King Air

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT
JUNE 2018 • VOLUME 12, NUMBER 6 • $6.50

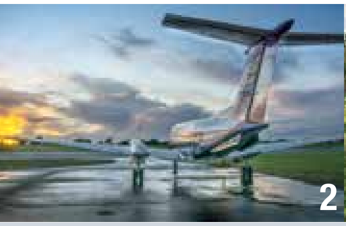
Answering the Call

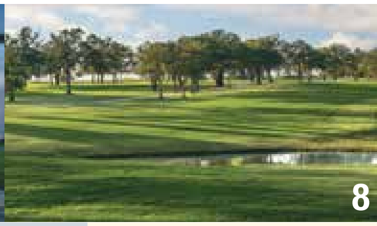
King Air Delivers Time-Critical Patient Transport in New Zealand

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

King Air

JUNE 2018 Volume 12 / Number 6





EDITOR
Kim Blonigen

EDITORIAL OFFICE
2779 Aero Park Dr.,
Traverse City MI 49686
Phone: (316) 652-9495
E-mail: editor@blonigen.net

PUBLISHERS
J. Scott Lizenby
Dave Moore
Village Publications

GRAPHIC DESIGN
Luana Dueweke

PRODUCTION MANAGER
Mike Revard

PUBLICATIONS DIRECTOR
Jason Smith

ADVERTISING DIRECTOR
John Shoemaker
King Air Magazine
2779 Aero Park Drive
Traverse City, MI 49686
Phone: 1-800-773-7798
Fax: (231) 946-9588
E-mail: johns@villagepress.com

ADVERTISING EXECUTIVE ASSISTANT
Betsy Beaudoin
Phone: 1-800-773-7798
E-mail: betsybeaudoin@villagepress.com

SUBSCRIBER SERVICES
Rhonda Kelly, Mgr.
Kelly Adamson
Molly Costilow
Diane Smith
Jamie Wilson
P.O. Box 1810
Traverse City, MI 49685
1-800-447-7367

ONLINE ADDRESS
www.kingairmagazine.com

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 provided by New Zealand Flying Doctor Service (Stu Drake)

Contents

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.

New Zealan Super Hero

The King Air is Essential for Flying Doctor Service's Critical Missions

(PHOTO CREDIT: STU DRAKE)

The New Zealand Flying Doctor Service (NZFDS) is the fixed wing division of GCH Aviation that provides inter-hospital transfers of patients nationwide for two districts located in New Zealand's South Island. The nation's health care system is centralized due to the country's size in comparison to its population. Similar to the role played by the Royal Flying Doctors, located in nearby Australia, the NZFDS aids in the transportation of critically ill patients from smaller outlying hospitals and medical centers to more established hospitals and medical specialists in New Zealand's larger cities.

In 2009, the Flying Doctor Service added their first King Air, a Super King Air 200C (ZK-FDR), based in Christchurch, as their service area grew and led to more challenging flight conditions. Three years later they purchased a King Air C90B, currently based in Nelson. As their operations continue to grow, they plan to increase their King Air fleet.

Saving Lives from the Start

NZFDS was established in 1995 and the first mission would drastically demonstrate its need. A tragedy, known as the Cave Creek Disaster, occurred in Paparoa National Park on the West Coast of South Island. A viewing platform high above Cave Creek collapsed and fell almost 100 feet (30 meters) killing 13 students and a Department of

d’s NZ FLYING DOCTOR SERVICE

by Kim Blonigen

Conservation worker, and critically injuring four more. NZFDS transferred medical teams from Christchurch to Grey Base Hospital in Greymouth, located near the scene of the accident, and the only facility on the West Coast that offered the specialized services needed in this situation. Once the immediate needs of the survivors were attended to, NZFDS transferred the patients to Christchurch for further treatment and provided ongoing critical care inflight.

The disaster reinforced the need for a flying doctor service that could travel to the most remote regions in New Zealand and administer time-critical care enroute to a more specialized treatment facility. John Currie, who was already operating Garden City Helicopters in an emergency rescue capacity, had the foresight to start the Flying Doctor Service. “Although we were operating the rescue helicopter in the South Island at the time [of the Cave Creek Disaster], it was evident that there were times when you needed more than a rescue team and a helicopter,” he said.

He saw that those who were very sick and required a specialist’s care needed to be transferred to a hospital that could provide advanced medical treatment. Sometimes the distances were substantial, and at other times the need for a pressurized airplane was required to fly over the Southern Alps. The pressurized aircraft was also needed to keep the patient at sea level cabin pressure, which is critical for very sick patients. “Most of all, [the patients] need to have intensive care right through the journey from one hospital bed to another until specialized treatment is available at the destination,” Currie explained.

When NZFDS began, it was staffed by paramedics, but soon after a specialist and nurses were employed so patients would receive the same level of care throughout their transport. Today, the medical flight service operates

New Zealand Flying Doctor Service's Super King Air 200C and C90B in front of their new facility in Christchurch.
(RUPERT MACLACHLAN)

24/7/365 out of its two bases covering the greater part of South Island and the Chatham Islands. It employs a full-time team of 12 pilots, 25 intensive care flight nurses who are supported by intensive care doctors and senior medical officers, and a small, dedicated neonatal and midwife team. The flight service transports an average of 1,500 patients annually.

Perfect Aircraft for Critical Missions

New Zealand's South Island consists of about 58,000 square miles and a population of approximately 1.1 million people, making it the 12th largest island in the world by area. The island is classified by the New Zealand Civil Aviation Authority as 80 percent "mountainous terrain." Several of the mountain ranges have peaks of over 5,000 feet and the Southern Alps and Mt Cook reach up to 12,300 feet.

In 2009 when the NZFDS was operating a Cessna Conquest and a Cessna 421 Golden Eagle, an increase in patient numbers and expanding service area pushed the decision to acquire a King Air to allow for a second stretcher and meet their flight condition needs. The company was fortunate to purchase the Super King Air 200C from the Royal Flying Doctors of Australia, as it already had a large cargo door and the medical stretcher system installed. The Conquest now serves as a backup to the 200C and the Cessna 421 was relocated

The GCH Evolution

The GCH Aviation Group is an umbrella brand representing parent company Garden City Helicopters, based in Christchurch, New Zealand, and many associated aviation operations extending throughout New Zealand and into the South Pacific. The collective group offers certified flight training, tourism and charter flights, commercial services, air rescue and ambulance operations through its fleet of helicopters and fixed-wing aircraft.

Parent company Garden City Helicopters was established in 1983 as a coastal helicopter rescue service and a scenic flight tourist operator. As those areas grew, and there was a need in other areas of aviation, Garden City Helicopters started expanding by adding other aviation service groups including the New Zealand Flying Doctor Service.

Garden City Helicopters is widely respected as a premier helicopter operator in New Zealand, so it only made sense to introduce a brand name for all of the separate entities to operate under. GCH Aviation was introduced in order to present a professional, cohesive and quality-focused service to its customers with the following mission statement:

> *GCH Aviation Group aims to provide a professional service tailored to meet the wants and needs of our individual clients.*
>
> *Operating with very experienced pilots we wish to maintain our excellent flight safety record and pass on our high standards to trainee pilots who graduate from our program.*
>
> *We wish to remain progressive and innovative to keep pace with a changing external environment and introduce diversification within the realms of our core operations.*
>
> *Our organisation is a high-profile company and we wish to maintain our image and credibility built up over the last 30 years.*

Ruddenklau concluded by saying, "Safety is the paramount consideration for all of GCH Aviation's operations. The vast experience of the pilots, regular training, familiarity of equipment and extensive and continual exposure to the extreme terrain covered by our network, ensures that our safety record is maintained."

NZFDS was established to provide intensive care to patients throughout their transport and from one hospital bed to another. (STU DRAKE)

to Nelson and was eventually replaced with a King Air C90B in 2012. The operation in Nelson doesn't work at an intensive care level and mostly transfers patients who can walk up and down the stairs of the aircraft. The C90B does have the ability to load and unload patients on a stretcher via the standard door, if needed.

