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A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT





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SUBSCRIPTIONS

King Air is distributed at no charge to all registered owners of King Air aircraft. The mailing list is updated bi-monthly. All others may subscribe by writing to: King Air, P.O. Box 1810, Traverse City, MI 49685, or by calling 1-800-447-7367. Rates for one year, 12 issues: United States \$15.00, Canada \$24.00 (U.S. funds), all other foreign \$52.00 (U.S. funds). Single copies: United States \$6.50, Canada/Foreign \$9.00.

COVER PHOTO

Photo courtesy of Tim Buchanan

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King Air is wholly owned by Village Press, Inc. and is in no way associated with or a product of Textron Aviation.

King Air (ISSN 1938-9361), USPS 16694 is published monthly by Village Press, Inc., 2779 Aero Park Drive, Traverse City, Michigan 49686. Periodicals Postage Paid at Traverse City, MI. POSTMASTER: Send address changes to King Air, Village Press Inc., P.O. Box 1810, Traverse City, MI 49685. Telephone (231) 946-3712. Printed in the United States of America. All rights reserved. Copyright 2017, Village Publications.

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Wichita businessmen, friends share ownership of King Air 200

Friendly

by MeLinda Schnyder





regular reader of *King Air* magazine, Tim Buchanan always enjoys the columns written by Edward H. Phillips. "I find them very interesting and full of great historical facts and people," Buchanan said. "I appreciate having this globally distributed magazine tell the history of my hometown."

Buchanan reached out to the magazine after reading the September 2016 column, "They wanted wings," Phillips' account of Truman and Newman Wadlow. The identical twin brothers from Wichita, Kansas, learned to fly as teenagers in the late 1920s with the help of Walter Beech.

"Truman and Newman were my great uncles. Their brother Clyde is my grandfather, and father of my mother," Buchanan wrote. "I lived with my grandparents for several years growing up. We lived by the Ken Mar shopping center, which was built at the site of the Ken Mar airport, I believe. I grew up hearing stories of Truman and Newman, and your article is especially meaningful to me."

Buchanan didn't quite follow in his great uncles' footsteps but aviation has always been a part of his life as a resident of Wichita, the Air Capital of the World, a designation that dates back to 1928 and continues to pay homage to the city's aviation heritage and the presence of manufacturers and suppliers.

Buchanan, 62, is a partner in a 1976 Beechcraft King Air 200 with Ron Ryan, 78, who has a place in Wichita's aviation history as the founder of Ryan Aviation Corp., which eventually became Ryan International Airlines.

Here's the story of how these two friends and businessmen came to be partners in a King Air.

Ron Ryan

Ryan grew up in Iowa and started his career as a tool and die maker. He moved to Kansas City for a job with Western Electric and eventually was promoted into engineering. The company asked him to go to night school to earn an engineering degree. After earning 21 credit hours and not enjoying the classes, he met the chief pilot for TWA who encouraged him to learn to fly. "Six months later I had my private, commercial, instrument and multi-engine ratings," Ryan said.



Ron Ryan and his wife, Renae, bought back Ryan International Airlines two years after selling it and built it back up to a successful business with 60 airplanes and 2,500 employees.

His first job was flying about 200 hours a month in a Beechcraft Queen Air, Cessna 195 and Piper Cherokee Six aircraft for Skyway Aviation in Fort Leonard Wood, Missouri. He moved back to Kansas City to become a fulltime flight instructor for Midwest Corporate Aviation, which then became a Learjet dealer. "I got a job flying the Learjet after landing a Cessna 310 with the gear half up and half down with the owner of the company on board," Ryan stated. "He said he was going to give



me a million dollars if I didn't hurt him. I didn't hurt him or the airplane. I got a steak dinner out of it and a job flying co-pilot on their Lear."

Ryan traveled to Wichita regularly for maintenance on the Learjet and on one trip friends connected him with Jack DeBoer, a real estate developer looking for a full-time pilot. Ryan moved to Wichita in 1968 and flew for DeBoer until 1973; during that time DeBoer was considered the second largest multi-family developer in the U.S., building more than 16,000 apartments across 25 states. In 1974, Ryan started flying for George Ablah, another legendary Wichita developer, and the two formed Ryan Aviation Corp., which started as a charter flight operation and cargo carrier.

"George and I built it up into an airline, and when I got into the passenger business in 1982 we set up a strategy to either sell it or take it public. As fate would have it, we had a couple different entities wanting to buy it so we sold it in 1986," Ryan said. "Two years later, I bought the airline back for pennies on the dollar as they had destroyed almost everything but still had the air carrier certificate. My wife Renae and I, plus a lot of other knowledgeable, hard workers, built Ryan International Airlines back to a place where we sold it again in 2004. At that time, we had 2,500 employees with 60 large planes, two of them DC-10s each able to carry 389 passengers flying three times a week to Hawaii. The company was doing over \$300 million a year is sales."

After the sale, the Ryans moved to Florida. They moved back to Wichita in 2008 to help raise their granddaughter. "She was 10 years old then and she's about to graduate from high school," Ryan said. "We didn't want to raise her in North Miami Beach; Wichita is about as good a place as there is."

The Ryans are "retired" but still have a healthy number of business and philanthropic interests. They are the primary investor in 11 Meineke Car Care Centers in Kansas and Oklahoma that are run by family members. They are investors in several green energy businesses and, "We have a company called Agriboard where we are building a plant that makes a building product out of compressed straw," he said.

For nearly the entire time he operated the airline business, Ryan owned two Learjets and a King Air. "When you have 60 airplanes out there flying, you have a lot of need," he said. "We used both the Learjets and the King Air a lot. If we'd have an airplane break down somewhere, we'd fly people and parts out to rescue the airplane. If you've got a DC-10 that breaks down, you've got 389 passengers and you need to do something quickly."

He sold the Learjet when he sold the airline and continues to own and fly a King Air. Over the past 30 years, he said, he's owned five models – from a Queen Air to a Model 90 to three different 200s.



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Buchanan owns and operates 35 independent living, assisted living, memory care and nursing residences through Legend Senior Living in Kansas, Oklahoma, Florida, Colorado and Texas.

"I've always liked and flown Learjets but they require two pilots and I like the fact that I can have a nice, safe, easy to fly airplane that burns 90 gallons an hour, carries 10 people, goes five and a half hours at over 300 miles per hour and can be flown single-pilot if you choose," Ryan said.

He purchased his current 1976 King Air 200 about five years ago, and flies 100 hours a year, which is why he invited Buchanan to buy half of the airplane.



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Tim Buchanan

Buchanan's uncle was a recreational pilot and gave him his first flight as a kid. His father worked on the assembly line at Cessna Aircraft Company for 28 years. While aviation has always been a part of his life, the 62-year-old was in his 50s when he learned to fly. "I loved planes and I had always dreamed of getting my pilot's license," he said. "I soloed in 1989 for the first time but then life just got too busy with other priorities."

As a home builder and developer

in the 1980s, Buchanan was inspired by mission trips he went on with First Church of the Nazarene. Seeing the life-changing effects of helping build schools and churches in places like Haiti and Honduras made him want to have that same sense of fulfillment with his work at home. He focused his efforts on senior housing and is considered among the pioneers of the assisted living concept and helping create a new option of residential housing and care for seniors we find today versus the clinical environments found in years prior.

He co-founded Sterling House Corporation in Wichita in 1990 with one location and took it public in 1995, then merged with a Wisconsin-based group in 1997. When Buchanan left the business in 1999, it had grown to more than 400 locations in 35 states.

Even while he wasn't a licensed pilot, Buchanan was using airplanes to grow his business. While building the Sterling House portfolio in the 1990s, the company owned a half share of a Citation II to regularly take management to properties from Florida to Indiana and throughout the Midwest. After the merger with the Wisconsin company in 1997, Buchanan and other managers based in Wichita flew on the Citation every Monday for a year to spend the week in the Milwaukee office, flying back to Wichita every Thursday.

After a non-compete period, Buchanan got back into assisted living in 2001 by acquiring a property in Florida and creating Legend Senior Living. Today the privately held Wichita-based company owns and operates 35 residences representing more than 2,380 units of independent living, assisted living, memory care and nursing residences in Kansas, Oklahoma, Florida, Colorado and Texas.

