Panel power—for the pilot

Our project airplane goes under the knife

BY STEVEN W. ELLS

While the original instrument panel in our sweepstakes Bonanza was a good example of cutting-edge technology in 1966 when Beech pushed her out the door, it just couldn't contain all the avionics we wanted to install. So we ripped out all the old stuff and started from scratch. Since the sweepstakes Bonanza will be outfitted with the latest avionics from Garmin and Meggitt Avionics, and a brand-new autopilot from S-Tec, we had to get creative.

When J.A. Air Center at DuPage Airport in West Chicago is finished with the avionics/autopilot/instrument panel installation (it was to be done by the first week in May), it is guaranteed to be the envy of some airline captains, and will be a flying example of the state of early twenty-first-century general aviation avionics technology.

The avionics equipment list

The center stack of avionics will be all Garmin. From top to bottom the stack will consist of a GMA 340 audio panel and six-place voice-activated intercom with marker beacon receiver; one GNS 530 GPS/nav/com, the all-in-one design that has ratcheted the capabilities of GA avionics well into the new century; a GNS 430 GPS/nav/com, the 530's very capable little brother; and a GTX 327 solid-state transponder. Lightning detection is provided by a Goodrich WX500 Series II weather mapping sensor system, which will display activity on the 530 or 430 screens.

For those who have been out of the loop for the past three years, it's time to wake up to the Garmin GNS units. The smaller 430, and the 530 with its 5-inch, full-color screen, are chock full of features (such as a Jeppesen database) and capabilities (moving map, VHF nav, VHF com) that fit perfectly into the Bonanza's new panel. Simply put, Garmin has done it again. The company Web site offers detailed information, downloadable owners' manuals (the GNS 530 manual is 214 pages long), and a GNS 500-series simulator. (Contact information for project contributors may be found on page 111 and on AOPA Online.) Take a few

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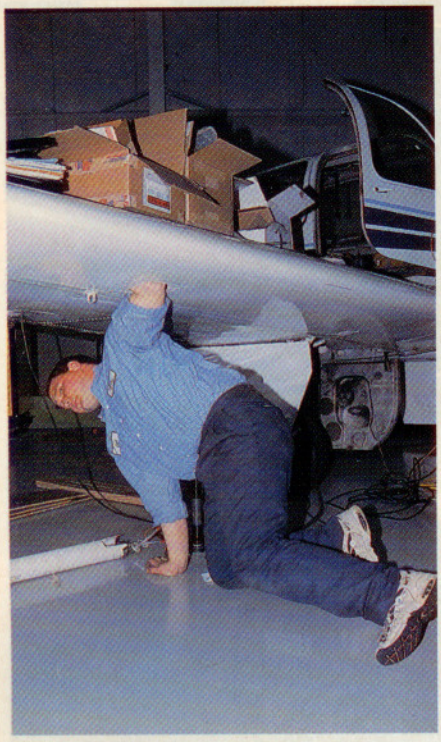
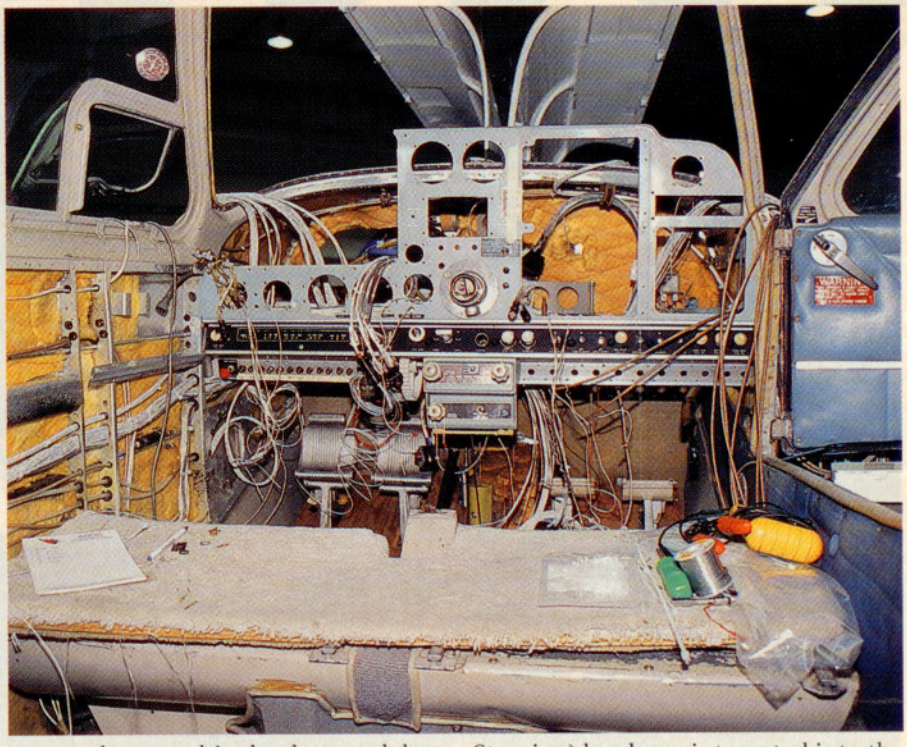




evenings to experiment with the simulator (it's also downloadable) and you'll soon see that the 530 provides capabilities that GA pilots had only been able to dream about until recently.

