



Panel POWER

2011 avionics come to a 1974 front office

BY THOMAS A. HORNE

One down, three more to go. Work packages for AOPA's 2011 Crossover Classic sweepstakes Cessna 182, that is. Those of you who've followed our sweepstakes restoration projects in the past know how these very substantial projects progress through four basic stages: engine and propeller; avionics; interior; and paint. At this point in the Crossover Classic's metamorphosis, Air Plains Services of Wellington, Kansas, has already finished installing our new, more powerful Continental engine and Hartzell propeller—along with 12-gallon wing-tip fuel tanks from Flint Aero.

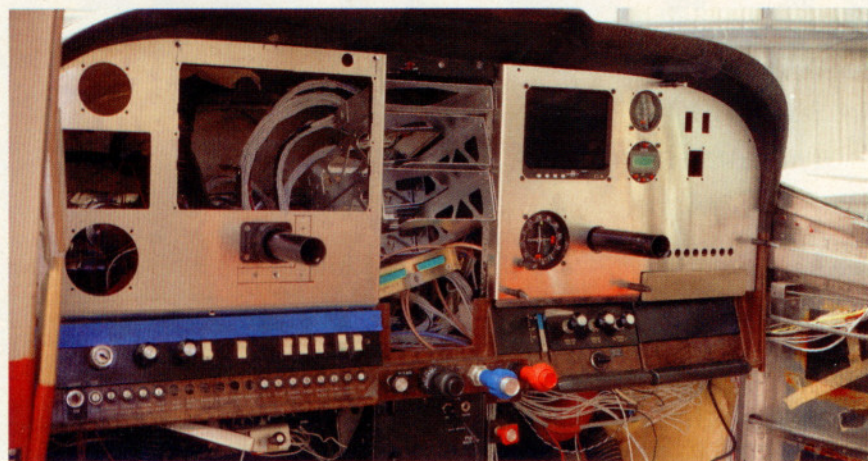
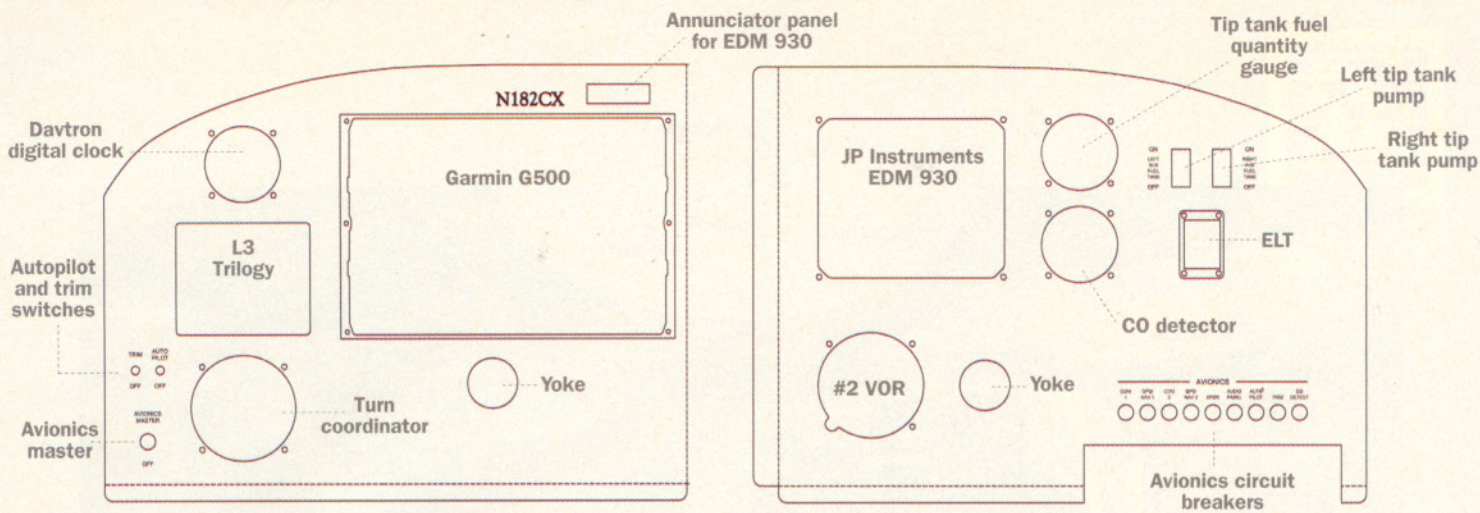
Now it's time for the old avionics to go. And boy, do they need to go! And the original panel—full of 1970s-era Narco and Cessna/ARC boxes—has indeed left the building, to use Elvis-speak. That building being Advantage Avionics' impressive shop at the Chino, California, airport (CNO).

Advantage Avionics has earned a reputation as one of the biggest retrofit installers of Garmin G500 avionics suites. As

this writing, Advantage has installed a total of 35 G500s in all manner of piston singles and twins, and more business keeps coming. In terms of major installation packages of all types, Advantage says that it does approximately 15 to 20 per year. We wanted an outfit that was in practice, so picking Advantage was an easy choice.

