King Air

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

MARCH 2016 • VOLUME 10, NUMBER 3 • $4.50

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Correction

In the February issue of *King Air* magazine, in Dean Benedict's maintenance article titled "Wing Bolts," the photo displaying two wing bolts (pictured again below) shows one in tension (top) and one in shear (bottom). The bolt in shear has the brassy stripes. It was held in place by "fingers" that gradually wear off the brassy finish. The remaining brassy stripes indicate the spaces between the wrap-around "fingers."

Our apologies for any confusion this may have caused.

The King Air Re

An Appraiser's View of the Market

by Jim Becker

Last spring, we took an in-depth look at the market for some of the most popular King Air models. It's a good idea to revisit the market to see what it's been doing during the past year.

The King Air has been in continuous production since 1964. During those 52 years, there have been many different models produced. From the original 90 to the current 350i, there have been over 7,000 units manufactured encompassing an astonishing 25 separate and distinct models of King Airs.

With all of the various incarnations of the aircraft, there are many submarkets within a market. For example, the B200, which started production in 1981 and had its last rebranding in 2011, has at least seven submarkets within its production, making it impossible to generalize the entire market. Because there are so many market types, this article will focus on only the variants that are still in production – the King Air C90, B200, and 350.

The Avionics Effect

One of the biggest factors regarding used King Airs, both from a marketability and value standpoint, are its avionics. Many avionics systems in King Airs are facing obsolescence. This is going to force operators to choose to continue to try and use their current systems or to upgrade. Outdated avionics can't only potentially ground the airplane, but can be more expensive in the long run to maintain than upgrading. Not only that, but many times your only solution to maintain your current system is to buy aftermarket avionics.

In addition to obsolescence, like all other aircraft, King Airs are going to be required to meet the 2020 FAA mandate to transmit ADS-B out. Currently there are a

visited

The King Air 350 debuted in 1990, and although the model didn't change significantly until upgraded Collins Pro Line 21 avionics were added in 2004, there are still some areas of segmentation with often different activity levels at either end of the market.

few options to meet this mandate. If you have a Universal UNS-1 FMS, you can upgrade your existing FMS to a WAAS unit, modernize a monitor and your transponders. If you have a Pro Line 21 system, you can upgrade your GPS to a 4000 Alpha GPS and your transponders to a TDR-94. You can also update your panel to a Garmin G1000, which includes ADS-B out standard.

While there are different upgrade options, I would advise you to consult with a good King Air service center if you have any questions. You will need to determine what is going to be the best option for you and consider the effect those improvements have to your airframe. As far as ADS-B out only solutions, you should also consider that the closer we get to January 1, 2020, avionics shops are going to get busier, leading to longer wait times and potentially higher premiums for service.

The C90

For this model, I will review the King Air C90B through the GTx. When looking at the C90 market, there are several defining points where the market views a production change significant enough to affect value beyond an adjustment for the model year.

The C90B was an improved version of the C90A. Introduced in 1992, this model featured new four-blade propellers, Collins avionics, and cabin soundproofing. All but a handful of 1992 models had Collins EFIS-84, and all had Pratt & Whitney PT6A-21 engines. There are 414 of this model currently in service. The King Air C90B was pretty uniform for its entire production run, and for the most part, its market is fairly homogenous. It is moving in the same direction with little difference at either end. The average number of days on the market for the C90B selling in 2015 was 703 days, with over

In 2008, Collins Pro Line 21 avionics were added to the C90GT which was rebranded to the C90GTi.

six percent of the fleet sold. Market activity was down slightly in 2015, with three fewer units sold over 2014. For the C90B, prices declined slightly for 2015. The selling prices for an average aircraft are between $900,000 and $1,300,000, which is down about five percent from 2014.

Produced in 2006 and 2007, the King Air C90GT was an improvement over the C90B as the engines were upgraded to Pratt & Whitney PT6A-135A models. This provided a nearly 30-knot increase in airspeed and created a distinct market segment within the 90 series. The C90GT segment is quite small, with only 98 models produced. Prices for an average aircraft range from approximately $1,650,000 to $1,700,000. The average days on the market for a C90GT was 915 days, with just over seven percent of the fleet selling in 2015. Only seven C90GTs sold in 2015, which is a decline of four units when compared to 2014. The C90GT market appears to be trending downward slightly, with price declining around five percent in 2015.