To the right of the Garmin stack will be an improved, third-generation Avionics Innovations CD player and AM/FM radio. AI's high-quality AM/FM radio and CD player is increasingly popular among GA aircraft owners. This unit, combined with the excellent audio management systems in the GMA 340, will deliver stereo music to the intercom headphone jacks.

The GMA 340 audio panel will also be the distribution point for the P2 Inc. Audio Advisory System. This STCed system generates audio advisories for normal and abnormal landing gear positions, and for V_{NE} (overspeed) conditions.

Directly in front of the pilot will be the two active-matrix LCD screens of the Meggitt Avionics New Generation Integrated Cockpit (MAGIC) electronic flight instrument system (EFIS). The upper 4-by-5-inch screen, called the primary flight display (PFD), will display information that would normally be shown on the airspeed, vertical speed, artificial horizon, altimeter, directional gyro, and LOC/GS instruments. At first this sounds like an impossible task, but Meggitt pulled it off.

Different colors are used on the screen display to signify the importance of specific data. For instance, the airspeed and altimeter readouts are black numerals on a white background, but amber is used to focus the pilot's attention—for example, the airplane symbol on the pitch indication display, or warnings of problems, such as failure flags, the stall warning indication, decision height indicator, and the air data attitude heading reference system (ADAHRS) source warning. Red is reserved for maximum airspeed and stall indications.

Located directly under the PFD is the navigation display (ND). The ND has menu options for type of display (HSI, Arc, or Map), what symbols the pilot desires to show on the display (airports, waypoints, navigational aids, and nondirectional beacons), and information sources for various displays. The pilot can change the display (add intersections, NDBs, airports, etc., or remove any or all information) to suit his needs at any time after the unit has warmed up. If the PFD fails, the push of a button moves all the PFD data onto the ND screen.

The last big piece of the panel is an S-Tec System Fifty Five X full-function two-axis flight control system. The panel components include a programmer/computer that mounts in the avionics stack, an S-Tec turn coordinator, an altitude selector/alerter, switches on the pilot wheel for autopilot disconnect and control wheel steering, and a remote annunciator.

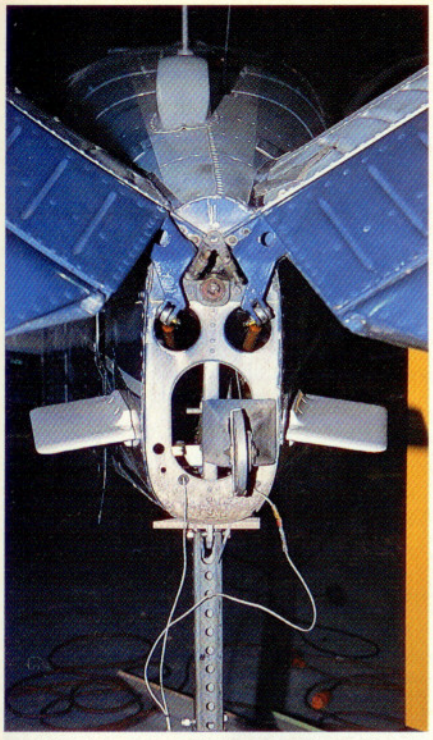
The Fifty Five X is an improved version of the System 55, which was introduced in 1994. New easy-to-read black-on-silver LCD displays are part of the improvement package. In addition, GPSS (GPS Steering) has been integrated into the system circuitry. This improvement helps the Fifty Five X respond better to GPS roll steering information (which is converted to rate commands in the autopilot) from the Garmin GPS units. This allows the autopilot to execute transitions and procedures that are available in the Garmin GPS navigators' database, such as flying procedure turns, holding patterns, and DME arc handoffs.

The Garmin 530/430 GPS units, when combined with the System Fifty Five X flight control system, will be able to take over the flying of the Sweepstakes Bonanza immediately after takeoff and fly a flight plan of almost any complexity, in almost any weather.

Round instruments

Yes, there will be 11 round instruments in the panel. The reason there's room for all of this equipment is careful planning by the expert installers at J.A. Air Center, with assistance from Mike Keirnan, the manager of installations and certification at S-Tec/Meggitt.