In 2005, four years after Buchanan launched Legend Senior Living, he decided to finally make time to learn to fly. He got his license in 2006 and purchased a 2002 Cessna T206 Stationair that same year. He has flown it about 400 hours and his son Matthew, who is director of finance at Legend, also started flying. They both fly the 206 to properties in Texas, Oklahoma and Colorado, and also use it for personal travel to homes in Missouri and Colorado.

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Buchanan owns a 2002 Cessna T206 Stationair that he and his son Matthew, director of finance at Legend, fly to properties in Texas, Oklahoma and Colorado, and also use it for personal travel.

"We started doing more work out of Colorado and had more and more buildings down in Florida," said Buchanan, who is owner and CEO of Legend. "Ron Ryan is a good friend, we go to church together and he's just a good guy to ask about anything aviation related. I asked him advice one day on finding a plane to partner in and he said he didn't use his plane enough. He was interested in partnering in his King Air and hiring a pilot to manage the partnership."

The Partnership

In 2013, Buchanan bought half of the 1976 King Air 200 that Ryan had owned for just a couple of years.

"If you are going to share a boat or an airplane, you want to have a good partner. Tim's a very good partner," Ryan said.

Buchanan added: "It's worked out extremely well. We are great friends first of all, and we really don't have any scheduling issues with use of the plane." Over the years, Buchanan said, he'd been on demo flights in King Airs and he knew Ryan had acquired a quality airframe that had been well cared for. Importantly, the Beechcraft matches one of Legend Senior Living's company values: stewardship.

"We don't own a Citation X and we don't own a brandnew King Air," Buchanan said. "We own a very high-quality aircraft and I can justify the cost of this transportation and see great value in it. This King Air is a great, multipurpose aircraft that provides economical transportation for what we do: regional trips or multi-hop trips where you might want to visit several cities in a day."

Ryan said Raisbeck modifications that the previous owner installed have made this his favorite of the five King Airs he has owned.

"It has the Raisbeck wing lockers, the four-bladed props, the strakes and all, and I'm guessing I get another 10 to 15 knots out of it," Ryan said. "A friend of mine invited us to go to Indianapolis a couple of years ago, because he had a couple of cars in the race there. He had a King Air 350 and I had my 200. We were all loading up at the same time at Jabara Airport. I taxied out ahead of him and took off ahead of him. When I landed, they were unloading their airplane. I looked at my pilot and said, 'For another \$2 million we could have been here at the same time they were.' Between Wichita and Indianapolis, it wasn't more than a difference of 15 minutes."

The King Air is based at Jabara Airport in northeast Wichita and a full-time pilot, JD Ratz, manages the schedule and maintenance, which is done by Jabara Midwest Corporate Jet and Bevan Rabell at Wichita's Dwight D. Eisenhower National Airport. Ratz flies singlepilot when Buchanan is using the aircraft and he flies right seat when Ryan is using the plane.

Ryan, who said he stopped logging his flight hours around 30,000, including 7,000 in Learjets and 4,000

to 5,000 in King Airs, said he might consider a Blackhawk engine upgrade down the road but doesn't have any modifications planned. "It has two GPS' in it, and that's all we've really needed. We don't have a glass cockpit but I don't know that I want or need one," he said.

The Ryans use the airplane for business trips to Oklahoma, Texas and Florida, as well as some personal travel. "The King Air is a fun, easy, simple and extremely safe airplane to fly," Ryan said. "We just went to Kansas City in December to see the Chiefs play and there was a lot of weather. I was able to go up to 22,000 feet and get over it. We had a nice flight up and back, although we had a 90-knot tailwind so it was a little slower coming home."



Ryan said the King Air 200 doesn't have a glass cockpit, but he doesn't know if he really wants or needs one.

Buchanan uses the King Air about 130 hours a year, most often for business trips to Florida, Texas, Colorado and Oklahoma. While it's a long haul to Florida, the King Air is the perfect vehicle for hopping from city to city to visit Legend's 11 properties across the state.

"We can hit all of our assets down there in a very short trip that would be impossible without this kind of an airplane," he said. "We'll take three or four home office employees from different disciplines – sales, operations, clinical – and we'll fly down to meet the regional team, then take two or

three of them with us to the properties. We can have team meetings along the way, and talk over business with the directors at each location."

The King Air is an integral part of Legend's growth plans. "We can take opportunities that we would probably not otherwise take," Buchanan said. "For example, we are going into Ohio now and other states in that direction. We're in the care business and what we do requires a lot of attention. We don't want to have properties in places we can't get to.



Buchanan appreciates the large interior of the 200 where he can hold meetings with regional managers on their way to a location visit.

"We've doubled the company in size in the last five years," he continued. "We added three to five new buildings a year plus acquisitions but we'll never have 400 buildings. We're hands-on: we like to know the customers and we like to know our associates. There's a scale at which that is lost and the minute we feel that way we'll stop growing. I joke that I could never go on Undercover Boss because I can't go in to any of my properties without being recognized. You couldn't disguise me enough. That's really important to me and to a large degree the airplane makes it possible."



The King Air Cabin Door

by Dean Benedict

have a customer that had a cabin door problem for two-and-a-half years. He kept receiving the cabin door warning light on the annunciator panel when he was in flight, but never on the ground. When the light came on, it was never at the same altitude and happened at various times throughout the flight – sometimes early, other times later. It was also intermittent, and didn't show up on every flight. This issue was as variable and unpredictable as they come; hence, it was extremely difficult to troubleshoot. But, whenever I see a King Air squawking the cabin door light, nine times out of 10 it is a bad switch, so that's where I start.

The Three-Switch System

First of all, I must specify that all King Airs have the same door – from the oldest A90 to the newest 350 – it is the same door and same door frame. The only change made throughout the years was beefing it up to accommodate greater pressurization demands as the King Air product line was improved and expanded.

Older King Airs have three switches pertaining to the cabin door. An actuated switch gives continuity and shuts off the cabin door light on the annunciator panel. When a switch is not properly actuated, it stays "open" (no continuity) and the warning light stays on. There are two switches on the door frame located at the



A look inside the door inspection hole. Just to the left of the latch (red "arm") is the switch.



A King Air cabin door supported on a cart for maintenance access.

lower forward latch bolt. Both are activated by a spring steel actuator. When the door is closed and latched, the bolts extend into the door frame and hold the door shut. When the lower forward latch bolt extends, it activates the two switches - one extinguishes the cabin door light on the annunciator panel and the other turns off the cabin door step lighting. The third switch is in the cabin door handle inspection light hole. Prior to departure, when you pull the door shut and put the handle in the locked position, you have to push the light button so you can see inside the inspection hole to get a visual that the handle mechanism is in the locked position. You can't get a clear view of the switch in that hole, but it is there. If that switch does not activate, you'll have a warning light on the panel. So, if you can see that the door is properly locked, but you have a cabin door warning light on, maybe the switch is bad and not activating when it should.

Typical Problems

The inspection hole switch is the first place I look when the cabin door light fails to turn off. The actuator on that switch can become bent due to over-travel, and a bent actuator prevents continuity, so the warning light stays on. Being over-zealous with the cabin door handle will cause over-travel and this will bend the actuator. Eventually the actuator will fail and the switch will need replacement.

Whenever a switch is changed, the pins must be checked for correct rigging in accordance with the maintenance manual. The switches in the door frame have a spring steel actuator tab and this tab has a relief hole where cracks can develop. Obviously, cracks will weaken the tab. If the tab breaks, it's a major ordeal to replace it due to the location of the tab in the cabin door frame. The switches in the door frame can fail in other ways, but a broken tab is the bigger bummer.

The Five-Switch System

New King Airs and many 300 and 350 models have five switches in the cabin door warning system. They have the three switches already discussed, plus a switch at each upper door hook. The King Air with that maddening cabin door light squawk is a 300, and it has the fiveswitch system.

The first time the aircraft was brought in with this squawk. I went straight to the switch in the door handle inspection hole. Sure enough, that switch would not "ohm-out" properly – it gave really odd readings on the ohmmeter, and it never gave the same reading twice. When the cabin door is locked, a good switch should read zero, meaning it is activated, there is continuity, and no warning light showing up on the panel. But this switch, when the door was locked, was reading 50 or 60, then 120, then 300 ohms – anything but zero.

The inconsistency in the switch seemed to support the intermittent nature of the squawk, so we changed the switch and rigged it per the maintenance manual. It was good on ground running and I thought that was the end of it, but I was wrong!

The Boomerang Squawk – It Keeps Coming Back!