According to Arthur Ruddenklau, NZFDS's operations manager, a typical mission is a flight from Christchurch to Greymouth to transfer an intensive care patient to a more specialized hospital in Christchurch. Greymouth, on the West Coast of South Island, is a thin stretch of flat land sandwiched between the South Alps and the Tasman Sea. "The prevailing weather patterns are westerly in nature which makes the West Coast very wet. The average rainfall ranges from 200 centimeters (78 inches) on the coastal area and 1,000 centimeters (394 inches) on the western side of the Southern Alps which presents a number of challenges for the pilots," Ruddenklau said.

NZFDS also conducts medical flights to and from the Chatham Islands – a group of 10 islands in the Pacific Ocean about 500 nautical miles east/northeast of Christchurch. "The weather on the Islands can also pose a challenge with a constant 'breeze' averaging 16 knots, and for at least 120 days of the year, it can gust to more than 35 knots. There are also a number of days that the islands are affected by low clouds, drizzle, mist and fog which adds to the flight challenges," Ruddenklau explained. "The Super King Air 200C is well suited for these flights as it can carry a standard medical team of a nurse and doctor, two pilots and enough fuel to reach the island and divert back to the mainland if required."

The King Air has proven to be the right aircraft for the NZFDS and they are currently searching for a

The King Air C90B, purchased in 2012, is based in Nelson and mostly transfers patients who can use the stairs. (MATT HAYES)

ZK-FDR at Greymouth where the massive amount of rainfall creates challenging flight conditions. (STU DRAKE)

later model B200C to join their fleet as their growth continues every year. Later, the Flying Doctor Service plans to look for another model B200, B200C or B350 to replace the Conquest and start charter flights through their new FBO facility in Christchurch. It would also serve as a backup for medical flights during scheduled and unscheduled maintenance.

Ruddenklau concluded by saying, "The reliability of the King Air is remarkable as is the parts support and technical advice. The aircraft offers a huge level of safety, comfort and is an extremely stable platform to operate both from a pilot and clinical point of view." KA

Although the flying conditions can be challenging, the views are spectacular. The Southern Alps during mid-summer with the Tasman Sea in the background. (WARRICK MASON)

King Air Gathering III

September 28-29, 2018
Fredricksburg, Texas (T82)

by Kim Blonigen

Although the next King Air Gathering is still a few months away, King Air operators are already registering. The event is being held September 28-29, 2018 at the Hangar Hotel Conference Center located right on Gillespie County Airport (T82) at Fredricksburg, Texas.

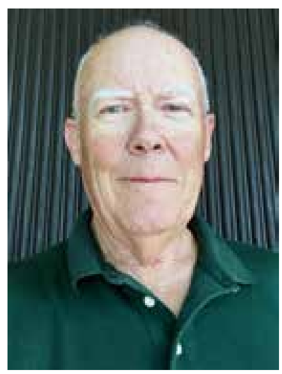
Conferences will be held Friday and Saturday – two full days of seminars presented by King Air experts. Friday will focus on upgrades and modifications, from avionics and engines, to performance and fuel and weight enhancements, as well as an ROI perspective. Saturday, experts will discuss planning for cost-effective maintenance, maintenance consultants, the importance of acceptance inspections and flights (pre-buy, maintenance, etc.), how to efficiently run your engine, and more.

Keynote speakers for the event are all well-known in their own right when it comes to the King Air. King Air Expert, **Tom Clements**, author of *The King Air Book* and the "Ask the Expert" column in this magazine, will discuss 40 years of flying the King Air – piloting best practices, why non-events turned catastrophic, as

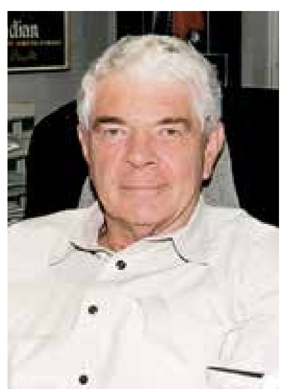
A golf tournament is being offered the day before the seminars at the Lady Bird Golf Course, which recently went through a $2 million renovation. (FREDERICKSBURG CVB)

Reservations can be made at the Hangar Hotel located right next to the convention center where the meetings on Friday and Saturday will be held. The hotel was uniquely designed to resemble a World War II hangar and carries the 1940's theme inside with décor. (HANGAR HOTEL)

well as answering your questions. King Air modification legend **James Raisbeck** will review the history of Raisbeck Engineering and the impact its products have had on the King Air. Back by popular demand, **Dr. David Strahle** will provide a wealth of information when he presents "Advanced Weather Planning and the Use of Available Resources for your Next Flight." Dr. Strahle presented at KAG II and attendees found his information to be very valuable.



Tom Clements



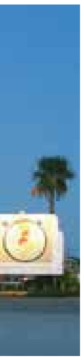
James Raisbeck

For those who can arrive early, a golf tournament is being held for attendees on Thursday, September 27, at 1:00 p.m. at the Lady Bird Golf Course, which recently went through a $2 million renovation and is located near the airport.


Dr. David Strahle

Hotel rooms are available, but limited, at the Hangar Hotel located right next to the Conference Center. It features airplane memorabilia, model airplanes and USO history, and is located adjacent to the airport. Other hotels with a discounted rate are also available.

Go to *www.kingairgathering.com* for registration and more detailed information regarding hotel options, speakers, the golf tournament and a complete agenda. KA



Platinum Sponsors: Textron Aviation and Blackhawk Modifications

The Parking Brake

by Dean Benedict, A&P

We all know the "Do's and Don'ts" of parking brakes.

Don't set it when you pull into an FBO for any length of time, because they will likely tow your King Air to another spot. I've seen the entire nose gear assembly ripped out of a King Air by an over-zealous line guy. I guess he didn't get the memo to first try a gentle tug and make sure the aircraft will roll.

Don't rely solely on the parking brake to hold the aircraft. They are notoriously unreliable. I will never forget the morning I pulled into work and found a V-tail Bonanza on the ramp with its tail and rear fuselage sliced neatly into spiraled segments. It looked like a giant slinky. This was years ago at BeechWest in Van Nuys, California. The owner of a Twin Bonanza was getting ready to fly. Line service had pulled his aircraft onto the ramp and chocked it. He hopped in, started the engines, then realized he forgot to pull the chocks. So, he set the parking brake and got out of the aircraft with the engines running. As soon as he kicked the nose chock out of the way, the aircraft started rolling. He tried to stop it by pushing on the nose cone, but he slipped and fell between the prop and fuselage. Miraculously, he was unscathed as his airplane moved beyond him, but the V-tail parked nearby was not so lucky.

The System

Most of us were taught when we first started flying that parking brakes in airplanes are unreliable, if not borderline useless. The parking brake system used by Beechcraft is no exception, although King Airs do have a beefier version than its piston cousins.

Downstream from the master cylinders, there is a valve that traps the hydraulic fluid between the brakes and the park valve. When the brake is set, O-rings in this valve confine the brake fluid on the brake side. This maintains the pressure and keeps the brakes engaged. When these O-rings leak, the brakes begin to release ever so slowly. If the engines are running, the aircraft will creep.

Some pilots are finicky about a leaky parking brake. Others pay it no heed whatsoever because they seldom use it, if at all. If you are fond of your parking brake, pay attention. They can create some serious havoc.

Partial Release and Total Destruction

I got a frantic call from a King Air pilot I did not know. He had flat-spotted a tire on takeoff and had no idea how this happened. Then the brakes failed, and the B200 careened off the taxiway as he tried to make his way back to the hangar. He was rattled, the passengers were alarmed, but thankfully no one was hurt.

The brakes, however, were another story. In all my years working on airplanes, I have never seen brakes so thoroughly and completely destroyed. The mechanic who took everything apart had worked for me when I had my shop. He has about as much King Air experience as I do, and he was equally stunned. These brakes didn't just overheat, they exploded.

The regular pilot of the B200 was unavailable and a temp pilot was hired for the trip. On takeoff he found he was unable to accelerate past 80 knots, so he aborted. While taxiing back, he had no brakes. Unable to slow down for a 30-degree turn in the taxiway, he went into the gravel median. Everyone disembarked at that point. That's when they noticed the severely blown tire on one side. Line service reported extreme difficulty getting the aircraft onto the tarmac and into its hangar.

At first, all focus was on the side with the blown tire. But the next day, brake fluid was pooled on the hangar floor under both main gear. Initially, the pilot thought the parking brake did not fully release, but later he said he may not have pushed the handle in all the way.

