

DINOSAURS, DUMPSTERS & DOLLARS

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With all of the options and details in your head from Part I and II, it's time to start designing your new instrument panel. An optimal custom instrument panel installation starts with a good plan. A good plan is the result of a lot of communication between the owner-pilot, panel builder and the avionics shop. Having built numerous Beech panels over the years, our experience level puts us in a position to evaluate almost any idea an airplane owner may have. Conversely, the owner is most likely going through the custom panel project for the first time.

Since this project is very important to the pilot and will represent a major investment in the airplane, the most valuable advice I can give to someone planning a custom panel is "Don't rush into it."

- Look at as many panels as you can; evaluate different layouts and equipment combinations. Ask owners

what they like and dislike about their panels. Try to find out how reliable and maintainable the various components and systems have been.

- If you are new to the airplane, fly it for a year or so and spend those quiet hours in cruise visualizing and analyzing various panel options. A year of research can produce some rather pro-

nounced changes from your initial thoughts and how that dream panel will finally look and function.

- Take lots of pictures and make notes. I started carrying a camera in my flight bag in the '60s. I so treasure having a permanent record of the special sights, people and technical things that only general aviation can show us. When it comes to a complex project, the pictures of a good idea you saw six months earlier can be very valuable, particularly when you finally meet face to face with the panel builder.

- Choose your panel builder wisely. My eyes have seen the dread of a lot of instrument panel shortcuts.

PROJECT PLANNING

The project featured in this series of articles started with many phone calls, ideas, questions, answers and some "might be able to do." Why the "might be able to do" part? This customer and I share a passion for the classic look and feel of an older Bonanza. In the nostalgic spirit of that idea, we wanted to achieve a panel design that was the best of two worlds, one being the appeal of aforementioned classic vintage Bonanza, the other blending in as much state of the art glass equipment as possible.

After a couple of pilot-to-pilot meetings, priorities began to take shape on paper. As we discussed the many details and possibilities, we selected, sketched, moved, resketched and deleted a number of options.

Not all panel ideas are as undefined at startup as this one was. Some are more straightforward, often allowing the customer to have an accurate design drawing when the airplane is dropped off. This panel was unique to the point that this customer left with preliminary sketches that defined three groupings of details.

Group one is all the stuff *I know we can do*. Group two is all the stuff *I'm fairly certain we can do*. And finally, there is group three, *the long-shot stuff*. I know this sounds a little precarious but if you are trying to build a truly custom



To design a truly custom panel, it is often necessary to evaluate many panel sketches to find one that works.

panel, tailored to the needs of a specific pilot, this initial assessment of undetermined possibilities is necessary.

No matter how experienced and creative a panel builder is, there's always room to learn new ways of doing things. This open-mindedness is fundamental to achieving a higher level of success. There is nothing "custom" about doing the same things over and over.

A trusting partnership between the owner-pilot and the panel builder is the key to the success of this process. Usually it's about one-third of the way through the job when a final drawing is sent to the customer. The parties must be in close communication as the various options are explored and finalized.

Do we end up with every component exactly where we want it? No. The mission is to build a functional panel for a specific customer with as few compromises as possible.

We, like many panel builders, have some tried-and-true designs that work well for many of our customers with minimal change. With new equipment coming to the market almost every month, this panel design game will probably remain in a constant state of flux. I love it!

A word to the wise: Precheck every system and component related to the panel before starting the tear-down. We even do a pitot and static leak check. Not all of the problems in these systems will be behind the panel. If the problem is in an instrument, it can be sent out for repair while the panel work is being done. Good planning saves down time.

Pretesting protects both the customer and the installer by establishing, up front, the status of those often old and certainly delicate components. This eliminates the potential for the finger-

pointing contest of "It was working when I brought the airplane in." One can spend a lot of time troubleshooting newly installed wiring only to find out that the box is bad.

TIME TO GET ORGANIZED

With the plan and wish list in hand, it's time to get organized and tear into the project. The key word here is "organization." Have lots of plastic sandwich bags for small components and related parts. A digital camera will help a less-than-perfect memory keep track of lots of details.

Never unhook or cut a wire without first understanding and confirming its function. That means that a thorough start-up check of all systems is an absolute must. "An ounce of prevention is worth a pound of cure." Remember to mark *every* wire.

The actual teardown process begins by removing the crew seats, left forward side panel, right side kick panel, lower pedestal, floor carpets and padded glareshield. Start thinking of ways to keep stuff from falling into critical places below the floorboards or into the control cable tunnel located immediately and

below the throttle/prop/mixture controls.

We have more than once found something like a hose clamp that had fallen down into this area and lodged itself between a pulley and a cable. This resulted in a frayed cable and a worn pulley, obviously requiring replacement of these expensive components.

