

The panel of my 1981 A36 fully retrofitted with PFD, EIS, Digital autopilot, and GPS.



A Systematic Approach to an Avionics Upgrade

Part 1: Plan your upgrade

By Kevin Crozier

Owners of Bonanzas and Barons face a unique challenge during avionics upgrades. Our airplanes aren't just transportation, they're complex, high-performance machines with their own distinct personalities, shaped by decades of modifications. Every one of them has some combination of tip tanks, deicing systems, upgraded engines, aftermarket autopilots, engine monitors, or even STC'd turbo systems. Any one of these upgrades can change how a new avionics suite must be installed and configured.

Before diving into any panel upgrade, it's critical to clearly define your upgrade goals. Your objectives will determine the scope, complexity, and ultimately the cost of your avionics project. For Bonanza and Baron owners, the range of goals can vary widely—from simply replacing aging radios to fully modernizing the cockpit with integrated flight displays, advanced autopilots, and engine monitoring systems. Understanding your primary mission and flying habits is crucial to making informed equipment choices that meet your actual needs, rather than simply following trends.

For example, if your primary goal is to improve IFR capability and safety, your upgrade path might focus on adding a modern GPS navigator with WAAS capability, a digital autopilot for precise vertical guidance, and enhanced situational awareness tools like synthetic vision or ADS-B In/Out for traffic and weather. In many

cases that means investing in a fully integrated flight deck with "glass" flight displays, a GPS navigator, digital engine monitoring, and an advanced autopilot that can reliably handle complex IFR procedures. For example, a common setup pairs a Garmin GTN 750Xi with a G500TXi or G3Xdisplay and a GFC 500 autopilot, providing a seamless, highly capable IFR platform.

Conversely, if your flying is mostly VFR with the occasional long cross-country trip, you might focus on upgrading to more reliable communications radios and ADS-B compliance equipment without fully replacing your existing analog instruments. In this case, a hybrid panel approach can be cost-effective – retaining familiar primary flight instruments while adding selected modern avionics for safety and convenience. This path might include a Garmin G5 or G1-275 flight instrument to replace an aging attitude or heading indicator

gyro, GTX-345 ADS-B transponder, GNC-215 NavCom radio, and an iPad to display traffic and weather information.

Another common goal is to simplify engine management and fuel monitoring. Accurate engine data is crucial for efficient engine operation and engine health monitoring, and preventing fuel exhaustion. Here, the upgrade may focus on installing or upgrading dedicated engine monitoring systems that are integrated with your GPS for fuel planning and range estimation, rather than a full glass cockpit overhaul. This path could include a JPI 930 or EI CGR-30 engine monitor upgrade.

Audio panels are a critical part of your avionics suite that are often overlooked during upgrades, yet they have a major impact on pilot workload and communication clarity. Modern units, such as the Garmin GMA 350 or PS Engineering PSE450, integrate radios, intercom, and external audio sources into a single, intuitive device, making it simple to manage conversations, monitor ATC, and hear alerts without distraction. Features such as Bluetooth connectivity for music and phone calls, 3D spatial audio for easier radio separation, automatic muting of non-essential inputs, and multiple intercom modes add both convenience and safety. It's the one piece of avionics you'll interact with on every flight, so it deserves just as much attention in your upgrade plan as your GPS, displays, or autopilot.

Clearly defining the goals upfront allows your installer to recommend an avionics package that aligns with your flying style, mission profile, and budget. It also guides necessary wiring, configuration, and testing steps to ensure your new systems meet expectations, perform reliably, and integrate smoothly into your airplane's unique environment.

Once you've set those goals, the next step is understanding how the different pieces of your existing and new avionics communicate and work together. Avionics systems transmit data over communication buses, such as RS-232, ARINC 429, or CAN (ARINC 825). This data includes GPS position, aircraft attitude, engine parameters, traffic, weather, and alerts. But not every unit "speaks" every protocol or supports every feature. For example, some engine monitors output data only over RS-232, which can limit how they feed information to a flight display or GPS. For instance, some autopilots and PFD/MFD combinations use CAN exclusively, meaning an extra converter box may be required to interface with ARINC 429-based GPS navigators.

It's just as important to recognize the limitations of your existing equipment when integrating modern capabilities. For example, a new GPS navigator might offer VNAV, giving you vertical guidance to meet altitude restrictions along an arrival or approach. But many older autopilots and retrofit displays can't process VNAV commands, meaning you'll still need to manage those altitude changes manually. Pairing a Garmin GTN 750Xi and G500TxI with a legacy KFC-200 autopilot, for instance, won't let you take full advantage of VNAV capability offered by the new Garmin avionics. Spotting these compatibility gaps early in the planning phase helps you avoid unexpected limitations on your first flight—and the costly "wish I had known" fixes that sometimes follow.


The same principle applies to ADS-B traffic and weather. While many modern navigators and MFDs can display FIS-B weather and ADS-B traffic, they can only do so if they receive the data over

Questions to Ask Before Choosing Your Avionics (Use these with CFIs, other owners, or your installer)

1. How well does this GPS/autopilot combination support VNAV, Altitude Preselect, and GPS vertical guidance?
2. Did you encounter integration quirks between this equipment and the existing systems?
3. Does the traffic/weather display where I want it (MFD, PFD, tablet), or only on certain screens?
4. Have there been any software updates that fixed—or created—problems?
5. If you could redo your panel, what would you change?

a compatible link or protocol. Some ADS-B receivers share data over Bluetooth or Wi-Fi. Others require wired RS-232 or ARINC 429 connections. In mixed-brand panels, it's not uncommon for a receiver to feed your iPad flawlessly but remain invisible to your panel display, or vice versa. For instance, an L3 NGT-9000 Lynx transponder can broadcast traffic and weather to Foreflight on your iPad over WiFi, but it cannot send that same ADS-B data to a Garmin GTN 750 or G500TxI flight display. Sorting out these compatibility issues before installation ensures you get the full benefit of your investment and prevents that "but the brochure said..." moment.

Taking time before the upgrade to read user manuals, study installation guides, and attend manufacturer webinars or training sessions will pay dividends when it's time to make decisions. Go deeper and talk with knowledgeable CFIs who regularly fly different avionics suites in Bonanzas and Barons. They often have first-hand insight into how various systems behave in real-world flying, including quirks you won't find in the marketing materials. Likewise, seek out other owners who already operate the specific equipment you're considering; they can share what works well, what falls short, and what they wish they had done differently. By combining this hands-on perspective with your own research, you'll enter the installation process informed, confident, and far more likely to end up with a configuration that works seamlessly—enhancing safety and making your flying more enjoyable.

Now that you've selected the avionics for your upgrade, part two of this series will focus on the practical steps—preparing for installation, confirming configuration details, and completing both ground checks and the post-installation test flight. Finally, in part three, we'll build on that by exploring real-world installation challenges I've seen while flying with students after their panel upgrades, and how those lessons can help you avoid similar issues. 

Kevin Crozier is the caretaker of a turbonormalized 1981 A36. He's an ABS Recognized Instructor (CFI / CFII / MEI), and an FAA-designated software Designated Engineering Representative. Kevin is the owner of KTronics Aero Services, located near Austin, Texas.