

# Trim Around the Ailerons

**Low-cost aileron trim eliminates wing-heaviness, lowers pilot workload on singles and light twins.**

by Jim Weir

**Y**OU KNOW WHAT trim is, right? Trim is that little wheel or handle that keeps flight instructors hoarse. Remember those halcyon days with Fang in the right seat? "Do you have any idea, *any idea*, why the veins in your left arm are bulging and we are still descending 500 feet a minute? Trim, dammit, *trim*." Yup, trim is the subject of this article.

Everything I've ever flown has had elevator trim, from the smallest sailplane with its rubber band bungee setup to the multimotored kerosene queens with their push-button, super-duper, electronic presettable controls. Why trim the elevator? Well, primarily because fore-aft c.g. loadings can vary so much. One day you (all 98 pounds) are out solo in the front seat having a merry old time smashing bugs; the next day, you, Grinelda, your weight-lifter wife, her brother the Sumo wrestler, his girlfriend the human blimp, the dog, both cats (in their concrete cages) and 200 pounds of ski equipment are piled into your poor, little four-seater for a cross-country trip. If it weren't for elevator trim, pretty soon you would have arms like Popeye and an intense hatred of heavy people.

Although elevator (pitch) trim is standard equipment on most light aircraft, rudder trim is found only on the more sophisticated lightplanes, and aileron trim is reserved for that class of aircraft of which impoverished magazine writers only dream. Although rudder trim is a great advantage over no trim at all, it is aileron trim that varies on a daily basis. Unequal fuel burn, unequal side-by-side passenger weight, baggage loading, or minute fluctuations in wing rigging can cause aileron out-of-trim conditions.

The usual remedy for a light wing is to develop a calibrated left arm that is

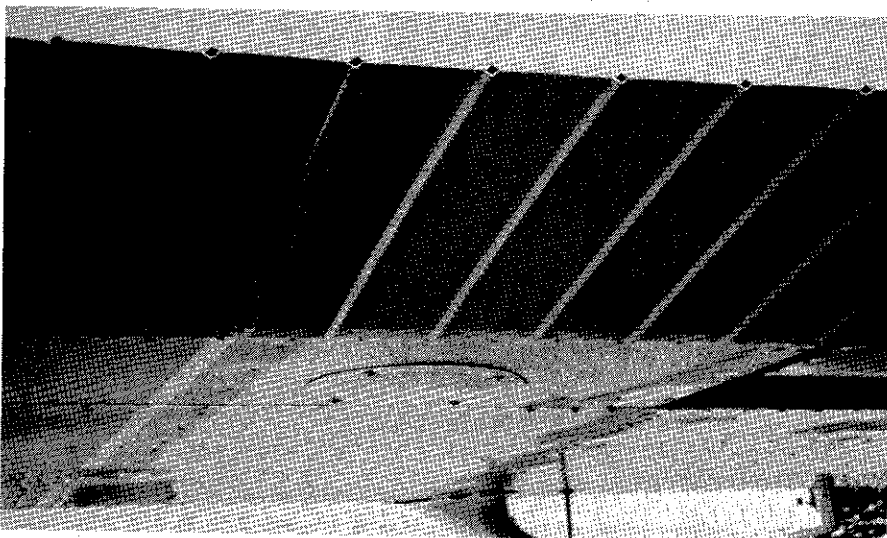
draped over the control wheel in such a manner as to keep the errant wing down on the side of the flyweight passenger. Although this is a fair solution, and you may look like Gary Cooper with one arm on the corral ("Why, shucks, ma'am, I'm jest restin' ma arm here to keep this lil ol' critter from rollin' away"), I swear to you that there is a better way.

Enter the hero, a small Florida company called Aero-Trim. Aero-Trim is the proud manufacturer of a tiny electric motor/gear arrangement that connects to a small, movable trim tab on the left aileron. Push a button in the cockpit that says LWD, and the motor whirrs, the trim tab moves and the left wing goes down. Press the button some more and the wing goes down farther. Press another button that says RWD and I'll be dipped if that little motor doesn't spin the other way, pushing the tab up and the right wing down. Not only that, a calibrated meter on the instrument panel shows how far

and how fast the trim tab is responding.