Step-by-step

"This is probably the most ambitious installation we've ever done," said Mark Krueger, president of Advantage Avionics. "It will take us about eight weeks and 300 hours of labor to do the job." When asked about the progression of events, Krueger explained that it's not simply a matter of yanking out the old avionics and installing a new panel. "Sure, the first step is always pulling all the old avionics out of the panel, but then the real work begins," he said. "The G500 and the GTS 800 traffic advisory system require a lot of remote installations,



Line drawing (top) shows the airplane's instrument cutouts, and bottom photo shows the panel's progress as of early January. Advantage's Mark Krueger (above left) traces an old instrument panel—not ours—using a digitizer that recreates the panel's exact dimensions. After this step, the new panel is laid out with AutoCAD software, cut by a CNC machine, powder coated, and laser engraved. Advantage's shop (top right) has a showroom of avionics suites. Garmin's G500 (above right) is the heart of the panel to be.

as does the Cobham/S-Tec System Fifty-Five X autopilot." (See "Avionics: Traffic Roundup," page 101.)

After the panel was gutted and the old wiring removed (plugging brand-new gear into 40-year-old wiring makes no sense), work shifted to antenna installation. That's saying a lot. There are two GPS antennas to mount on the fuselage, as well as two sets of traffic-detection antennas—one installed on the top of the fuselage, the other on the bottom. The supplemental type certificate (STC) recommends that the upper-fuselage traffic antenna mount be reinforced. The 182's skin is a mere 0.032-inch thick, so Advantage installed a doubler to stiffen the skin and make the antenna mount stronger.

Next, GTS 800's remote-mounted traffic detection box was installed aft of the rear seats, as well as Garmin's GDL 49A datalink receiver box, the attitude and heading reference system (AHRS) unit, and the autopilot's pitch, roll, and trim servo motors. All of this equipment came with mounting brackets, but once again, additional measures had to be taken with the AHRS unit.

The AHRS is a vital element in the operation of the G500 because it provides, well, attitude and heading information. In order to issue accurate data, it can't exceed strict vibration limits. An AHRS rattled by too much engine vibration will put two big red "X" symbols on the G500's display screens, telling the pilot that attitude and heading information is unreliable, erroneous, and unusable. To steady the AHRS' mounting platform, Advantage took two hours to make a strong, solid mount. To do this, the company's computer numerically controlled (CNC) machine makes precise cuts derived from computer-aided manufacturing (CAM) design guidance.

Panel construction

With all the remote assemblies installed, next comes cutting the new panel. Again, the CNC machine is called into play to make the cutouts for the G500 and other components. The all-aluminum panel is thicker than the original, so that it can properly hold the G500's screens. While the old panel's aluminum was 0.050 inches thick, the new panel will be 0.080 inches thick—and much sturdier. “If we used the old panel, it would have been flimsy with the G500 in it,” Krueger said.

After giving the panel a powder-coat of enamel paint, Advantage then laser-engraves all the necessary placards, switch labels, logos, and identification text. Laser engraving beats silk screening because the lettering is more durable, and won't rub off. See examples of Advantage's laser engraving on its website (www.advantageavionics.com) and click on the “engraving” link.

Testing, testing

With the panel in place, it's time to install the new avionics, connect their wires, and power up all the components. In the avionics community, this step is jokingly called the “smoke test.” (If noth-

ing smokes after you turn everything on, then the smoke test was satisfactory.)

Jokes aside, what then follows is a calibration of the AHRS, programming of the G500 and GNS 430s, and a magnetic compass calibration. The G500 and GNS 430 calibration includes such items as plugging in the V-speeds, airspeed arcs, and other target and limiting information. The JP Instruments EDM-930 engine and system information display has already received a similar calibration, based on the parameters of the Continental IO-550 engine, the airplane's system voltage, fuel quantities, and other data.

Flight testing comes last, to ascertain that all functions well in flight. It's a welcome milestone for both Advantage and yours truly, who'll be on hand for the event. But let's not get ahead of ourselves just yet. At this writing—late December 2010—the G500 and the other panel components have yet to be installed. To look at the panel in its current state is to behold, uh, a whole lot of nothing, and a bunch of holes in a beat-up panel just crying out for new life. It won't be long in coming.

How much?

Many readers have written me, asking for

price information for the upgrades we're doing on the Crossover Classic. AOPA relies on contributions and discounts from participating manufacturers, vendors, and service providers—that's the only way we could afford to rejuvenate a 40-year-old airplane and still remain within our budget.

But for the curious, the list price for a two-screen Garmin G500, installed, is currently \$21,000. Add synthetic vision and you'll pay another \$4,500. Expensive? You bet. But Garmin says G500s are selling like hotcakes, and almost every customer opts for synthetic vision. Why the popularity? If you wanted to modernize your aging airplane, where would you get the most bang for your buck? Fresh avionics is one sure way.

Check the website (www.aopa.org/sweeps) for the latest information on the Crossover Classic, including photos, videos, and blog posts. Next month in *AOPA Pilot* we'll take a good look at the finalized instrument panel, and learn more about Advantage Avionics. See you then! **AOPA**

E-mail the author at tom.horne@aopa.org. Read the author's blog (www.aopa.org/sweeps).

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