become "monospar" units, meaning most of the wing loads are carried by the further-back-than-normal main spar and a D-shaped torque box ahead of it that doubles as the leading edge of the wing. This meant the rear spar, to which the ailerons and flaps are attached, could be quite light, which simplified carrying the loads through the engine compartment.

Cooling a pusher engine is another challenge, which Anderson-Greenwood met by incorporating jet-like scoops under the wing roots that feed into an updraft cooling system. The air outlets are purposely close to the propeller so that, on the ground, the prop is helping pull air through the cowling. Dave says that at no time does the engine run even slightly hot.

To make the airplane perform on minimum power meant not only keeping it light, but making the wing as efficient as possible. Both of these goals were accomplished by using an ultra-high-aspect-ratio wing. At 9.6-to-1, the AG-14 has one of the highest aspect ratios put on any general aviation wing and its 18 percent thick, 44 series airfoil (NACA 4418) let AG make the structure stiff while using very light gauge material. It also generated lots of low-speed lift, but at the expense of some drag.

After producing only five aircraft, production stopped when the Korean War drove raw material prices up. Four of the original five AG-14s are still in existence. Serial number one was destroyed when it caught a power line on takeoff in the 1960s.

The AG-14 is more than just a cute-as-a-puffin face: It's a well-thought-out, sophisticated little traveling machine.

distractions, as you tap along the component, you allow the coin to bounce off the surface, letting it slide free of your fingers for a moment. You're listening for a difference or change in the sound as you tap along the item. With practice and experience, an inspector can pick out voids near the surface. More recent NDT inspection methods such as radiography will often give more consistent, reliable results, albeit for greater expense. While the coin tap test is rather subjective, excellent results can be obtained using this time-tested procedure.—HGF)

"With all our searching, besides our prop, we've only found one other and Mr. Anderson himself has that one. I've been talking to him, and his family, but I'm not convinced I'll ever own it."

"When we got the airplane close to being finished, we mulled over the paint scheme for a couple of years. I settled on a scheme that I felt would complement its lines and not look too 'flashy' or new, sort of timeless. It was designed by Craig Barnett at Scheme Designers."

The big day finally arrived, and it says something about his wife, Julie, that he flew it for the first time on her birthday, May 9, 2007. And how does it fly?

"It flies like any other 90-hp airplane that has its nose wheel hooked directly to the yoke, has only one brake pedal—no differential braking—and only one small rudder in one fin. It's a little disconcerting at first because you literally steer it on the ground. Just like a car. It has rudder pedals, but they don't steer it. Because the yoke does steer it, that means when you're landing you have to remember to center the wheel at the last moment or the nose wheel will be cocked and will take you off toward the bushes. This is especially counterintuitive when landing in a crosswind. And don't forget that small, single rudder!

"The main gear has a huge amount of travel, almost a foot, and it has good shock absorbers, so, if you flare high and drop it, it doesn't feel like that hard a hit. And the first time everyone flies it, almost everyone does hold

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it off high because they aren't used to not having a nose in front of them. In fact, that's the first thing everyone comments on when they get in the airplane. The instrument panel is really low and there's nothing but windshield in front of you, so you don't have any of the normal references.

"Of course, if you ask someone to start it without explaining anything to them, they'll never get it started: The starter is a small pedal on the floor between your feet.

"It climbs at about 700 feet per minute and cruises about 115-120 miles per hour. The controls are not perfectly balanced, the ailerons are heavy, while the elevator is light. Did I mention that at full roll deflection one aileron is up 40 degrees and the other aileron is also pointed up, but at 10 degrees? This is because of some of the steering linking geometry. Plus the trim is an overhead crank, which a lot of 1950s airplanes had. Service ceiling is 16,500 feet and I have flown it several times above 11,000 with no issues. Gross weight is 1,400 pounds.

"Power off on final at 65 to 70 mph, it sinks quickly, about like a Piper Arrow and it has almost no float in that situation. The flaps aren't terribly effective (two-position Johnson bar), but they do get the nose even further down, so you're looking through that big windshield at the ground rushing up at you and it can really be unnerving. Especially in a high wind. So, to keep from embarrassing myself, I generally add a little power right at the end.

"In general, I'd have to say that I grossly underestimated every aspect of restoring the airplane. Even though it looks like a light airplane, it is really fairly sophisticated and it took a lot more time to do some of the things that Anderson-Greenwood had designed into it. They wanted to build an airplane that is unspinnable and efficient, but state of the art for its time, and I'd say they did it. My only regret about the entire project is that my dad didn't get a chance to see it fly."

I also want to thank Cleo Bickford for the aircraft prints and "DJ" Short (Short Air) for much of the final restoration work.