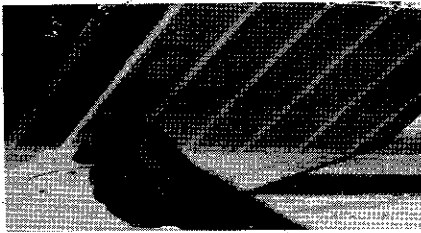
A gimmick? An expensive toy? Yes. So are electric engine starters, VOR receivers, directional gyroscopes and flaps, not to mention lambs-wool seat covers, gimbelled soft-drink holders and hangars. None of these items are required to bore a hole in the air, but, my friends, I'll tell you true that the Aero-Trim I just installed on my C-172 has done more for my cross-country flying than anything I've put in since the Mason jar. I installed an Aero-Trim on the airplane just before this year's Oshkosh odyssey. While I expected a relief of minute-to-minute control pressures, that little rascal proved to be just short of an autopilot in relieving my workload. It is, by my picky standards, an unqualified success.

Speaking of autopilots, Smith has described to me how the Aero-Trim can aid the operation of your three-axis electronic genie. Even though some autopilots feature knobs that say "roll trim," all twisting the knob does is reset the "null" or zero-point in the electrical gyro, levelling the wings but limiting the operating parameters of your autopilot or wing leveller. The knob does not trim any aerodynamic surface, as the Aero-Trim does.

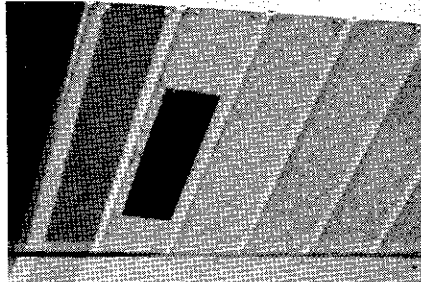


**1) Using a cardboard template cut to the dimensions of the Aero-Trim cutout helps make marking the aileron precise. There is less than 0.2 inches margin for error.**

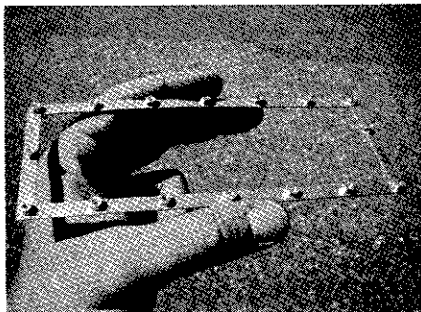
**2) Before beginning the cut, confirm that the guideline is drawn precisely and neatly.**



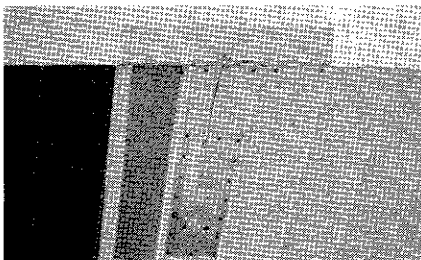
3) Nibbler is used to cut to outer edges of the template marking.



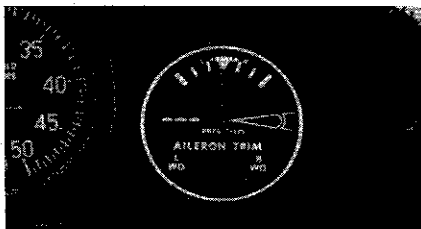
4) If the cut is done cleanly, you will be left with a rectangular hole in the aileron (shudder), precisely the size of the Aero-Trim motor/mounting bracket combination.



5) Mounting ring assembly for the aileron trim allows easy removal for inspection and maintenance.



6) Aero-Trim motor is installed with flathead screws and trim tab is riveted in place along trailing edge, using existing rivet holes.



7) Aero-Trim control-indicator head shows both degree and rate of trim tab deflection.

A true trim device is not attached to a control cable. It is an independent surface that, in the case of the Aero-Trim, actually flies the mechanical "slop" in your aileron rigging, Norm said. He claims that, by trimming your airplane around the roll axis before engaging the autopilot or leveller, you'll get more speed and save up to 12% in fuel burn.