Once they got it up on jacks to address the issue, it was one surprise after another. These were OEM (BFGoodrich®) brakes. Disassembly was difficult at first due to the extreme heat generated during the takeoff roll – those brakes had to have been glowing red. Once they got into it, pieces of the stationary discs dropped on the floor. This was not a good sign.

No Good, Beyond Bad and Just Plain Ugly

The brakes, or what was left of them, were tossed in a box and brought to me for inspection. By this time, I was assisting the owner in assessing the damage and deciding on the best course of action. I was astonished by what I saw.

The right-hand (R/H) outboard froze up and the tire gave out (photo A). The only stationary disc that survived intact was in this brake assembly (photo B). You can see how the lugs fit into receptacles in the caliper housing.

The stationary discs in the other three brake assemblies blew apart. We spent a good hour piecing stationary discs together like giant jigsaw puzzles as shown in photo C. Notice the lugs are mangled or missing. In photo D it shows that even the steel lug receptacles were damaged.

The rotating discs in photo E fared no better, warping under the intense heat; note the plugged-up

Photo A: Blown Tire

Photo B: The intact stationary disc. Notice the lugs fitting into receptacles in the brake caliper housing.

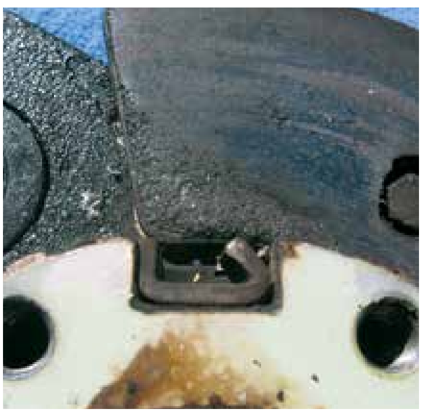


Photo D: A close-up of a damaged lug receptacle due to the extreme heat, which dislodged the steel lugs.

Photo C: One of the stationary discs pieced back together with what was left after the brakes were removed. Notice the three mangled lugs on the inside; one is missing completely.

Photo E: The cooling slots in the rotating discs were filled with gunk, like the one circled above.

cooling slot. As the heat intensified, the pad material began to break down and melt. Most of the cooling slots in the rotating discs were filled with this gunk.

Check out the heavy gouging in photo F; once the stationary discs broke into pieces, their lugs cut into the caliper housings. This was the worst-case scenario – these brakes had no redeemable cores whatsoever.

And the wheels? All bad. When the stationary discs broke up, the centrifugal force pushed the pieces against the wheel halves and their outer edges dug in (photo G). As for the R/H outboard wheel, the long taxi back at high idle on a mangled tire followed by a plunge into the gravel median took its toll.

If the brakes were engaged, or partially engaged, the whole time, I was asked why they failed at the taxiway turn. I'm sure the system was overheated so severely that the O-rings melted.

Photo F: Extreme gouging on the brake caliper housings, created by the stationary disc lugs once it broke into pieces.

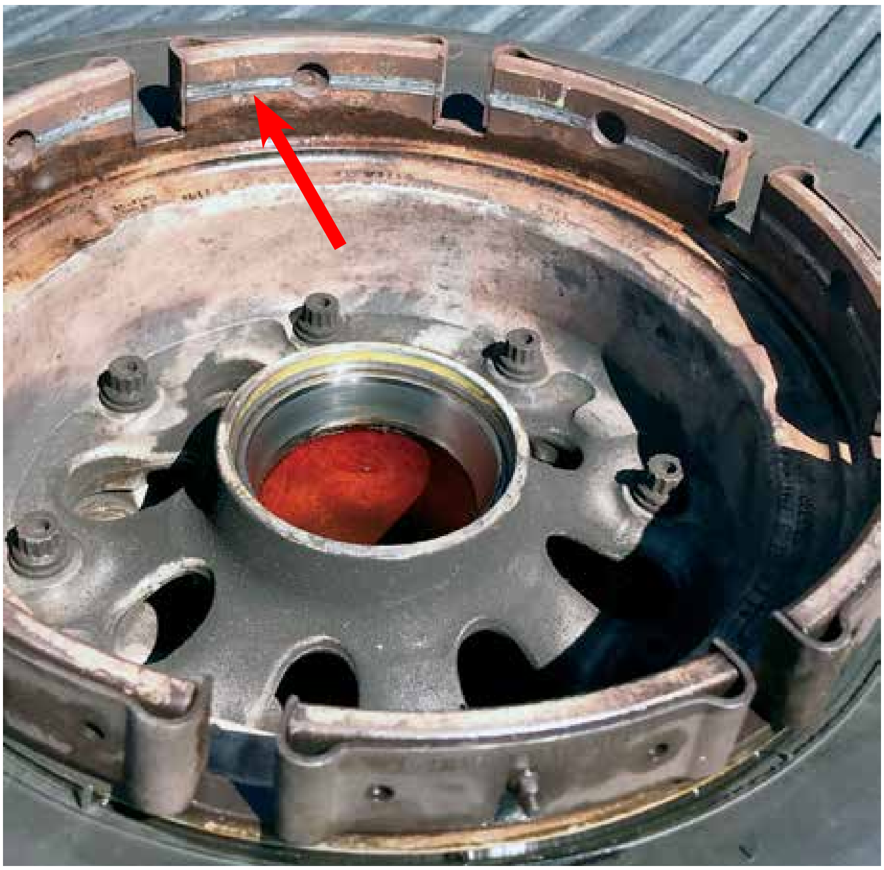


Photo G: Gouging on the wheel halves.

Then when the pilot tried to apply the brakes during taxi, the fluid went right through and he got no response.

Replace or Convert?

At first the owner was adamant about sticking with OEM equipment on his King Air. However, after pricing everything out, I concluded it would cost at least $100,000 to buy the BFGoodrich parts outright (i.e., no core credits) plus labor, freight, consumables and taxes. In contrast, a Cleveland conversion kit, with new wheels and everything else, was just about one-third of that amount. It was a no-brainer; he opted for the Cleveland conversion.

Not too long ago I wrote an article for this magazine comparing the OEM and the STC brake systems. In the October 2017 issue, you can read about the BFGoodrich internal disc system versus the Cleveland external disc system. However, I was unable to fit my concerns about the parking brake in that article, so I'm seizing that opportunity here.

High Idle Taxi Equals High Expenses

I strongly suspect the temp pilot of that B200 was taxiing out at high idle. Why? Because high idle generates enough momentum to get a King Air rolling, *even if the parking brake handle isn't pushed all the way in*, or if the brake somehow failed to release all the way.

At low idle, if the parking brake is partially engaged, you can't get rolling. If you do, it will feel labored, and it won't feel right. In fact, this is the perfect test to see if your parking brake has failed to fully release – see if you can roll in low idle.

While on the subject, let me point out the many reasons you shouldn't taxi at high idle. The aircraft is simply going too fast for safe handling on the ground. To compensate, you are forced to ride the brakes and/or go into Beta or reverse to maintain control. Using Beta or reverse is hard on the props and throws ramp debris out in front of the aircraft. Such debris spells damage to your prop blades and potential FOD for your engines.

Accelerated brake wear, unnecessary stress on the prop system, chewing up blades and potential FOD – what is the upside to taxiing in high idle?

Some guys choose to do this, so they can run the air conditioning (A/C) and keep both engines at the same rpm. On 200, 300 and 350 models, with the A/C assembly mounted on the R/H engine, the compressor won't kick in below 62-65 percent N_1 (the exact setting may vary). They don't want to taxi in low idle and nudge the R/H engine a little higher to get the A/C going, because they don't like the right side wanting to pull ahead. I understand the reasoning, but if you're concerned about containing your maintenance costs, consider taxiing in low idle only.

Burn Them In, Part 2

When the Cleveland conversion was completed on that B200, it was understood that I would burn in the new brakes. Since I wasn't familiar with the airport, I asked the regular pilot to come along with me sitting right seat. And guess what? He fires it up and taxis out in high idle. Whoa Nelly! He was riding those virgin brakes like crazy, which is the *last* thing you want to do to new brakes before they're burned in. It was an awkward moment, but I got him to switch to low idle.

As I mentioned in my earlier article on brakes, the proper burning in of brand-new brakes "ensures they have the proper stopping capacity, reduces the possibility of noise or chatter, and makes them wear better." They wear more evenly and last longer if done properly. When you taxi out to burn in brand-new brakes, use low idle and touch them as little as possible before the burn-in run.