In 2008, Collins Pro Line 21 avionics were added and the C90GT was rebranded as the C90GTi. This further segmented the C90 market and created a large value difference between a 2007 and a 2008 model. The C90GTi production run consists of 125 aircraft. Five units sold in 2015, representing four percent of the fleet. This is a slight decrease from 2014. The average days on the market for the ones that sold in 2015 was 1,026 days. Pricing for an average C90GTi range from approximately $1,800,000 to $1,900,000, and it dropped approximately five percent in 2015.

The final change to the C90 market came in 2010 with another rebranding. Winglets were added and the newest C90 was christened as the C90GTx. This model is the most current version of the C90, and has a current production of around 150 aircraft. Six preowned units sold in 2015, which represents four percent of the segment and is on par with 2014. Average selling time was 472 days on the market. Pricing for a used C90GTx is between $2,200,000 to $2,500,000 for an average aircraft, which is trending downward from 2014 by about 10 percent.

I have not mentioned the C90SE, which was produced from 1994 to 1999. This aircraft was produced as a lower cost version of the C90B, and featured Bendix King Silver Crown avionics, three bladed Hartzell propellers, and a more modest interior. They were equipped like an older C90A. Although priced $600,000 less than a C90B, only 14 units were produced as it wasn't a favorite of the C90 buyers of the day. Today, they trade more closely with the C90A than the C90B.

Popular Upgrades

There are many upgrades available for the C90 series of King Airs that improve performance, comfort and utility of the aircraft. Some of the most popular upgrades that we see are the Garmin G1000 avionics, BLR winglets, Blackhawk PT6A-135A engines and Raisbeck enhancements like Dual Aft Body Strakes, Nacelle Wing Lockers and the Turbofan Propeller System. While it is impossible to determine the effect on the value of a particular airplane without evaluating that particular airframe, an aircraft with multiple upgrades could have its value changed by up to $500,000.

The B200

The King Air B200 has enjoyed an amazing production run with a basic aerodynamic design that has been largely unchanged for over 40 years. At first glance, it would be easy to group all of the B200s together as one single market, but I can point to at least seven distinct market segments.

The original B200 was an improved version of the King Air 200, produced from mid-year 1981 to 1984. For the 1981-1984 B200, approximately 280 airframes are

A four-blade propeller was one of the improvements made to the King Air B200 in 1994, which created another market segment.

still in service. Out of these, 29 sold in 2015, making up around 10.5 percent of this segment, which is equal to those sold in 2014. The average number of days on the market for a 1981-1984 B200 was 178 days in 2015.

Prices for an average aircraft of this vintage is between $950,000 and $1,150,000, and is down slightly from last year, but remains fairly stable.

For model year 1985, improvements such as a hydraulic landing gear, three element wing spar, and triple fed electrical bus created a separate segment within the B200 market. This segment of the B200 market, produced in 1985 through 1993, contains roughly 250 aircraft that are still in service. Of these, there were 26 sold in 2015, which is eight more than those sold in this segment in 2014. This represents roughly 10 percent of that segment. The average hold time for the models that sold was 184 days on the market. Expect to pay between $1,200,000 and $1,500,000, which is down about eight percent from last year.

For model year 1994, improvements such as a standard four-blade propeller and a cabin noise reduction system created another market segment. In this segment, approximately 180 aircraft remain in service. Of these, 11 units sold to retail customers in 2015, which is on par for the activity in 2014. This represents six percent of that segment. The average hold times for those aircraft that did sell was 305 days. Expect to pay between $1,600,000 and $1,800,000 for an aircraft of this vintage. Pricing in this segment has shown some softness in 2015 with declines of about six percent.

A redesign of the B200's interior occurred in 1999, as well as an increased TBO to 3,600 hours. Manufactured from1999 to 2003, this market segment contains approximately 190 aircraft. There were 15 retail sales in 2015, making up nearly eight percent of this segment. Sales were off by three units when compared to 2014. The average time on the market for the ones that sold was 388 days. Prices for an average B200 in this segment range from $1,900,000 to $2,100,000, which has declined around five percent during the past year.

Model year 2004 encompassed the biggest changes to date with the switch to a Collins Pro Line 21 avionics system. This created a several hundred-thousand-dollar difference in value between the 2003 and 2004 model years. This segment is the 2004 to 2008 Pro Line 21 market. It contains 157 aircraft with 12 sales in 2015, which was one less unit than 2014. Roughly eight percent of this segment traded hands last year, with a hold time on average of 148 days on the market. Pricing for this B200 segment is still relatively soft with values declining. Expect to pay between $2,300,000 to $2,500,000 for an average B200 of this vintage, which has declined about four percent from last year.

