

## A 172 makeover. Step four.

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onsidering the scant avionics requirements imposed on us by the Federal Aviation Regulations, we pilots sure make a big deal about what goes in our panels. If you fly only from, to, and between nontowered airports in VFR conditions and below 10,000 feet msl, you need no avionics. Even for instrument flights, you're only required to carry a "two-way radio communications system and navigational equipment appropriate to the ground facilities to be used," according to FAR 91.205(d)(2). If you're flying on an IFR flight plan on a VOR airway and landing at an airport with a VOR approach, the minimum necessary avionics include a single VOR receiver, a com radio, and a transponder.

As in all cases, the regulations are minimums only. From a practical standpoint, we need more avionics to conveniently operate in the air traffic control system. In much of the country, flying without a Mode C transponder with altitude-reporting encoder is impractical. Even for basic VFR flying, at least a single nav/com sure makes life easier. Especially for IFR flight, a second nav/com not only provides a backup to the first, it also means you can listen to ATIS or AWOS and identify an intersection with a lot less knob turning. Want to increase the likelihood of getting in when the weather is bad? Add glideslope and marker beacon receivers and shoot the ILS. Want to listen to the ball game during those long cross countries? Wedge an ADF receiver into the panel (you might even use it to fly an NDB approach once in a while). And if you really want to be with it, find a prominent place on the center stack for a GPS or loran receiver.

When deciding what avionics to put in N13057, our "Good As New 172" project airplane, we talked with numerous avionics dealers. A few years ago, a wellequipped IFR airplane would have the requisite two nav/coms and the usual glideslope and marker beacons. One of the navs might actually be a VOR/DME-based area navigation system. If it had no RNAV capability, the airplane would at least have a stand-alone DME receiver.

But, at least according to several avionics dealers we talked to, the day of the DME is waning, and VOR/DME area nav systems will soon go the way of the LP record.

"I can't give a DME away," says Stephen M. Nolan of



N13057's panel as it was when we bought it back in February. The rudimentary audio panel had no "auto" function. The King DME and the glideslope on the number-one nav, a Narco 122, also didn't work, and the transponder was weak.

Nolan Avionics in Durant, Oklahoma. For the same \$1,650 he might spend on a DME, an aircraft owner can get a GPS receiver with a full database. Without DME, you can't shoot a VOR/DME approach or fly a DME arc, but there are few airports where those are the only options for an instrument approach. You also can't identify some airway intersections without DME, but ATC won't ask you to report those points if you file your flight plan with the proper equipment suffix. The turbocharged set may want to see Nolan about his giveaway offer, though. DME is required for flight at and above Flight Level 240.

Once manufacturers begin producing GPS receivers that meet parts A1 and B1 of Technical Standard Order C129, the day of the VOR/DME RNAV system will be numbered. Those panelmount GPS receivers meeting the TSO will be good for oceanic, enroute, and terminal use and for nonprecision approaches except localizer, simplified directional facility, and localizer directional aids (see "GPS for IFR," September Pilot). Sales of RNAV systems have slowed over the past five years, but some customers in areas where RNAV approaches provide the lowest minimums are still opting for the equipment. With the dawn of IFR GPSs, Fred Kattermann of Islip Avionics in Islip,

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New York, describes the Bendix/King KNS 80 and 81 RNAV equipment, the most popular of the RNAV systems, as "obsolete, yes, but they work well." The customer who buys an 80 or 81 is the type who will also buy a new IFR GPS once it is available and carry both, he adds.

Further complicating the avionics buyer's decision-making process was the recent introduction of the Bendix/King KLX 135 combination GPS/com by AlliedSignal General Aviation Avionics. The units, which will be for VFR use only, won't be available until the first quarter of 1994, but they will give the aircraft owner even more options in configuring a panel.

Taking all of this into consideration for our GAN 172 project, we decided to go with some of the old technology and some of the new to make the finished product IFR capable. When we purchased the 1974 Skyhawk last February, it came with a nav/com and a separate nav, com, ADF, DME, and transponder, some of which didn't work. It was a hodgepodge of brands and faceplates.