In My Humble Opinion

I never use the brakes when taxiing because: A) I'm never in high idle, and B) I've got props to make the turns. Most King Air pilots I know do the same.

The only time I would set a parking brake is when the tower tells me I'm number five in line for takeoff. I say: "Set it, but don't forget it." Be on the lookout for creep. It's common with many aircraft, not just King Airs. Then, when it's finally your turn to take off, push that parking brake all the way in, roll out and have a great, safe flight in your King Air. KA

Dean Benedict is a certified A&P, AI with over 40 years of experience in King Air maintenance. He's the founder and former owner of Honest Air Inc., a "King Air maintenance boutique" (with some Dukes and Barons on the side). In his new venture, BeechMedic LLC, Dean consults with King Air owners and operators on all things King Air related: maintenance, troubleshooting, pre-buys, etc. He can be reached at *dr.dean@beechmedic.com* or (702) 773-1800.

Pressurization Basics

by Tom Clements

I keep observing a disturbing lack of knowledge and understanding of an aircraft's pressurization system. Let me try to set the record straight … or at least straighten it out a little bit. I will use the numbers associated with a member of the King Air B200-series. However, what I write, with minor modifications, will apply to any pressurized airplane.

Differential Pressure (ΔP, "Delta P")

Differential Pressure is simply the difference between inside and outside absolute pressures. In engineering parlance, the Greek letter Delta, Δ, is commonly used to indicate the difference between two measurements. So, expressed as a formula, ΔP = PCABIN – PAMBIENT.

If a positive amount of ΔP exists, the airplane is pressurized with more pressure inside than outside … just like a party balloon. The doors and windows are trying to be pushed open and the structures must be strong enough to withstand these forces. This is the reason why pressurized airplanes are heavier than their unpressurized predecessors.

So, like that party balloon, we push more air in than is let out and the airplane becomes pressurized, right? When doing a test in the maintenance run-up area, yes, that is correct. In a great majority of our flights, however, it doesn't work that way. In most cases, we set the pressurization controller for a cabin altitude that is higher than the field elevation from which we departed, right? And then after takeoff the cabin is climbing to that altitude, right? Well anytime the cabin is climbing it is decreasing its pressure and the fixed-volume cabin is therefore *losing* air, not gaining air. The pressure inside the cabin is indeed decreasing but why we are getting pressurized is because it is *not decreasing as fast as the ambient pressure outside the cabin*.

Here's an example: Let's say we depart from sea level and the cabin climbs to 10,000 feet while the airplane climbs to 25,000 feet. PCABIN goes from 14.7 psia (SL) to 10.1 psia (10,000 feet) but PAMBIENT goes from 14.7 psia (SL) to 5.5 psia (25,000 feet). So ΔP went from 0 psid (14.7 – 14.7) to 4.6 psid (10.1 – 5.5).

In a King Air B200 (as well as in all of the 300-series), the maximum certified ΔP is 6.5 psid (Pounds per Square Inch Differential). As in everything that is mechanical in nature, there must be some tolerance and the allowable tolerance in maximum ΔP is plus or minus 0.1 psid. In other words, when running on the maximum ΔP relief, any ΔP between 6.4 and 6.6 means that your King Air is doing what it was designed to do. Of course, Beechcraft marketeers, seeing that the *Maximum* maximum is 6.6, were quick to put that figure in the sales brochures.

The Pressurization Controller

The purpose of the pressurization controller is merely to be a governor of cabin altitude. Within its capabilities it will make the cabin climb or descend to a newly-selected cabin altitude value at the rate the rate knob is set for and then keep the cabin at that altitude the best it can. Just like a propeller governor cannot *always* maintain the selected RPM – for example, propeller speed decreases on landing as the governor causes the blades to flatten as far as they can go – likewise the pressurization controller cannot always maintain the selected cabin altitude. **Two things will prevent this**: First, the cabin can never be higher than the airplane. That would cause a negative differential pressure – ΔP would be a negative number since PCABIN is less than PAMBIENT – and negative ΔP is prevented by dedicated relief valve portions contained identically within both the outflow and safety valves. Second, the cabin cannot maintain the selected altitude if doing so would cause maximum attainable ΔP to be exceeded. That "maximum *attainable* ΔP" is often *not* the maximum *certified* ΔP, as I will explain.

To maintain the cabin at any selected altitude, all that must occur is for total air mass inflow to equal total air mass outflow. In the B200, as in most all pressurized airplanes, the incoming flow is regulated to be as constant as possible and all control of cabin altitude and rates of climb and descent are accomplished by varying the outflow through the outflow valve. Of course, what exits through the outflow valve is not the total outflow … we must consider the contributions of all the little and big leaks. Here's where the conceptualization gets tricky. How much mass flow exits through the leaks depends upon ΔP. If there is a low ΔP, then the "push" that causes air to flow through the leak hole is small and hence the flow is small. But when ΔP is large, then the mass flow across the leak is also large, even though the leak size has not changed.

Let me apply some numbers to an example. Suppose that both the left and right inflow systems – the Bleed Air Flow Control Packages, or Flow Packs – were pumping in seven pounds per minute (ppm) of air, for a total of 14 ppm. To keep the cabin from climbing or descending, a total outflow of 14 ppm must be taking place. If, at 6.5 psid, the leaks accounted for a total of five ppm, that means that the outflow valve would be positioned by the controller to allow nine ppm to escape (14 ppm in, 5 + 9 ppm out) … we're in balance and the cabin is holding its altitude, maintaining a constant cabin pressure.

Now let's make the leaks add up to 20 ppm at 6.5 psid. (Don't ask me how we got to 6.5, because we won't be staying there, as you'll see.) Since now, even with the outflow valve totally closed, there is more air exiting (20) than entering (14) a net loss of cabin air is taking place and the cabin must be losing air molecules, losing pressure, and hence climbing. As the cabin climbs while the airplane flies level, however, ΔP is decreasing and hence the mass flow through the leaks is also decreasing. As the cabin goes up and ΔP goes down, eventually a perfect balance will be reached, wherein the leaks total 14 ppm, equal to the inflow. At that point, the cabin stops climbing. But now you see two common but incorrect indications: First, the cabin is higher than the altitude you've dialed into the controller, and second, your maximum attainable ΔP is well below the correct 6.5 psid value.

Inflow

The flow packs attempt to provide constant air mass flow regardless of altitude, outside air temperature, or compressor speed (N_1 or N_g). If compressor speed is too low, however, the flow cannot keep supplying the pounds of air that it should … the air pump isn't turning fast enough. A quick and unscientific check of your inflow and outflow is this: Can you maintain maximum ΔP with both power levers pulled back far enough to just trigger the landing gear warning horn? If the answer is no, then you can be sure that your air inflow is too low (weak or dead flow pack) or your air outflow is too high (excessive leaks) or a combination of both.

As you reduce power aggressively for a descent – either to comply with an ATC request or to keep the speed down due to turbulence – you may observe the cabin starting to climb. In fact, I tend to watch the cabin's vertical velocity indicator (VVI), more than torque or fuel flow, when I reduce power significantly. You may need to push the power levers back up a bit to keep supplying enough inflow to prevent the cabin from ascending. On the other hand, if you need to come down steeper, it's time for landing gear extension and maybe, if it's not overly turbulent, approach flaps too. Remember that the maximum allowable load factor limit is reduced when flaps are extended.

Even the relatively small portion of air that is bled from the engine's compressor for cabin pressurization and heating in a King Air typically causes the engine to run about a 10 to 20 degrees hotter ITT than if the bleed air were shut off and allowed to remain in the engine. That explains why leaving the bleed air valve switches closed sometimes allows more takeoff power to be achieved.

Outflow

The pressurization control system is made by Honeywell Aerospace. Honeywell is the name that has survived from a long line of company acquisitions and mergers. The control system we use evolved from the very first installations used on B-29s in the latter days of World War II. The company that designed and manufactured that system was Garrett AiResearch. So even today, most of us say it is an AiResearch control system.

