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A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

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COVER PHOTO
Photo courtesy of
Ron McAlister

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Building

Ron McAlister recently purchased this 1968 King Air B90 for the King Air Academy and he personally flies the 1984 King Air B200, both shown on the ramp at Phoenix Deer Valley Airport.

a Legacy

King Air B200 owner creates King Air Academy

by MeLinda Schnyder

Ron McAlister is a guy who should be retired, but he's working two jobs and loving it.

"I gotta tell ya," the 62-year-old said, "I'm having a ball." One of the main reasons he's having too much fun to stop is that he's the owner-operator of a King Air B200 – "The King Air is the fifth airplane I've owned and there will never be another type." – and he incorporates the airplane in both jobs.

His day job is as a founding partner with First Trust Portfolios, a financial services firm he helped start in the Chicago area in 1991. His second job is owner of King Air Academy, a training facility in Phoenix that he started in 2013 with Tom Clements and Kevin Carson.

"I was 60 when I started King Air Academy and people were asking, 'why are you doing that?' Because I love aviation, I love flying and it's been such a part of all aspects of my life," McAlister said. "I'm also a salesman and a business guy, and I like the idea of building a legacy business."

Through the years, McAlister had reasons to never learn to fly (he was making $24,000 a year with a young family when he started flying lessons) or to quit (he had a heart attack at 55).

"My life is not airplanes, airplanes have been a part of my life that has made it magnificent though," McAlister said. "The airplane keeps me focused to eat right, to exercise and do the things I need to do to pass my nuclear stress test every year. I consider myself one of the most fortunate guys in the world, I say that with humility and gratitude."

A lifetime of airplanes

"I was 18 years old when I got engaged, and I didn't have two nickels to rub together. I told the girl I got engaged to, 'Someday I'm going to learn to fly. I don't know how, I don't know when, but if you have a problem with that, tell me now.'"

Ron McAlister, left, and Kevin Carson in the cockpit of McAlister's 1984 King Air B200. McAlister founded the King Air Academy and Carson runs the academy's day-to-day operations.

She didn't have a problem with it, and a year later Ron married Donna. They finished college together, and the flying came nearly a decade later after they had started a family.

"I was 26 years old and had a six-month old son; the guy I went to work for had a little Cessna 172. I told him that I'd learn to fly but only when I could afford to buy an airplane. I was working for him for about six months and he came up to me and said, 'Are you serious about learning to fly?' He sold me the little 172 and he told me he wouldn't touch my base salary but I paid a percentage of all the commissions I made until I paid off the plane. I started taking flying lessons every Saturday morning and it took me a year to get my license."

McAlister, who has an MBA from Illinois State University, began his career as an IBM computer salesman, quickly learning that large companies and computers didn't light his fire. "Then I got hired by a little bond firm and it became very successful," McAlister said. "I was an institutional bond salesman there, so I sold fixed income securities to mutual funds and insurance companies and people like that."

He mostly flew recreationally and not very often, until he traded up to a Beech Sierra. "It was kind of a baby Bonanza, and I got my complex rating, my instrument rating," McAlister said. "I was a young guy with four kids, so I'd wedge a little time out here and there. Then I got to where I would incorporate the plane in my job by flying to customers. I'd fly out and play golf with them, fly up and play racquetball – in Minneapolis, Des Moines, Cincinnati and New York. But I still wasn't flying a whole lot."

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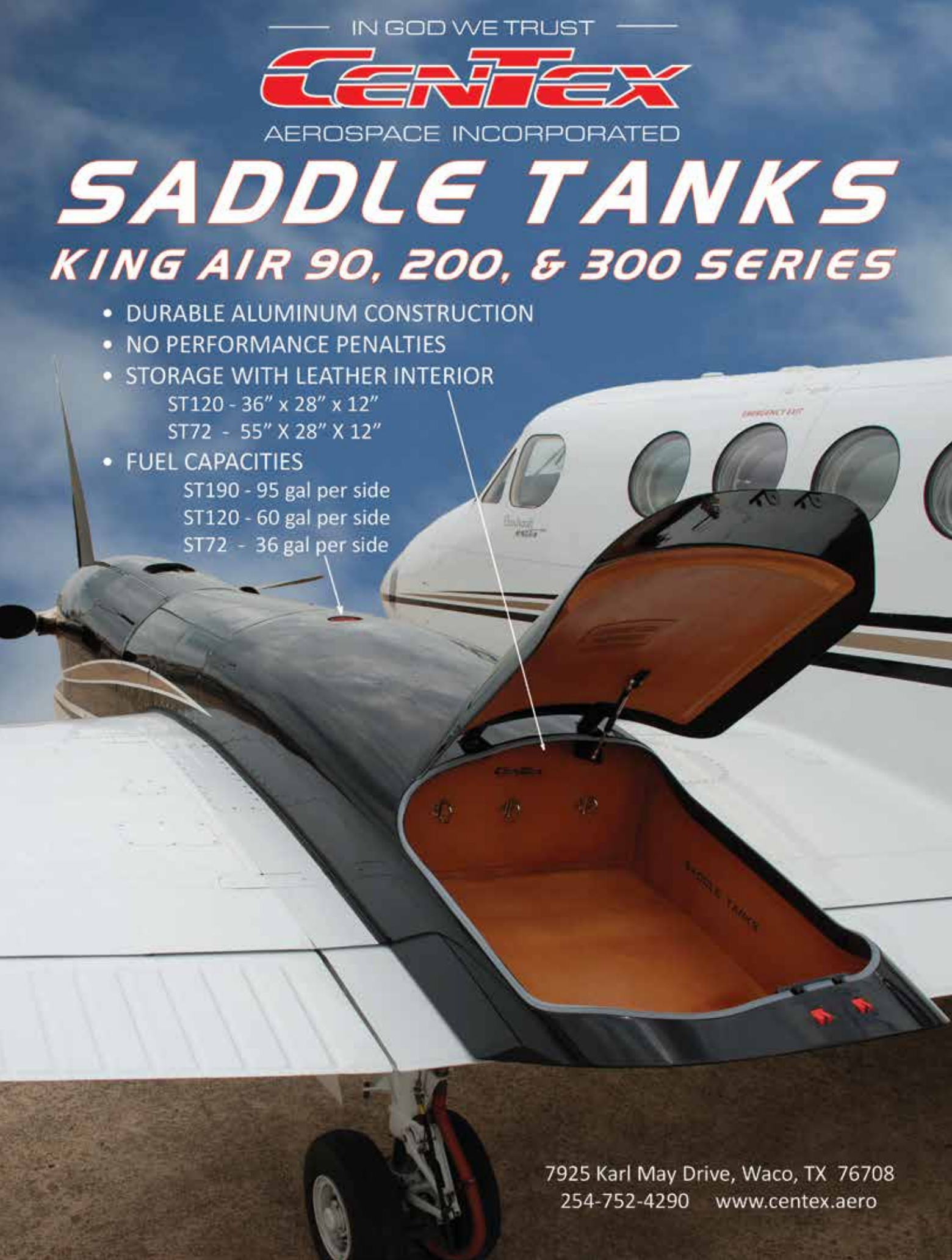

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Businessman Ron McAlister has owned his 1984 King Air B200 since 2006 and says, "The King Air is the fifth airplane I've owned and there will never be another type."