The next time I saw the particular 300, we checked the switches again and they were good. While checking the door frame switches, we looked at the cabin door locking bolts since we were in the neighborhood. There are four of them, two on the forward edge of the door and two on the aft edge. The door frame switches, you will recall, are at the lower forward door bolt. We found that bolt right on the ragged edge of being out of rig and not activating the door frame switches, so we rigged it per the maintenance manual. Again, this was one of those things that could create intermittent failure, so I thought we had it licked this time. Everything was good on the ground, but the squawk eventually came back with the same intermittent quirks as before. It didn't happen every flight and it didn't happen at the same altitude. Sometimes it would come on, go off, then come on again. Sometimes it flickered.

On the next shop visit we checked the switches again and found a bad one in the door frame! Here's a switch that checked good



the last time, but now it's bad? Grrr! Airplanes can bedevil the best of us, and this one was giving me a run for my money! We put in a new door switch, it was good on the ground, but (you guessed it!) the squawk came back.

Peeling the Onion, Layer by Layer!

Troubleshooting is like peeling an onion – you can't just dive in and start replacing stuff willy-nilly. You need thorough knowledge of the system you're working on. You observe what is working correctly and what is not, and you go from there.

The next time the King Air 300 came in to the shop, we zeroed in on the upper door hook switches and found the aft door hook switch failing to make proper connection on an intermittent basis. Being as this squawk was so squirrelly, finding another intermittent switch gave me hope. We changed it, rigged it, and it worked perfectly on the ground. On the flight home, 20 minutes after reaching 28,000 feet, the darn light showed up again. This time it stayed on until landing, which had not happened before. I'll be honest, I was crushed.

Meanwhile, the owner was furious and I didn't blame him one bit. By this time we had replaced three switches; each one being verified bad at the time, but the squawk kept coming back. What to do?



An Atypical Problem

At that point, I was thinking it must be a mechanical problem, not a switch problem. The next time the owner was in our area with the aircraft, he stopped by and we tore that door apart – molding and panels were removed. It was disassembled to where I could see all five switches in operation. We closed and latched the door, fired the aircraft up, taxied out for ground running and pressurized it on the ground.

I deliberately did not use a huffer for this test. I wanted the vibration from the running engines in case that was a factor in the problem. I hoped to simulate flight as much as possible. After some time, the forward upper hook began to move ever-so-slightly away from its proper over-center position. Eventually the switch lost continuity and the light came on. Eureka! For the first time, I had a hard fail on the ground and I saw it with my own eyes!

We taxied back and shut down. I went straight to the rig holes for the upper hooks thinking they would be out of rig, but they were good. They were properly adjusted per the maintenance manual ... hmmm. I saw some index markings on the mechanism for the upper hooks which got me curious. This aircraft had less than 5,000 cycles, so the side bolts hadn't been replaced; the upper hook is to be replaced at 10,000 cycles, so it hadn't been changed either. So why were there index markings at the upper hooks? It made no sense.

I called the pilot who had been flying this King Air for seven to eight years, but before he came along, the aircraft was in a hurricane down in Florida. Was it possible that this wasn't the original door to the aircraft? Unfortunately, the logbooks had little to say about the cabin door. Regardless, although the rig holes checked out good, I delved into the upper door hook rigging. Back in the hangar, the cabin door was open and lying on a table for support. I locked the door handle and inserted my rig pin into the upper forward rig hole; it went right in. This was normal and exactly what I was hoping for. Next, I began to adjust the rod that holds the upper forward hook in its over-center position. I gradually lengthened the rod, which in turn increased the pressure on the hook. With each slight adjustment, I checked the rig pin to ensure I wasn't throwing the rigging off. The pin still went in. So far, so good!

I had to make sure that these adjustments did not affect the door handle operation, so we closed the door and locked it several times. The handle operated normally and was not too stiff. Finally, we ran the aircraft on the ground exactly as before – a full power run-up with pressurization. The upper forward hook stayed put. (Thank God!) Even better, the boomerang squawk had not reared its ugly head since that time.

Epiloque

This was a very unusual problem. The pilot flew this 300 for at least five years before this squawk cropped up, seemingly out of the blue. Was it the hurricane from years ago? Did the fuselage get tweaked a little bit? I doubt we'll ever know for sure. All I can sav is that I found a combination of bad switches and a couple of rigging issues that came together to create the ultimate boomerang squawk.

I do know from experience that a King Air door can become slightly tweaked over time. This is more

likely with single cable doors that have been subjected to heavy use (Note: adding a second door cable is easily done to any door with a kit). There is a good reason for that placard on the door that states only one person at a time be allowed on it, and I encourage you to be vigilant in making sure all passengers observe this. Additionally, don't be over-forceful in locking the cabin door.

I wish you many squawk-free hours in your King Air. KA



A placard on the cabin door shows what you should see inside the inspection hole when the door is properly latched.

Dean Benedict is a certified A&P, AI with over 40 years of maintaining King Airs. He's the founder and former owner of Honest Air Inc., a maintenance shop that specialized in Beech aircraft with an emphasis on King Airs. In his new venture, BeechMedic LLC, Dean consults with King Air owners and operators on maintenance management, troubleshooting, pre-buys, etc. He can be reached at drdean@BeechMedic.com.



From the Technology Leader in Aircraft Environmental Systems

Ask the Expert

Cold Weather Ground Ops



by Tom Clements

N ow that Old Man Winter is holding much of the country in his icy grasp, I thought it would be an appropriate time to review how to warm up the cabin most effectively after engine start. Operators of the King Air model 90, A90 and B90 have only two choices: Either select *auto* or *manual heat* on the Cabin Temp Mode rotary selector switch. If your auto mode works well, you will probably use that position. If it is rather unreliable – and that is quite common in these older birds – then "man heat" is the position to select. In either case, the combustion heater should activate and turn a minor amount of kerosene into a major amount of cabin heat, pronto!

The vast majority of King Airs now use bleed air as their source of incoming cabin air – eliminating the supercharger that is found on 90s, A90s and B90s – and supplement this source of heated air with an electric heater of some type. Let's discuss the options.

There are still pilots who are somewhat lazy in their approach to bleed air ... leaving the left and right switches on at all times, summer and winter, including during startup and shutdown. I am happy that this lazy technique is disappearing and being replaced with a much more correct and scientific approach. It has been found that bleed air flow control packages (flow packs) tend to experience some oil mist contamination when they are *on* at start and shutdown. This is because the labyrinth-style bearing seals in PT6 engines do not seal well until the engine is running and producing internal air pressure; so now most King Air pilots are turning off the flow packs before shutdown and not turning them on until the next start is completed.

Realize this: If you want heat, turn on the flow packs right after starting. For those of us living in climates that are generally warm, it becomes standard practice that the bleed air switches remain off until *runway lineup*. But when faced with cold weather operation, that is no longer optimal. Instead, as soon as the engines are running, the bleed air switches are moved to the *up*, *open* position. Granted, at *idle* compressor speed, the air is not as compressed and the bleed air is therefore not as hot as when lots of power and compressor speed are experienced. However, the bleed air entering the cabin, even at idle, will be warmer than the trapped, frigid, cabin air, so allow it to enter and start providing warmth right away.

It is exactly because the PT6 does not produce an overabundance of hot bleed air at idle that King Airs contain a supplemental electric heater. The electric heat system varies quite a bit depending upon the King Air model being discussed. I will start my discussion with the electric heat system that is contained in C90s, E90s, F90s, 100s, A100s and B100s. This includes all later C90 variants: the C90A, C90B, C90SE, C90GT, C90GTi and C90GTx.

For these models, the first thing to do is to ensure the engine speed is high enough to support the very large electrical demand that the heater system requires. This means we must have a minimum of 57 percent N1. Since Low Idle for the standard three-blade propeller models in this group is about 50 percent, you will need to adjust both condition levers forward to attain about 60 percent N1. On the other hand, the four-blade propeller models already idle near 60 percent – to avoid the "reactionless vibration" mode that can be harmful to these props – so further tweaking of the condition levers may not be required.

Make sure the N1 speed is near 60 percent and now select *auto* or *man heat* with the mode selector. Next, reach over and position the electric heat switch to the up, "Grd Max" position ... and standby for heat! Running all eight electric heat grids – four for the normal heater and an identical four for the ground maximum system – really puts out the BTUs!