The system is mechanical, using springs and vacuum. Electricity plays a minor role. In the King Air, the system uses electric power primarily for Dumping: Opening a normally-closed solenoid valve that permits vacuum to suck open the Safety Valve and thereby create an opening (hole) so large that cabin pressure quickly equalizes with ambient pressure. In fact, the reason that a total loss of electric power in flight always leads to a lack of pressurization is not because the control system fails.

No, it is because the inflow of air ceases. (Electric power is needed to keep the flow packs open.)

Somewhat surprisingly, since it is rather complex, the AiResearch control system is quite reliable. The problem with an airplane that cannot maintain the cabin altitude selected is very rarely due to a bad controller. Instead, it almost always is caused by too little inflow or too much outflow or a combination.

Troubleshooting Pressurization Problems

You have discovered that your pressurization is not working as it should. For example, you cannot reach 6.4 – 6.6 psid ΔP, or you see the cabin starting to climb even though the power levers have been only slightly reduced. How can you find what's wrong? How can you help your mechanic reduce his troubleshooting time? Here are some ideas that pilots can do in flight. Mechanics have their own and, sometimes, more accurate procedures to use.

First, you can make sure the controller is functioning properly in this manner: In level flight, set the controller's cabin altitude for 3,000 or 4,000 feet below you. For example, fly at 10,500 feet with the cabin set for 7,000 feet. Now zoom up to 11,500 and then dive down to 9,500 without changing engine power. Does the cabin stay level as it should? Next, back in level flight, dial the cabin up to, say, 9,000 feet. Does it start climbing? Twist the rate knob to the minimum setting. Does the cabin rate of climb decrease to almost nothing? Now spin the rate knob to maximum. Does the cabin climb like a homesick angel? Next, dial the cabin down to a lower altitude and check the rate control again as it descends. In almost all cases, you will find that the controller is working perfectly. As I wrote above, it is a surprisingly robust piece of gear. By doing this test with a small difference between airplane and cabin altitude, ΔP is very low and thus the effect of excessive leaks or weak inflow will also be low.

Second, on a deadhead leg – so that passengers' ears will not be subjected to uncomfortable pressure fluctuations – force ΔP to the maximum attainable by dialing the cabin altitude down to sea level while you are up high, typically above FL180. When the cabin stops descending, note the indicated ΔP. (Write it down or, better yet, take a picture.) You have forced ΔP to its maximum attainable value and if it is not within 0.1 psid of the ΔP gauge's redline, then you have identified a problem.

Move the left bleed air valve switch to the center, Envir Off, position. (It doesn't matter which side you do first, but we'll start with the left.) Take a video of the cabin VVI while you do this or at least note and record the peak cabin climb that takes place. Maybe it hits a peak, say, of 1,600 fpm. What should next happen is that the cabin will stop its climb, go into a descent, and return to the exact altitude where it began. The King Air *should* be able to maintain maximum ΔP even with only one flow pack supplying air. Can yours do that? It is not at all uncommon to find the cabin will not descend back to where it started. Let's assume that is what we see here … the cabin does not recover back to its starting altitude but keeps climbing at an ever-decreasing rate. This means either the still-operating flow pack is weak – lack of inflow – or the leaks are excessive – too much outflow – or a combination of both. When we finish this little test, we will know what the problem is.

Turn the left bleed air valve switch back on and give plenty of time for the situation to return to normal operation, with the cabin altitude and ΔP the same as they were when you began the test. An occasional flow pack is balky to reopen. Give it time. You will know it reopens when the cabin VVI shows a downward surge. ITT will also increase a little and torque will decrease a little.

Once everything is the same as it was initially, switch off the right side's environmental bleed air and record or film those results. Let's suppose that this time the peak cabin climb is 600 fpm and the cabin quickly reverses the climb and descends back to the original altitude. Before reading further, take a moment to think about these results and see if you can determine why there is a difference.

Tick-tock-tick-tock-tick-tock. Ok, got your answer?

The answer is that the right flow pack is much weaker than the left. We lost less air when we turned off the right pack and it, when operating alone, was not strong enough to overcome the cabin's leaks. Yet we lost a lot of air when we terminated the left pack's flow and it overcame the leaks just fine and was able to maintain full pressurization when operating by itself.

But even one or two strong flow packs may not be able to supply enough air to overcome massive leaks. So how do we complete this test and determine how badly your airplane leaks?

We start by turning the right pack back on and giving plenty of time for things to return to normal, at the maximum attainable ΔP. Now we turn both bleed air switches off simultaneously. (If you have three-position switches – as all of the 200- and 300-series do – make sure you go only to the center, not bottom position. You don't want to lose the inflation pressure for the door seal.) Observe the peak on the cabin VVI.

If it is less than 2,500 fpm, then you have an airplane that meets Beech's specifications. Congratulations! Sadly, a leak rate this low is exceedingly rare to find. You have a one-in-a-thousand, exceedingly tight airplane. More typically, you will see a leak rate of 3,500 to 5,000 fpm. Realize this, too: If the combination of weak inflow and excessive outflow prevents your airplane from attaining the proper maximum ΔP of 6.4 – 6.6 psid, then this check will not be valid since you have not attained the "push" that would exist if you could get to the proper maximum ΔP. To better explain: If you can only get 5.0 psid maximum and the peak leak rate at that ΔP is 4,000 fpm, perhaps it would be 5,500 fpm at 6.5 psid.

My personal criteria for deciding that a King Air's pressurization system is satisfactory looks at two things: First, can either side's flow pack alone maintain full ΔP when at cruise power? Second, can I pull both power levers back to the gear horn's setting, with both flow packs operating, and not have the cabin start to climb? If both of these are true, then I see no reason to spend money and time on overhauling flow packs and/or finding and sealing cabin leaks.

I hope this presentation of basic rules of pressurization will help you better understand your system and troubleshoot problems when they arise.

King Air expert Tom Clements has been flying and instructing in King Airs for over 46 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, contact Tom direct at *twcaz@msn.com*. 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 editor@blonigen.net

"Monoplanes Cessna"

Part One

In 1927, more than 11 years after he completed the first airplane built in Wichita, Clyde V. Cessna unveiled the *Phantom* cabin monoplane – a landmark design that paved the way for creation of the Cessna-Roos Aircraft Company.

by Edward H. Phillips

As the cold winter winds of 1926 blew into Wichita, Kansas, Clyde Cessna was entering his second year as president of the infant Travel Air Manufacturing Company. Although the enterprise was slowly establishing itself as a builder of rugged and dependable biplanes, Clyde was growing increasingly restless. He was anxious for the company to design and build its first monoplane, preferably one with a full cantilever wing configuration.

Travel Air's fat order book, however, prevented any such ambitious plans as customers plunked down $3,500 to buy their own Model "A" biplanes. Sometime during January or February, Clyde approached Walter Beech and Lloyd Stearman to ask if they would object to his building a monoplane on his own time and at his own expense outside of the company. There was no objection and both men wished him success. Cessna rented a small workshop on the west side of town, and by March initial construction was underway.[1]

Clyde had been working for months on the monoplane's design, often laboring well into the night at his home on South Green Avenue. The airplane would feature an enclosed cabin for five occupants surrounded by generous window area, and a semi-cantilever wing spanning 44 feet was mounted above the cabin. To those who knew Clyde well, it was no surprise that the ship would be powered by an Anzani static, air-cooled radial engine – a type that Cessna had been using since 1914. The 10-cylinder powerplant developed 110 horsepower, and Clyde estimated that the airplane would be capable of carrying up to 1,000 pounds of passengers, fuel and lightweight cargo.

On June 14 with Cessna at the controls, the monoplane took to the skies on its maiden flight that lasted about 20 minutes. Clyde was satisfied that the monoplane met his basic expectations, and the next day Walter Beech flew the ship and was impressed with what his friend and business associate had created in such a relatively short period of time. Beech went so far as to suggest that the airplane held promise as the first Travel Air with one wing.[2]

Although the Type 5000 was a successful design for the young company, Cessna was not content. He wanted to upgrade the airplane with a full-cantilever wing that would eliminate drag-producing lift struts that supported the existing wing. There was no doubt in Walter Beech's mind that Clyde's design had demonstrated the merits of monoplanes, but he and the board of directors were skeptical about building a full-cantilever wing.