His third airplane was a Turbo Saratoga. "It was more of a functional, fast airplane and I started flying more," McAlister said. "Plus, my son was playing college soccer so I'd fly around and watch him play."

He graduated to a twin-engine airplane when he and a business partner at First Trust Portfolios purchased a Piper Navajo Chieftain, then he made the decision to get what he considered the ultimate airplane.

"We've been unbelievably fortunate in life and I'm not going to leave all the money to the kids, so I think I'm going to buy a King Air," McAlister told his wife. As always, he said, she was supportive.

Creating King Air Academy

King Air Academy is at Phoenix Deer Valley Airport, 17 miles north of Phoenix. It has two custom-built simulators designed off a base of a King Air 200, as well as a recently purchased King Air B90 for flight training and IPC and BFR check rides.

"We purchased the 1968 B90 from a guy who spent a lot of money on it. For example, engine instruments are typically horizontal across the dash, on this B90 they are vertical like the later models. It's got new avionics: it has a Garmin 530W and a 430W, an Avidyne EX500 and an STEC-65 autopilot, among other goodies," McAlister said.

McAlister calls the academy a labor of love.

"My idea with King Air Academy began because I had attended other flight schools and was disappointed by the lack of customer service and the wide variance in curriculum and instructors," he said.

As a salesman and a businessman, McAlister felt he could create a better experience. His wife agreed, telling him, "I think you should do that."

"The advantage that I have, with an ongoing business that's been very good to me, is that this is a passion I have that I can invest money in and I can develop it the way I want to," he said. "I decided to focus on only one airplane: the King Air. This is only possible because of the long history of King Airs and the sheer volume of pilots flying them. Then I had to surround myself with the best people. That's where Tom and Kevin come in.

"A successful business needs three things. You need to know your business and the business you're entering, you need the capital to sustain yourself in that business, and then you need to be able to execute your business plan. Tom Clements brings the knowledge, the curriculum and the expertise; I provide the capital strength and the salesmanship aspect; and Kevin Carson is the guy who makes sure all the things get executed."

King Air Academy at Phoenix Deer Valley Airport has two simulators custom built and designed off a base of a King Air 200.

Carson, who runs the day-to-day operation for the King Air Academy, retired early after starting his own software company. He has been flying since he was 16, is King Air qualified, flies his own Beechcraft T-34 in airshows and has his A&P ratings.

Clements, author of "The King Air Book" and a writer for *King Air* magazine, oversees the academy's curriculum and mentors its instructors.

"Nobody else has Tom Clements and nobody else has a Tom Clements curriculum that's been edited and reviewed by the guy who is the highest time King Air pilot in the world," McAlister said. "What I said that resonated with Tom was that we wanted to be the paramount school in this little niche, in the King Air. I wanted to develop the best curriculum and training style and Tom related with that because he's a perfectionist. He's got a brilliant mind and high energy, and he's gotten very involved."

The King Air B200

McAlister bought the 1984 King Air B200 in 2006 and has flown it 1,100 hours.

"I absolutely fell in love with the airplane," he said. "It's so reliable and it's just so functional. It's the best airplane for me and I don't see ever flying another type."

The McAlisters, married 43 years now, have four grown children, eight grandkids and three more on the way. They still live outside Chicago and use the airplane for a mix of business and recreation.

As one of the founding partners of First Trust Portfolios, McAlister is now responsible for the Canadian segment of the business. He flies the King Air to Toronto once or twice monthly.

"I live 10 minutes from DuPage Airport in West Chicago, so I can leave my house at 8:30 in the morning and I'm in the air before 9 o'clock," McAlister said. "I'm at the Island Airport in downtown Toronto an hour and 45 minutes later. I clear customs and I'm in the office by 1:00 p.m. I work up there and once I'm done, I reverse it and fly home. It saves me time and it makes my job fun."

He also takes several golf trips annually and spends time at homes in Colorado and Arizona.

"In March, I flew with my wife, our daughter and all her kids to Arizona. There were strollers, bicycles and tricycles. It takes three minivan trips to get it all up to the house and it all fits in the King Air, and we're all together. It's just spectacular," he said.

Tom Clements (in hat) oversees the academy's curriculum and mentors its instructors.

"Other guys get jet-itis. That holds zero appeal to me," McAlister said. "The King Air will be the only plane I'll ever fly. As far as overall airplane, as far as how it's built – the King Air is the King of its class." KA

MAINTENANCE TIP

Oil Migration

by Dean Benedict

Oil migration can cause an oil level reading to suddenly be "off the stick."

Imagine you are pre-flighting your King Air, checking the oil and the oil is off the stick on one side. After uttering the obligatory expletive, what do you do? If your first instinct is to dump a couple quarts in that engine and check the stick again, chances are you will be wiping oil off the flaps and gear doors at the end of your trip because you over-serviced the oil.

Oil is the lifeblood of any engine, so when it is off the stick, it gets your attention, and rightly so. But before you add more, try motoring that engine for about 30 seconds and check the stick again. If you find the oil back at the level you typically expect for that engine, then you are good to go. You have a minor oil migration problem that can be easily remedied at the next phase inspection. As long as you are checking the oil on a cold engine, you'll want to motor that engine briefly whenever checking that side until the migration problem can be properly addressed.

Checking Cool or Checking Hot?

Pratt & Whitney says you should check the oil level on each engine within 20 minutes after shutdown; but in reality, who does that? First of all, the engines are still piping hot after just 20 minutes. And even though you may have shut everything down and buttoned everything up, there's still baggage and passengers, instructions for the line guy, possibly a rental car, or maybe just a long drive home. Let's face it, at the end of a trip, checking the oil on a hot engine is not everyone's favorite thing to do.

Far more important in my book is just checking the oil, whether the engine is hot or cold. (Those of you out there who never check your engine oil … ever … might want to pay attention.) Whichever way you choose to check the oil, whether it's post-shutdown or before the first flight of the day, do it that way consistently.

In addition to simply verifying oil is present, you are discovering and then maintaining the oil level at which your engines like to be. I've found many PT6 engines like to run at between two and three quarts down. To be clear, on a cold engine, that's between the second and third hash marks below *Max Cold* on the stick. Some engines stake their claim at three or even three-and-a-half quarts low. And many times there will be a disparity between your engines – the left side is happy at two down, but the right side prefers two-and-a-half down.

More on Migration

As an engine cools after running, the oil collects in the oil tank located above the oil filter housing. But if the oil is able to get around the housing and travel down to the accessory gear box and the bearing areas below, it will go there. Then you come along, checking the oil before your next trip and (surprise!) the oil is off the stick. It looks like you suddenly lost all of the oil on that side. But it has to go somewhere, so if you don't have obvious evidence (such as a puddle on the floor and a mess inside the cowl), try motoring that engine for 30 seconds and check the oil again.

