Panel magic

AOPA's Catch-A-Cardinal SWEEPSTAKES

The avionics you want—and use

BY JULIE K. BOATMAN

It takes a team.

The goal from the start of AOPA's 2007 Catch-A-Cardinal Sweepstakes: to make your 1977 Cessna 177B shine like no Cardinal anyone has ever seen before. And a team atmosphere would lay the solid foundation for this plan—because strong teams make superior products. So as field project manager Dan Gryder and I put together the group of shops that would form our core squadron, we knew it would take special people to deliver what we asked.

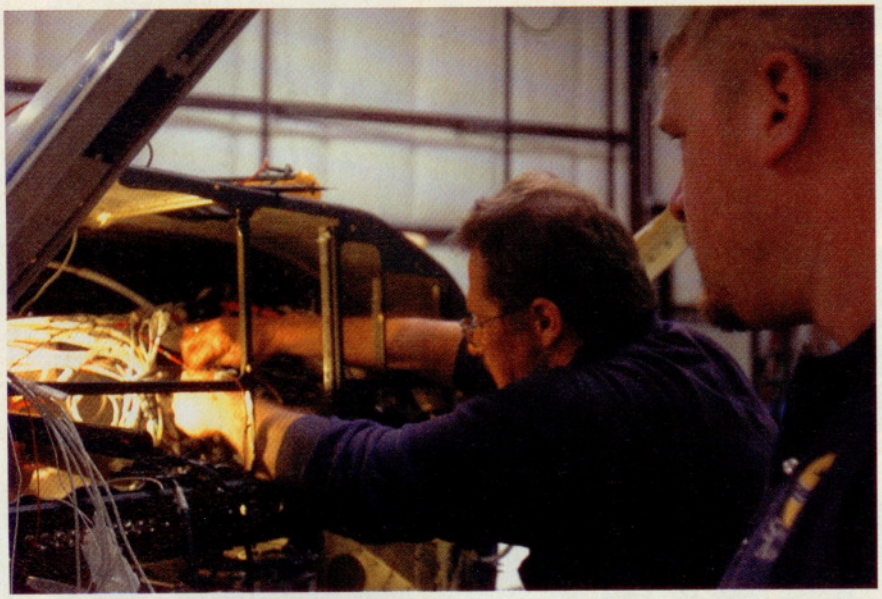
We had some stellar players to choose from, but one application for the avionics installation kept coming to the top of our list: Sarasota Avionics International, based in three locations in west-central Florida, including two at the Sarasota/Bradenton International Airport and one at Venice Municipal. If you plan a panel overhaul, your criteria for a shop should follow ours: a solid reputation for quality work, a focus on customer service (because there will be issues that crop up in an installation of this complexity), and a full line of talent to ensure the work is accomplished in a timely manner—you don't want to miss an entire flying season! On paper, Sarasota Avionics exceeded these criteria. But would it buy into our ideas (and our timeline) for the airplane?

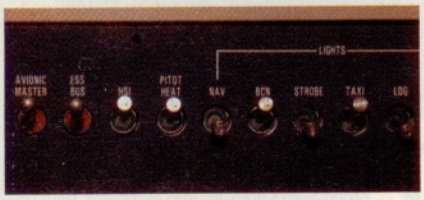
The first time I met Dave Clarke, Sarasota's avionics manager, he was enjoying a Starbucks in Palm Springs, California, during AOPA Expo last November—a long, dry way from the Florida beaches. Clarke and Sarasota Avionics coowners Vince Veltri, Bert VanKirk, and Kirk Fryar were enthusiastic about joining forces with AOPA on the sweeps project from the beginning—and from the beginning threw their top resources into the plan. In December, Fryar and Clarke flew in the company's Cessna 182 up to Griffin, Georgia, where the airframe, engine, and paint work would be accomplished. We sat down with these electrical and avionics experts and strategized the goals for the sweepstakes airplane's electrical system and instrument panel overhaul.

Although initially skeptical about the depth of our plans—some of what we asked for simply isn't done in light general aviation aircraft, outside of a masterful restoration of a classic airplane—Fryar and Clarke listened intently. Gryder and I had meshed our wish lists regarding the best upgrades to the airplane: the standard AOPA sweepstakes project goals of optimizing the panel layout and installing all-new avionics. Designing and installing an essential bus (placing critical components on a separate bus wired directly to a power source). Remov-

The Cardinal's new panel bears no resemblance to the original—but you'll recognize several star players in the avionics lineup, as installed by the team from Sarasota Avionics.

PHOTOGRAPHY BY GUS ANAYA





Arleigh Yeomans works behind the panel while Dave Clarke looks on (left). The pilot's electroluminescent subpanel features the essential bus and HSI switches (below left). The primary attitude and directional instruments are set off with a bold white line for instant identification. Clarke sets the panel in place (below right). The new windshield from LP Aero retains its protective covering through the process.

