



Paint—protection and pride

The airplane formerly known as N14422

BY STEVEN W. ELLS

It's been 24 years since the AOPA Sweepstakes Bonanza was last painted—35 years since it left the Beech factory. Over the past six months avionics, airframe, and engine specialists have installed a new powerplant and a turbonormalizer

system; riveted on repairs; and installed antennas, anti-ice system components (see "In-Flight Ice Protection," p. 92), various modifications, and new windows. It was finally time to make the sweepstakes Bonanza look like what our year-long refurbishment had turned it into—a twenty-first century high-performance Bonanza.

Based on recommendations from the Bonanza experts at the American

Bonanza Society, we handed the airplane, and the details of the new paint scheme, over to Steve Tolson at Murmer Aircraft Services in Arcola, Texas, for a complete strip and paint job.

Murmer Aircraft Services was started by Bill Murmer and has grown into a high-quality paint shop that has built up decades of Bonanza painting experience. Last winter Tolson finally convinced Murmer, now 80 years old, to

hand over the reins. Tolson's crew made short work of the paint removal and initial airframe inspection. While they were cleaning up some surface corrosion (a Murmer paint job includes five hours of surface corrosion removal and five hours of minor airframe preparation) a few Beryl D'Shannon modifications were being installed.

Beryl D'Shannon modifications

Beryl D'Shannon Aviation Specialties (BDS) has contributed mightily to the sweepstakes Bonanza with a gray-tinted Speed Sloped windshield installation, new gray-tinted side windows, aileron and flap gap seals, and a set of vortex generators.

The BDS list of STCed Bonanza, Baron, Debonair, and Travelair modifications is



so comprehensive that almost every modification and upgrade that has been added to the sweepstakes Bonanza could have come off the pages of a BDS catalog.

The three-eighths-inch-thick Speed Sloped windshield installation added a smoother, more streamlined look that helped to modernize our Bonanza. Both of the three-eighths-



Stripped and masked for painting, the AOPA Sweepstakes Bonanza sits in front of Murmer Aircraft Services in Arcola, Texas (above). A fan keeps Doug Kelly cool while he's installing the new Beryl D'Shannon windows (left).

inch-thick pilot and copilot side windows have inward-opening vents—and these vents are frameless, so visibility is better and the cabin feels more open, a marked improvement over the original pilot's vent window. Aileron and flap gap seals prevent air bleed-through around the control surfaces. This improves slow-speed handling, as well as reduces drag. Lower drag equals faster cruise, and better climb rates.

The vortex generators (VG) are bonded onto the top of each wing approximately halfway between the leading edge and the spar. Projecting up into the

boundary layer air, the VGs energize this thin layer of air. Energizing the airflow helps it to stick to the airfoil surface, which delays airflow separation at higher angles of attack. Thus, the VGs make the airplane safer by reducing stall speeds—by as much as seven knots in straight-ahead power-off stalls—and improving low-speed stability and handling.

The AOPA Bonanza got new life in the altitude and go-fast end of the performance spectrum when we installed a 300-horsepower engine (BDS also has an STC for this upgrade) and a turbo-normalizer. With the installation of the

BDS gap seals and vortex generators, better handling and an increased margin of safety at the go-slow end of the spectrum is guaranteed. For more information on vortex generators and other BDS upgrades see the Web site (www.beryldshannon.com).

Doug and Therese

If you'd like your BDS modifications installed at your home airport, Doug and Therese Kelly can be hired to come to your airplane.

The Kellys travel the country in their motor home installing BDS (and only



A diagram from Scheme Designers is ready to guide painters in applying the sweepstakes Bonanza's new colors.

BDS) modifications and upgrades. After Tolson's crew finished stripping the old paint and cleaning the airframe, Doug and Therese installed our BDS mods. They're experts. As they do all around the country, they showed up on time with a trailer full of parts and tools.