Here's what happens: During every phase inspection, the oil filters and chip detectors are pulled, inspected and reinstalled. Some oil filters are difficult to get out and get back in. The process of removing and reinstalling a stubborn oil filter might jostle the oil filter housing ever

so slightly; and if that happens, the O-rings between the filter housing and the engine case could lose a tad bit of their seal. If you have an oil migration problem, these O-rings are the likely culprits. That 30 seconds of motoring gets the scavenge pump to move the oil back into the oil tank.

Funny thing about Pratt's recommendation, if you only check your oil levels within 20 minutes after shutdown while the engines are hot, you would never know whether or not you had an oil migration problem. It could go undetected for years.

Mass Migration

Oil migration is an oil leak inside the engine. The good news is that the engine is still full of oil and will operate properly.

If you opened your engine cowl and saw oil dripping out of the compressor inlet, you should have reason for more concern. This indicates a larger amount of oil is leaking out of the tank and accumulating inside the engine where the bearings are. When the oil reaches the level of the shaft, it leaks out. You want to get that addressed.

If you read this magazine regularly and think I'm repeating myself, you are partially correct. I wrote about engine oil levels in a 2011 issue, but I barely touched on oil migration. Over the past 40 years of working on King Airs and working with their pilots and owners, I find the topic of engine oil levels, although basic, comes up repeatedly. KA

About the Author: Dean Benedict is a certified A&P, AI, and has 40 years of experience in King Air maintenance. He is president of Honest Air, Inc., which specializes in Beechcraft King Air maintenance and repair.

If there is a particular maintenance issue you would like Dean to address in a future issue, please email Editor Kim Blonigen at kblonigen@cox.net.

A Supercharger on a King Air?!

by Tom Clements

Why, yes indeed! All straight 90s, A90s and B90s use a single supercharger, driven by the left engine, as the source of air inflow for cabin pressurization. The PT6A-6 and PT6A-20 engines that these models used had lower compression ratios and delivered less air than later members of the PT6A family, yet in 1971 when the B90 ceased production and the C90 took its place, Beech did indeed use bleed air, tapped equally from both engines – the same old PT6A-20s – as the pressurization air source. So if sufficient air had always been available, why was it not used on the first three King Air models?

After all, not only does bleed air have the advantage of redundant, left and right supplies, but also it is so much warmer than the air from the supercharger that it becomes the primary in-flight heat source for the cabin. This allows the Jet-A-burning combustion heater (Janitrol heater) to be replaced by a much simpler and more reliable electric heater. With these advantages in mind, again we wonder why Beech ever made King Airs with superchargers.

The answer to this enigma is that Beech had always planned a piston-engine-powered "King Air," and no bleed air was available from that type of powerplant. By going with the supercharger, a common system could be fitted to both models. The decision was made to proceed with the turbine version first. The piston-powered one, the Queen Air 88, did not make its appearance until a couple of years later. The 88 was never a hot-seller and less than 50 were made during its brief four-year production run. (Prospective customers had been spoiled with the much better performance of the turbine version, the venerable King Air. The 88 earned the not-so-affectionate nickname "Lead Sled" among the factory pilots.)

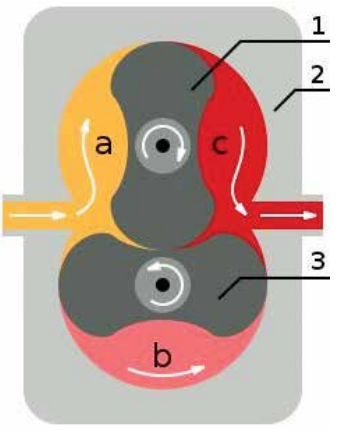
The PT6A-6 on the original 90, as well as the IGSO-540 on the Model 88, both used the same method for driving the supercharger: The engine had a hydraulic pump that circulated fluid to a hydraulic motor that spun the supercharger. This cumbersome arrangement was replaced on the A90 and B90 models by a much simpler mechanical drive gearbox attached to the left engine's accessory case. I doubt that any 90s remain that have not been upgraded to the mechanical drive.

So what exactly is this supercharger? Wikipedia states, "The **Roots type supercharger** or **Roots blower** is a positive displacement lobe pump which operates by pumping a fluid with a pair of meshing lobes not unlike a set of stretched gears. Fluid is trapped in pockets surrounding the lobes and carried from the intake side to the exhaust. It is frequently used as a supercharger in engines, where it is driven directly from the engine's crankshaft via a belt, chain, or gears.

It is named after the American inventors and brothers Philander and Francis Marion Roots, founders of the Roots Blower Company of Connersville, Indiana, who first patented the basic design in 1860 as an air pump for use in blast furnaces and other industrial applications. In 1900, Gottlieb Daimler included a Roots-style supercharger in a patented engine design, making the Roots-type supercharger the oldest of the various designs now available. Roots blowers are commonly referred to as air blowers or PD (positive displacement) blowers, and can be commonly called "huffers" when used with the gasoline-burning engines in hotrod customized cars."

Wow! A design from 1860 still doing service as an air supply for some pressurized airplanes! Google search it if you'd like and you can find some fascinating drawings and even videos of the blower in action.

Figure 1 shows a two-lobe rotor model which is used in the King Air. The pump body has external fins to help dissipate the heat caused by compression. I do not have



A Roots blower with two-lobed rotors. Most real Roots blowers' rotors have three or four lobes. Key:

1 Rotary vane 1
2 Pump Body
3 Rotary vane 2
a Intake
b Pumping
c Forced air or air-fuel mixture into intake manifold

Figure 1: An example of a two-lobe rotor model as is used in the King Air.

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an exact figure to provide for the temperature of the air that leaves the blower and heads for the cabin, but we know it is much less than the 500 degrees Fahrenheit and higher temperatures that P3 bleed air can provide. An air-to-air heat exchanger – radiator – is located in the left wing center section in front of the main spar to provide a method for outside air to cool the compressed air before it enters the cabin.

Of course, when heat is desired, the cooling of the compressed air is not desirable. Hence, a butterfly valve is installed in the ambient air duct to the heat exchanger and the pilot has a push-pull control in the cockpit, labeled "Pull On – Schgr Heat," just to the right of his control wheel (Figure 2). By pulling the knob out, he can close the valve, decrease the ambient air flow to the heat exchanger, and retain more temperature in the cabin's air inflow.

I am sure readers of this magazine are familiar with the Bleed Air Flow Control Package that regulates the flow of environmental bleed into the cabin of later King Air models. The "Flow Pack" can mix bleed and ambient air and serves to stabilize total air mass inflow throughout altitude, temperature, and engine speed changes.