Three important comments need to be made here. First, with that much electrical load – about 300 amps total heater demand – it is common to see that the Fuel Control Unit (FCU) has permitted some sag in N1 speed. This may be great enough that the four-blade prop models have even allowed their idle Np to drop below the limit. If this has happened, simply move the condition levers forward enough to get the necessary propeller speed.

Second, make your final condition lever adjustments to match propeller speed, Np, not compressor speed, N1. By doing so, the airplane sounds better – less outof-sync drumming – and tends to track straighter while taxiing. Requiring a 1 or 2 percent split in N1 speeds to match Np speeds is common. If much more than that is required, it indicates that the maintenance shop needs to do a better job of setting the propellers' low pitch stops to the correct and same, left and right blade angle.

The third comment concerning the use of the heater on the ground is to remember that certain, more important, in-flight users of electricity take priority over the comfort provided by heater operation. These "heater lock-out" items are windshield heat, prop deice and engine lip boot heat, if installed. The pitot cowls fitted to the C90A and after models use exhaust gases to heat the inlet lip, but previous C90s, B90s and A90s – as well as 100s, A100s and F90s – use an electric heating boot on the cowling inlet lip. When any of these lock-out items is operating, all heater operation is prevented. (Lip boot heat will not operate on the ground since the boots can get too hot without sufficient, in-flight airflow over them. Thus, the lip boot lock-out function should only occur when airborne.)

If you are departing immediately into icing conditions, you will want all anti-ice and deice systems on prior to takeoff. But wait until runway lineup before doing so unless you wish to forgo electric heater operation as you taxi out and conduct your equipment checks.

It is common that full heater output is so effective that the cabin begins to get too warm while still taxiing. If this occurs, move the electric heat switch from the top "Grd Max" position down to the center "Normal" position. Doing so kills the extra four heat grids and allows the normal four grids to continue to be available ... operating if manual heat is selected and standing by to operate as needed if in the auto mode.

It is rare that electric heat is needed when flying since bleed air heat should be sufficient. However, there are a couple of situations in which in-flight use of electric heat is desirable. The first of these is caused by a very weak or totally dead flow pack. One pack alone should be able to provide full pressurization, but with cold OATs at altitude a single pack won't provide enough heat to keep the cabin at a comfortable temperature. So, when the cabin is chilly, even with the cabin temperature rheostat cranked up fully clockwise, make sure the electric heat switch is in the center "Norm" position and turn off the lock-out items. Now the four normal heat grids can come on to add to the total heating capacity.

"But what if I am flying in clouds and need to keep all of the ice protection activated, including the lock-out

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items?" In that case, hand out the blankets; the cabin will remain chilly.

The second situation in which supplemental electric heat is desirable in flight occurs when engine power remains low for a lengthy period. The lower the power, the less the compressor speed, the cooler the bleed air. During a prolonged low-power descent or while drilling holes in the cold sky in a holding pattern, let the normal heat grids help in keeping the cabin comfortable. As discussed above, you must be out of icing conditions so that the lock-out items may be turned off.

Now I'd like to address the supplemental electric heat system on the 300-series (300s and 350s) and the later 200-series, the ones produced in 1993 or after. (This discussion does not apply to the Keith Environmental Control System found on 200s and 350s since about 2006.) Instead of normal and ground maximum heating grids, there are two separate heaters installed in the floor air distribution ductwork - one forward and one aft. On the ground, a solenoid latches the electric heat switch in the up, on position when that position is selected while the rotary mode selector is either in the "Auto" or "Man Heat" mode. At this time, only the forward heat grid begins to operate. But in 100 percent of the cases, you will probably also want the aft heater to operate. By merely moving the aft blower switch to the up, on position, you have achieved that. The heater \blacklozenge



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would get too hot rapidly were there not sufficient airflow over it, so only when the aft blower is running will the aft heater start to operate. Ah, I feel the cabin getting warmer quickly!

The engines installed on the 200- and 300-series have a higher compression ratio than those engines on the smaller King Airs and, because of that, they put out hotter bleed air in flight at typical power settings. Recognizing this, the designers concluded that there would never be a need for supplemental electric heat in flight. Therefore, the electric heat we are discussing now is definitely a ground-only system. The latching solenoid will not work in flight and even if the crew physically held the electric heat switch up, neither forward nor aft heater will operate.

During the runway line-up procedure, we are directed in these models to position the electric heat switch to the "Off" position. This reduces generator load, allowing the engine to be more likely of meeting takeoff power requirements. If we ever forget this step (of course we never would!), it's not a big deal because (1) the engines will have plenty of power capability due to the cold OAT, and (2) when the strut extends, the switch will turn itself off anyway since the holding magnetic solenoid latch releases.

Temperature sensors installed in the heater ductwork protect the system from getting too hot. The temperature at which the heater shuts off due to this over-temperature protection, about 115°F, is much higher than the temperature at which the system will permit the heater to reset and start to operate again, near 60°F. The practical result of this? Suppose the cabin reaches a comfortable temperature while taxiing out and the crew decides to switch the heater switch off. Unfortunately, there is a lengthy ATC delay, so the King Air must hold short of the runway. Dang! The cabin is getting chilly again, so it's time to turn the electric heater back on. There is a good chance that it won't come on, the switch will not latch. Why? Because of that "allow to operate" temperature limit in the ducts. Conclusion? Make darn sure you have a toasty cabin before switching the heater off since there is a high probability you won't be able to get it back on.

I will conclude this article by discussing the last of the supplemental electric heat systems, the one that was an option on the 200-series from the model's start in 1974 through 1992. This system is comprised of radiant heat panels in the cabin's headliner. (Just in the actual cabin; not in the cockpit nor in the toilet and baggage areas.) In my opinion, the systems that we have previously covered – the ones in the 90-, 100-, later 200- and all 300-series – are real winners that do indeed put out the heat! But the radiant heat panels? What a joke!

The single time that the panels can indeed prove useful and effective is when an external power unit can be plugged in an hour or more before the intended flight and then the heat panels can be switched on for an extended period of time. Slowly, the frigid cabin will be warmed nicely. In the relatively short time between engine start and takeoff on a typical flight, there is not enough time for the radiant heaters to do much. Expect to remain chilly until takeoff power is applied and finally the bleed air gets nice and hot.

If you decide to switch on the panels while taxiing, it's a good idea to leave the mode selector in the "Off" position. There are two reasons for this. First, leaving the mode selector off means that the vent blower can also be left off. If it is running, all it does is blow cold air out the various vents. Second, the cabin temperature sensor that feeds information to the control board when in the "Auto" mode is, for almost all serial numbers, located in the cabin ceiling. It can get an erroneous indication that the cabin is warmer than it is due to its proximity to the heated panels.

The only way to really get a lot of heat energy into an early 200 is via the bleed air input, but of course the temperature of the bleed air depends upon the speed of the engines' compressors. I certainly do not recommend taxiing around in the winter at high idle or even more N1 speed – since the aircraft wants to roll so fast – but, while stopped in a run-up area, selecting high idle will indeed contribute to better heating.

A commonly reported annoyance with the radiant heat panels is that, in use, the heat weakens the glue that is holding the panel to its Velcro strip, so one or more panels begin to sag down from the ceiling. That does *not* contribute to warm and fuzzy feelings in the passengers! Thank goodness it has been rare, but there are also some reported cases of a radiant heat panel catching on fire! As I wrote earlier, this system is kind of a joke!

One last bit of advice before I bring this article to a close: It is never desirable to turn off a powerful duct heater at the same time that airflow through the heater ceases. Not being blown downstream, the residual energy in the heater elements can cause excessive, localized temperatures to result. So never switch off a heater while the vent and/or aft blower is stopped. Instead, switch off the heater while ensuring the blowers remain on for *at least* 15 seconds more. This important step is actually stated in the 300 and 350 POHs, but it is the proper technique for all models with heating elements buried in the ductwork.

I hope this information helps you King Air aficionados stay nice and warm during your winter flying!

King Air expert Tom Clements has been flying and instructing in King Airs for over 44 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.

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Game Changer – Pratt & Whitney Canada's PT6A Part Two

After years of intense development, PWC's small gas turbine faced an uphill battle for the financial and market resources required to achieve certification and acceptance by prospective customers

by Edward H. Phillips

E arly in January 1959, Pratt & Whitney Canada (PWC) management recognized that with the PT6 program it had entered the highly competitive arena of engine manufacture, but it lacked much-needed experience to help move the project forward. The factory in Longueuil was geared toward the manufacture of spare parts for thousands of static, air-cooled radial engines such as the R-1340 and the R-1830 that were still in operation worldwide with commercial operators and military forces.

