



## Extreme makeover— hangar edition

**W**hen an airplane has been in the family for generations, you can't help but develop a bond with it. My family has spent thousands of hours in our 1968 Beechcraft D55 Baron exploring the country, visiting family and friends, and creating lasting memories. Its look, sound, and smell are synonymous with long-ago memories as well as the more recent adventures. My father, Dr. Rowland Bedell, bought the airplane in 1971 because it could carry our family of six, all of our luggage, and full fuel. At the time, it was the perfect airplane for our missions and my father found its performance addictive.

Of course as addictive as any airplane can be, practicality always looms as a competitor to the emotional aspects of owning an airplane, and our flying machine has had its close calls of being sold or traded for other models

A member  
of the family gets a  
new lease on life

**BY PETER A. BEDELL**

for various reasons, including the passing of my father in 1990. Despite that too-soon event in our lives, my two brothers and I clung to the Baron. Money was tight for three young adults to care for and feed a Baron, but where there's a will.... We greatly reduced our cost of ownership by performing all of the routine maintenance on the airplane and by participating heavily in every annual inspection.

Recently, we came to another day of reckoning for the old twin. Both engines were beyond the 1,700-hour time between overhauls (TBO) and nearly

double the recommended calendar age before overhaul that Teledyne Continental Motors (TCM) publishes. Although the engines had a midtime top overhaul many years ago, they owed us nothing. We treated them well and they returned the favor by carrying our family, friends, and business colleagues faithfully with dispatch reliability that would make any airline take notice.

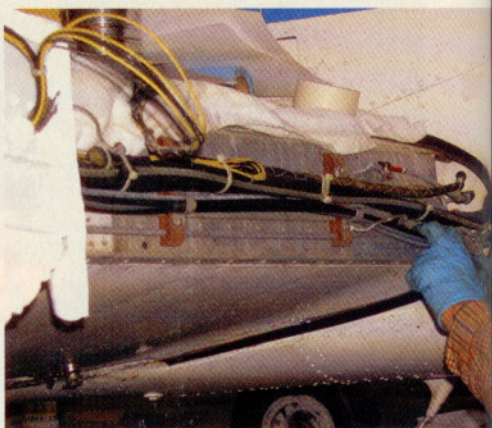
Both 285-horsepower IO-520 engines were equipped with crankshafts and crankcases deemed obsolete by airworthiness directives (ADs). Putting the last nail in the coffin for the left engine was the discovery of air leakage past the exhaust valves of three of the six cylinders at the most recent annual inspection. The news

**The author (left) and brothers Rob (center) and Bill (top) with mechanic Dave Hopkins in the Gaithersburg, Maryland, hangar.**





One of the more agonizing tasks was replacing all of the engine control cables. The cables are fed into the fuselage (below) and attached to the appropriate control lever behind the panel (left).



was hard to swallow but not unexpected. Since both engines were at or near the end of their lives, the possibility of converting the airplane to 300-horsepower Continental IO-550 engines was considered.

For any big-time upgrade such as an engine conversion, it makes economic sense to sell your airplane and get one that has already been modified. We considered that, but were faced with a lack of choices. After all, owners who make such a significant investment in their airplane tend not to sell. Besides, the unknowns of buying an old airplane on the used market were quite scary, especially for guys like us who had been happily monogamous with one airplane for more than 30 years. We decided to fix up our old friend instead of selling it.

### **There's no such thing as too much power**

The IO-550 is dimensionally the same as the 520, meaning no major airframe modifications were needed. Put in motorhead terms, the 550 is a "stroked" 520, which means that the extra 30 cubic inches of displacement are achieved by lengthening the distance that the pistons travel up and down through the cylinders. The crankshaft is the main difference between the two engines.

The IO-550 was certified to produce a minimum of 300 horsepower while the IO-520 was certified decades earlier to produce a maximum of 285 horsepower. Because of this fact, the net gain in horsepower is greater than just the 15-horsepower-per-side difference shown on paper. Reports from other Baron owners assured us that we would gain at least 10 knots in cruise with the bigger engines. In addition, because of

that longer stroke, we could expect the same or slightly more speed on the same fuel burn as the 520s'.

Perhaps the clincher decision of whether to perform the conversion rested on the condition of our existing propellers. The 550s require three-blade propellers, and we had the original two-blade McCauley props. Of course, buying new props adds significant cost. But McCauley doesn't make new blades for the old props anymore and ours were past due for overhaul. If one or both failed inspection, which is always a possibility with 36-year-old props, there would be a very good



Rob Bedell strips the firewalls to bare metal—another labor-intensive task.



chance we'd have to spend a sizable chunk of money on propellers that were becoming orphaned. Never wanting to throw good money after bad, it made sense to invest money in new propellers rather than Band-Aid the old ones for an undetermined time.

Based on that, and a Tim "The Tool Man" Taylor-like desire to have even more horsepower, we decided to go for the 550 conversion using Beryl D'Shannon Aviation's Raw Power STC (supplemental type certificate). After all those years of owner-performed and owner-assisted maintenance, we deserved to splurge a little. Besides, we milked a lot of life out of the old engines while prepping the wallets for the looming overhaul. And most important, this is a

worked with us for years in maintaining the Baron. He knows what we're capable of and draws the line on what maintenance items would best be left to him.


