



SWEEPSUPDATE

A MONTHLY UPDATE ON THE PROGRESS OF YOUR SWEEPSTAKES AIRPLANE



Über upgrades

The beginnings of an amazing instrument panel

BY IAN J. TWOMBLY

It's time to go glass. After months of work from Oxford Aviation on the beautiful cosmetic appointments, and Penn Yan Aero on the new powerplant behind AOPA's Get Your Glass Sweepstakes Archer, it's finally time to begin work on the airplane's instrument panel. Penn Avionics in West Chester, Pennsylvania, accepted the charge, and began work earlier in the year on the panel transformation.

The work on the instrument panel began long before it reached Penn's shop at Brandywine Air-

port. Like most instrument panel refurbishments, we spent months researching the best equipment and how each piece integrates to create a great panel. With any major job like this, it's best to take a broad look and compare your needs with what's available on the market, and how well that equipment suits the mission. It would be frustrating to install a Garmin GMX200 multifunction display, for example, only to find that your favorite traffic system doesn't display on the unit. Avionics manufacturers and installation shops are the best

The sweepstakes Archer undergoes panel work at Penn Avionics prior to Sun 'n Fun in early April.

Although not an ideal situation, the panel was completed in two phases—radios, the MFD, and the Aspen Avionics PFD were installed prior to Sun 'n Fun; the rest after the show. Notice the attitude indicator and directional gyro are absent as the panel awaits the Aspen.



sources for such information, but the decision-making process takes time. In the end, we decided on the Aspen Avionics EFD1000 primary flight display as the cornerstone of the new panel. We knew the system interacted with the Garmin GNS430W, as well as

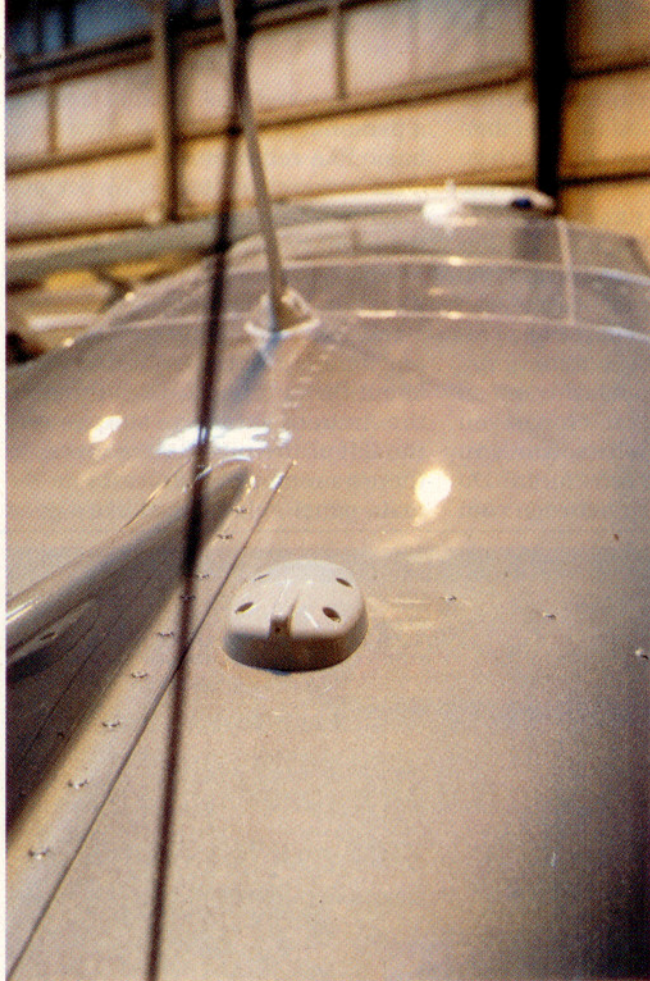
the S-Tec Fifty Five X autopilot we wanted to install.

Space is also a major consideration. When it came time to design the panel layout, we found that we couldn't do everything we wanted to do because of space limitations. With Archers, there is

very little vertical space in the central radio stack. The answer was to get an Avidyne EX500, which has a 5.5-inch diagonal display, compared to Garmin's GMX200 at 6.5 inches (it was later that we discovered the EX500 is larger in the back, another important point).