To prevent this from happening, we like to stuff appropriately shaped pieces of 2" thick upholstery foam into the odd-shaped openings around these critical areas. This works great and doesn't cost much money.

STRUCTURAL RELATIONSHIPS

Before we start drilling off the old panel components, it's important to understand the structural relationship these pieces have with the airframe. The lower span-wise truss and the old aluminum, permanently-attached panel overlay are part of the support structure for the center control console components, as well as a span-wise cabin support that helps maintain the structural integrity of the main cabin and door-frame at the forward end.

Due to the structural importance of these pieces, it's important that the new



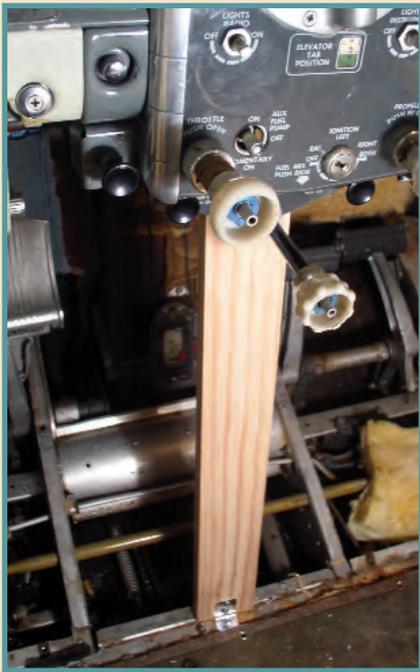
An example of a poorly designed and fabricated subpanel truss that had failed in service, allowing the center throttle quadrant to move about 1/8" vertically.

ONE LAST PLANNING ISSUE...

If ever there were two jobs made to be done together in Bonanzas and Barons, it would be installing a new windshield at the time a new instrument panel is being built. **The panel project is so much easier to do with the windshield removed.** We have certainly installed a lot of custom panels in

Bonanzas and Barons with the windshield in place, but caution must be taken to protect the windshield.

The use of double layers of good masking paper works well. But with the windshield masked off, you can no longer see as well behind the panel, so many access, clearance, checking, removal and installation tasks are just a lot more difficult. If you're able to, plan to do these two jobs at the same time.



Temporary support for the center throttle quadrant.

panel be equal to the original in strength. Check out the picture of a homemade subpanel that was poorly constructed and under-designed to the point that it failed in service and, as you can guess, there was no logbook entry for this bogus installation. That's just one example of things we can find when we disassemble a panel for something as relatively unchallenging as painting it. No one ever said this job would be boring!

It is very important to support the lower subpanel structure during the panel building process. If not supported, the center quadrant will sag, resulting in

the two support sub-panel pieces dropping toward the center of the panel. Keep an eye out for this phenomenon as you look at custom panels; you will eventually find one with this ailment.

The not-so-high-tech solution to this problem is cutting a genuine "FAA-approved" 1" x 2" piece of wood and securing it between the floor structure and the base of the center quadrant. This will support the entire lower panel structure in its designed position as the panel is being built.

OUT WITH THE OLD...

Now it's finally time to remove the old panel overlay and fixed defroster. We do this with all the instruments installed and the radios removed from their dust covers. Use an appropriately sized drill bit and remove the mounting rivets around the perimeter of the panel overlay and defroster. With these pieces removed, you now have open access to the instruments that are mounted on the shock-mounted subpanel. *Be sure to tag all wires and lines.*

Be very thorough about taping or capping off all the pitot, static and pressure lines and fittings. And do the same on the instruments, too. A little dirt goes a long way.

Another tip: The original six-instrument cluster contains some very delicate nonreplaceable fuel-quantity temperature and pressure gauges.

Protect the faces of these obsolete and very valuable instruments immediately with a piece of stiff cardboard.

If you're dealing with a very early Bonanza with a mercury vapor oil temperature gauge, be sure to temporarily secure the instrument to protect the very delicate and small-diameter copper vapor line. These old gauges can be expensive to repair.



Properly protected engine and fuel gauges.

... BUT SAVE THE PARTS

If you plan to replace these units with modern equivalent, make sure to save the old ones. They could bring good money on eBay, and you are helping yourself and another old Bonanza owner by making these treasures available. We save these coveted pieces for our in-house projects. We won't charge our customers for these often priceless components as we've inherited them from previous projects.

Having these parts allow us to work on these old panels. Sometimes just painting a panel can cause an old instrument to fail, and our on-hand stock can save the day.

With the instruments removed and safely stored, it is time to remove the old shock-mounted instrument panel, shock-mounting brackets, battery box, old insu-



All the old stuff removed.