TOP: DAVID TULIS

ing every single inch of original electrical system wire, upgrading the quality and gauge of most of the wire, and wire stamping each one at 6-inch intervals. And building a custom all-metal panel to replace the original metal panel and plastic overlay found on the Cardinal.

The final assessment from Fryar and Clarke said it all.

"Yes, we can."

Time to fill the stack

You've told AOPA over and over what your favorite avionics are, what you find easy to use, what you go to in a crunch. And you know what? Those are what we put in the panel of your Cardinal.

The timing was excellent too. Garmin International just announced last fall the debut of its popular GNS 430W and 530W navigators with WAAS (Wide Area Augmentation System) capability. And we said, "OK, we'll take one of each!" However, after measuring the height available for the radio stack in the 177B, we discovered that two 430Ws would fit nicely—but trying to wedge in a 530W would move something besides the transponder to the copilot's panel. Not a "best in show" option, so we went with dual 430Ws. These navigators give you GPS and VHF nav capability, including localizer and glideslope, plus the WAAS features of LPV precision approaches and vertical navigation profiles to nonprecision approaches (see "What's Up With WAAS?" December 2004 *Pilot*).

We also opted for a Garmin GMX 200 multifunction display. The high-res screen depicts not only a detailed terrain and hydrology base map, but also the ADS-B (automatic dependent surveillance-broadcast) traffic and weather information in those coverage areas through the GDL 90 universal access transceiver (mounted in the tail of the airplane). Rounding out the Garmin stack is the GTX 330 Mode S transponder, also with datalink and traffic capability (displayed on the 430s), and the GMA 340 audio panel with up to six-place intercom, dual stereo music inputs, and independent volume controls.

The full-function, two-axis S-Tec System Fifty Five X autopilot was our top choice in flight control systems. At first, we thought this amazingly capable autopilot would break with our "keep it simple" philosophy: Would a pilot flying primarily VFR really need all the functions it offers? In the end, though, the Fifty Five X is so straightforward to use—and makes cross-country flying and instrument approaches so much easier to execute as a single pilot—that it won out over more modest autopilots.

Tools from the trenches

Build a panel in 5 steps

1. Determine your budget. You need to know at the outset what you can spend; set aside some money for periodic maintenance items, such as instrument overhauls, that cost a little more but increase the life of your panel.

2. Assess your needs. You can buy the latest gee-whiz gadgetry, but are you going to use it? Sometimes more is just more distracting—but some upgrades pay off with added safety and situational awareness.

3. Look at your backups. Put together a series of failure chains that show you what will fail under what circumstances—and what components will continue to function. Aim for a panel that only goes completely dark under the direst circumstance for the ultimate safety.

4. Know it if you're gonna install it. Plan into your schedule (and budget) the time (and expense) to get to know your new avionics with training and practice both in home study and flying VFR in the local area.

5. Keep your options open. For example, many pilots report that the most bang for your buck comes from getting weather information in the cockpit—but there are several ways to do it. You can go for a panel-mount display or a handheld; you can sign up for commercial datalink weather or (in an increasing number of regions) opt for ADS-B. —*JKB*

That autopilot coordinates well with another best-in-show player in our panel: the Honeywell Bendix/King KCS 55A flight control system. The part you may be most familiar with is the KI 525 horizontal situation indicator, but in fact it's a complete automatic slaving compass system. And the package has proven time and time again to reduce pilot workload: You (or the autopilot) direct the course on the 525's combination directional gyro and omni-bearing selector, and the system solves reverse-sensing problems and helps you visually synthesize course information with heading information.

To fill out the weather information arena in our Cardinal's cockpit, we chose the Stormscope WX-500 lightning detection device by L-3 Communications Avionics Systems. Real-time lightning strike information marries well with the uplinked radar graphics and textual weather delivered by ADS-B—there's no "as-it-happens" alternative to this strike info through datalink (though the technology continues to evolve).

For more data on the powerplant up front, J.P. Instruments provided AOPA with the EDM-800 engine analyzer. The EDM-800 allows the pilot to keep tabs on 24 engine parameters and record that data for assessment on the ground. A fuel computer comes with the package as well. The results are displayed to an accuracy of a tenth of a percent—a fine detail you'll appreciate if you want to keep a close eye on your Cardinal engine's health.

Although the Cardinal's original analog clock was soldiering on when I ferried the airplane from Texas to Georgia, we've improved timekeeping in the cockpit with a new SC-5 digital

Featured contributors

Garmin International

Gary Burrell and Min Kao launched what is now Garmin International with a team of dedicated engineers and one really great product idea: a GPS navigator for personal use. Now Garmin, based in Olathe, Kansas, is nearly synonymous with "GPS" around the world, not only in aviation but also in recreational, marine, and automotive applications—with more products by the minute, it seems, adding to the millions of GPS receivers the company has already sold.