In January 1959, the infant PT6 program received a major boost when Thor E. Stephenson became president of PWC. He was well qualified for the job – in 1942 he earned a degree in aeronautical engineering at the University of Toronto, and during World War II served on the staff of Canada's prestigious National Research Council. In 1946 he was awarded a master's degree from the California Institute of Technology.¹

One of Stephenson's key initiatives upon taking the helm at PWC was supporting efforts to offer the PT6 as a viable powerplant for a military aviation application either in Canada or the United States. During the first six months of 1959 he oversaw work to sell the engine to one or both governments, in part because the \$1.2 million in funding from the Canadian government seemed, at least in part, to depend on the company attracting interest in the small turbine from the United States military. It was a gamble Stephenson had to take, because the alternative was not to his liking: "If applications cannot be developed within a year it is doubtful whether the project has any merit," he wrote.²

As a result, sales personnel covered the globe singing the praises of the PT6 in hopes of winning customer interest. Dozens of contacts were made, including 70 in the United States where the leading candidates were Beech Aircraft Corporation, Hiller helicopters and Republic Aviation. Although the campaign to sell the PT6 generated a lot of interest, nobody stepped forward with a commitment. One potential market, however, did emerge in 1960 when the United States Army moved forward with specifications for a Light Observation Helicopter (LOH) that would replace fixed-wing aircraft currently fulfilling that role.

The PT6 appeared to be the ideal engine for that application, and PWC quickly shifted its emphasis to the turboshaft version, placing the turboprop edition on the back burner for the time being. Unfortunately, none of the competitors (except Republic) showed serious interest in



A group of engineers responsible for developing the prototype PT6 were photographed in a test cell. Gordon Hardy (right of propeller blade) was chief engineer, Cyril Blizzard (left of propeller blade) was test engineer. (PW&C ARCHIVES) the PT6. The Army eventually chose the Hughes YHO-6A over Bell Helicopter's YHO-4A and Hiller's YHO-5A design. The Hughes aircraft was powered by Allison's T63 turboshaft engine rated at 250 shaft horsepower (shp).³

Meanwhile, back in Longueuil PWC's experimental department was hard at work designing the turboprop PT6. Among the many challenges faced by engineers was the configuration of the combustion section (combustor) and the axial compressor section. Plans called for these components to be operated for the first time in November 1958 and complete tests for a preliminary flight rating in December. Initial experiments with the combustion section were conducted using a clear plastic mockup immersed in the water tunnel operated by the National Research Council.

John Vrana, who oversaw the tests, recalled that water infused with tiny particles of metal was used to observe flow patterns within the combustor, and a camera recorded results. A series of "runs" were made that recorded temperatures at various locations inside the combustor under a range of pressures, altitudes and atmospheric temperatures. It took the team nearly a year to finalize a prototype design for the combustor, but the final configuration worked so well it became standard on production engines.

Another set of tests centered on evaluating the gas turbine's structural integrity, which was deemed suspect after completion of a rigorous review of the powerplant's aerodynamic and mechanical design. The concern focused on the single-stage centrifugal compressor that was originally fabricated from cast aluminum alloy. Although the compressor would be economical to manufacture and require only a small amount of final machining, it suffered a structural failure during a run in a test cell. The cast aluminum design was rejected in favor of one that was forged, and no further failures occurred.

In addition to structural issues, it was determined that the prototype engines, designated Mk. 1, weighed 20 percent more than the design weight of 250 pounds. That condition was corrected by performing a part-bypart weight reduction program that helped resolve the issue. Allan Newland remembered that during those early days of prototype engine testing, the PT6 did not achieve its design power and was plagued by high fuel consumption. He attributed these problems, at least in part, to anomalies in engineering drawings during the manufacturing process that were gradually eliminated through continuous design upgrades.

These and other changes were incorporated into what became the Mk. 2 PT6. Although the Mk. 2 was an improvement over the Mk. 1, it had its share of problems. These included the gas generator section that suffered from an uncontrolled vibration at about 20,000 rpm – a redesign of the thrust bearing solved that problem. Another issue



centered on mounts for the turbine vanes. These failed, allowing the vanes to "collapse forward, severely damaging the rotor blades," according to Newland. Redesign of the mounts solved that problem.

Despite these and other setbacks, in November 1959 Stephenson decided that time had come for PWC to show the world the PT6 in operation, or at least part of it. With a group of senior aerospace officials from Canada and the United States watching intently, the gas generator section was run in a test cell (the power turbine section and RGB were not installed). In the wake of that demonstration, coupled with the promise of funding from the Canadian government, further development of the PT6 looked promising.

In February 1960, the first complete PT6 with a propeller installed was run in a test cell, and at least 8,000 more hours would be required before the engine finally entered production. In addition to testing complete engines, many components and parts were rigorously evaluated, often to the point of destruction, in small labs equipped with special equipment that made precision measurements. The equipment had to be calibrated and monitored for accuracy, and a significant amount of time was lost correcting problems with instrumentation. As work progressed, the engineering budget was increased to \$1.7 million from \$980,000, chiefly because of rapidly escalating costs. There was, however, good news: none of the prototype engines undergoing tests had suffered





Pratt & Whitney Canada borrowed a Beechcraft C-45 to use as a flying platform to test flightworthiness of the PT6. The airframe was modified by de Havilland early in 1961. First flight occurred in May of that year. (PW&C ARCHIVES)

any catastrophic failures. As one engineer recalled, "Not only does this speak well for the general soundness of the design, but for care exercised in setting speed and other limitations, and hours of running per build and the degree of inspection between builds."⁵

By July 1960 it was becoming increasingly apparent that the Canadian team would need help from engineering at Hartford to overcome rising costs associated with resolving technical issues. The Mk. 2 engine was running but was plagued by problems, and the decision was made to seek guidance from parent company Pratt & Whitney Aircraft. There was a lot riding on the PT6 program because it held promise for future applications in aircraft for the United States Army and Navy. After meetings between officials from both companies, it was agreed that a team from Hartford would transfer to Longueuil temporarily to help get the program on track. No one at PWA doubted the abilities of PWC's engineers, but they lacked understanding of how to conduct engine development.

The American team was led by Bruce Torell, a native of Winnipeg and a graduate of the University of Minnesota. As did Thor Stephenson, Torell worked at the National Research Council during the war, but whereas Stephenson focused on aerodynamics, Torell specialized in engine design and development. He would prove to be just what the struggling PT6 project needed – a hard-driving, no-nonsense engineer who knew how to get things done right the first time. Early in 1961 the team from PWA took control of the technical aspects of the program.

As engineering manager Elvie Smith recalled, "We learned how to develop engines from Bruce Torell. None of us from PWC had ever run a major engine development program." Torell, however, ruled the proceedings with an iron fist. He immediately put the engineers on a roundthe-clock schedule – no more single-shift work as had been the case, and cost was no longer an impediment to

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The Hiller Ten99 helicopter was the first aircraft to fly solely under PT6 power. It was powered by a PT6 Mk. 2 engine. First flight was in July 1961. (PW&C ARCHIVES)

progress. Torell obtained whatever he deemed necessary to secure the PT6's detail configuration, and he spent whatever money was required to develop alternative designs. "If we had done things in sequence it would have taken forever," Smith said.

Torell's leadership soon began to pay off. In February 1961, both turboprop and turboshaft versions of the Mk. 2 powerplant were run successfully, followed in March by a 50-hour test of the turboprop engine at a rating of 450 shp. As a result of that test, in June the PT6 was cleared for installation in the nose section of a Beechcraft C-45 *Expeditor* borrowed from the Royal Canadian Air Force (see *King Air* magazine, May 2015, Page 20). During 1962 the future of the PT6 was still uncertain, but Torell kept it moving forward toward initial production.