How can such a small device perform such miracles? Easy. Aero-Trim Owner/Designer/Manufacturer Norm Smith has embodied the KISS principle (Keep It Simple, Stupid) within the device. The trim button is pushed, the motor rotates, a gear moves a rod, the rod pushes a tab and the aileron moves in the commanded direction. There are no transistors to blow, integrated chips to fail nor tubes to burn out. Press, whir and push. It works.

Norm has done his homework. Because it's simple, he has gotten an official, FAA-STC'd blessing on the Aero-Trim for aircraft from the Cessna 150, 152, 172, 182 and 206 class through the multimotor Piper Apache and Seneca types of aircraft. In addition, there are no separate "models" for different aircraft. The motor, trim tab and meter that you install on your AeroStar are the exact same parts that I install on a Cessna 150. As an engineer, I've got to admire a product that does so much with one design.

**"The Aero-Trim has done more for my cross-country flying than anything I've put in since the Mason jar."**

Because I've put this rascal on my airplane only recently, I think you might enjoy and benefit from my comments on the installation in the company C-172. In several minor installation points, I differ from Brother Smith. However, as usual, your friendly local airframe mechanic has the final say-so as to precisely how and where the device is installed. I offer my comments as a first-time installer, only.

The Aero-Trim comes out of the box in three separate pieces. First is a hinged trim tab that rivets onto the back of the left aileron. Second is a small motor/gear assembly that fits *inside* the bottom of the left aileron. Third is a control-head indicator that mounts in a regular, 2.3-inch instrument hole on the aircraft instrument panel. A fourth "piece," if you wish to call it that, is a complete set of installation instructions. Rather than cover the instructions in detail, I instead will amplify and improvise upon the directions.

The first order of business is (shudder) cutting a hole in your aileron. The instructions tell you what size hole to cut, but I found that a cardboard template of the exact hole size (see photo 1) makes this square cutout much easier to mark.

The cut must be fairly accurate; there is less than 0.2 inches of "grab" on either side of the mounting bracket.

Once the square cutout is marked (see photo 2), a nibbling tool is used to trim to the edges of the marks (see photo 3). The end result is an accurately cut-out, rectangular hole in the fifth outboard aileron bay (see photo 4).

At this point, the instructions say to cherry-rivet the motor assembly into the aileron. In the interest of maintenance, I built the little mounting ring assembly shown in photo 5. The 14 little cylindrical parts are called pressed-inserts and are 2-56 threaded nuts that are pressed (using an arbor, a drill press, lock-tite pliers or a hammer) into the aluminum bracket. Using this bracket as a nut-plate on the inside of the aileron, the motor assembly then may be attached with flathead screws to the bottom of the left aileron as shown in photo 6. Of course, regular A.N. nut plates could have been used instead of the press-serts, but the amount of labor to install them would have tripled.

Photo 6 also shows the installation of the aileron trim tab on the back of the aileron. This is done by drilling out the six rivets holding the aileron trailing edge together, sandwiching the trim tab between the top and bottom aileron skins, then riveting this sandwich together.

The next task is to string the 4-conductor cable between the motor assembly just installed in the aileron and the instrument hole where the indicator is going to go. Of course, you are stringing wire in the general vicinity of aileron cables, so be sure to tie the 4-conductor cable out of harm's way. The last thing to install is the control-head indicator assembly on the instrument panel. The only trick in my airplane (see photo 7) was to find an unused instrument hole! After hooking the cable coming from the aileron motor to this indicator, the only thing remaining is a full-blown run-it-to-the-stops test to check for possible binding and chafing of your installation.

Of course, before flying the thing around the patch, you must write out the requisite paperwork (logbook and form 337) in your aircraft documentation.

That's it. It takes only a little more time to install it than it takes to tell it. Norm Smith of Aero-Trim says that you will take about four hours with a helper. It took me eight hours by myself, so I suspect that the four-hour figure is fairly accurate. My compliments to Aero-Trim for a very useful product.

*(The Aero-Trim is available for \$495 from Aero-Trim, Inc., 1130 102 St., Bay Harbor, FL 33154. Jim Weir is vice-president—engineering for Radio Systems Technology, Grass Valley, California-based manufacturer of kit avionics and accessories, including radios, headsets and intercoms.—Ed.)*