Similar to the flow pack, the 90, A90 and B90 contain a *Flow Control Valve* in the left wing root, upstream of the heat exchanger. It also serves as a regulator on the incoming airflow, attempting to keep the flow constant over a range of altitude and engine speed changes. This Flow Control Valve is electrically controlled and vacuum operated. With either unavailable – no electric power or no vacuum – the Flow Control Valve dumps the supercharger's air into the wing and does not send it to the cabin. When electricity opens a normally-closed solenoid valve, vacuum now provides the "muscle power" to overcome spring tension and thereby send the proper airflow into the pressure vessel, or cabin.

How is vacuum derived? In the Queen Air 88 it comes from the old familiar engine-driven vacuum pumps. In the early King Airs, just like in the current-production

Figure 2: Just to the right of the pilot's control wheel is the heat pull labeled "Pull On – Schgr Heat."

models of 2015, it comes by sending regulated bleed air through an ejector (venturi tube) in the cabin's belly. Yes, even though the 90, A90, and B90 did not use "Big P3" Environmental bleed air for cabin pressurization and heating, they did indeed use "Little P3" to provide pneumatic pressure for deice boots and the vacuum-creating ejector.

Figure 3: A three-position switch labeled "Schgr Vent – Press Test," located in the environmental control grouping on the copilot's left subpanel.

In the environmental control grouping on the copilot's left subpanel, these early King Airs contain a three-position switch labeled "Schgr Vent – Press Test" (Figure 3). The switch normally remains in the center position. It will spring back to the center after being held down to the Pressurization Test position, but it will remain up when placed in the Supercharger Vent position.

Follow-up on Brake Deice System Article

A few months back, my article for this magazine dealt with the optional Brake Deice system that is offered on King Airs with dual main tires. An alert reader, Chaz Harris, contacted me with a valid observation and concern that I had overlooked. He, like a lot of us, has experienced numerous instances of the brake deice valves sticking in the open position when tested in flight. His observation is that Beech/Textron Aviation does not address the procedure to use when this rather common abnormality occurs.

There is a published procedure directing us what to do if a Bleed Air Fail or Brake Deice Overheat (F90-series) annunciator illuminates. And, I suppose, if the valve remains stuck in the open position long enough with the gear retracted, we will probably eventually receive this light as the plastic sense line melts. But before that happens, why don't we go ahead and turn the respective side's Bleed Air Valve switch all the way down to the "Inst & Envir Off" position (or "Pneu & Envir Off" position for the later serial numbers), and terminate the bleed air flow upstream of the stuck valve? Well, that's the procedure we should take and – are you listening, Textron Aviation? – it is the procedure that should be added to the revised AFM Supplement you'll be publishing soon. Right?

(Notice both the Schgr Vent – Press Test switch on the top row, as well as the Press Control circuit breaker on the lower right.)

When the landing gear squat switch – or WOW, weight-on-wheels, switch – is activated, electric power is removed from the Flow Control Valve's solenoid, causing the vacuum to be removed and hence stopping the inflow of supercharger air. Selecting the "Press Test" position of the switch in the cockpit causes the Flow Control Valve to receive electricity and vacuum, making it send its normal air supply into the airplane. At the same time, the Dump and Preset solenoids are de-energized to allow the pressurization controller to operate normally. (The Preset solenoid did not appear until the B90 model, LJ-318 and after.) With the pressurization controller set for a lower-than-field-elevation altitude, the cabin should start descending to verify a proper pressurization test.

In a similar manner, moving the cockpit switch up to Schgr Vent does *half* of what Press Test does. Namely, it causes the Flow Control Valve to send proper airflow into the cabin, but it has no effect on the outflow or safety valves. Thus, the airplane will be receiving air from the supercharger to *ventilate*, not *pressurize*, the cabin…explaining the name, Supercharger Vent(ilation).

Once airborne, of course the outflow and safety valves should be doing their respective things and the supercharger should already be supplying proper inflow. That leads to the conclusion that you can select any position at all – up, center, or down – with this strange switch when you are flying and nothing changes whatsoever. It only has functionality while on the ground.

You may be wondering, "When would one use Supercharger Ventilation anyway? What purpose does it serve?" The simple answer is that it serves almost no purpose and most pilots of these airplanes have probably never used it! But its most common use in days past was smoke removal! "Huh? Smoke removal? Why would I still be taxiing out with smoke in the airplane?!" Because the boss and his friends in back are smoking cigars and cigarettes! Yes, back in the '60s when these airplanes were being produced, smoking was still amazingly widespread and passengers thought nothing of lighting up after they took their seats. It could get pretty unpleasant, especially for any non-smoking pilots, when all of that "polluted" air was trapped in a pressure vessel with no inflow and no outflow. By selecting Schgr Vent, bringing the outside air in and forcing flow out of the safety valve, the smoke level in the airplane could be decreased significantly. (If you are lined up behind a row of airliners on the taxiway, you have the choice of smelling the cigarette smoke or the kerosene fumes, eh?) As I said, nowadays the switch is rarely ever moved to its Up position.

Figure 4: Notice what's wrong in the above picture? Someone has erroneously swapped the knobs on the ends of the cables. The parking brake should be silver; the firewall shut-off should be red.

What if we encounter "real" smoke in the airplane while flying? Maybe our Roots Blower developed a leak that allowed oil to mix with the air. How do we terminate the cabin air inflow when we need to?

On the pilot's left subpanel is another push-pull knob, labeled "Press Air – Firewall Shut-Off Pull," just to the left of the control wheel. When the knob is pulled, a mechanical shut-off valve located on the left engine compartment firewall stops the flow of air heading toward the Flow Control Valve and instead dumps the air back into the engine compartment through a hole in the firewall, where it can escape harmlessly overboard through a vent on the left side of the nacelle.

While conducting flight training in these "mature" King Airs, I have found – more often than I'd like – that this firewall shut-off valve cannot be closed by the push-pull control. The lack-of-use combined with some corrosion probably has provided too much resistance. If you operate one of these old birds, please make sure you and/or your maintenance providers exercise this control with some degree of regularity to ensure its freedom.

However, what if we encounter environmental smoke in flight, try the knob, and find it's stuck? Is there a workaround? Of course. Locate the "Press Cont" CB on the copilot's left subpanel and pull it. Doing so will de-energize the Flow Control Valve and stop cabin air inflow, dumping the air into the wing where it can leak overboard. This method is not as desirable as use of the push-pull control since it allows the air to pass through the firewall and enter the wing. In most cases, that will be no big deal since typically the smoke comes from a minor supercharger oil leak. On the other hand, were there an actual fire … hmmm, I hope that doesn't happen and also that your push-pull control is not stuck.

Most of our readers will never have the opportunity to fly one of these old King Airs equipped with a supercharger. But for those who are flying one now or who will be flying one at some time in the future, I hope you've found this history lesson worthwhile. KA

About the Author: King Air expert Tom Clements has been flying and instructing in King Airs for over 43 years, and is the author of "The King Air Book." He is a Gold Seal CFI and has over 23,000 total hours with more than 15,000 in King Airs. For information on ordering his book, go to *www.flightreview.net.* Tom is actively mentoring the instructors at King Air Academy in Phoenix.