Our high-tech circuit protection device.



CONGRATULATIONS TO THESE MEMBERS WHO HAVE RECENTLY EARNED DESIGNATION AS AN ABS AVIATOR (AS OF 8-6-08)

TO DATE 277 MEMBERS HAVE EARNED ABS AVIATOR STATUS

CARLOS ACOSTA, Arlington, TX, attended FlightSafety International's Beech courses four times, then BPPP to include the expanded walk-around inspection, totaling 320 points.

DAVID FRIIS, Boulder, CO, earned 100 points with a level of FAA WINGS, three AOPA online courses and six hours of seminars at the 2007 ABS Convention.

GEORGE EDMUNDSON, Hood River, OR, earned 100 points from 10 AOPA online courses.

ADRIAN CHAPMAN, Annandale, VA, completed BPPP and four AOPA online programs, worth 110 points.

LAWRENCE RICHTER, Terre Haute, IN, earned 100 points with BPPP, the expanded BPPP walk-around inspection, and two AOPA online courses.

LEVEL 2 ABS AVIATORS
(100 MEMBERS HAVE EARNED LEVEL 2 STATUS)

RONALD ARNOLD, Big Canoe, GA, earned 190 points with FAA WINGS and 15 AOPA online courses.

ROBERT INMAN, Dawsonville, GA, earned 100 points with King School's Practical Risk Management for Single-Pilot IFR DVD program and eight AOPA and FAA online courses.

STEPHEN SCHWARTZ, Ann Arbor, MI, earned 230 points by completing his CFII and 13 AOPA online courses.

MARK DEAN, Fresno, CA, earned 100 points by completing 10 AOPA online courses.

RANCE HOPWOOD, Vienna, VA, completed two King School's Practical Risk Management DVD courses and six AOPA programs to earn 100 points.

RICHARD SCHMIDT, Brookfield, WI, completed a formation-flight training clinic, King School's Practical Risk Management for Weather DVD and three AOPA online courses for 100 points.

LEVEL 3 ABS AVIATORS
(17 MEMBERS HAVE EARNED LEVEL 3 STATUS)

JIM BLODGETT, Walnut Creek, CA, completed SIMCOM and four AOPA courses to earn 100 points.

RAYMOND LEWIS, Granbury, TX, attended eight hours of ABS Convention seminars, FAA physiological training, and a recognized formation-flying clinic, and completed AOPA's VOR Approach online course for 160 points.

T. ALLISON SCOTT, Live Oak, FL, completed 13 AOPA online courses for 130 points.

SARKIS DERDERIAN, Columbia, SC, attended SIMCOM and completed six AOPA online programs for 120 points.

DAVID KING, Anderson, SC, earned 180 points by attending BPPP and taking 11 AOPA online courses.

RON TIMMERMANS, Bedford, TX, earned 115 points with six AOPA courses, three hours of ABS Convention seminars and accreditation as a NAFI Master CFI and Master Ground Instructor.

THOMAS TURNER, Rose Hill, KS, earned 100 points by completing BPPP, taking four AOPA online courses, and completing Pilot Workshops' IFR Planning course. 

To participate, send copies of your training certificates to absmail@bonanza.org or fax 316-945-1710 attn: ABS AVIATOR.

lation, gear and flap position indicator lights, switches and circuit breakers. I repeat—Tag all the wires and lines!

Since we are retaining the original piano-key switches in this featured project, these components and their wiring will remain in place. That said, you should still do a thorough inspection of these components and wiring, and any needed repairs can be made at this time.

We temporarily hook up a battery to the terminal wires using a 5-amp circuit breaker to protect all the ship's wiring for any progressive electrical testing. No matter which circuits might be shorted out, the wires and the related component will be protected by this temporary 5-amp circuit protector. Where there's smoke there's fire (and we hate fire)!

CLEANING

The final step in the tear-down inspection process is to clean all the inner skins and firewall. Be especially diligent to clean the firewall area around and below the old battery box; we use a battery-acid-neutralizing solution of baking soda and water for this job. We use lacquer thinner and Scotchbrite



The old acid-laden battery box being removed.

pads to clean the old insulation and glue residue from the back side of the firewall and boot cowl areas. Here's your chance to easily access these places; once cleaned, we intend to install new modern composite insulation materials in these areas.

Now that the old mess is removed and cleaned up, we're probably at a good stopping point. Next time, we'll start on the new systems fitting and structural attachment layout. Until then, fly safe.

Dennis Wolter is an A&P, IA and a 3,000-hour instrument pilot who started Air Mod in 1973 to bring innovative design and high-quality renovations to the general aviation market. Dennis has a degree in industrial design from the University of Cincinnati.