Clyde Cessna posed for the camera with his latest design he called *The Comet*. Built in 1917, the Anzani-powered monoplane featured a cockpit in front of the pilot that could accommodate a passenger, albeit a small one.
(EDWARD H. PHILLIPS COLLECTION)

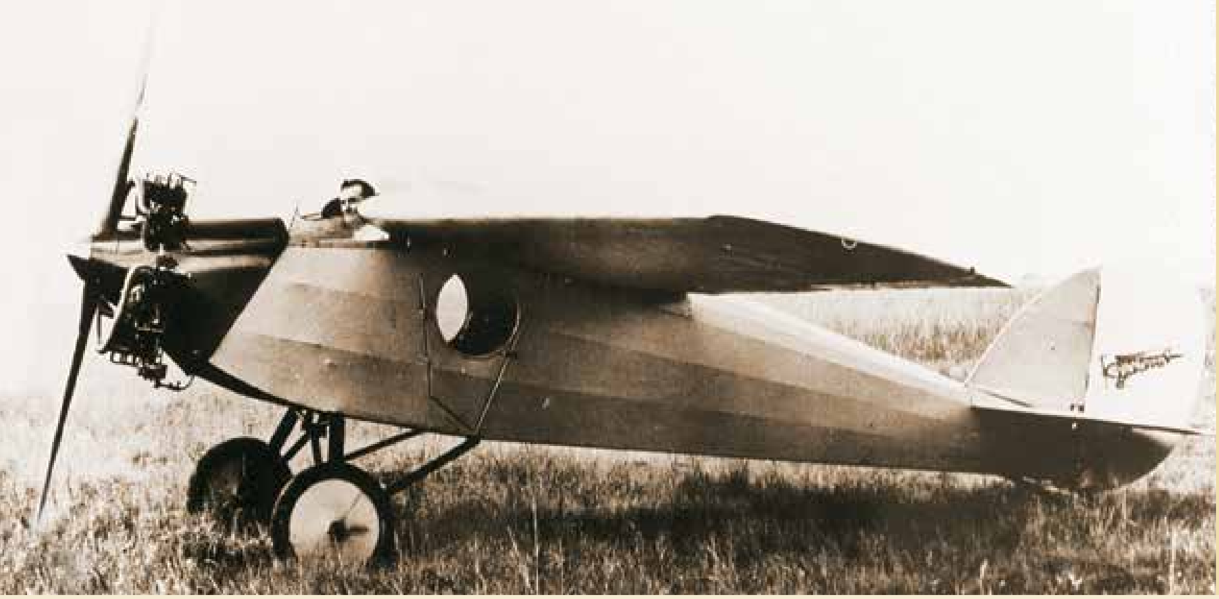
The Cessna Aircraft Company also offered the Model BW powered by a Wright J-5 radial engine rated at 220 horsepower. The engine's upper cylinders restricted forward visibility from the cockpit.
(ROBERT PICKETT COLLECTION/TEXTRON AVIATION)

Clyde knew it was time to strike out on his own, and in January he informed Walter that he was resigning from the company to start his own business. Beech was sorry to see him go, but he offered encouragement and wished Clyde only success. They respected each other's view on airplane design and construction and remained good friends for the remainder of their lives. Another reason for Cessna's decision came from three Wichita businessmen who offered to buy Clyde's (privately-held) stock in Travel Air. Profits from that transaction would soon allow him to realize his long-standing desire to build and sell "Monoplanes Cessna."

Word spread quickly around town that Cessna was planning to create a new company. Cornered one day by the local press, Clyde told them that "Monoplanes are the only worthwhile type of aircraft." With that statement he had set his course. Cessna would remain in Wichita where he intended to design, manufacture and sell airplanes bearing his name and featuring a full-cantilever wing. During the past 11 years he had believed such a structure was technically feasible, and now he would attempt to turn his convictions into reality.[3]

A few months later in April 1927, Cessna told the press that he was establishing the Cessna Aircraft Company with assets of two airplane designs, one employee and lots of optimism for the future. The two airplanes featured full-cantilever wings. One design, unofficially dubbed the *Cessna All Purpose*, would carry three occupants, have a wingspan of 36 feet and a 100-horsepower radial engine. Its sister ship, the *Cessna Common*, featured a wing span of 47 feet, would carry up to five people and be powered by a Wright J-4 radial engine rated at 200 horsepower.

Clyde rented a small workshop, hired a few local, skilled craftsmen who had experience building airplanes, and began construction of the three-place ship, now renamed the *Phantom*. The fuselage dimensions were carefully outlined in chalk on the shop floor before the steel tubing was tack-welded to check alignment, then the fuselage was transferred to a wood jig for final welding.



The "Phantom" was powered by the ubiquitous (but obsolete) Anzani radial engine, of which Cessna had acquired large numbers during recent years. The monoplane was first flown in August 1927 with local pilot Romer G. Weyant at the controls. (ROBERT PICKETT COLLECTION/ TEXTRON AVIATION)

Clyde knew the major challenge would be designing and building the full-cantilever wing structure to withstand the torsional and bending forces imposed during flight. Cessna tackled the problem two ways: he overbuilt the wing and hired Joseph Newell – the highly respected professor of aeronautical engineering at the Massachusetts Institute of Technology, to perform the complicated stress analysis of the wing.

Clyde knew that the new Aeronautics Branch of the U.S. government's Department of Commerce (DOC), which was responsible for issuance of Approved Type Certificates for new aircraft, would give the wing design a particularly stringent evaluation. Therefore, Newell's expertise would be essential if Cessna was to gain Federal Government approval to build and sell production aircraft. Soon a raft of technical drawings were sent to Newell so he could begin his analysis.[4]

A prototype airplane, now renamed the *Phantom*, first flew in August 1927 with Romer Weyant at the controls. Upon landing he reported that the ship flew well, but that during maneuvers some torsional vibrations of the wing occurred. The problem was traced to weak wire bracing within the structure. The installation of additional wires of greater diameter apparently resolved the issue.

Cessna was pleased with the airplane's initial performance, and so was Victor Roos, a motorcycle dealer from Omaha, Nebraska. After learning about the Phantom's successful flight, he approached Clyde about forming a partnership. Roos was a superb salesman and liked what he saw in the sleek monoplane. It was a fresh and unique design that he believed held promise in the emerging market for small commercial airplanes. By August the two men had reached an agreement and the Cessna-Roos Aircraft Company was born. The two men had equipment and materials that had to be incorporated into the new company. Among these were 67 Anzani 10-cylinder radial engines, aircraft-quality wood, sheet metal and tooling.

It had already become apparent that the workshop (50 feet × 75 feet) was completely inadequate for the manufacture of production airplanes. A new factory complex, to be located on the city's west side, was quickly approved by management and a local contractor was soon at work breaking ground for the facility.[5]

As autumn approached a second airplane was under construction in the downtown workshop, and there were sufficient materials to build another 12 Phantoms. In October a third prototype monoplane had been completed and made a successful first flight.

An "A"-series forward fuselage was loaded with sandbags to a specific weight before undergoing drop tests of the main landing gear from a height of 24 inches. The tests were witnessed by a government inspector who documented every detail. (ROBERT PICKETT COLLECTION/TEXTRON AVIATION)

The latest version featured a few modifications, including lengthening the fuselage to 25 feet from 23 feet, increasing total wing area by 50 square feet, redesigned wing ribs and four thickly-padded seats were installed in the fully upholstered cabin. A 200-horsepower Wright *Whirlwind* radial engine powered the ship.

The Cessna-Roos Aircraft Company's monoplane was nearly ready for production. Newell had been working hard to complete the multi-faceted stress analysis of the monoplane's airframe, followed by preparing and submitting a plethora of highly detailed documentation to the Bureau of Aeronautics for perusal by government aeronautical engineers. Earlier in the process Newell had notified Cessna that the original wing design was both overweight and overbuilt. As a result, he assured Clyde that production wings could be built lighter without sacrificing strength or safety factor.

When inspectors at the Bureau of Aeronautics reviewed Newell's work, they advised the professor and Cessna that the company could proceed with deliveries to customers pending award of an Approved Type Certificate. Newell's hard work had paid off. Later, he traveled to Wichita to personally observe all the static tests for the entire airframe, and particularly the wing. These tests were conducted at the Cessna factory and strictly supervised by a DOC inspector who carefully documented every step of the process.