Another plus of the EX500 is that Avidyne is offering the TAS600, it's active traffic system, weather datalink, Sirius satellite radio, and digital approach plate capability through Jeppesen. Luckily, L-3 Communications Avionics Systems' WX500 stormscope displays on the EX500, meaning the sweepstakes winner will also have real-time lightning data, a key safety feature. We also did some basic measurements and discovered that we would have room for two Garmin 430Ws, which we decided to go ahead with.

For the final preparation steps, we flew to Brandywine to meet Peter Fiorot, Penn's in-house panel designer. Fiorot is well versed on computer-aided design (CAD), which makes laying out a panel incredibly easy. Whereas previously we were making crude, caveman-like sketches of instrument panels in the office, Fiorot already had the exact dimensions of the Archer II panel and the instruments we were planning to install loaded in CAD. All we had to do was ask him to make changes, and the design changed within seconds. It was visual brainstorming, and it worked fabulously. In the end, space was the major con-



Antennas and sensors such as Aspen's magnetometer always come first in a Penn Avionics project. Despite its GPS-like appearance, the sensor controls attitude as well as the company's backup GPS.

straint. Instead of the customary center stack of audio panel on the top, then MFD, and GPS, we were forced to go with the GPS on top and MFD on the bottom, sans audio panel. Unfortunately, while the EX500 has a smaller screen than the GMX200, it's also one solid piece going back about a foot. The Archer's sloping panel in the back required putting it on the bottom.

One nice thing about laying out an instrument panel is that it forces you to analyze your habits. Do you change the MFD screens often? Do you constantly switch between com

radios one and two? A panel layout is a personal decision, and aside from basic FAA requirements, should be done however you prefer. We decided to go conservative and ended up with the primary 430W on top of the center stack, the MFD below it, the audio panel on the top of the right radio stack, followed by the second 430W, and finally the transponder. What about the autopilot? We put that on the Archer's extensive subpanel to the left of the pilot's yoke. Because there's a remote annunciator on the main panel, this seemed like a good

place. The biggest lesson we learned doing the layout with Fiorot in front of his computer is that it pays to lean on the shop for expert advice. The lengthy work we did in preparation was unnecessary because we weren't aware of issues such as the EX500's back end size, the fact that the chain between the yokes goes directly behind the electrical switches (can't put a radio there), or that the tachometer cable is short and it's difficult to move the instrument.

More power please

Laying out the panel was only a small portion of the advance work. Early in the project we began to discuss the various merits and problems associated with converting a 1976 airplane to



Chris Vinciguerra works on the auxillary control unit for the Aspen PFD. Although it can be mounted behind the panel, space limitations meant it had to be placed under the rear seats with the autopilot servos.

glass. Many of these issues will be associated with all older models as Aspen and other manufacturers make their way into the retrofit market. Being a sweepstakes airplane, we wanted to show the best of the best, so we toyed with the idea of significantly changing the aircraft systems. Specifically, we thought about trashing the vacuum pump. Aspen's EFD1000 is a primary replacement instrument, meaning it serves as the primary instrument for all six of the analog "six-pack" gauges. Given that it runs com-

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Penn Avionics

Peter Stelzenmuller opened Penn Avionics in 1989 with just himself and one employee. Since then he has quietly grown the company to be one of the largest general aviation avionics shops in the Northeast, and one of the world's biggest dealers for equipment from Garmin and other suppliers. Stelzenmuller is a pilot and aircraft owner who understands the needs of GA pilot/owners, and his work in the shop reflects that. We thank Penn Avionics for working on this year's project and making a 1976 Piper Archer II turn in to a beautiful and capable glass-equipped aircraft.

Avidyne

Avidyne is a modern avionics pioneer. The company claims a number of industry firsts, including the first datalink-capable multifunction display and the first integrated cockpit avionics suite for general aviation. Today Avidyne continues its innovation, while constantly improving its well-known products. With an EX500 MFD complete with traffic, weather, and approach plates, the winner will have some of the best situational awareness tools available.

pletely off electrical power and we could install an electric backup attitude indicator, tossing the vacuum pump seemed like a viable option. But would such a move be practical, safe, or even legal?

