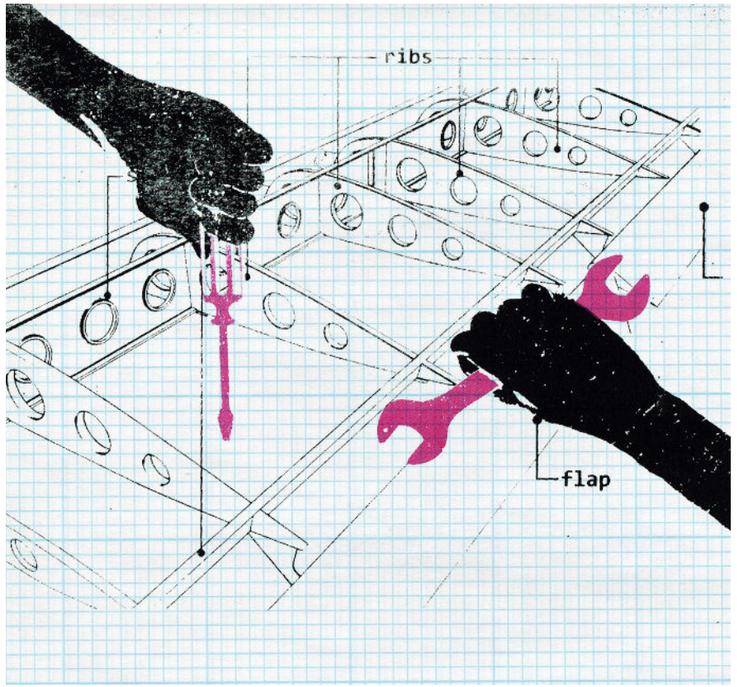
My SR22 is equipped with Starlink, FIS-B, and SiriusXM Aviation weather. Each system has its strengths, but Starlink has completely changed the way I experience weather in flight. Traditionally, datalink weather is reliable, but it often comes with limitations—lower resolution, slower updates, and gaps in coverage at times. Starlink bridges that gap by bringing full-internet connectivity to the cockpit.

High-resolution weather at my fingertips allows me to better anticipate changing conditions, avoid turbulence, and plan more efficient routes.

Starlink service has proven to be highly reliable overall. During flights, I have observed occasional brief dropouts, but these have been infrequent and well within acceptable limits for in-flight connectivity. In general, the system has delivered consistent coverage and dependable service, making it a strong solution for inexpensive airborne internet needs.

For me, it's not just about convenience—it's about safety and decision-making. If you need internet access, the side benefit of an almost unlimited array of weather data is added value. High-resolution weather at my fingertips allows me to better anticipate changing conditions, avoid turbulence, and plan more efficient routes. It's like having a personal weather center in the cockpit.

And yes, I know some pilots will roll their eyes at the "gadget overload," but for someone obsessed with the skies, it's a game changer. ■ *JP Dice is a veteran meteorologist, flight instructor, and corporate pilot flying Cessna Citations and Gulfstreams.*



KATIE EDWARDS

SAVVY MAINTENANCE / OPINION

DIY parts

The regs that keep vintage aircraft flying

BY MIKE BUSCH

IF YOU FLY a certificated piston airplane built during the great production boom of the 1960s and 1970s, and statistically most of us do, you've already discovered a painful truth about repair parts: every year they're harder to find, and every year they cost more.

Some manufacturers—notably Textron—still deserve credit for supporting legacy fleets decades after the last airplane rolled off the line. Other manufacturers have dropped support or quietly moved on.

But even the good actors can't escape economics. When a particular rib, hinge, bracket, or casting sells one or two units a year, the cost of maintaining tooling, drawings, inventory systems, and regulatory compliance gets out of control. That's how you wind up with a $3,000 aluminum frammis that probably cost $15 to make in 1976.

And when sales drop low enough, the part doesn't just get expensive—it vanishes.

But this doesn't mean those aircraft are forever grounded. Almost always, they aren't. That's because the FAA built a quiet little safety valve into the regulations that has kept thousands of aging general aviation airplanes flying safely and legally for decades.

It's called "owner-produced parts." And despite the myths that still swirl around hangar coffee tables, it's not only legal, it's one of the smartest tools in the maintenance toolbox.

The reality of the parts market

For high-turnover items—tires, exhaust parts, windshields, seat tracks, fuel bladders—third-party PMA manufacturers step in, parts become readily available, and prices remain at least somewhat tethered. But low-volume components are a different story. There's rarely enough demand to justify the cost of obtaining PMA approval, so the factory becomes the only source, if it remains a source at all.

Salvage yards often help, and I'm a big fan of good used parts when they make sense. I've personally saved tens of thousands of dollars going that route over the years. But sometimes the part simply isn't available used, and for parts that wear out, installing a 40-year-old component doesn't seem reasonable.

That's where owner-produced parts enter the picture.