Between the right side of the PFD and the left side of the Garmin radio stack there are two rows of standard 3-and-1/8-inch instruments. The top row has an airspeed indicator, a vacuum-driven artificial horizon, and an altimeter. To the left of the ND will be a Garmin GI 106A course deviation indicator. These four instruments are required as backups to certify the Meggitt MAGIC system. Anticipating that



J.A. Air Center's Chad Zylstra gets the arm-twisting job of threading fuel lines to the tip tanks (opposite page). New VOR antennas add flair to the V-tail (far left, this page). Following the "measure twice, cut once" rule, Mike Good and Chuck Walling take careful measurements for the new panel.

certification would also require a backup electrical power source, we installed an STCed B&C Specialty Products engine-driven backup alternator system. This proven system will automatically take over if the primary alternator fails and can provide 20 amps of continuous power indefinitely.

Below that row is the S-Tec turn coordinator, engine manifold pressure, and engine tachometer. A little lower in the panel is a J.P. Instruments EDM-800 engine monitor and fuel computer, the J. L. Osborne tip tank fuel quantity gauge, and a vacuum gauge.

Planning ahead

Planning makes perfect. Nowhere is this more true than in instrument panel and avionics installations. We knew pretty early that we would have to fabricate a new instrument panel. The Meggitt displays wouldn't fit into the original shock-mounted flight instrument section of the panel. Knowing this actually simplified a lot of layout considerations because we weren't limited by the constraints of an existing design. How did we create the layout? Simple—we used paper building blocks.

During a visit to meet the folks at J.A. Air Center in March, I joined the avionics staff, and we moved paper instruments and radios around an instrument panel mockup. In addition to the large list of avionics equipment, we had to locate the backup airspeed, artificial horizon, and altimeter instruments in accordance with certain regulatory guidelines. This is

CONTRIBUTORS

AOPA would like to thank the following companies that donated or discounted their products and services to refurbish the Sweepstakes Bonanza or otherwise assisted in the project.

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where Mike Keirnan, Meggitt/S-Tec's manager of certification and installations, came in. Keirnan will be in charge of presenting the installation of the Meggitt EFIS to the FAA for certification so his input was followed closely.

Since this avionics package has been operating smoothly as the preferred avionics suite in every New Piper Meridian, we're excited about putting the same equipment in the sweepstakes Bonanza.

Prewiring

This installation required a lot of planning, since J.A. Air Center is installing a fully integrated system, with antennas, remote sensors, servos, circuit breakers, and peripheral equipment—such as the cabin entertainment center—that must be woven into the mix. By the time the panel was cut in late April, three-quarters of the nine-week-long work and planning process had already been completed. Like all avionics installations, there were weeks in the middle of the process when it appeared as if someone had taken the money and gone south for the rest of the winter. Then, all of sudden, large pieces of the puzzle instantly appear, and are quickly installed. The last two weeks of the installation will tell whether the planning and preinstallation steps have been well executed.

J.A. Air Center has an experienced and talented avionics and maintenance facility. While one crew has concentrated on the avionics, the maintenance crew has installed the J.L. Osborne wingtip fuel system, a set of new fuel bladders from Aero Tech Services, a Whelen Comet Flash strobe light system, and a Beryl D'Shannon Speed Sloped windshield. The resident Bonanza expert has given the airframe a thorough once-over, tweaked a few items, and pronounced it sound.

Future flight

This year's airplane will be a quantum leap ahead of any previous AOPA Sweepstakes airplane. Imagine the capabilities—a comfortable four-place airplane that has a useful load of more than 700 pounds after filling the four fuel tanks. The full-fuel capacity (114 gallons) is sufficient to fly still-air legs of more than 1,200 miles at more than 200 knots. The Superior engine, bolstered by the Tornado Alley Turbo turbonormalizing system and the new McCauley propeller, will provide the pilot with a smooth, powerful powerplant that promises weather-topping capabilities in all but the worst conditions, and the new panel will provide the pilot with unparalleled avionics performance.

In May, the sweepstakes Bonanza was in Mineral Wells, Texas, where the Meggitt/S-Tec crew checked it out for about a week. Then it flew to Salina, Kansas, where a TKS weeping-wing ice protection system was installed.

AOPA members will be able to get their first look at the partially completed airplane at the AOPA Fly-In and Open House on June 2 in Frederick, Maryland. Still to come, after windows, and flap and aileron gap seals by Beryl D'Shannon, is paint by Murmer Aircraft Service, and a custom interior by Air Mod. We'll have another report next month. Check AOPA Online weekly for updates. AOPA

i Links to additional information about the Sweepstakes Bonanza may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

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