D'Shannon no longer deals in engines, which left the engine acquisition up to us. D'Shannon does deal in propellers, though, and the Raw Power STC specifies both McCauley and Hartzell props. Because of limitations in the D55's alcohol anti-ice system, the propeller decision was made for us—Hartzell.

The new Hartzells use a modern hub and carry a six-year/2,400-hour TBO. They also provide another inch of ground clearance. Although the new props add 30 pounds to the airframe, they put the weight where it's needed—up front to help the aft-tending center of gravity of the Baron when fully loaded. D'Shannon shipped the props, two of its High-Efficiency Baffle Cooling Kits, and the STC paperwork right to our hangar.

We chose Air Power Inc., of Arlington, Texas, to supply our rebuilt IO-550s mainly because of its helpful Web site, which allowed us to pick out specifications for the engines. In addition, Air Power will hold (not deposit) a personal check for the core charges. "Spec-ing" an engine was more detailed than we thought, but in the end we got exactly what we wanted for a very competitive price.

Of course, our new IO-550s would have many improvements over the engines they replaced, most important the so-called "heavy" crankcases, which include the "seventh stud" hold-down bolt for the cylinders. They also contained crankshafts manufactured using the vacuum arc remelt process. The case and the crankshafts eliminate the two major ADs that applied to our Baron. On the downside, TCM charges a "core up charge" of \$2,000 each engine to exchange an IO-520 for an IO-550.

Back at the hangar, Hopkins removed the old engines and pillaged them of parts that would either be reused or sent out for overhaul. Exhaust stacks and vacuum pumps stayed, and the mags and alternators got shipped back on the cores. Our tired-looking engine mounts were subject to a recurring AD that required inspection for cracks every 100 hours. The plan was to send them off to a shop that would restore them and bring them in compliance with the AD.



**Dave Hopkins (left) and Rob Bedell ready the engine to be attached to the airframe.**

partnership, and each of us would have to cover only one-third of the bill.

We thought about farming the work out to a shop that has done this sort of thing many times before but, given our level of involvement in the maintenance of the airplane over the years, we figured why not put the same effort into this engine conversion? There was a laundry list of items that needed attending to while the engines were off, and we weren't keen on paying skilled technicians \$75 an hour to do such menial tasks. On the downside, the do-it-yourself routine would take months and be limited to the haphazard schedules of my brothers and me.

Since none of us is a certified mechanic, overseeing our "do-it-yourself engine conversion" was Dave Hopkins, an airframe and powerplant mechanic with inspection authorization (A&P/IA) who owns DH Aviation at the Montgomery County Airpark in Gaithersburg, Maryland. Hopkins has





After being completely stripped of 36 years of grime, the firewalls were primed and painted white (above). After several hours of flight time, Dave Hopkins and the brothers check on the engine's status (right).



## Surprise!

Our first surprise expense came when we discovered that our original engine mounts couldn't be upgraded to use the full 300 horsepower of the new IO-550s. We could use them, but we'd have to limit manifold pressure to create no more than 285 horsepower. For an airplane based at higher altitudes (above 4,000 feet or so) this would be a nonissue since the engines would be automatically limited in power. But most of our flying is to and from flat-land airports and the added power would be welcome and used. Besides, if we ever had to sell the

airplane, it would be a negative selling point if manifold pressure had to be limited at lower altitudes. Although we budgeted \$1,100 to restore each engine mount, we ended up forking over \$4,500 to replace both—ouch!

With the engines and mounts removed we went to work restoring the firewalls. We used 3M's Roloc discs powered by a drill to remove most of the corrosion and other grime that accumulated on the firewalls over the years. The

rest was painstakingly done by hand with 3M Scotch-Brite pads. We then primed and painted the firewalls to create a nice white finish that would match our new baffles from D'Shannon.

D'Shannon's baffle kit makes many changes to improve cooling, and we deemed that important since we were upping the power and, therefore, heat.



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## IO-550 conversion

### Pros

- Increased performance all around.
- Better single-engine performance.
- Reduced vibration of three-blade props.
- Altitude-compensating fuel pumps available.

## Do-it-yourself overhaul

### Pros

- Significant cost savings in labor.
- Significant cost savings in parts ordered through our "company."
- Learn about the airplane.
- Airplane is not "held hostage" in somebody else's hangar.

Detaching the old baffle seals from the inside of the nacelles was a huge job requiring the removal of hundreds of thick staples. Like the firewall-prep job, the many hours required to do this work cost us only our spare time and the skin on our knuckles.

When the new engines arrived, Hopkins went to work installing the

### Cons

- Requirement for three-blade props can be costly.
- May need to upgrade engine mounts depending on model year.
- Increased fuel consumption unless you fly higher.
- Weight of three-blade props.

### Cons

- Lots of downtime.
- Lack of spare time for busy schedules.
- Beware the hidden fees and surprise expenses.

