

B&C Specialty Products

STANDBY ALTERNATOR

BY TOM TURNER

The long-awaited B&C Specialty Products standby alternator system for Raytheon/Beech Bonanzas is now available for 1984 and newer A36s and B36TCs. Owners of these late-model Bonanzas now have access to a vastly improved standby electrical system in the event of primary alternator failure.

Beechcraft, and later Raytheon Aircraft Corporation, has offered a standby electrical generator for many, many years. Available for many 14-volt and all 28-volt Bonanzas, the older standby generators are far better than battery power alone in the event of an alternator failure, especially at night or in Instrument Meteorological Conditions (IMC). Even so, owners of standby generator-equipped Bonanzas must be keenly aware of that system's limitations. The older "factory" standby unit has relatively limited output. It is hard-wired into an emergency electrical bus that provides power to only certain equipment—notably not to things like landing gear, flaps, most avionics, electric Horizontal Situation Indicators (HSIs), most interior lighting and the exterior lights.

Historically, the standby generator is a high-maintenance item. The standby generator system, good as it is, is nonetheless truly an "emergency" device. Turning on the standby generator—even in day visual conditions—is cause for landing at the first practical airport for repairs, and not initiating even Visual Flight Rules (VFR) flight again until the primary unit is repaired or replaced. Remember, it's possible that drive-gear failure in the primary alternator may cause engine damage or crankshaft failure, so a speedy landing after alternator failure is advised.

Many owners of Bonanzas (and other aircraft makes, for that matter) wished for a more powerful system, one that would allow the pilot to select which equipment he or she wanted to operate. Such a design would provide the highest level of safety and flexibility for dealing with airplane emergencies. Furthermore, a powerful standby system available to all aircraft equipment would allow safe and legal "day VFR" flight in the event of a primary alternator failure, if you can positively determine the primary alternator drive gears are intact. This would reduce the chances of stranding pilot and passengers perhaps for days, while waiting for a new primary alternator.

Bill and Celesta Bainbridge, founders of B&C Specialty Products, Inc. of Newton, Kansas, had already made a name for themselves in providing powerful, lightweight standby electrical components and starters. Their reputation for reliability was highlighted when B&C-modified alternators and alternator control units were chosen as primary equipment for the Voyager 'round-the-world flight. Now they have earned FAA approval for

the standby alternator many Bonanza owners have wanted.

Standby Alternator

Bill and Celesta's business grew as the high-performance homebuilt aircraft industry expanded in the 1980s. Soon owners of certified airplanes wanted the powerful, lightweight and reliable B&C designs for their airplanes, too. Requests for shipment came in; the B&C staff was careful to point out that many of their products were not at that time approved for use in certified airplanes, and that owners wishing to install B&C components in certified airplanes may need to obtain one-time FAA approval (a Form 337) to legally add a B&C system. Many owners were successful in gaining such approval, but others hit a bureaucratic brick wall, a snag which almost put Bill and Celesta out of business.

Disheartened but not deterred, B&C continued development of a standby alternator system that would meet the strictest of the FAA inspectors' approval. The result is the BC410 standby alternator. This light, compact design provides 20 amps of continuous output. Bill, Celesta and company approached both Raytheon and Mooney aircraft companies, hoping to market their design in a current-production airplane, and then pursue authority to sell the unit to owners of similar airplanes in an FAA-approved kit.

Raytheon Aircraft, which was already selling its standby generator system to buyers of new A36 and B36TC Bonanzas, wanted to modify Bill's basic design. Raytheon engineers reportedly wanted to keep the standby electrical bus and a manually activated standby unit, while Bainbridge and most Bonanza pilots wanted the standby power to be available to any pilot-selected equipment (within the power output limits of the standby alternator), with automatic activation in case the primary alternator should fail.

Mooney Aircraft, on the other hand, was pursuing approval for flight in icing conditions ("known icing" certification) for its then-new M20R Ovation. Icing certification requires, among many other things, a standby electrical system with little impact on system operation. The B&C unit fit the bill perfectly. Mooney chose the B&C Specialty Products design, which was approved as part of the Ovation type certificate. In 1998, Thomas A. Bowen, Mooney's vice president of engineering, reported that a total of 47 Ovation customers had flown for up to two years with no "field service actions" or warranty claims on the BC410. It was a success.