Another significant model change occurred in 2008 with the switch to Pratt & Whitney PT6A-52 engines, resulting in the aircraft being rebranded as the King Air B200GT. The B200GT has an active fleet of 115 units. There were eight retail sales in 2015, which is two more than in 2014, representing seven of this segment. The

Another significant model change for the B200 occurred with the switch to Pratt & Whitney PT6A-52 engines, resulting in the aircraft being rebranded as the King Air B200GT.

average number of days on the market for the aircraft that sold was 339 days. Pricing on the B200GT is still soft. Expect to pay between $2,800,000 and $3,300,000 for an average aircraft. The B200GT market lost around six percent of its value in 2015.

The last model segment occurred in 2011 with yet another rebranding. Composite curved propellers, winglets, and Raisbeck's Ram Air Recovery were added to the B200GT to make the new King Air 250. There have been approximately 125 King Air 250s produced

Upgrades on all models of King Air can increase its value anywhere from $450,000 to $750,000. Above, some of the more popular upgrades include Raisbeck Wing Lockers (left), Blackhawk's engine upgrades and BLR winglets.

since 2011. There were seven used retail sales in 2015, which nearly doubles the transactions for 2014; this represents 5.5 percent of the fleet. The average time on the market for the aircraft that sold was 301 days. Pricing on the 250 is trending downward, the market fell significantly in 2015, losing around 10 percent of its value. Expect to pay between $3,400,000 and $4,100,000 for an average aircraft.

Popular Upgrades

The popularity and number of King Air 200s in service has led to a many aftermarket upgrades, more than any other type of King Air. The most popular upgrades we see are Garmin G1000 avionics, BLR winglets, Blackhawk PT6A-52 and PT6A-61 engines and enhancements from Raisbeck like Dual Aft Body Strakes, Nacelle Wing Lockers, Enhanced Performance Leading Edge, Ram Air Recovery and the Turbofan Propeller System. As with the 90 series, it is impossible to tell the effect on the value of the airframe without evaluating it on a case-by-case basis, but multiple upgrades to this airframe can change the value by up to $750,000.

The 350

The King Air 350 debuted in 1990. Although the model was largely unchanged until upgraded Collins Pro Line 21 avionics were added in 2004, there are still some areas of segmentation with often different activity levels at either end of the market.

Although the model for the most part didn't change from 1990 to 1997, the newer models perform differently in the used market than do the older ones. For this market segment, there are roughly 190 airframes with 12 retail sales in 2015. This equates to about six percent of the fleet in this segment. Compared to 2014, there were two fewer sales for this segment. The average time on the market for these aircraft was 160 days. Pricing for this segment of the 350 market was stable in the first part of 2015, with falling prices during the second half. Expect to pay between $1,500,000 to $2,100,000 for an average aircraft, which reflects about a five percent drop from 2014.

For the 1997 to 2003 model years, there are around 190 airframes still in service with 19 retail sales last year – down five units from 2014. This represents 10 percent of the fleet with an average hold time of 139 days. Prices in this market segment have also softened a bit in the latter half of 2015. Expect to pay $2,150,000 to $2,500,000 for an average aircraft. This segment has also declined approximately five percent from 2014.

The 2004 to 2009 segment included the change to Collins Pro Line 21 avionics. There are 255 of these aircraft is service with 14 retail sales in 2015, which is three more than 2014. This represents six percent of this market segment with an average hold time of 168 days on the market. Pricing on these 350s are still relatively soft. Expect to pay $2,900,000 to $3,900,000 for an average aircraft, which is a drop of around seven percent from 2014.

The 350i was introduced in 2010 and featured an upgraded interior, as well as a sophisticated cabin management system. There have been 280 King Air 350is produced with 11 retail sales last year, four more than in 2014, representing four percent of the total fleet. The average time on the market was 389 days. The 350i market is still trending downward. Prices have fallen around 10 percent from 2014. Expect to pay between $4,100,000 and $4,700,000 for an average aircraft.

Popular Upgrades

Since the King Air 350 incorporated many enhancements at the factory, there are not as many aftermarket modifications available. Some of the most popular that we see, however, are Garmin G1000 avionics and Raisbeck Dual Aft Body Strakes and Wing Lockers. Like the other two markets, it is impossible to determine the effect on value without evaluating on a case-by-case basis, but multiple upgrades on a King Air 350 could change the value up to $450,000.