Before the modifications were permanently installed, a protective coat of epoxy primer was applied to keep corrosion at bay. Doug says they're working on a Web site, but for right now the only way to contact them is through their nationwide phone number (888/787-0689).

Corrosion

Corrosion is a chronic problem for aluminum airplanes. The most common aluminum alloy used in general aviation airplanes is 2024, which is 92 percent aluminum combined with copper (4.5 percent) and manganese (1.5 percent) to form a lightweight metal that is high in strength and easy to machine and work. Unfortunately, 2024 has poor corrosion resistance. Virtually all 2024 used in general aviation airplane construction has a thin layer of corrosion-resistant pure aluminum rolled into each side of the alloy. Aluminum alloy with this coating is called *Alclad*.

Since the pure aluminum layers are very thin, typically 10 percent of the overall metal thickness (5 percent on each side), even a small scratch can penetrate the corrosion-resistant cladding and let water and dirt come in contact with the corrosion-susceptible alloy. Paint is the most cost-effective

long-term solution to structural aluminum's inherent tendency to corrode.

The most common form of unprotected metal corrosion is a general dulling and, with extended exposure, a slight roughening of bare aluminum. This is called *surface corrosion*. It's usually not very serious. Only airplanes that are situated in very dry (this includes very cold) climates escape this process. Much more critical are pitting and intergranular corrosion. The common denominator here is an electrolyte, since these corruptions are all electrochemical in nature. The most common electrolyte is H_2O —yep, that's right, plain old water. As with other chemical reactions, as the temperature rises, the actions are more vigorous. Salt water (or salt air) accelerates the corrosion process partly because the salt itself is corrosive and partly because the salt absorbs water, keeping the electrolyte in contact with the metal.

The sweepstakes Bonanza spent 15 years near the ocean on the California coast. Although many areas of Southern California go for months without measurable rain, in this case increased moisture from coastal marine-layer fog and the temperate climate resulted in a few areas that needed attention before paint application. The area that was most affected was under the wing walk coating on the right wing.

Murmer applies a chemical conversion coating during all paint jobs. This coating acts as a chemical Alclad that, when applied in combination with modern high-quality paints, provides very good protection against future corrosion for years.

In-flight ice protection

Ice is a fact of life when flying in the clouds. And the AOPA Sweepstakes Bonanza, with its state-of-the-art avionics, rare-air engine and turbonormalizing system, and continent-jumping fuel capacity, is surely equipped for instrument flying.

Paraphrasing a quote from George Washington, "To be prepared for ice is one of the most effective means of preserving safe flight." Never wanting to ignore sound advice, especially in regard to in-flight icing, the AOPA Bonanza will be equipped with the TKS Ice Protection System.

The TKS system (see "Weeping Wings for Singles," February 1995 *Pilot*) distributes anti-icing fluid over the airframe, propeller, and windshield at the flick of a panel-mounted switch. This fluid, which weeps out of laser-drilled holes in bonded titanium leading edges, depresses the freezing point of airborne water vapor encountered in clouds. Since the water vapor can't freeze,

it flows harmlessly off the airframe.

The fluid is electrically pumped from a seven-gallon bladder-type reservoir that is mounted in the right wing. This supply is sufficient for more than two hours of continuous application at the minimum flow rate.

Fluid is distributed to propeller leading edges via a propeller slinger ring, and to

wing and stabilizer leading edges where it weeps out of laser-drilled holes in bonded titanium leading edges. There is also a small wind deflector and spray bar forward of the pilot's windshield. The windshield bar, with a dedicated pump that is separate from the rest of the system, is seldom used because the prop fluid flows aft, protecting antennas, cowlings, and the windshield.

During flight the only decision facing the pilot is whether to turn the metering pump to high flow, which will deice the airplane if ice has already formed, or low flow, which is

sufficient to protect the airplane if turned on before ice forms. The control panel also has a switch for an ice-detection light that illuminates the left wing's leading edge.