D'Shannon baffles on the engines while we finished up the firewalls and took care of other problems. With Hopkins overseeing, my brother Bill replaced all of the engine control cables from the cockpit to each firewall. The mixture cables were getting hard to move in cold weather and others had some slop in movement.

While the firewalls were exposed and lots of downtime was planned it was a good time to go ahead and replace all of the cables. While we were at it, we replaced tired-looking insulation in the sidewalls of the forward cabin, which was gutted to replace the cables. We also replaced both brake master cylinders and the attaching hoses, which were getting worn. Fixing items while the airplane is all opened up is another advantage of the do-it-yourself job. If you don't like the way something looks, fix it while you have the downtime.

Five months after it last flew, N497A rolled out of the hangar coated with dust but sporting an entirely new look with its three-blade Hartzell props. The first start was a bit nerve-racking but was an overall success. Neither alternator worked and the right engine's vacuum pump sheared its shaft.

Another week went by as we got all the squawks fixed in preparation for the first flight. You can imagine there was a bit of trepidation revolving around who was going to fly it for the first time after all the work. My brother Rob drew the short straw with me playing "flight engineer" in the right seat. Hopkins (wisely?) watched from the ramp.



Despite being occupied with gauge watching and data logging on that first flight, I was happy to note that the old Baron ran fast and cool. On that first flight we saw 210 KTAS at full throttle, 2,400 rpm at 7,000 feet. The hottest cylinder head was 310 degrees Fahrenheit. Despite the higher power, these engines run cooler than the IO-520s they replaced—a good testament to the efficiency of the D'Shannon baffles. The three-blade props create a higher-pitch noise than the rumble of the old two-bladers, but the vibration level is noticeably less, especially on the ground.

We were dealt a few early setbacks when we discovered that the left engine's fuel pump wouldn't start auto leaning until about 6,000 feet or higher. In addition, one of our spinners cracked within a few hours because of a lack of clearance between the dome and the alcohol feeder tubes. The fuel pump had a sticky aneroid and required leaning the engine manually until the aneroid became unstuck. As for the props, we had to remove the alcohol feeder tubes and disable the prop anti-ice system to allow us to continue flying while Hartzell engineered a fix. In a matter of hours, engine oil consumption stabilized, signaling the successful break-in of the engines.

Soon afterward, business required me to travel to Mobile, Alabama, so I called nearby Teledyne Mattituck Services in Fairhope to set up an appointment to get the fuel pump exchanged under warranty while I was in town. Since the engines were running too rich, a re-rigging of both fuel systems was in order. I figured who better than TCM's factory service center to set up the fuel system just the way it was intended to be. In addition, the boys in Fairhope looked over and blessed our engine installation. They said it was "better than average." We'll take that as a compliment.

### A new airplane

The upgrade to the D'Shannon Raw Power conversion has transformed the performance of our old Baron. The upgrade has worked like mild turbocharging. We can maintain the typical cruise power of the old engines up to a higher altitude where the air is thinner and gains in true airspeed are about 10 to 15 knots higher than before. As a result, most of our trips are flown a few thousand feet higher to keep fuel burns at the same level as the 520s' while enjoying faster speeds. If you're willing to pour

the fuel to it, the superlative cruise speed at our usual 2,300-rpm setting is 205 KTAS on 32 gph total.

On the other side of the coin, the new 550s are approved to run very miserly on the lean side of peak exhaust gas temperature for those short trips where speed isn't needed. We often loaf along at about 18 gph total at 155 to 165 KTAS, depending on altitude. With the fuel systems set up right and the altitude-compensating pumps doing their jobs, it has greatly simplified our flying.

With the added power, cruise in the flight levels is certainly possible while maintaining respectable true airspeeds. Coming back from Fairhope, I was happily tooling along at 15,000 feet with a true airspeed of 190 knots on about 22 gph. Along the same lines, the single-engine service ceiling is now in the 10,000-foot range, inspiring confidence on those flights across the mountains. I suspect that the single-engine rate of climb will be 500 feet per minute at or near max takeoff weight.

All told, this was a monumental project that if nothing else, reinforces the complexity of maintaining an aging airplane, especially a twin. My brothers and I have renewed respect for the technicians and shops that perform such projects in a matter of a few weeks. These are labor-intensive machines that require lots of patience and resolve to maintain.

Total labor for Hopkins was about 150 hours and at least that much for my brothers and me combined. Parts alone sent the bill north of \$90,000. Had the equivalent work been done at a typical shop, the total tab including labor would have been more than the value of the airplane. Offsetting the cost somewhat was the sale of our old propellers and other parts.

The D'Shannon Raw Power conversion has increased the value of the airplane by \$15,000 over that of a stock D55 with rebuilt IO-520s. Not that we're thinking of selling. Just like my father was sold by the performance of our Baron decades ago, we've become smitten with the performance of our "new" Baron. **AOPA**

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**i** Links to additional information about engine conversions may be found on AOPA Online ([www.aopa.org/pilot/links.shtml](http://www.aopa.org/pilot/links.shtml)).