Back to Bonanzas

During this time, Raytheon management decided to make improvements to the essentially frozen Beech piston designs. Bill Bainbridge continued to stay in touch with nearby Raytheon, and the two design teams once again got together. Looking at customer requests and the success of the Mooney installation, Raytheon engineers accepted the basic BC410 design, with automatic activation and electrical availability to any airplane equipment. With his FAA entanglements behind him, Bainbridge was then able to obtain FAA Supplemental Type Certificate



The BC410 installation in an air conditioning-equipped Bonanza.



An amber "standby" enunciator (far right) illuminates when the B&C standby activates.

(Provided by permission of B&C Specialty Products, Inc.)

(STC) approval—with the significant help of Raytheon—for installation of the BC410 in 1984 and later A36 and B36TC (current production-style) Bonanzas. Raytheon will soon offer a B&C Specialty Products-licensed system as a factory-installed option.

Why only the 1984 and later model airplanes, at least for now? STC approval for an airplane modification requires extensive engineering and flight testing. The cost of earning STC approval for even an uncomplicated modification can and often does run into the many hundreds of thousands, if not even millions, of dollars. Raytheon wanted the BC410 design for installation in factory-new Bonanzas, and provided assistance (notably, in flight testing) for acceptance of the design in their "target" airplanes. As most know, the A36 and B36TC designs underwent significant changes with the 1984 model year—so significant, in fact, as to require a brand-new Type Certificate. A "supplemental" type certificate allows modification of the "basic" type certificate, so the STC for the BC410 currently applies only to 1984 and later Model 36s.

Knowing that there is likely a vast market for his product among owners of pre-1984 Bonanzas and the '84 and later F33As, Bainbridge is pursuing STC approval of his system for those airplanes as well. He's also working on an equivalent system for older, 14-volt Bonanzas. Such approval will take time and a lot of money. To gauge the level of interest and determine how much he should invest in gaining approval, Bainbridge asks owners of these other Bonanzas to call and let him know if they are seriously interested in an approved B&C design.

Meanwhile, some Bonanza owners are pursuing Form 337 approval for the design in their airplanes. B&C has designed a system that will flash the "Standby Alternator On" enunciator in the event the standby is "asked" to produce more than 20 amps, meaning pilots of these "non STC" airplanes won't have to install a loadmeter with the system.

First to get the FAA's blessing was Bob Siegfried, a retired United Airlines captain, prominent ABS member and V35B owner. Bob has been working with the FAA for some time on general avia-

tion issues, most notably GPS approach design and approval, and his good working relationship with the feds may have helped somewhat to streamline the 337 approval process. Gaining FAA approval and a 337 took about three months. "The inspectors," Bob said, "were quite pleasant and liked what they saw. Since I already had an Electronics International Volt/Ammeter installed, I just added an extra shunt and modified the procedures that had been approved for the late model 36s to coincide with my installation and that is what the FAA approved on my airplane. The biggest holdup was getting the Airplane Flight Manual Supplement approved. That has to go to engineering. The local folks can't do it. We were fortunate to be able to hand-carry the project through the Chicago office at a time when things weren't too busy. That process could take a long time."

Let's get technical

Here's what you'll get when you buy a BC410 system: a cool-running, reliable, 20-amp spline-driven standby alternator that mounts on your engine accessory case; a BC203 regulator; "Loadmeter Primary/Standby" and "Standby Alternator Master" selector switches to the left of the pilot's yoke; an amber "Standby Alternator On" enunciator light that illuminates in the event of primary alternator failure; installation instructions; and a Pilot's Operating Handbook supplement.

The alternator/regulator kit with STC paperwork currently costs \$1,800, while the installation kit is an additional \$385. You'll need to have your lower left-hand switch panel shipped to B&C in Kansas for modification, costing another \$230. Bainbridge and company try for a 48-hour turnaround. Soon, they'll ship "new" panels along with the kit for \$310, a little more cost to shave a week or more off the down-time.

If your Bonanza has a "factory" air conditioner, you'll need a B&C redesigned compressor mounting casting that allows clearance for the standby alternator. Modifying the air conditioning casting costs \$150. The very most recent new-production Bonanzas include this casting as standard. With a new switch panel, the owner of an air conditioned A36 or B36TC will invest \$2,845 plus tax, shipping and installation to get a B&C standby alternator.

Bill Bainbridge says that installing the B&C system should take about two “uninterrupted” work days. Air-conditioned Bonanza owners should plan on three to four additional hours of shop time. The installation procedure does not require venting the air conditioning compressor so you don’t need to take your airplane to an EPA-approved refrigerant facility for or before the work.