Our goal is to refurbish the sturdy Skyhawk and then give it away in AOPA's Good as New 172 Sweepstakes. (For details on the sweepstakes, see p. 19.) We've already written about the purchase ("Good as New 172: Skyhawk Sweepstakes," April Pilot), fixing up the airframe ("Good as New 172: Airframe Aspects," June Pilot), and the engine overhaul ("Good as New 172: Engine Overhaul," August Pilot). N13057 was scheduled to be in the paint and interior shops throughout September and to come out with a new registration, N172GN. We'll report on those processes in upcoming issues. The mostly completed project is scheduled to be on display at AOPA Expo '93 in Orlando, Florida, November 3 through 6. We'll finish up last-minute details after that and then give the airplane away in January to some fortunate member.

We looked at the panel as really two parts, the avionics stack and the plastic-covered instrument panel itself. With the good-as-new mandate, we wanted to not only upgrade the avionics stack, but also the panel. Today's airframe manufacturers have, for the most part, done away with the 1960s plastic overlays and gone to clean, flat metal panels. We hope to install a new flat metal panel in the airplane to replace the plastic. The panel could not be installed in time to have the airplane ready for display at the Experimental Aircraft Association's annual fly-in in Oshkosh last July, so we opted to install the avionics in the old panel, as you see on these pages. We plan to revisit the panel project in October. Look for more photographs when the project is complete.

In choosing avionics, we decided a basic IFR package suited to the capabilities of the airplane was in order. With its Bendix/King products, Allied-Signal provides by far the most complete line of avionics available for light airplanes. In support of the project, the company offered a generous discount on their products.

For the most part, Bendix/King has an excellent relationship with its dealers and a good reputation in the industry. For that, they generally command a bit higher price than the competition, at least 10 percent more, according to one shop owner we spoke with. Other options include Terra Avionics, which makes a capable line of IFR avionics especially well suited for fitting in small panels, as is a transceiver from Icom. Another choice might be Narco Avionics, though the half-dozen dealers we spoke with seemed reluctant to recommend purchasing new Narcos. The company recently required that its dealers begin shipping all radios back to the factory for repairs as a way of generating revenue. Narco claims to have loaner equipment available to keep the customers flying while the radios are being repaired, but the shops we talked with hadn't been able to obtain any. The dealers also were not happy with the length of time it took the factory to make the repairs. A Narco spokesman said the company was working to boost the inventory in the loaner pool. Turnaround times were usually one to two weeks, but faster times can sometimes be arranged.

Instead of going brand-new, some aircraft owners with very old radios and a small budget might opt to upgrade to newer radios. The various trade publications carry page after page of advertisements from avionics shops hawking all sorts of used avionics. Some are excellent bargains. A couple of caveats apply. When buying com radios, make sure they will tune at least 720 and preferably 760 channels. Otherwise, you'll find yourself unable to operate in some airspace as ATC begins using more and more frequencies spaced only 25 kHz apart. Also, make sure the radios meet the new Federal Communications Commission frequency tolerances of 0.003 percent. Radios manufactured since 1982 meet the tighter tolerances, and some older radios can be upgraded to meet the new specs. Effective January 1, 1994, radios that don't meet the tolerances will be illegal.

Owners of certain models of King KX 170 and 175 radios can opt to modernize their existing radios with a kit available from McCoy Avionics. The resulting MAC 1700 radio includes a new digital display and many other enhancements.

The electronically apt can even opt to roll their own nav/coms and audio panel with kits from Radio Systems Technology. Along those lines, Allied-Signal recently began allowing its Bendix/King dealers to sell its lowest cost radios directly to the customer without the usual installation requirement. The dealer must supply the wiring harness, but the customer is permitted to install the equipment himself under the supervision of an A&P mechanic or avionics technician.

For a complete listing of avionics products and manufacturers' addresses, see the "Avionics Directory and Buyer's Guide" in the 1993 edition of

The new Bendix/King stack includes an audio panel, two nav/coms with indicators, an ADF, a transponder, and a Magellan GPS. The PS Engineering intercom above the pilot's yoke will be relocated when the new flat metal panel is installed.



## AOPA's Aviation USA.

In the end, we decided on a mostly Bendix/King stack, including two KX 155 nav/coms paired with two new indicators, one with glideslope. We can manipulate the sound with a KMA 24 audio panel with built-in marker beacon receivers and indicators. The new transponder is a KT 76A. We used the Skyhawk's existing Narco encoder because it was working fine.