If you have a question you'd like Tom to answer, please send it to Editor Kim Blonigen at kblonigen@cox.net.

"For our aircraft, we were faced with the decision to continue costly recurring avionics maintenance or to upgrade. When we compared all of the numbers, the Garmin G1000 made the most financial sense. Elliott Aviation provided the best customer service for our King Air 350 Garmin G1000 upgrade. Not only are they experienced in Garmin G1000 retrofits, their attention to detail was second to none. At Elliott, they understand the importance of my time by offering a 15-day guaranteed downtime. My experience was incredible, and I was impressed with the exceptional service Elliott provided."

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Flight Watch Services Now on 122.2 MHz

by Kim Blonigen

As of Sept. 24, flight crews should use the flight service common frequency of 122.2 MHz for flight watch services that were formerly available on 122.0 MHz and Emergency Flight Advisory Service (EFAS), more commonly known as "Flight Watch." The change means that most pilots will utilize a single frequency for access to all enroute flight services. This change is a significant move toward further consolidation of flight advisory services in the United States.

Lockheed Martin Flight Service, the company that operates the U.S. flight service states (FSS) on behalf of the FAA, will continue monitoring 122.0 and high-altitude EFAS frequencies throughout a six-month transition period, thus enabling pilots time to adjust to the new procedures. KA

BONANZA!

In the wake of World War II, America's lethargic general aviation market was ripe for an airplane that was fast, comfortable and above all, affordable. Walter H. Beech and his "Beech Boys" answered that call with the all-metal Model 35 "Bonanza."

by Edward H. Phillips

When the world's bloodiest conflict ended in 1945, thousands of military pilots returned home and began flying for airlines, air taxi and flight schools. Civilian aviation was essentially banned during the war because of security concerns, the consumption of fuel and oil, as well as a critical need for war materiel. After suffering through more than three years of war, the American general aviation market exploded with demand for new aircraft. The market seemed unlimited, and sales of airplanes built by Piper, Taylorcraft, Aeronca and other airframe manufacturers skyrocketed.

Unfortunately, for airmen returning from the war-torn skies over the European and Pacific battlegrounds, so-called "new" airplanes were nothing more than warmed-over remakes of prewar models. Although reliable and well-designed for their time, these ships were saddled with technology stemming from the late 1920s. Their airframes were chiefly welded steel tubing covered with cotton fabric, and their wings were wood enveloped in doped cloth. There were a few exceptions, namely the Cessna 120 and 140 whose all-metal fuselages and metal wings (still covered in fabric) represented a step in the right direction. Cessna Aircraft Company, led by Dwane Wallace, recognized the need for an entirely new type of small airplane that would finally relegate the days of tube-and-fabric construction to history.

Wallace wanted to be ready for the postwar airplane boom, and late in the war put his engineers to work to design what he called "The Family Car of the Air." Officially, the airplane was designated the P-370 but it failed to progress beyond the mockup stage and was cancelled in 1945. If the P-370 had made it to production, it was projected to have had a maximum speed of 165 mph, cruise speed of 140 and a landing speed of 50 mph.[1]

Other airframe manufacturers were looking to the future, including North American Aviation. The famed builder of the war's best all-around fighter, the P-51 "Mustang," introduced the "Navion," a four-place, all-metal design powered by a 260-hp Lycoming engine. Equipped with a fighter-like sliding canopy and retractable landing gear, the Navion could cruise at 170 mph and land at 55. In 1947, California-based Ryan Aeronautical Company bought design and manufacturing rights to the Navion, and more than 1,000 were built from 1948-1950.

In 1944, a Beechcraft Model 26, known as the AT-10 "Wichita" in military form, was the first Beech Aircraft design to fly with a V-tail empennage. The flight test program centered on investigating stability and control characteristics of the unusual configuration. A series of flights continued into 1945 and contributed valuable information to engineers designing the Model 35 Bonanza. (TEXTRON AVIATION)

In Wichita, Kansas, the anticipated, postwar demand for a modern light airplane had not escaped the notice and attention of Walter H. Beech. As early 1943 the leader of Beech Aircraft Corporation had already realized that the days of the classic Beechcraft Model 17 Staggerwing cabin biplane would soon end. As a result, the company studied design of a four-place monoplane designated the Model 33. A wood fuselage mockup was completed, but the concept was shelved.[2]

During its heyday in the mid-to-late 1930s, the Model 17 had earned a reputation as the "Cadillac" of single-engine business aircraft and had no peer in terms of style, comfort and performance. Walter knew, however, that his beloved old biplane had an "Achilles heel" – cost. From its introduction in 1934, the Model 17 had been a hand-made machine that required thousands of man-hours to fabricate, assemble and complete.

Worst of all, perhaps, was the fact that a postwar version was projected to cost customers a stunning $29,000. Despite the "sticker shock," in January 1946 the company established a production schedule for 50 Model G17S, but only 20 were eventually built because manufacturing costs proved prohibitive. Although a myth has arisen during the past 80 years that Walter

The third Beechcraft (after the Model 35 prototype) to fly with a V-tail was the unique Model 34 "Twin-Quad" designed for the postwar regional airline market. The empennage proved thoroughly satisfactory, as it was already on the Model 35 then entering its first year of production in 1947. Only one Model 34 was built and was scrapped after a forced landing in 1949. The airplane featured four Lycoming engines, two in each wing driving the propeller through a common gearbox using a clutch engage/disengage system for each engine. (TEXTRON AVIATION)

Beech was firmly committed to the biplane, nothing could be farther from historical reality. Beech was committed to the future, not the past. He had learned to fly in a Curtiss JN-4 biplane in 1919, by 1926 he was quick to embrace the monoplane as the way of the future.

With the advent of aluminum alloy, stressed-skin airframe construction was pioneered and proven by designers such as Jack Northrop in the 1930s, Beech put engineer Theodore "Ted" Wells to work in 1935 with orders to design an all-metal, twin-engine Beechcraft. The prototype first flew in 1937 as the Model 18 and the "Twin Beech" went on to become a legend in its own time. More than 7,000 were built from 1937 to the end of production in 1969.

Mr. Beech knew that to compete in the highly competitive postwar market that was certain to occur, his company would need a "game changing" airplane. Amidst the pressure of war-time contracts and America's relentless rush toward victory over Germany and Japan, he assigned chief engineer and vice president Wells to commence design studies for a four-place low-wing monoplane. Wells wisely put Ralph Harmon in charge of a group dedicated to bringing the project to fruition by 1945. Harmon, an experienced engineer who had made important contributions to the Beechcraft Model 28 gunship that became the U.S. Army's XA-38 "Grizzly" in 1944, tapped fellow engineers Alex Odevseff, Noel Naidenoff, Jerry Gordon and Wilson Earhart to complete the team.

Gordon was the company's expert on aerodynamics and would tackle design of the wings, and Earhart would design the wings' internal structure. Odevseff was assigned responsibility for designing the fuselage while Naidenoff developed the fuel system and engine mount for the proposed Continental E-165 piston engine. As the airplane's design evolved, Wayne Porter, an automotive stylist, joined the team. His job was to make the new Beechcraft attractive to the eye both inside and outside of the cabin.