One of the Aspen's key safety features is its backup battery. The engineers at Aspen know the GA community, and decided in the beginning that a backup power source was essential. The FAA has certified the battery to provide 30 minutes of backup power to the unit, although tests have shown a slightly longer figure. That means if the alternator and aircraft battery quit, the Aspen should still shine brightly long enough for the pilot to land, or fly to VFR conditions.

A backup attitude indicator is still required because the sweepstakes airplane will have only one Aspen (a second unit would mean dual air data and heading reference systems, thereby negating the need for backup in-

struments). But that instrument could also be electrically powered. In the end, we decided to keep the vacuum pump. After all, it's installed in the airplane and is working fine. Why not keep it? But if and when it does fail, perhaps the winner will reconsider.

Aside from pondering the merits of eliminating one system, we explored the alternatives of adding another. Because the Aspen is electrically powered, it only makes sense that we would add a backup electrical source. Unfortunately, the options are very limited. Adding another

battery isn't practical when you factor in the size, weight, and potential benefit. Backup alternators are on the market, but not for those running Lycoming O-360-A4M engines. The alternator is connected to the back of the engine case on a pad, and the Archer's engine didn't have a pad to spare. Finally, ram air turbines are an unusual option that didn't seem to fit in the concept of the program. It was a moot point anyway because there wasn't one certified for the Archer at the time we were going through this exercise.

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Time to work

Finally, after much preparation, Penn took delivery of the airplane and immediately got to work. The plan to retrofit the airplane's panel was a bit different from normal jobs. Instead of doing all the work in one visit, we decided to break it up and only have Penn install the Aspen, the Avidyne, both Garmin 430Ws, the transponder, and the audio panel on the first work order, and then finish everything else, including the one-piece flat panel, on the second. Penn started the work in early March and we wanted to be able to show off the first certified installation of the Aspen at Sun 'n Fun in early April. It was going to be tight, but Penn assured us they could do it.

If the alternator and aircraft battery quit, the Aspen should still shine brightly enough for the pilot to land, or fly to VFR conditions.

Peter Stelzenmuller, the owner of the shop, assigned Chris Vinciguerra the job. Vinciguerra is one of Penn's most experienced installers, and he has done a number of first-time installs with new equipment. On our first visit to the shop after Vinciguerra got to work, it was clear that his U.S. Navy training had served him well. Not only was his work organized and logically done, it was clean and efficient. Since a large portion of time is spent building wiring harnesses on a bench, it can be days before he actually starts working on the airplane itself. Penn uses all mil-spec wire and it has a standardized process for building harnesses to ensure quality and consistency. Once finished with the harnesses, it was time to go to the airplane.

Here, Vinciguerra's flow is out to in, back to front on every job. "I start with

the antennas first," he said. So even though the Avidyne TAS 600 wasn't to be installed until later, the antenna was mounted in the first round. The reason is simple. Why bring down a new headliner multiple times if you don't have to? Vinciguerra also replaced all the coaxial cable in the airplane. To try and limit the number of antennas, we turned to Comant for help. Comant produces many of the antennas for manufacturers, as well as some nice aftermarket products. One of them is a combined GPS/comm antenna that saved us some space. We also combined the GPS and datalink antennas. After installing all the antennas, including Aspen's magnetometer, Vinciguerra headed inside the airplane and began work on the auxiliary boxes in the tail and under the back seats.

For the initial install, the only auxiliary box needed was for the Aspen. Although in some applications this small box can be installed behind the panel, there's no chance that was going to happen in the Archer because of the space limitations. Instead, Vinciguerra attached it under the rear seats in a hole along the spar that also contains the autopilot servos.

From there, Vinciguerra headed forward to finish building the radio racks, removed the vertical speed indicator, and relocated the turn coordinator and attitude indicator. Because the Aspen occupies the holes where the attitude indicator and directional gyro are normally located, they had to be removed prior to installing the unit.

To finish the job, Vinciguerra simply attached the Aspen's mounting plate to the screw holes previously reserved for the attitude indicator and DG, and then popped the display into the bracket. It was that easy. After a bit of programming on all the new avionics, the airplane was ready to make its way to Florida for Sun 'n Fun.

Despite less than a month to complete a major panel upgrade, Penn Avionics delivered on its promise and made N208GG a highly capable glass-equipped airplane with equipment that worked perfectly and talked to each other exactly as they were supposed to. But there was much more work to be done after the show. Stay tuned next month to learn how it all came together.

ACPA

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