Years later Stephenson reflected on the engine's prospects: "The early days of the program were not encouraging, technically or sales-wise." There was sufficient doubt about the PT6 program that James Young, the founder of PWC, and board member Hubert Welsford, traveled to Hartford in an attempt to scuttle the project entirely. The powers at Hartford, however, rejected their assault. The PT6 had dodged a very powerful and deadly bullet.⁶

After a pre-production engine had been installed in the C-45, the PT6 made its first flight (in a fixed-wing aircraft) on May 30, 1961. The Beechcraft, of course, had two radial engines to rely on if the gas turbine failed. By contrast, the Hiller Ten99 helicopter was the first aircraft to fly solely under the power of a PT6 engine. Company founder Stanley Hiller had been interested in PWC's compact, lightweight powerhouse since 1960 when he was competing against Bell Helicopter for a light helicopter contract submitted by the Canadian Army. In the wake of a proposal from the United States Marine Corps for an assault support helicopter, and Hiller eventually built a prototype of its candidate, the Ten99, to be powered by a turboshaft PT6. PWC responded in April 1961 by shipping a PT6 Mk. 2 engine to Hiller for installation in the prototype, which flew for the first time

in July. Hiller lost the competition but the Ten99 still exists as a resident of the Hiller museum in Redwood City, California.

Other rotorcraft manufacturers also experimented with PT6 power in their helicopters. These included the Piasecki 16H that flew with the turboshaft engine in March 1962, and Lockheed's XH-51a Aerogyro powered by a single PT6B that flew in November of that year. Charles Kaman, whose signature design feature was twin main rotor blades that overlapped, had been the first manufacturer to fly a turbine-powered helicopter when the K-225 flew with a Boeing turboshaft powerplant in December 1951. His interest in the PT6 stemmed from the company's K-1125 that became the first rotorcraft powered by twin PT6 engines, flying in April 1963. The first flight of any aircraft powered by two PT6 engines, however, fell to the deHavilland Otter on May 7, 1963. Seven months later the first deHavilland DHC-2 Beaver flew with a 550-shp PT6, but its high rate of fuel consumption compared to the R-985 radial enginepowered versions limited production of the Turbo Beaver to only 60 airplanes. The major goal of PWC's small gas turbine engine program was attained in December 1963, when the Canadian government granted civil certification after the PT6 had undergone 11,000 hours of testing and 1,000 hours of flying.

The story of how the PT6 became the right engine at the right time for the Beech Aircraft Corporation was detailed in the May 2015 issue of *King Air* magazine, and will be reviewed only briefly here. In October 1958 Beech officials met with PWC to discuss size and configuration requirements for a small turbine powerplant, and six months later the first official presentation of the PT6 was made to company management and engineering. PWC, however, was not alone in pursuing the Wichita, Kansas-based airframe manufacturer. Allison was offering the military T63 and Boeing was touting the merits of its T60 engine.

It was not until 1961 that Beech Aircraft and Pratt & Whitney Canada agreed to cooperate on a new program that would install two PT6A-20 engines in a United States Army L-23F aircraft. The L-23F was a workhorse airplane

that provided VIP and troop transport, light cargo and liaison capabilities for the Army. These airplanes were powered by two, eight-cylinder Lycoming IGSO-480-A1A6 engines, each rated at 340 horsepower. It was essentially a modified version of the commercial Model 50 *Twin Bonanxa* that was introduced in 1951.

Behind the scenes, however, Beech engineering and marketing teams were secretly working on design of the next generation Beechcraft tentatively designated the Model 120. It was unveiled in mockup form at the 1961 convention of the National Business

Aircraft Association, and PWC officials were stunned to learn that the airplane would be powered by French Turbomeca Bastan turboprop engines. The Canadians realized that the Model 120 targeted the exact market they foresaw as an application for the PT6. Reacting quickly, Thor Stephenson joined forces with long-time Beech engineer Jim Lew, who wielded a lot of influence with company CEO Olive Ann Beech. They offered to install two engines in an L-23F and fly the airplane for 100 hours to evaluate the combination. The Army agreed, but in exchange convinced both Beech Aircraft and PWC to sell it the modified airplane for the tidy sum of one dollar. The deal was struck.



The United States Army's success with the PT6-powered NU-8F led Beech Aircraft Corporation officials to launch the Model 90 King Air in July 1963. First flight was January 24, 1964, powered by two PT6A-6 engines. (EDWARD H. PHILLIPS COLLECTION)

A year later market interest in the Model 120 had weakened, and company management realized that the best potential for developing a turbine-powered commercial Beechcraft rested with the Army L-23F. PWC shipped two PT6A-6 engines to Beech Aircraft for installation in the modified Model 65 airframe. Company vice president Frank E. Hedrick monitored progress, and as Beech engineer John Calhoun recalled, "Hedrick came





in to see the prototype one day. He was very impressed by the neat appearance of the PT6 installation, and that's when he decided to back a commercial turboprop." By May 1963, the PT6-powered Model 65 had been re-designated by the Army as the NU-8F, and made its first flight that month with test pilots Steve Tuttle and Jim Weber at the controls.

The Army Aviation Test Board at Fort Rucker, Alabama, took delivery of the airplane in March 1964, and put the NU-8F through a tough six-month experimental flight evaluation program. After years of faithful service, the airplane was retired and served as a training aid for mechanics before being placed on static display in the Army Aviation Museum. In the wake of the Army's success with the NU-8F, management at Beech Aircraft Corporation were ready to invest in the PT6 program and ordered 29 engines from PWC. According to PWC, Beech paid \$25,000 per engine. The PT6 would power the company's next-generation business airplane, the Model 90 *King Air* that was introduced in July 1963, first flew in January 1964 and received FAA certification in May of that year.

The success of the King Air program probably has done more to establish the reputation of the PT6 and assure its future than any other airframe application. As of 2015, more than 41,000 engines had been manufactured and serve nearly 7,000 operators in 170 countries. In addition, the engines have accumulated more than 335 million flight hours. Except for the Beechcraft Model B100 that was powered by AirResearch TPE-331 turboprop engines, the PT6 has powered all King Air commercial models and military derivitives.⁷

The following basic list covers PT6 applications for the commercial Beechcraft King Air and military series.

Commercial:

- PT6A-20: Model 90/A90/B90/99
- PT6A-20A: Model C90

The PT6A-21 turboprop engine, rated at 550 shaft horsepower for takeoff, powers the King Air C90-1, C90A and C90B. (EDWARD H. PHILLIPS COLLECTION)

- PT6A-21: Model C90A/B90/C90-1
- PT6A-27: Model 99A
- PT6A-28: Model E90/B99/100/A100
- PT6A-36: Model C99
- PT6A-41: Model 200
- PT6A-42: Model B200
- PT6A-52: Model B200GT/250
- PT6A-60A: Model 300/350
- PT6A-65B: Model 1900/1900C-1
- PT6A-67: Model 1900D
- PT6A-135: Model F90
- PT6A-135A: Model F90-1/C90GT/C90GTi/C90GTx

Military:

- PT6A-20: A90-1/U-21A/RU-21E/U-21G
- PT6A-28: A90-4/RU-21E/RU-21H/U-21F
- PT6A-41: A100-1/A200/C-12A/A200C/UC-12B
- PT6A-65B: UC-12J 🖾

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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.

^{5.} Ibid





King Air Gathering Filling Up Fast!

The premier King Air Gathering (KAG) announced by Tom Clements in his "Ask the Expert" column in the January 2017 *King Air* magazine has been positively received by King Air owners and pilots. The KAG being held **April 21-22 in Las Vegas, Nevada (KHND)** will focus on saving time and money while managing your King Air's maintenance. It will include presentations and Q&A panel sessions by King Air experts, as well as a walkaround of a jacked-up King Air in the hangar, and demonstrations of normal and emergency landing gear operations. **This KAG has been limited to 50 registrants so all attendees will have a close-up and personal learning experience.**

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Garmin[®] Introduces G1000[®] NXi, the Next Generation Integrated Flight Deck, for King Air 200, 300 and 350 Models

Garmin International Inc. announced in early January its successor to the ever-popular G1000 integrated flight deck, the G1000 NXi. Boasting a modernized flight display design with significant performance enhancements, the G1000 NXi incorporates innovative capabilities into a state-of-the-art avionics platform. Features such as wireless cockpit connectivity, includ-

G1000 NXi on the surface: physical enhancements and display advancements

The G1000 NXi system incorporates modern processing power that supports faster map rendering and smoother panning throughout the displays. Saving valuable time in the cockpit, the displays initialize within seconds after start-up, providing immediate access to frequencies, flight plan data and more. The G1000 NXi system also incorporates contemporary animations, modernized design for improved readability and new LED back-lighting, offering increased display brightness and clarity, reduced power consumption, as well as improved dimming performance.