Figuring into Walter Beech's idea of exactly what a postwar airplane should be, J. Carlton Ward, president of the highly respected Fairchild Engine and Airplane Corporation, commented in 1944 that the "…postwar airplane, which recent consumer surveys indicate the public thinks should cost about $1,500-2,500 would, under present conditions, cost about $13,000. Standard equipment for such a ship, which could carry four or five passengers and their baggage in comfort equal to that of the automobile, but with 500-mile range and at a speed of 150 mph, would alone cost $12,500." In addition, Ward refuted the assertion made by some analysts that postwar mass production of airplanes similar to that of the automotive industry was

First flown in December 1945, the Model 35 was certified in March 1947 and featured a Continental E-165, six-cylinder opposed engine that produced 165 hp. That powerplant eventually was replaced by the E-185-1 engine rated at 185 hp for one minute and 165 hp for continuous operation. (TEXTRON AVIATION)

The Bonanza caused a sensation when it was introduced, and 1,500 were built during 1947-1948. Pilots praised its performance and its low price of just under $8,000 for an airplane that could carry four adults and baggage in car-like comfort at 180 mph. (TEXTRON AVIATION)

achievable. He cited figures showing that the American aircraft industry was capable of building only 10,000 per month at the height of the war. Considering such low numbers, he warned, "… it will therefore be seen that there is no mass production of airplanes comparable to that of the automobile industry."

Walter Beech, however, was not interested in mass production. As Beechcraft Bonanza historian Larry Ball wrote in his classic book, "Those Incomparable Bonanzas," Mr. Beech "had built his reputation by manufacturing swift, dependable airplanes with good comfort, range and payload" and Harmon's team would be faced with maintaining that reputation. In addition, Walter Beech was equally adamant that a new, postwar Beechcraft excel in overall efficiency, therefore the team doubled their efforts to create an airplane with outstanding aerodynamics.[3]

Following months of study, discussion and postulating, it was decided that a single-engine, four-place, all-metal monoplane was the only plausible solution. Although competitors North American Aviation with its Navion and Republic Aviation with its four-place amphibian "SeaBee" were more than capable of designing and manufacturing airplanes, in 1945 neither company had experience selling their products in the general aviation marketplace. By contrast, Beech Aircraft Corporation had more than a decade of hard-won experience selling and supporting its products in that highly competitive arena – a distinct advantage that in the years ahead would play out in its favor.

Another and perhaps more formidable competitor than North American or Republic was the Piper Aircraft Corporation based in Lock Haven, Pennsylvania. In 1947, it was busy developing its own version of what a postwar Piper should be – the handsome, four-place PA-6 "Sky Sedan." Powered by a 165-horsepower Continental engine, the PA-6 airframe was of mixed construction with aluminum alloy fuselage and fabric-covered wings. The airplane featured a retractable, conventional landing gear configuration, a maximum speed of 160 mph, a cruise speed of 140 and landed at a benign 49 mph. If the Sky Sedan had been certified and produced in quantity, it would have proven a worthy competitor to the new Beechcraft. William Piper could have beaten Walter Beech to the postwar market with an all-new design, but only two airplanes were built before the program was terminated in 1948 because of financial constraints.

Months into the design process it was decided that an opposed, four-cylinder engine was the best choice. Radial engines were never seriously considered and would have played havoc with aerodynamics because of the engine's large frontal area. By contrast, inverted, in-line engines, either liquid-cooled or air-cooled, would benefit aerodynamics because of their narrow width, but the team rejected the incline powerplant as well.

A market research survey conducted by the company indicated that there would be sufficient demand for the new Beechcraft to justify development of an engine suitable for the design. Unfortunately, there were no engines that met all the team's requirements. Choice of the engine was among the most critical aspects of the project and Harmon knew they had to get it right the first time. Letters were sent to Lycoming and Continental asking if they would consider developing an engine. Both companies responded in the affirmative. Two powerplants eventually became available—the six-cylinder Continental Motors E-165 and the four-cylinder Lycoming GO-290, both rated at 165 horsepower for takeoff. Because each engine met specifications, Harmon decided to test both designs.

Another important consideration was the landing gear. During the war, conventional gear configurations

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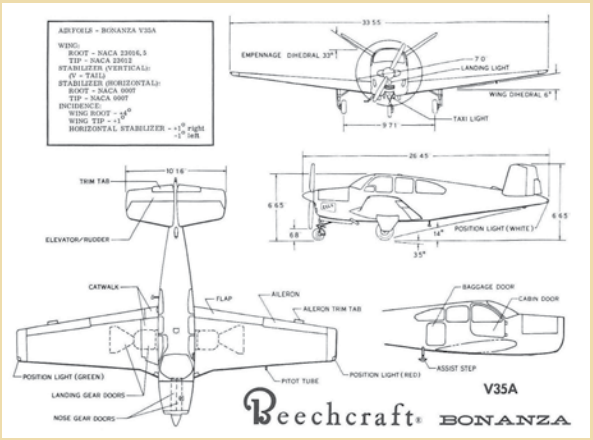
In 1966, Beechcraft marketers introduced the Model V35 Bonanza, powered by a 285-hp Continental IO-520B. The latest Model 35 had a maximum speed of 210 mph (sea level) and cost $32,500. The V35A, introduced in 1968, featured a one-piece "Speed Sweep" windshield of increased area. (TEXTRON AVIATION)

(tailwheels) still dominated both military and commercial aircraft, particularly fighters. There were, of course, some exceptions such as the Martin B-26 "Marauder" and the North American B-25 "Mitchell" medium bombers, as well as the Consolidated "Liberator" and Boeing B-29 "Superfortress" heavy bombers and the Bell P-39 "Aircobra" fighter, all of which featured a tricycle gear arrangement. After much debate and discussion, the team agreed that only a fully retractable, tricycle landing gear was acceptable.

The next consideration was the airfoil section and the wing itself. The engineers had experience with the National Advisory Committee for Aeronautics (NACA) 23000-series airfoil that had been used on the bullish and brutally powerful XA-38 "Grizzly" in 1944 and the venerable Model 18. The team also tested a laminar flow airfoil that offered less drag but would be more expensive to build. Wind tunnel tests showed that the NACA 23000 airfoil was the best choice for the airplane's overall performance capabilities (in 1946 Beech Aircraft did flight test work with a laminar flow airfoil, but no further action was taken).



A three-view detail of the V35A Bonanza. (TEXTRON AVIATION)

The next challenge was the empennage. Throughout the design process, the engineering team had made every effort to reduce drag, and a V-tail arrangement was favored over the conventional configuration. The reason for that choice centered not only on drag reduction and weight (two surfaces instead of three), but also because a V-tail could be located higher on the fuselage to avoid turbulent airflow coming off the wing. As early as 1943, the company had conducted wind tunnel tests of a V-tail and in 1944 installed an experimental assembly on a Model 26, AT-10 multi-engine trainer. The assembly featured a dihedral of 40 degrees and flight tests indicated that the V-tail was a promising design alternative.