The DOC's static test of a wood wing was often a long and tedious process, often requiring days to complete. To evaluate the wood wing under various load conditions it was placed upside down on a special fixture designed to simulate various high angles of attack. The structure was divided into six sections along the wing's 40-foot, two-inch span and three sections along the chord. That particular arrangement was deemed necessary so that loads could be applied to accurately simulate stresses encountered during flight. To simulate G-forces imposed on the structure, heavily-loaded sandbags were placed on the wing. As testing progressed, more weight was placed along the wing's span. No failures occurred anywhere in the structure until weight equivalent to a load factor of 6.0 was applied. A four-foot section of the leading edge located about three feet from the root, began to yield but did not fail until a load factor of 6.5 was imposed.

To correct the problem, Newell instructed Cessna engineers to install both additional ribs and wider

An early prototype for the proposed Cessna "A"-series monoplanes was photographed after completion in December 1927. Note unusual placement of the name "Cessna" on the forward fuselage that was repeated in an artistic style on the rudder.
(ROBERT PICKETT COLLECTION/TEXTRON AVIATION)

capstrips in the affected area. Drawings were prepared and approved, and production wings already on the assembly line were quickly modified to comply with the change.

When a load factor of 6.5 was achieved without failure, sandbags were added until a load factor of 7.0 and finally 8.0 was attained. Fortunately, the main and secondary spars carried the load, with the wing bending downward so far that the tips were only one-half inch above the floor. The inspector then called for workers to push down on the tips vigorously, then quickly release the tips to observe the reaction. Once again, the structure did not fail. The static test was considered complete when the wing could not be loaded with any more sandbags because the wingtips were resting on the floor.

After all the sandbags had been removed, the entire wing structure was examined carefully to detect any sign of internal buckling, distortion or separation of wood plies. In the wake of the tests, Cessna's sturdy wing design was approved by the Bureau of Aeronautics for production monoplanes powered by the 90-horsepower Anzani, 110-horsepower Warner *Scarab* and 125-horsepower Siemens-Halske radial engines (later, airplanes powered by the 130-horsepower *Comet* powerplant were added to the list).

Although Clyde was pleased that his design had won government approval, the factory was nowhere near completion. Until it was, impatient customers would not be receiving their new monoplanes. By mid-December, however, overworked construction crews had completed the main buildings and were being replaced by Cessna employees hurriedly installing equipment, tooling and other machinery.

Up to this point in his partnership with Clyde Cessna, Victor Roos had been content to remain in the background, but as 1927 drew to a close he became openly displeased with the way Cessna and other members of the company's board of directors were conducting day-to-day operations. During a meeting Roos declared his objections to "proposed plans and changes" for the enterprise that included changing the name to "The Cessna Aircraft Company." Although no

The Pioneer Tire Company of Omaha, Nebraska, planned to enter a Model BW in the New York-Los Angeles Air Derby held in September 1928 but withdrew before the event began. Pilot "Chief" Bowhan (left) and his wife posed with the airplane's owner, F.W. Grace of the Pioneer Tire Company.
(ROBERT PICKETT COLLECTION/TEXTRON AVIATION)

action was taken during the meeting, it was obvious to everyone present that tensions were beginning to rise between Roos and his colleagues.[6]

At the next meeting the controversy resurfaced and this time, sparks flew. Roos vehemently objected to any alteration of the company's name, claiming it would be detrimental to the business at a time when production was about to begin. In addition, he claimed the change was a clear injustice to him personally. Adding insult to injury, the board of directors also refused to meet Roos' demand for compensation, and he resigned on the spot. The disgruntled motorcycle salesman was soon employed to manage the Swallow Aircraft Company across town.

With Victor Roos out of the picture at last, the Charter Board of the State of Kansas approved "The Cessna Aircraft Company" corporate name. As Christmas approached, 20 employees were building six airplanes in the new factory in addition to four that had been completed since the company started operations five months earlier.[7]

The year 1927 had been a hectic, stressful, but productive 12 months for Clyde Cessna and the company that bore his name. He had succeeded in attaining government approval to sell his full-cantilever wing monoplanes powered by various radial engines, built a new factory, was in the process of forging a nationwide sales and marketing team, and had signed up dealers and distributors coast-to-coast to promote and sell his airplanes.

Of the 284 aircraft granted an Approved Type Certificate (ATC) by the DOC during 1927, Cessna was awarded two; one for the Model AA (ATC 65) and the other for the Model AW (ATC 72). Limited production versions, such as the Model AC (Comet engine), Model AF (Floco/Axelson engine) and Model AS (Siemens-Halske engine) were approved under the DOC's Group Two process. Group Two approvals allowed airframe manufacturers such as Cessna to offer one airframe that could be powered by different radial engines without having to seek an ATC for each configuration.

The year 1928 would witness rapid growth for the Cessna Aircraft Company as it gained a solid reputation for building fast and efficient monoplanes. Cessna's airplanes would find their way onto the front pages of national newspapers, bask in the winner's circle at air races and increase Wichita's fame from coast-to-coast. Clyde would make his mark on aviation and testify to the world that "Monoplanes are the only worthwhile type of aircraft." KA

NOTES:

1. "Hearsay history" has long claimed that Cessna and Beech clashed over the design merits of biplanes and monoplanes. While it is true that Cessna believed that monoplanes were superior to biplanes in terms of both aerodynamics and speed, there is no evidence to support the "myth" that Clyde resigned from Travel Air in the wake of arguments with Beech, who firmly supported biplanes.
2. During the second half of 1926 Clyde's design did serve as the basis for development of Travel Air's Type 5000 cabin monoplane that first flew in December. One month later Travel Air won a contract from National Air Transport for eight of the monoplanes. The production ships would be larger overall and powered by nine-cylinder Wright J-5 radial engines.
3. Full-cantilever wings were not a new development. One example was the famous Dutch designer Anthony Fokker's DVIII fighter of World War I that boasted a full-cantilever wing, and during the 1920s Fokker's series of large transports featured wings with no supporting struts. It was, however, unusual to employ that structure on a small aircraft. The Lockheed *Vega* of 1927 (designed by Jack Northrop) is an excellent example of a full-cantilever monoplane design.
4. It is important to understand that in 1927 stress analysis of commercial aircraft structures was still evolving. The science was relatively new and was based largely on procedures developed by the U.S. military to evaluate the airframe structures of fighters and bombers. Proper analysis required a thorough understanding of mathematical equations and how to apply them properly to a structure. In the late 1920s few builders of small airplanes had someone on staff qualified to do the computations required. In October 1927 the Department of Commerce's Bureau of Aeronautics issued manufacturers a *Handbook for Airplane Designers* to guide engineers as to methods of distributing loads and analysis of structures prior to submitting paperwork required to obtain an ATC. The Handbook supplemented the Air Commerce Regulations that became effective on December 31, 1926.
5. The facility was large enough that Cessna and Roos offered to rent part of the factory to Lloyd Stearman, who had recently returned to Wichita from California. Lloyd, along with chief engineer Mac Short and pilot Fred Hoyt, had struggled to sell Stearman biplanes on the West Coast since November 1926. Stearman, however, declined, preferring to start production of the C-3-series biplanes in the old Jones Motor car buildings north of downtown, where Cessna had constructed the first airplane built in Wichita 11 years earlier.
6. From the beginning of his association with the company, Victor Roos had been considered an outsider by some members of the board of directors who firmly believed that Clyde Cessna should be in charge. Roos found such a proposal totally unacceptable.
7. According to records, as of December 1927 a combined total of 974 airplanes had been built in Wichita since 1919. These would include airplanes built by E.M. Laird, the Swallow Aircraft Company, Travel Air Manufacturing Company and the Cessna Aircraft Company.

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.


REACH YOUR ALTITUDES FASTER
The Blackhawk XP67A Engine+ Upgrade
Turning your aircraft into the fastest King Air on the planet may also be the best investment you make all year.
With the STC Approved XP67A Engine+ Upgrade, your King Air 350 will have jaw-dropping speed, climb and payload performance and you will have a more valuable aircraft that costs less to operate than most comparable jets.
There's never been a better time to upgrade your King Air.
Call to schedule your upgrade today.
FIRST IT WAS A TURBOPROP, NOW ITS A BLACKHAWK.
Blackhawk
(844) 832-4456 • blackhawk.aero

Raisbeck Receives ANAC STC Approval for Composite Five-Blade Swept Propeller

Raisbeck Engineering, Inc. announced that it has received Supplemental Type Certificate (STC) approval from the National Civil Aviation Agency of Brazil for its Composite Five-Blade Swept Propeller for the King Air 350 series aircraft.