G1000 NXi for the next generation

Connext[®] wireless cockpit connectivity unlocks more capabilities from within the G1000 NXi integrated flight deck. Available as an option, Flight Stream 510 enables Database Concierge, the wireless transfer of aviation databases from the Garmin Pilot[™] app on a mobile device to the G1000 NXi system. Flight Stream 510 also supports two-way flight plan transfer, the sharing of traffic, weather, GPS information, back-up attitude information and more, between the G1000 NXi and compatible mobile devices running Garmin Pilot or ForeFlight mobile. The D2[™] Bravo and D2 Bravo Titanium aviator watches also sync with the Garmin Pilot app to ensure flight plan data matches throughout the cockpit.

Visual approaches integrated within the G1000 NXi system offer pilots safety-enhancing guidance in visual flight conditions based on a three-degree glideslope from the threshold of the runway. Pilots can select the runway for which they have been cleared to land, set customized minimums, select vectors or straight-in for the final approach intercept and fly a visual approach coupled with the autopilot. By utilizing visual approaches within the G1000 NXi, pilots are provided a more stable descent and precise flight path throughout the approach and landing phases of flight in visual conditions.

Geographical map overlay within the HSI is available on the primary flight display (PFD), which also supports

ing wireless aviation database updates using Garmin Flight Stream, enhanced situational awareness with SurfaceWatch[™], visual approaches, map overlay on the HSI and more, are all available with the G1000 NXi. Deliveries are expected to begin in February as the Federal Aviation Administration (FAA) has granted Supplemental Type Certificate (STC) approval for the G1000 NXi integrated flight deck in the King Air 200 and expects approval for the King Air 300/350 aircraft models within the coming weeks.



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the display of NEXRAD, FIS-B weather, weather radar, SafeTaxi[®] airport diagrams, traffic, terrain and more. For example, pilots can display SafeTaxi on the HSI map while preparing flight plan information on the multi-function display (MFD) or simultaneously display NEXRAD radar and traffic on the HSI map and view a variety of other SiriusXM aviation weather products on the MFD such as lightning, storm cells and more.

Aiding in situational awareness, optional SurfaceWatch runway monitoring technology provides visual and aural cues to help prevent pilots from taking off and landing on a taxiway, on a runway that is too short or on the wrong runway based on performance data entered during preflight. Visual and audible runway distance remaining annunciations are also available, which provides aural callouts beginning at 5,000 feet through 500 feet.

Equipped to meet future airspace modernization initiatives, G1000 NXi equipped-aircraft are rulecompliant to meet FAA and European Aviation Safety Agency (EASA) Automatic Dependent Surveillance-Broadcast (ADS-B) requirements. The G1000 NXi also supports the display of various ADS-B In benefits, including traffic and subscription-free weather. FIS-B weather products include: NEXRAD, METARs, TAFs, PIREPs, winds and temperatures aloft, NOTAMs, AIRMETs and SIGMETs. Exclusive traffic features such as Garmin's patented TargetTrend[™] and TerminalTraffic[™] further enhance the traffic picture. TargetTrend provides pilots with a more intuitive method of judging target trajectories and closure rates, while TerminalTraffic displays a comprehensive picture of ADS-B-equipped aircraft and ground vehicles throughout the airport environment. These ADS-B In benefits combine to give pilots superior situational awareness tools throughout the terminal and enroute environments.

The G1000 NXi integrated flight deck also supports additional features:

- Display of sectional charts, as well as IFR low/high enroute charts on the MFD.
- COMM frequency identification displays the station ID, as well as frequency type.

- Advanced Doppler weather radar capabilities, including ground clutter suppression and turbulence detection as options.
- NEXRAD weather radar imagery can be overlaid on the moving map and animated on the MFD, as well as the HSI map.
- Vertical Situation Display (VSD) incorporates terrain profile view on the MFD, taking into consideration the active flight plan, altitude constraints and winds aloft.
- Pilots can preview departure and arrival procedures on the MFD prior to loading and activating the procedures.
- Pilots can optionally overlay European Visual Reporting Points (VRPs) on the moving map, as VRPs are standard within the navigation database.
- Aircraft maintenance personnel experience faster system software upgrades and streamlined equipment replacement.
- Three-color terrain shading incorporates green, yellow and red contouring, which depicts the aircraft is 2,000, 1,000 and 100 feet above ground level (AGL) respectively.



Simple path to upgrade or transition from G1000 to G1000 NXi for King Air aircraft

For new installations, the G1000 NXi integrated flight deck is estimated to provide a weight savings of 250 pounds or more in King Air aircraft, allowing additional baggage, passenger and/or fuel load flexibility. New G1000 NXi installations also utilize a new, fully integrated and lightweight air data and attitude heading reference system (ADAHRS), streamlining the

Looking for a King Air 90 or 200 to place on our part 135 certificate We're located in Michigan and Marco Island, Florida. And we're approved in the lower 48, Canada, and the entire Caribbean (Cuba soon). Multiple Caribbean Cuba soon). upgrade process. King Air owners and operators with an existing G1000 integrated flight deck can easily upgrade to the G1000 NXi with minimal aircraft downtime and disruption of the panel as the displays preserve the same footprint and connector so panel modifications are not required.

The G1000 NXi will be available in February from select Garmin Authorized Dealers. EASA approval is expected later in 2017. New G1000 NXi installations and display upgrades all come with a



two-year warranty, which is supported by Garmin's award-winning avionics product support team.

Textron Aviation stated, shortly after Garmin's announcement, that its company-owned service center network will offer the next-generation Garmin G1000 NXi integrated flight deck retrofit for fielded Beechcraft King Air 200/300/350 series turboprop aircraft.

For additional information regarding the G1000 NXi upgrade for the King Air, contact Scott Frye at (913) 440-2412 or *scott.frye@garmin.com*. For additional details, visit: www.garmin.com/kingair.

Astronics Max-Viz 1200 Enhanced Vision System Certified

Astronics Max-Viz announced that its low cost Max-Viz 1200 Enhanced Vision System (EVS) for fixed and rotor wing aircraft has been certified to DO-160G standards by the Radio Technical Commission for Aeronautics (RTCA).

DO-160G is the industry standard for the environmental testing of avionics hardware and is recognized by the International Organization for Standardization (ISO) as de facto international standard ISO-7137. The solid state technology of the \$9,000 Max-Viz 1200 EVS requires no routine maintenance.

The company states that the environmental compliance for its lowest priced certified EVS further demonstrates the system's reliability in all kinds of weather and flight conditions. "The Max-Viz 1200 meets or exceeds RTCA standards to include resistance to temperature, altitude, humidity, shock, vibration, water, sand and dust, fungus, magnetic effect, power spikes, audio and radio frequencies, lightening, icing and flammability."

The Max-Viz 1200 EVS features a low power, uncooled thermal camera. The sensor image can be presented on any video-capable display that accepts Composite video (RS-170) NTSC or PAL/Analog signals. The lightweight 1.2 pound system is compatible with display systems including the Garmin G500, 600 and 1000, and various EFBs.

The Max-Viz infrared enhanced vision system detects the differences in heat of objects and terrain in an airplane's environment, producing an accurate real-

time picture of the surroundings in the absence of visible light. With thermal imaging, the EVS display enables pilots to see when flying day or night in smoke, haze and light fog. The EVS can work as an alternative to, or in tandem with, light-based night-vision goggle technologies.

The Max-Viz 1200 EVS complements synthetic vision displays, allowing pilots to see transient obstructions, like wildlife and construction barriers not in synthetic vision databases. The system gives real time confirmation of the operating environment, as well as supporting the approach to landing transition from Instrument Flight Rules to Visual Flight Rules in marginal visual conditions.

With over 40 Supplemental and Type Certificates in fixed and rotor wing aircraft, the benefits of the Astronics Max-Viz EVS include:

- Ability to see and avoid runway/taxiway incursions
- Instant awareness of airport surface traffic on approach
- Unambiguous runway/taxiway identification
- Aid in identifying taxiway edges and increased sign clarity
- Avoidance of parking ramp clutter and ground collision
- An augmentation to TAWS display with clear visual picture of terrain
- Help avoiding nighttime cloud buildups for smoother flight
- Help avoiding inadvertent flight into instrument meteorological conditions (IIMC)
- Help avoiding controlled flight into terrain (CFIT)
- Visual clarity through smoke, haze and light fog For more information, go to max-viz.com.

Hampton Aviation New Dealer for CenTex Aerospace

Hampton Aviation of Mena, Arkansas, has joined CenTex Aerospace's network of authorized dealers/ installers. Since 1965, Hampton Aviation has provided structural repair, inspections and modifications in its facility located in western Arkansas. The facility has also been the premier King Air inspection and repairs facility for the U.S. Army, Air Force and Navy since 2003.