The installation weighs in at approximately 37 pounds. The fluid weighs 9.2 pounds per gallon, resulting in a full reservoir weight of a little more than 100

This fluid depresses the freezing point of any airborne water vapor

pounds. Current draw for the 14-volt Bonanza is 2.8 amps. This system weighs less than comparable inflating boot-type systems, and requires less maintenance.

The TKS system adds a safety margin to the sweepstakes Bonanza that promises the lucky winner a comfortable feeling when navigating in the clouds. The striking new paint job, combined with the shiny, impact-resistant titanium leading edges, adds just the right look to the AOPA Sweepstakes Bonanza, further marking it as a unique, no-holds-barred general aviation traveling machine. —SWE

Magnesium ruddervators

In addition to the aluminum alloys used in the airframe, Beech chose magnesium for the skins of the left and right ruddervators. Magnesium has some very unique qualities—the most important of these for aviation is its high

strength-to-weight ratio. Unfortunately, magnesium is even more chemically active than aluminum, and so is more likely to corrode. Since magnesium corrosion products occupy several times the volume of the original metal that is corroding, lifted paint films provide an

easy-to-spot visual telltale indicating the presence of magnesium corrosion. Tolson spotted paint lifting on the bottom surface of the right ruddervator. After removing the paint only light surface corrosion was found. Although the cleaning and conversion coating prod-



ucts used on magnesium and aluminum differ slightly, the corrosion removal steps and the paint application processes are very similar.

Scheme Designers and the Bonanza

Craig Barnett, the president of Scheme Designers, met with the AOPA staff to create a distinctive paint scheme for the sweepstakes Bonanza. Barnett had previously worked with AOPA on the Millennium Mooney paint scheme, and we were happy to have his help.

Throughout the creative process Barnett was able to weave the somewhat divergent opinions of the AOPA staff into a modern, distinctive paint design that looks good from every angle.



Heriberto Diaz masks striping on the Bonanza's wing tip (far left). Murmer's Lupe Lopez Jr. sprays gold trim over the white base coat (left).

Every step of the way Barnett presented a menu of options—after six review-and-suggestion sessions, spanning a little more than two months, we all agreed on the final design. This process can be followed on the Scheme Designers Web site (www.schemedesigners.com). As with every Scheme Designers layout, Barnett provided a 20-page book of detailed layout and specification drawings to Tolson.

Along with all the other new and upgraded parts for the sweepstakes Bonanza, AOPA thought the airplane formerly known as N14422 should henceforth be called N2001B. So we went through an N number search and found that N2001B was reserved. The owner graciously consented to donate the number to the AOPA Sweepstakes Bonanza.

Squirting paint

Cleanliness and preparation are the keys to any paint coating process. During chemical stripping, water is used to flush off the lifted paint. Etching, which uses a dilute acid solution to further clean, and the chemical coatings that prep the aluminum and magnesium metal surfaces for paint are also washed off with water. In order to guarantee a long-lasting, tight-gripping paint job, every suggestion of moisture must be eliminated before any paint can be applied.

Murmer applies two coats of chromate epoxy primer for maximum adhesion and corrosion protection. After primer application, the finish is again inspected for any possible defects before applying four coats of

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Jet Glo polyurethane over the entire airplane (six coats on all leading edges). Then the major accents and trim colors, in Acry Glo urethane, are applied. The result of Murmer's experience in properly preparing and applying a modern paint system to the sweepstakes Bonanza is a long-lasting, wet-looking finish that will protect the integrity of the airframe and boost ownership pride for decades.

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

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the integrity of the airframe and boost ownership pride for decades. **AOPA**

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CONTRIBUTORS

AOPA would like to thank the following companies that are donating or discounting their products and services to refurbish AOPA's 2001 Bonanza Sweepstakes project or are otherwise assisting with the project.

Sloped windshield, windows, vortex generators, aileron, and flap gap seals

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