Raisbeck's Composite Five-Blade Swept Propeller, designed to improve the King Air 350 comfort, performance and efficiency, was developed in collaboration with Hartzell Propeller. At 106-inches in diameter, the Composite Five-Blade Swept Propeller reduces weight and contributes to improved short field and climb performance, while providing strength, durability and lowering cockpit and cabin sound levels.

In addition to ANAC STC approval, the Composite Five-Blade Swept Propeller has received certification from the FAA (Federal Aviation Authority) and Australia, with Transport Canada and EASA (European Aviation Safety Agency) approvals expected soon.

Raisbeck Also Announces New Dealer in Rocky Mountain Region

Raisbeck Engineering, Inc. also recently announced the appointment of Mayo Aviation, Inc. to its global network of Authorized Dealers.

Founded in 1978 and based at Centennial Airport in Englewood, Colorado, Mayo Aviation is a premier provider of aircraft maintenance, management service and private jet charters. The company offers aircraft maintenance services, airframe structural repair, avionics installations, pre-buy inspections and more.

Asset Insight Launches Advanced Aircraft Valuation Tool

Asset Insight announced its new eValues™ web-based system that allows users to instantly obtain their aircraft's Current Market Value and estimated Residual Value, compare their aircraft's marketability against other aircraft listed for sale, and predict future maintenance expense, with all information updated daily. The only such tool available in the industry today, eValues also allows users to track data for one or more aircraft, an entire fleet or portfolio, and compare current and forward-looking information for selected aircraft side-by-side.

The eValues tool analyzes every production year for most modern make and model Business Class aircraft. Subscribers can access analytics based on preloaded aircraft information by simply entering a serial number, and they may also update existing data and assumptions for any aircraft. The system provides valuation and other information in graph and table formats for current, residual, orderly liquidation value, maintenance events, and more, advising where the aircraft stands today and during the next five years. Aircraft can be analyzed and compared side-by-side for buy and sell decisions, and groups of aircraft can be saved and tracked individually and, on a fleet, or portfolio basis.

The company says the eValues tool is the only automated, web-based system that can forecast Residual Values, maintenance events and their cost, aircraft marketability, and other useful planning and decision-making information.

Users can access eValues online from their computer or mobile device, and subscribers can choose between plans that cover one or all available aircraft. For pricing and subscription information, please visit *www.assetinsight.com*, or contact Asset Insight at (540) 905-4555.

New Items in ForeFlight 10 Revealed

ForeFlight recently announced some added capabilities to ForeFlight 10: new smart airspace features, improved search capability to help you find what you need faster, automatic chart and data updates to keep your device ready to fly and more.

- ForeFlight's improved app-wide Search functionality is smarter, faster, and more consistent across app views. It quickly finds routes, cities, airports, aeronautical information, and procedures, as well as street addresses or intersections, place names (e.g.: "Central Park"), and scheduled flights.

- Automatic downloads reduce preflight workload – you now have the option to automatically download chart and data updates when connected to Wi-Fi.
- Airspace in Profile View* enhances planning and navigation. In addition to terrain and obstacles, Profile View now features an interactive vertical depiction of controlled, MOA, SUA, and TFR airspaces along your planned route. In the air, Profile View shows the aircraft's altitude in relation to airspace along the flight track in real time.
- Automatic Airspace Highlight* considers the flight's climb, cruise and descent trajectory and uses Aeronautical Maps* layer to automatically highlight airspace near the aircraft or along the flight route. All other airspace dims to reduce visual clutter on the map.
- ForeFlight now features Jeppesen's global airspace information for FIRs, UIRs, controlled airspace, and special use airspace. Tap-hold anywhere on the Maps view to access center and radio frequencies, RVSM cruise tables, operational notes, speed restrictions, prior notification procedures, and communication details for CPDLC and satellite services

* available in Pro Plus

Garmin Pilot iOS Incorporates New Weather Features, Airspace Alerting and More

Garmin announced the addition of new features to the Garmin Pilot application for Apple mobile devices. Garmin Pilot 9.3 incorporates several new weather enhancements that aid in identifying storm cell movement and icing levels, as well as airspace alerting. With the latest version for iOS, pilots can also view improvements made to the display of traffic, runway extended centerlines and more.

Flight profile view adds icing

When viewing the flight profile view alongside a flight plan within Garmin Pilot, customers can easily view the probability or severity of icing and overall icing potential. Within the Flight Profile view, light green, yellow and red shading indicate an increasing probability that icing may occur at a particular altitude.

Storm cell movement

The radar overlay on the moving map has been enhanced to include the projected path of a storm cell. An orange circle paired with a line that extends from the strongest storm cells display the potential path of that storm cell and where it's predicted to be

located in 15-, 30-, 45- and 60-minute intervals. If hail or tornadic activity is present, a corresponding icon will also be displayed alongside the particular storm cell line. By selecting the storm cell icon on the radial menu, pilots can view additional information within the storm cell, including speed, direction and more.

Airspace alerting

Garmin Pilot 9.3 adds airspace alerting to notify pilots prior to entering select airspace segments. Pilots can select airspace alerts within the settings page and choose individual airspace types they want to receive alerts for while in-flight.

Traffic enhancements

Pilots can now utilize pinch-to-zoom gestures on the traffic page to zoom in and out to view traffic targets on the traffic page when Garmin Pilot is paired with an ADS-B In receiver. Pilots can also select whether traffic information is displayed in relative altitude (altitude relative to own-ship) or absolute altitude (altitude relative to the ground) so it's easier to identify traffic targets that may pose a threat.

Additional features:

Garmin Pilot has been optimized to support the high resolution, all-screen design of the Apple iPhone X. KA

King Air Technically... RECENT SERVICE BULLETINS, ADVISORY DIRECTIVES AND SAFETY COMMUNICATIONS

Beechcraft Service Letter #MTL-55-01

Date: May 2018

Stabilizers – Inspection of the Washer Location in the Elevator Support Assembly

Effectivity: King Air Model B200GT, Serial Numbers BY-301 through BY-303; King Air Model B300, Serial Numbers FL-1106, FL-1107, FL-1110, FL-1111, and FL-1113; and King Air Model B300C, Serial Number FM-72

Reason: The washers for the left and right elevator support assemblies may not be installed in the correct location.

Description: This service document provides parts and instructions to inspect the left and right elevator support assemblies to make sure the washer is installed on the inboard side of the support assembly.

Compliance – Recommended: This service document should be accomplished at a scheduled maintenance period or inspection.

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

1) The mechanic must complete all of the instructions in the service document, including the intent therein.

2) The mechanic must correctly use and install all applicable parts supplied with the service document kit. Only with written authorization from Textron Aviation can substitute parts or rebuilt parts be used to replace new parts.

3) The mechanic or airplane owner must use the technical data in the service document only as approved and published.

4) The mechanic or airplane owner must apply the information in the service document only to aircraft serial numbers identified in the *Effectivity* section of the document.

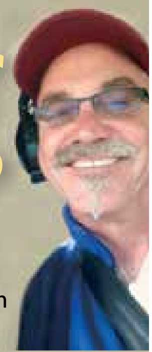
5) The mechanic or airplane owner must use maintenance practices that are identified as acceptable standard practices in the aviation industry and governmental regulations.

No individual or corporate organization other than Textron Aviation is authorized to make or apply any changes to a Textron Aviation-issued service document 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. KA

The above information may be abbreviated for space purposes. For the entire document, go to www.txtavsupport.com.

ADVERTISING INDEX




MORE POWER AT YOUR COMMAND
Introducing Raisbeck's Composite 5-Blade and Aluminum 4-Blade Swept Propellers for your King Air 300
Now you can add power, increase cruise speeds and improve efficiency without increasing noise. You and your passengers will enjoy a quieter, smoother ride while arriving at your destination earlier and feeling less fatigued. A great investment for your King Air 300 awaits you at your nearest Raisbeck Authorized Dealer. Now accepting pre-certification orders with deliveries beginning in June.
(800) 537-7277 | sales@raisbeck.com | www.raisbeck.com
RAISBECK ENGINEERING
AN AGC AEROSPACE & DEFENSE COMPANY