What 'owner-produced' means

When I last wrote about this subject in 2011, the authority for owner-produced parts lived in FAR 21.303(b)(2). Today, you'll find it in 21.9(a)(5). The rule allows an aircraft owner or operator to produce replacement parts for maintaining or altering their own aircraft—without needing a type certificate, PMA, or supplemental type certificate. Why would the FAA allow an owner or operator to do this without FAA production approval? The agency did it because if it didn't, huge portions of the GA fleet would have been grounded long ago.

For a part to be "owner-produced," you do *not* need to personally machine the part in your garage or basement with a bandsaw and a drill press. You can hire a machine shop to do it. You can contract out for CNC machining, TIG welding, laser cutting, or digital scanning. You might even be able to get the part 3D printed. You just have to be meaningfully involved in the process.

In a 1993 legal interpretation signed by Donald P. Byrne, FAA assistant chief counsel for regulations, the FAA stated that it considers the part owner-produced if you participate in the design, manufacture, or quality of the part, which may include any one of the following:

- Provide drawings or specifications or the old part to be duplicated
- Supply materials
- Specify fabrication methods
- Oversee quality control
- Supervise the manufacturing

Manufacturer's drawings and specifications are rarely available. So, in real-world practice, most owner-produced parts are simply careful duplicates of the original component made from equivalent or better materials.

Real-world examples

Suppose you have a cracked cast aluminum alternator bracket on a 1957 Beechcraft Bonanza. The factory part is unobtainable. A local machine shop duplicates it in billet aluminum alloy and CNC machining. Your new part is stronger, lighter, and more crack-resistant than the original casting. It'll probably outlive the airplane. It's an owner-produced part, so it's legal.

Because your owner-produced alternator bracket is better than the OEM part it replaces, it's not really a direct replacement. It's an alteration. But since it's a minor alteration, it doesn't require approved data. It only requires acceptable data, such as can be found in Advisory Circulars AC 43.13-1B and -2B.

Now, suppose the part you need to replace is a wing spar. That's classified by the FAA as a major repair, so it requires approved data. You might still be able to use AC 43.13-1B as approved data if you can simply duplicate the original spar and resist the urge to improve it. But to create an improved, stronger, better, more corrosion-resistant owner-produced replacement spar—which would make this a major alteration—you'd probably need to hire a designated engineering representative (DER) to bless the approved data for your improved replacement spar on behalf of the administrator. So, it might not be cheap, but it's still doable.

Mechanic-produced parts?

Why not just let your A&P produce the part you need? Good question.

Prior to the FAA clarifying the rule in 2010, A&Ps had no specific regulatory authority to fabricate repair or alteration parts. A mechanic could repair an old part if it was salvageable, but the regulations didn't clearly address making a new one.

The FAA addressed that ambiguity in a 2010 rulemaking that added Rule 21.9(a)(6). That rule now permits a mechanic or repair station to fabricate parts provided that two conditions are met. First, the mechanic or repair station must have a "quality system." Second, the fabricated part must be "consumed in the repair or alteration."

The "consumed" requirement means that an A&P could machine an oversize bushing to repair a wobbly torque link in an oleo strut, but he probably couldn't fabricate 20 such bushings and keep 19 in stock for future use. He certainly couldn't legally offer 15 of them for sale on eBay.

What about the "quality system" requirement? Interestingly, there's no clear definition of what sort of quality system an A&P mechanic would need in order to fabricate parts. There are references to quality systems in Parts 145, 135, and 121. AC 43-18 Chapter 2 provides guidance on how to structure a Fabrication Quality Control System (FQCS). But there's little practical guidance about what sort of quality system an individual mechanic would need to legally fabricate parts. All that's clear is that such a quality system need not be FAA-approved but only needs to be acceptable to the FAA, meaning that the FAA would not find it unacceptable if and when they ever looked at it.

Since A&Ps typically don't pay much attention to Part 21, many may be unaware that they now have the authority to fabricate repair and alteration parts, something that was not explicitly addressed in the regulations prior to 2010.

Solving the unobtanium problem

So, if the part you need can't be found anywhere—OEM, PMA, salvage yard, eBay—or can be found only at a ridiculously high price, you might need to resort to one of the following options:

Option 1—Persuade your A&P to fabricate a replacement part using his authority to do so under FAR 21.9(a)(6).

Option 2—Persuade your A&P to work with you to fabricate a replacement part using your authority to do so under FAR 21.9(a)(5).

In option 2, I say "persuade your A&P to work with you" because, although you have the regulatory authority to produce a part for your aircraft, that part won't do you much good unless your A&P is convinced it's an airworthy part that's legal to install. The best way to ensure he's good with the part you produce is to make him a co-conspirator in its creation. If your mechanic helps make it, he's much more likely to be OK with installing and signing it off.