Though they seem like ancient technology, ADF receivers are pretty complicated devices, and they command a commensurate price. The KR 86, Bendix/King's cheapest ADF, lists for more than \$3,000. We decided to install an ADF because we wanted our N172GN to be able to serve as an instrument trainer if the new owner needs it. The practical test standards for the instrument rating still require students to demonstrate ADF approaches and navigation. We ended up buying a KR 87, a more expensive (\$4,300 list) but more capable ADF that includes a digital display and two timers. Individual owners might rather spend their money on more useful equipment.

Of course, we couldn't resist equipping the airplane with a GPS receiver. New GPSs seems to be showing up on the market almost weekly. Some, such as the Bendix/King KLN 90, approach flight management systems in capability and seemed like a bit of overkill for a Cessna 172. Instead, we considered some of the new crop of GPSs with lower cost displays. One with which we had had little experience but that looked impressive was the Magellan SkyNav 5000. We had one in the office for evaluation and decided to buy it. The handsome SkyNav seems to work fine, though we haven't yet flown with it much. Look for a review in an upcoming feature on panel-mount GPSs.

Twenty years ago when N13057 was new, intercoms and headsets in light airplanes were a bit of a curiosity. Today, however, they're standard fare. We remedied N13057's shortcomings by installing a PS Engineering fourplace PM1000II intercom. The PM1000II provides a music input and voice-activated circuitry, pilot-isolate capability, and a host of other features that just a few years ago would have been unheard of in an intercom, let alone one as compact as this one.

Evaluating, buying, and installing a complete panel of new equipment can be an intimidating experience. Several



Installing a whole new stack of avionics and indicators and preparing for a new panel involves lots of new wiring and circuit breakers and lots of downtime.

AOPA members who had been through the process offered helpful advice, but by far, the most assistance came from the avionics dealers we've talked with. We found none of them to be the highpressure salesmen you might expect when dealing with such high-ticket items. Instead, most seemed genuinely interested in helping us select the avionics most appropriate for the missions and the aircraft we outlined, even when they didn't know we were from AOPA Pilot. AOPA's Membership Services Division is interested in learning about members' experiences with avionics shops. If you'd care to share your encounters-good or bad-send the details to the attention of Ray Gebhart at AOPA, 421 Aviation Way, Frederick, Maryland 21701, or leave a message on AOPA Online.

We asked Summit Aviation in Middletown, Delaware, to install the avionics for us. The FAA regularly uses Summit to install strange things on their airplanes for testing purposes at the FAA Technical Center in nearby Atlantic City, New Jersey. Summit installed the equipment in AOPA's Bonanza for the nonprecision GPS approach tests we conducted with the FAA last winter and, more recently, installed the equipment in the Bonanza for the ongoing precision DGPS approach tests we're running. For avionics technicians used to installing such esoteric equipment, putting a basic IFR Bendix/King stack in a Skyhawk must be rather pedestrian, but they always treated us like we'd just contracted with them to install a new panel in an Astra Jet.

The manufacturers also can help in planning your new panel. AlliedSignal, for example, offers a pamphlet called Avionics Retrofit Guide. The booklet obviously puts the soft-sell on Bendix/King products but offers good general advice, as well. While picking up the guide at your local dealer, ask for a copy of the Bendix/King brochure that includes full-scale photographs of the faceplates for all its avionics. Just cut out the faceplates and tape them on your panel to see how well the new boxes will fit.

As you've already figured out, such a complete panel makeover is an expensive proposition. List price on the Bendix/King stack alone tops \$13,500. The Magellan's suggested price is \$2,675. In both cases, you can probably do better than list with a little negotiating. The PS Engineering intercom goes for about \$330. Expect to spend at least \$3,000 for installation of all the equipment. New antennas, if necessary, may add several hundred more dollars. The price of the antennas was included in the list price of the GPS and the ADF. Our nav, com, and transponder antennas were in good shape after a little cleanup and paint.

All told, the panel, including installation, would top out at a retail price of almost \$20,000. We paid \$22,000 for the airplane. And while our finished product will be nice, it really is only a basic configuration. We could have increased the panel tab by more than 50 percent with the addition of an autopilot, engine monitor, and Stormscope.

In cost and complexity, a complete panel upgrade surpasses an engine overhaul. But unlike an overhaul, it's easy to do a panel makeover one step at a time. A new box every Christmas and Father's or Mother's Day and you'll soon be riding behind a good-as-new panel.