Bainbridge is quick to point out his people have taken measures to ensure system reliability. His standby alternator is rated at 20 amps continuous output, but the design itself is capable of 28 amps. Bainbridge chose to “derate” the alternator to ensure much cooler operation, which greatly extends system life. “Systems developing more than 20 amps,” says Bainbridge, “will be more likely to fail because of excess heat.” Citing the Mooney Ovation experience, Bainbridge boasts his system should make it to engine TBO (although, he adds, none of the Ovations have flown nearly that much yet).

The B&C POH supplement contains a handy chart listing the “typical” and “approximate maximum amps” for various airplane systems (prop de-ice, autopilot, pilot heat, landing light, etc.) that the pilot can use in deciding which items to power when “on the standby.”

Many customers have asked Bainbridge why his system runs continuously, instead of on a clutch mechanism. One criticism of the older “factory” standby generator is that it runs continuously with the engine, reducing the generator’s operational life even if it’s never turned on. Bainbridge’s response is that the generator’s most common failure is an internal shear shaft break, and that aftermarket devices like the RAPCO clutch are just a “Band-Aid fix for a bad design.”

The B&C drive shaft can take the stress to engine TBO, says Bainbridge; no clutch means fewer chances for failure, less system weight, and less stress on the mechanism by eliminating the “overhang moment” of the clutch-extended generator.

Since the standby system runs continuously, you can test it any time the engine is running. Simply verify you’re using 20 or fewer amps of electrical power, then switch off the primary alternator. You should see normal equipment operation and in-

dications. Then turn the primary back on and power up anything you turned off to conduct the test.

What if you have a “real” alternator failure while drawing, say, 30 or 40 amps of power? When the primary fails, the amber “Standby Alternator On” enunciator will light up. Your first response to any electrical emergency is to confirm it by looking at the gauges—so look at the loadmeter and see whether you’re pulling 20 or fewer amps. If you’re exceeding the standby alternator’s 20-amp capacity (which means anything in excess of 20 amps is draining from your battery, which won’t hold up for long), you’ll need to manually reduce electrical load to get it under the 20-amp limit. Use the B&C POH Supplement’s handy reference chart and your personal experience to determine what equipment you can use. At least with the B&C standby, you get to choose what equipment you will or will not run.

Off and running

Approval for the 1984 and later A36s and B36TCs was granted in December 1998. B&C Specialty Products will provide you with names and phone numbers of several satisfied customers, as well as the names and number of the shops that performed the installations. B&C is actively pursuing approval for earlier Bonanzas and late-model F33As. It’s likely that owners of at least some “non-STC” airplanes will get “field approval” for the B&C alternator.

Raytheon Aircraft should presently be offering the B&C system as a factory-installed option on new airplanes. With several distinct operational advantages over the factory standby generator system, the B&C Specialty Products standby alternator promises increased safety and reliability for pilots of the Beech Bonanza.

You can contact B&C Specialty Products, Inc., at 123 E. 4th Street, P.O. Box B, Newton, KS 67114-0894; by calling 316-283-8000; or by looking for the B&C booth at most major aviation gatherings.

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Earning the right

Most avid readers will remember the trials and troubles of Bill, Celesta and the B&C team over the last few years. The story has been widely reported in aviation circles, so I won’t belabor it here, save to review that certain FAA inspectors in Alaska contested Bill’s sending a “sample FAA Form 337” along with an alternator kit for the operator of a bush-flying Piper Super Cub. Although B&C’s literature was plastered with warnings that the system was not STC approved, and that the sample 337 was included simply to be used as a model for airplane owners when pursu-

ing their own one-time approvals, some FAA officials felt that B&C was misleading customers by making them think the alternator was already approved for use in certified airplanes.

The debate raged for years, with very nasty letters to B&C from the FAA threatening stiff fines and promising an even more dire response if B&C continued to market the design. The conflict culminated in a public “Meet the (FAA) Administrator” forum at EAA’s Oshkosh convention. Eventually, Bill, Celesta, and B&C Specialty Products received a personal apology from FAA Administrator Jane Garvey.

It sounds so quick and simple now, but the confrontation was a personal and business nightmare for B&C and its people for years. Meanwhile, they continued to sink large sums of money into design and approval of their products, wanting only to provide a superior product to the owners of superior airplanes, and to make the small personal profit enjoyed by most in the aviation industry. Although other companies may market similar products, Bill, Celesta and B&C Specialty have certainly earned the right to sell their standby alternator system to owners of Beech Bonanzas and other designs.