Centex selected Hampton Aviation for its proven track record and reputation for excellence in King Air modifications and will be able to install the company's complete line of King Air products.

More information about the facility can be found at *www.hamptonaviation.com*.



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Technically Service Bulletins, advisory Directives and Safety communications

Service Bulletins

Service Bulletin 34-4150: Navigation – Introduction of Automatic Dependent Surveillance-Broadcast Out (ADB-B Out) Installation Kit

Issued: December 2016

Effectivity: King Air B200 (Super King Air), Serial Numbers BB-1769, BB-1834, BB-1843 and after; B200C (Super King Air), Serial Numbers BL-148 and after; B200GT (Super King Air), Serial Numbers BY-1 thru BY-206, BY-208 thru BY-238, and BY-240 thru BY-249; B300 (Super King Air), Serial Numbers FL-381, FL-383 thru FL-953, FL-955 thru FL-1009, and FL-1011 thru FL-1030; B300C (Super King Air), Serial Numbers FM-12 thru FM -65.

NOTE: Textron Aviation-Owned Service Centers are the only facilities that can complete this service bulletin.

NOTE: Review Kits 101-3416 and 101-3417 for prerequisite configuration requirements before starting any work.

Compliance – Optional: This service bulletin can be accomplished at the discretion of the owner.

A service bulletin published by Textron Aviation may be recorded as "completed" in an aircraft log only when the following requirements are satisfied:

- 1) The installer must complete all of the instructions in the service bulletin, including the intent therein.
- 2) The installer must correctly use and install all applicable parts supplied with the kit drawings referenced in this service bulletin. Only with written authorization from Textron Aviation can substitute parts or rebuilt parts be used to replace new parts.
- 3) The installer must use the technical data in the service bulletin only as approved and published.
- 4) The installer must apply the information in the service bulletin only to aircraft serial numbers identified in the *Effectivity* section of the bulletin.
- 5) The installer must use maintenance practices that are identified as acceptable standard practices in the aviation industry and governmental regulations.

No individual or corporate organization other than Textron Aviation is authorized to make or apply any changes to a Textron Aviation-issued service bulletin, service letter, or flight manual supplement without prior written consent from Textron Aviation.

Textron Aviation is not responsible for the quality of maintenance performed to comply with this document, unless the maintenance is accomplished at a Textron Aviation-Owned Service Center.

Reason: This service bulletin is being issued to comply with operational requirements for ADS-B Out.

Description: This service bulletin announces FAAapproved Kits 101-3416 and 101-3417 that are available for installing ADS-B Out capable components that meet the operational requirements.

Service Bulletin 57-3867, Rev.2: Wings – Aileron **Drain Hole Inspection**

Issued: October 2007 Revised: January 2017

Synopsis of Change: This Service Bulletin has been revised to increase serial effectivity. Although a company name change to Textron Aviation occurred, this Service Bulletin will revise only technical and contact information. No further action is required for airplane owner/operators who have already complied with previous issues of this Service Bulletin.

Effectivity: (Added Models and Serial Numbers shown in red.)

(1) Airplanes

(a) Civil

Beechcraft Model B200 Super King Air, Serial Numbers BB-1 through BB-1964; Beechcraft Model B200GT Super King Air, Serial Numbers BY-1 through BY-25; Beechcraft Model B300 Super King Air, Serial Numbers FL-1 through FL-502, FL-504 through FL-516, FL-521 through FL-523, FL-530, FL-531, FL-533, and FL-546; Beechcraft Model B300 Super King Air, Serial Numbers FM-1 through FM-11.

(b) Military

Model A100-1 (U-21J) King Air; Model 200 King Air; Model 200C King Air; Model 200CT King Air; Model 200T King Air; Model B200 King Air; Model B200C King Air; Model B200CT King Air; Model B200T King Air; Model A200 (C-12A) King Air; Model A200 (C-12C) King Air; Model A200C (UC-12B) King Air; Model A200CT (C-12D) King Air; Model A200CT (FWC-12D) King Air; Model A200CT (C-12F) King Air; Model A200CT (RC-12D) King Air; Model A200CT (RC-12G) King Air; Model A200CT (RC-12H) King Air; Model A200CT (RC-12K) King Air; Model A200CT (RC-12P) King Air; Model A200CT (RC-12Q) King Air; Model B200C (C-12F) King Air; Model B200C (UC-12M) King Air; Model B200C (C-12R) King Air; Model B200C (UC-12F) King Air, all serials; Model B200CGT King Air, all serials; Model 300 King Air and Model 300LW King Air, all serials; Beech Model A200 (C-12A/C-12C), Serial Numbers BC-1 through BC-75 and BD-1 through BD-30; Beech Model A200C (UC-12B), Serial Numbers BJ-1 through BJ-66; Beech Model A200CT (C-12D, FWC-12D, C-12F), Serial Numbers BP-1, BP-7 through BP-11, BP-19, BP-22, and BP-24 through BP-63; Beech Model A200CT (RC-12D, RC-12H), Serial Numbers GR-1 through GR-12, and GR-14 through GR-19; Beech Model A200CT (RC-12G), Serial Numbers FC-1 through FC-3; Beech Model A200CT (RC-12K, RC-12P and RC-12Q), Serial Numbers FE-1 through FE-9, and FE-25 through FE-36; Beech Model B200C (C-12F), Serial Numbers BL-73 through BL-112, and BL-118 through BL-123; BP-64 through BP-71; Beech Model B200C (C-12R), Serial Numbers BW-1 through BW-29; Beech Model B200C (UC-12M), Serial Numbers BV-1 through BV-10; Beech Model B200C (UC-12F), Serial Numbers BU-1 through BU-10;

(c) Non-FAA Certified

Beech Model A200CT (RC-12N), Serial Numbers FE-10 through FE-24; Beech Model A200CT (RC-12P), Serial Numbers FE-25 through FE-31, FE-33, and FE-35; Beech Model A200CT (RC-12Q), Serial Numbers FE-32, FE-34, and FE-36; Beech Model B200 Super King Air, Serial Numbers BB-1385 through BB-1388; Beech Model B200CT (FWC-12D), Serial Numbers FG-1 and FG-2; Beech Model B200CT Super King Air, Serial Numbers BN-5 through BN-9; Beech Model B200T Super King Air, Serial Numbers BT-39 through BT-46; Beech Model B200C (RC-12M), Serial Numbers BV-11 and BV-12.

(2) Spares

All airplanes that have had a spares replacement aileron installed prior to January 2008.

Compliance – Mandatory: Textron Aviation considers this to be a mandatory modification and it must be accomplished as soon as possible after receipt of this Service Bulletin, but no later than the next 50 flight hours or three months, whichever occurs first.

Reason: This Service Bulletin is being issued because Textron Aviation has discovered the possible absence of a 0.19-inch diameter hole, which is designed to provide drainage from the aileron assembly. The absence of a drain hole may lead to a buildup of water in the area. This buildup could result in an unbalanced aileron assembly.

Warranty: None.

Labor: The following information is for planning purposes only:

Estimated man-hours: 1 hour. Suggested number of men: 1 man.

The above is an estimate based on experienced, properly equipped personnel complying with this Service Bulletin. Occasionally, after work has started, conditions may be found which could result in additional man-hours.

ML-B-200 Rev. 0.1: Incremental Update Release of ML-B-200 Rev 0.1 (Same as IML-200 Rev 60.1)

Date: January 2017

Effectivity: The following publication revision has been released as an incremental update to IML: Model B200GT/B200CGT Fusion Maintenance Manual - P/N 434-590168-0009A3 and the Model B200GT/B200CGT Fusion Wiring Diagram Manual – P/N 434-590168-0011C.

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



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The Garmin G1000 NXi Features the Following Upgrades over the Standard G1000:

- •HSI Map Overlay on the PFD (Flight Plans, Datalink Weather, Traffic, Weather Radar, Relative Terrain and More)
- •ADS-B In Technology Using Patented TargetTrend and Terminal Traffic as well as Visual Approaches
- Increased Map Performance with Contemporary Animations and Modernized Design
- •Optional Cockpit Connectivity Including Wireless Database Updates and Flight Plan Transfer Via Garmin Flight Stream
- Optional Surface Watch Runway Monitoring Technology



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