A Garmin avionics stack forms the heart of our Catch-A-Cardinal's panel. Check out Garmin's "In the Air" blog on its Web site (www.garmin.com/aviation), or test out the full range of Garmin innovations at the company's flagship store on Michigan Avenue in downtown Chicago. Call Garmin at 913/397-8200.

S-Tec

S-Tec, a wholly owned subsidiary of Meggitt and located in Mineral Wells, Texas, has focused exclusively on autopilots for general aviation since 1978. To date, it has shipped more than 35,000 autopilots to both aircraft manufacturers and to aftermarket customers—like AOPA, for our Catch-A-Cardinal sweepstakes airplane.

With a current product line that includes analog, rate-based autopilots and digital flight control systems, there's a suitable autopilot in S-Tec's stable for just about every airplane. Visit S-Tec's Web site (www.s-tec.com) or call 800/872-7832.

clock, courtesy of Electronics International. The SC-5 marks precious time in several ways: local time, Zulu time, up and down timers, and an engine timer that can serve as a backup to the Hobbs meter.

When the chips are down—or rather, if your primary vacuum system goes down—we have two more safety items to help you stay upright. First is the SVS-V standby vacuum system from The Vacuum Source. Operating on the differential between the pressure inside the engine manifold and ambient air pressure, the system opens a shuttle valve to draw manifold pressure by which to power the primary attitude indicator—a freshly overhauled RC Allen RCA11A provided promptly by Precision Avionics & Instruments. Your second ace in the hole is the Castleberry Instruments & Avionics Model 300-14EL backup electric attitude indicator, just to the right of the six-pack, and ready for duty.

Scotty Collins, owner of Precision Avionics, a new shop on the field at Griffin, has cheerfully supported the airplane's refurbishment throughout the disassembly and rebuilding project. Most recently, Precision's technicians pulled all the old tubing and connectors within the pitot-static system, and replaced that tired plastic with all-new components—just one of the many special touches we've made to the Cardinal to make it factory fresh again.

The finishing touches

Once the installation is complete, you won't see the brains behind the instrument panel—but you'll spend many hours looking at the beauty. So we took extra care in constructing the physical panel that cradles each instrument and frames the radio stack.

The black metal structure underlying the instrument panel on the Cardinal remains essentially intact. Sarasota Avionics' technicians carefully designed the subpanels—on the pilot's side, they contain the master and ignition switches, and all electrical switches and lighting rheostats. The copilot-side subpanel houses the circuit-breaker panel.

I never thought much about the all-metal instrument panels, which we

Who's behind us?

Sarasota Avionics International

Sarasota Avionics International, of Venice, Florida, started business in April 2000, but everyone on board has even longer-standing ties to the general aviation industry. Co-founders Vince Veltri (a pilot since 1974 and in the avionics business since 1991) and Bert VanKirk, and co-owner Kirk Fryar, are supported by Bert's son Ryan VanKirk, avionics consultant, and Dave Clarke; the Sarasota team is replete with pilots who love avionics.

The talented company includes professional technicians like Larry Viergiver, who knows his avionics—from legacy to cutting edge—after many quality years at Bendix/King, and Arleigh Yeomans, who had the requisite patience and keen eye to shepherd the painstaking overhaul of the Catch-A-Cardinal's electrical system. The company has three facilities in Venice and Sarasota. Visit the Web site (www.sarasotaavionics.com) or call 888/289-0997.

painted to match the Cardinal's yet-to-come new interior. It turns out that a precise fit is crucial—and elusive. Often, these panels are produced by painstaking measurement of each instrument's or avionics' case and bezel and the dimensions entered into a computer-aided design program or other, less-high-tech means of developing the panel layout.

Jet Panels has taken a metal process used in other precision industrial applications and developed a method for use in aircraft instrument panels—including our Cardinal's. We can't tell you how they do it (because the information is proprietary), although it doesn't involve laser, plasma, or water-jet processes normally used. But this method quickly and uniformly creates a perfect metal panel. This way, the instruments and radios fit firmly in place (the first time—no hand-filing or burring of the holes for a proper fit), and the aesthetics are unbelievable. We're finishing out the panel with placards printed directly on the panel in the same style as those on new Cessna piston singles.

Before installing the panel, we put in a sharp new gray-tinted windshield and windows from LP Aero Plastics—a longtime contributor to the sweepstakes projects. And what connects the pilot to the panel—the control yoke—is getting special treatment too. Precision Avionics professionally rebuilt our yokes to accommodate the new autopilot and electric trim switches with a custom panel per supplemental type certificate specifications. The yokes get wrapped in leather from Mayfield Aviation Leather, which also is graciously donating all the aircraft interior leather.

For now, dream about shooting an LPV approach and how that buttery-smooth yoke will feel in your hands. AOPA

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INTERACTIVE ▶

***AOPA PILOT* ONLINE**

Check out the interactive panel and more photos from the avionics installation process, plus the latest updates to AOPA's 2007 Catch-A-Cardinal Sweepstakes on AOPA Pilot Online.
www.aopa.org/pilot/sweeps0705