Ralph Harmon and Jerry Gordon successfully campaigned for adoption of that configuration for the new monoplane, but the dihedral was reduced to 30 degrees. Extensive wind tunnel tests of a 1/5-scale model of the airplane showed that the V-tail was equal to a conventional empennage in terms of controllability, but produced less drag.

Throughout 1945 the team made slow but important progress, including an exhaustive stress analysis and fatigue testing program using two prototype airframes. These Beechcrafts would never take to the sky, yet they "flew" for a simulated 20,000 hours to prove the airplane's robust airframe design and to ensure that no fatigue failures would occur during the certification flight test program. It is important to note that the fatigue tests were performed in addition to the normal static and fatigue tests mandated by the government's Civil Aviation Authority.

By late 1945, Beech Aircraft Corporation's ongoing effort to design and manufacture the most advanced four-place airplane in the world was nearing fruition. Five pre-production airplanes were built (including two for static/fatigue tests). One featured a laminar flow wing and was powered by Lycoming's engine, and another was built with the NACA 23000 airfoil section and the Continental engine. Veteran Beechcraft test pilot Vern Carstens was chosen to fly the Lycoming-powered Beechcraft on its maiden flight. After performing thorough ground-based tests of the engine, fuel system, flight control rigging and subsystems, a series of taxi runs were completed on the factory's paved runway that was oriented north-south in accordance with prevailing winds.

Those tests went smoothly, and on December 22, 1945, Carstens took the airplane aloft for a 40-minute evaluation. He found the airplane was about 10 mph faster than calculations had predicted, with a cruise speed of 175 mph. He cautiously probed the airplane's low-speed flight characteristics with flaps and landing gear extended and retracted, investigated control response in pitch, roll and yaw, as well as determining

Beginning in 1968, all Model 35 Bonanzas were designated by the letter "V" to distinguish those airplanes from the Model 33 Bonanza with its conventional empennage. The 1970 V35B (flown here by company test pilot Bob Buettgenbach) represented the pinnacle of Bonanza development. The last V-series Bonanza was built late in 1982, bringing an end to uninterrupted, 35-year production run of more than 10,400 airplanes since 1947. (TEXTRON AVIATION)

stall characteristics. He was impressed with the ship's overall behavior, and after landing declared to Walter Beech, "It's the best airplane we've built yet!"[4]

The second flight-test prototype, equipped with the Continental E-165 and NACA 23000 airfoil, flew soon after the first airplane. A comparison of the two found that both airplanes were capable of cruising at 175 mph. In the wake of further tests, the NACA airfoil was chosen for production airplanes because it was easier and less costly to build. During 1945, the certification program continued to advance, but one of the pre-production airplanes was destroyed and the pilot killed when the V-tail separated from the fuselage (the observer bailed out and reported what happened). The accident occurred during high-speed dive tests aimed at determining maximum dive airspeed when balance weights on the empennage separated from the control surfaces, inducing flutter. Deeply grieved at the loss of the pilot, Harmon's team pushed forward and implemented design changes to the empennage that resolved the problem.

To ensure that the airframe, engine, propeller, landing gear, flap systems and their components were ready for production and certification, Walter Beech ordered what today is known as "Function and Reliability" flights using three airplanes. The Beechcrafts were flown day and night in all weather conditions (except icing) along a 170-mile course that included 10 airports. Pilots eventually accumulated up to 600 hours on each of the airplanes, making a minimum of three takeoffs and landings per hour. The flights served their purpose, revealing minor problems affecting landing gear and flap motor operation as well as reliability issues with a few other components, all of which were quickly resolved.

As the certification program drew to a close, and before final specifications were released to Beechcraft dealers worldwide, Beech Aircraft Corporation received orders (with cash deposits) for 500 airplanes. When specifications were released, the orders swelled to 1,500 airplanes! Finally, on March 25, 1947, the CAA issued Approved Type Certificate A777 for the Model 35 Bonanza, paving the way for series production to begin. Initially, the factory manufactured 12 airplanes per day during 1947. Production slowly accelerated and by the end of 1948, 1,500 Bonanzas had rolled off the assembly line and into the hands of new owners.

As for the competition, the Republic's SeaBee amphibian soon failed, the victim of steadily rising production costs that forced an end to the program. Only the Navion posed any serious threat to the Bonanza's rapid dominance of the high-performance, four-place small airplane market. The Navion's level of high performance fell short of that of the new Beechcraft. Despite adding more and more horsepower to the airframe, the Navion was consistently 25 mph slower than the Bonanza.[5]

In 1949, the A35 Bonanza made its debut and was the first Model 35 to incorporate a sheet metal spar carrythrough that replaced the tubular steel unit used in early production airplanes. It was the first Bonanza to be licensed in the Utility Category at a maximum gross weight of 2,650 pounds. Beechcraft workers built 71 A35s before introduction of the improved B35 for the 1950 sales year. It featured a Continental E-185-8 engine that developed 196 horsepower for one minute (at 2,450 RPM), and engines installed in the C35, D35 and E35 versions produced from 1950 through 1952 featured more horsepower, the chord of the V-tail was increased by 20 percent and dihedral angle increased to 33 degrees. As the years went by, the Bonanza continued to evolve through the F35, N35, P35, S35 and finally, the V35.

Introduced in 1966, the V35 was powered by a Continental IO-520-B engine rated at 285 horsepower and could attain a maximum speed of 210 mph (sea level). Maximum gross weight was 3,400 pounds – an increase of more than 800 pounds since the Model 35 of 1947. Both the V35 and V35A (introduced in

According to Beech Aircraft records, the final V-tail Bonanza (V35B) was delivered to a customer in August 1984. (TEXTRON AVIATION)

1968) boasted a one-piece "Speed Sweep" windshield that replaced the two-piece unit of the S35. All Model 35 Bonanzas manufactured in 1968 and after were reclassified with the prefix "V" to separate those airplanes from the Model 33 "Debonair," which was renamed "Bonanza."

Production of the iconic Model 35 came to an end in November 1982 when V35B serial number D-10,403 was delivered to the production flight test department. It was delivered to a dealer in May 1984. The last Model 35 to be delivered to a retail customer, V35B serial number D-10,399 occurred in August 1984.

Regardless of how it is measured, whether by comfort, quality of manufacture, speed or utility, the Beechcraft Model 35 has never had an equal and is remembered as one of general aviation's most significant designs. It was, and remains to this day, incomparable. KA

NOTES:

1. Phillips, Edward H.: "*Piper – A Legend Aloft*;" Flying Books International, Publishers & Wholesalers; Eagan, Minnesota; 1993.
2. Phillips, Edward H.: "*The Staggerwing Story*;" Flying Books International, Publishers & Wholesalers; Eagan, Minnesota; 1996.
3. Ball, Larry; "*Those Incomparable Bonanzas*;" McCormick-Armstrong Co., Inc., Publishing Division; Wichita, Kansas; 1971
4. Ibid
5. Ibid
6. Phillips, Edward H.: "*Beechcraft – Pursuit of Perfection*;" Flying Books, Publishers and Wholesalers; Eagan, Minnesota; 1992.