Major versus minor matters

The fact that a part is owner-produced or mechanic-fabricated doesn't magically change repair classifications. If the part is used in a major repair—primary structure, flight controls, landing gear, engine—you'll need to fill out an FAA Form 337 with three signatures. A DER or flight standards district office inspector will need to sign off on the approved data, your mechanic will need to sign off on the repair, and an IA (who could be your A&P if she's an IA) will need to inspect the repair and verify that it conforms with the approved data. If the fabricated part is significantly improved over the original part it replaces, it might need to be documented on the Form 337 as a major alteration.

If the part is used in a minor repair—fairings, wing ribs, brackets, interior furnishings, non-critical structure—it can usually be documented in a simple logbook entry signed by your A&P. No Form 337 or DER or IA is needed. But the basic performance rule, FAR 43.13, must be followed, meaning that the work must be done in such a fashion and the materials must be of such quality that the repair is at least equal to the original condition with respect to structural strength, resistance to vibration and deterioration, and other conditions affecting airworthiness. In other words, it must be functionally (if not cosmetically) at least as good as new.

Persuasive paperwork

Any time an owner-produced or mechanic-fabricated part is installed on a certificated aircraft, there's always a concern that some IA performing an annual inspection years from now might take issue with the part and question the airworthiness of the repair. The best way to prevent this from happening is to ensure that the part is documented meticulously.

Clearly document that the part is owner-produced per FAR 21.9(a)(5) or mechanic-fabricated per 21.9(a)(6). Describe how it was fabricated. Describe how conformity with the aircraft's type design was ensured. If the part was owner-produced, document how the owner participated in the design, manufacture, or quality of the part. If the part was mechanic-fabricated, describe the quality system that was used. Then memorialize the repair in the normal fashion with a FAR 43.9 logbook entry. If a Form 337 was involved, the logbook entry should reference it, and a copy should be made part of the aircraft's maintenance records.

Whether you're an aircraft owner or a mechanic (or both), you should become familiar with the provisions of FAR 21.9(a)(5) and (6). These rules are the FAA's gift that lets us keep vintage aircraft flying even when repair parts are no longer available. ■

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Ask the A&Ps /

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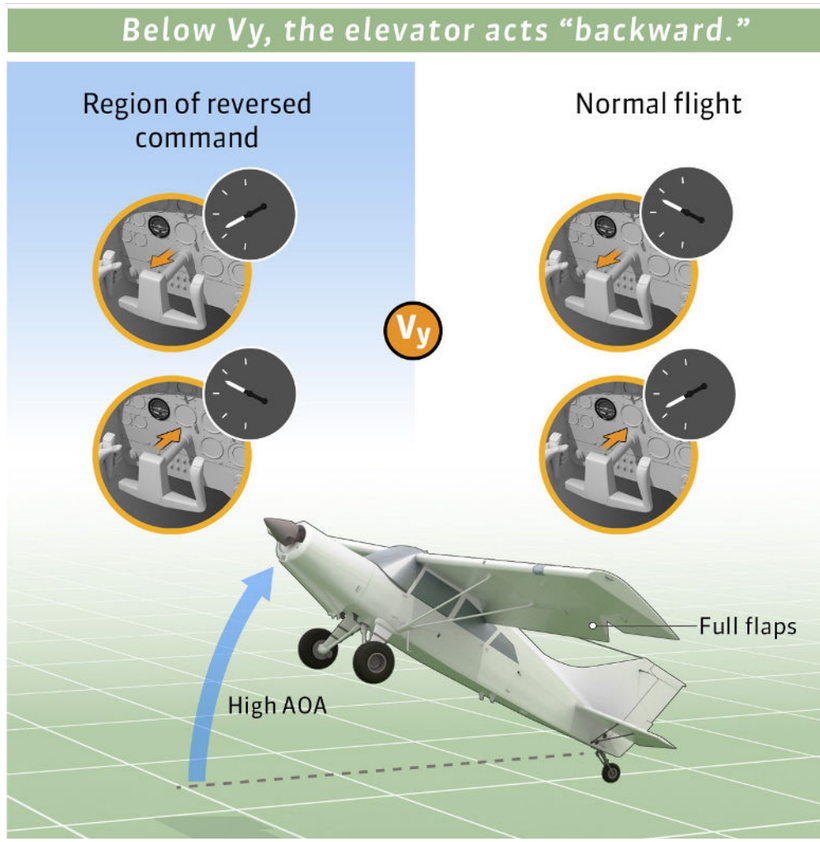

CHARLES FLOYD

FLYING SMART /

Where's your backside?

Locating the region of reversed command

BY CATHERINE CAVAGNARO

PILOTS SEEM TO understand that the "back side of the power curve" is a thing, but when I ask practical candidates about it, explanations are all over the map. Out of curiosity, I conducted an informal Google poll in which I asked pilots to specify the airspeed that defines the back side of the power curve and to describe the associated flight scenarios in which it's important for pitch to control airspeed and for power to control altitude. This airspeed range is called the "region of reversed command." The responses to my query confirmed that many people