About the Author: Ed Phillips, now retired and living in the South, has researched and written eight books on the unique and rich aviation history that belongs to Wichita, Kan. His writings have focused on the evolution of the airplanes, companies and people that have made Wichita the "Air Capital of the World" for more than 80 years.

New Benefits from Textron Aviation for King Air Owners/Operators

Textron Aviation has announced two new advantages from their combined companies for King Airs. Two new services centers in the East are now FAA-certified to work on King Airs, and the Citation Jet Pilots association has extended a free six-month trial membership to all Textron turbine operators which includes King Airs.

The company-owned service centers which have expanded their certifications to incorporate servicing Beechcraft King Air 90-, 200- and 300-series aircraft are located in Greensboro, North Carolina and Newburgh, New York. The company says that these latest certifications represent progress in their global strategy to service all of its brands at each company-owned service facility. Of the 21 Textron Aviation-owned service centers, 11 have received expanded certifications over the last year to service additional Textron Aviation products. The company expects all of these facilities will have expanded capabilities by year end.

The Citation Jet Pilots association is a member organization of more than 300 aircraft owners. The free six-month trial membership includes participation in the FuelAdvantage program for all Textron Aviation turbine owners based in the United States. This fuel program provides competitive Jet-A fuel pricing at exclusive partner fixed-base operations at hundreds of airports.

For more information regarding the organization, visit *citationjetpilots.com*.

King Air 350 Operators Get Choice of Swept Blade Propellers from Raisbeck

Raisbeck Engineering has begun FAA certification flight-testing on the first of two brand new Swept Blade Propeller designs for the King Air 350. These propellers incorporate the latest swept blade technology that is also available for King Air 90 and 200 models.

The Raisbeck/Hartzell four-bladed Aluminum Swept Blade Propellers are currently in FAA Certification flight-testing and is expected to be completed by the end of September. The five-bladed Composite Swept

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Blade Propellers begin certification flight-testing on the same King Air 350 in October, and will be completed in early November of this year.

Raisbeck Engineering and Hartzell Propeller Inc. have a long-standing relationship in developing swept-blade technology for the entire King Air family. The results of these efforts provide increased, across-the-board performance, a truly quiet environment, and stunning ramp presence.

Both versions of the newest 350 props will be on display at Raisbeck's booth during this year's NBAA, held November 17-19 in Las Vegas, Nevada. King Air 350 owners can place orders for the new props at the show. Deliveries begin in January 2016.

For more information, please visit *www.raisbeck.com*.

Ansett Aviation Training in Melbourne Purchases new King Air 350i/B200 Flight Simulator

Ansett Aviation Training has signed an agreement with TRU Simulation + Training for the purchase of a King Air 350i convertible to a B200 full flight simulator, which will be installed in Ansett's existing pilot training center in Melbourne, Australia. The Melbourne pilot training facility is adding the convertible KA350i/B200 full flight simulator to its fleet to support the training demand generated King Air aircraft sales in Australia and the surrounding region. Slated for delivery by the third quarter of 2016, the simulator will be equipped with the Rockwell Collins Pro Line 21 avionics, TRU's innovative REALCue™ motion system that drives the Moog actuators, advanced ADAS-X digital audio system, and front projection display system – providing optimum motion, audio and display performance. As part of the purchase agreement, TRU will also provide training courses for maintenance staff and instructors, as well as on-site assistance with initial qualification by the aviation authority. The device is expected to be qualified to CASA Level D FFS standards.

Service Bulletins

Service Bulletin 28-4059, Rev. 1: Fuel – Introduction of Improved Fuel Cell Gasket

Issued: August 2011, **Revised:** September 2015

Synopsis of Change: This Service Bulletin has been revised to introduce fuel cell gasket P/N 50-921587-0011 as a replacement for fuel cell gasket P/N 50-921587-7. Fuel cell gasket P/N 50-921587-9, which was introduced in the original issue of this Service Bulletin, is still allowed. Both replacement gaskets provide improved moisture resistance over the original P/N 50-921587-7 gasket and may be used interchangeably on the same airframe.

If Service Bulletin 28-4059 (issued August, 2011), has been accomplished, it is not necessary to replace the P/N 50-921587-9 gasket with the P/N 50-921587-0011 gasket. The P/N 50-921587-9 gasket may be used until the supply is exhausted. For optimal moisture resistance, it is recommended that the P/N 50-921587-0011 gasket be installed when the fuel cell is opened for maintenance.

Effectivity:

Airplanes — Model C90A, (C90B), C90GT, C90GTi, (C90GTx), King Air Serial Numbers LJ-1599 through LJ-2003; Model B200, Super King Air Serial numbers BB-1735 through BB-2016; Model B200C, Super King Air Serial Numbers BL-141 through BL-165; Model B200GT, Super King Air Serial Numbers BY-1 through BY-113; Model B300, (350), (350i), (350ER), Super King Air Serial Numbers FL-284 through FL-741; Model B300C, (350C), (350CER), Super King Air Serial Numbers FM-11 through FM-46.

Spares — The following models and serials that have installed gasket P/N 50-921587-**7** as a spare part:

All King Air Models: All Serial Numbers.

If you are no longer in possession of the airplane, please forward this information to the present owner.

Reason: This Service Bulletin is being issued to install a more moisture-resistant gasket for use on the fuel cell covers.

Description: This Service Bulletin announces the availability of fluorosilicone rubber gasket, P/N 50-921587-**0011**, as the preferred replacement for gasket P/N 50-921587-**7** and gasket P/N 50-921587-**9**.

Warranty: Warranty coverage offered in this Service Bulletin will expire six (6) months from the ***original*** issue date. After this date, the owner/operator assumes the responsibility for compliance cost. Beechcraft Corporation (BC) reserves the right to void continued warranty coverage in the area affected by this Service Bulletin until the date the Service Bulletin is accomplished by an HBC Authorized Service Center (ASC).

From King Air Model Communiqué 2015-06:

Issued: September 2015

ATA 73 - Fuel Control Unit Inspection

90 Series

Pratt and Whitney Canada recently released P&WC Service Bulletin (SB) No. A1774 recommending that owner/operators inspect their fuel controls.

The Service Bulletin addresses fuel control units (FCU) that are new or newly overhauled and have less than 100 hours time in service. The document recommends inspection of fuel controls for fuel leaks in the metering valve maximum stop area. If fuel leaks are found, replacement of the FCU is required.

FCU Metering Valve

The SB is applicable to PT6A-135A, PT6A-21, PT6A-28 and various other model engines. Only FCU serial numbers identified in the PWC service bulletin are affected.

The above information is abbreviated for space purposes. For the entire communication, go to www.beechcraft.com.

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