Summing it Up

As you can see, prices are down in 2015 for all of these King Airs. The newer models tend to take the biggest hit, as they are still on the steep part of their depreciation curve. Although pricing for the King Airs continues to be soft, the good news is that these aircraft have generally held their values better than their jet counterparts. Until we are able to see a healthier new King Air sales market, we are probably going to continue to see annual price declines.

NOTE: Figures for days on the market and aircraft transaction numbers are courtesy of AMSTAT.

Jim Becker is a graduate of the Aviation Institute at the University of Nebraska at Omaha, and also holds an FAA Airframe & Power Plant Mechanic license. With over 25 years in the aviation industry, 20 of those years have been with Elliott Aviation in the capacity of valuing aircraft. Jim is also an Accredited Senior Appraiser with the American Society of Appraisers. He can be contacted at *jbecker@elliottaviation.com* or by calling (515) 285-6551.

How Much Should You Carry on Your King Air?

by Kyle P. White

Making an informed decision on anything you purchase is important. Just like you want to ensure you purchase the right King Air to meet your needs, you want to purchase the right amount of liability coverage to meet the needs of your company, or you individually.

What does the liability portion of your policy cover?

"Liability coverage will pay on your behalf claims that someone else files against you for bodily injury or property damage losses. However, you must be legally responsible for the losses. Also, the losses must result from an occurrence that happens during the policy period and involves an aircraft that you own, maintain, or use."
- As defined by a sample policy from Old Republic Aerospace

I want to place emphasis on the term "legally responsible." What if you aren't "legally responsible" for the bodily injury of a passenger, but you feel obligated to "make it right." This is where "Voluntary Settlements" comes in to play. It is a separate limit within your policy.

"Voluntary payments for bodily injury coverage applies whether or not you are legally responsible for the bodily injury to passengers caused by an occurrence."
- As defined by an Old Republic Aerospace sample policy

Another fact to consider is whether or not your passengers are employees; if they are, they are covered under worker's compensation. However, "Voluntary Settlements" coverage can be offered to an employee and they can still be entitled to the benefits of the worker's compensation coverage, but they will not be entitled to bring suit against you because they voluntarily settled.

The policy will also pay for your cost of legal defense, even if the lawsuit that is brought against you is without merit. The cost of legal defense is, in most cases, in excess of the liability limits you purchase. The insurance company will stop defending you after they have paid the loss or exhausted the coverage limit in your policy.

So, how much coverage should you purchase? From a legal protection standpoint, the more you purchase, the more the insurance company has to lose if you lose a legal battle. Therefore, they are more inclined to protect and defend you. The bigger the purse, the bigger the defense! If you buy a low liability limit policy, the insurance company is more inclined to settle on your behalf, exhausting the limit, thereby no longer having the duty to defend you. If the injured party feels they are entitled to more, they'll keep coming after you, and now the cost of legal defense is all on you.

Consider your exposures. Are you primarily using your aircraft to move employees? If so, then you need to pay close attention to "Voluntary Settlements" and worker's compensation coverages because most policies exclude liability for claims for bodily injury to your employees if they are hurt in the course of their work for you. Many of you reading this may only have $100,000 of "Guest Voluntary Settlements;" many of you may not have any! This is a coverage that can be negotiated for very little or no additional premium. Additionally, you need to read the fine print within the coverage description. If not negotiated properly, you won't have the coverage you think you have.

If you use your aircraft to transport third parties, such as prospective clients or customers, your liability coverage will most likely be the key player. I recommend no less than $3,000,000 per seat, and in today's soft insurance market, $5,000,000 times the number of seats you have on board the aircraft is very affordable. For example, if you have eight passenger seats, plan on $40,000,000 to protect against passenger liability.

Charter operators have the greatest passenger liability exposure, and traditionally carry the lowest liability limits. Why? Like all companies, charter companies are trying to make a profit. Insurance is an expense, so to lower the expense, they lower the liability limits. Ten years ago this may have been more justifiable because premiums were significantly higher. However, in 2016, premiums are one-third of what premiums were in 2006. Currently, the difference between a $10,000,000 liability limit and a $25,000,000 limit could be as little as $2,000 per year. If Charter Company A has lower charter rates than Charter Company B, this is likely a factor in their ability to offer cheaper rates.

We've focused on the inside of the fuselage and emphasized the fact that the bigger the purse, the more the insurance company is enticed to spend on defending you. Now let's look at external exposures. What if, for example, you were flying over South America, and have a mid-air collision with a Boeing 737? Your aircraft lands, but only to discover the 737 crashed and there are no survivors. While this may sound like a *Doomsday Scenario* to many of you, to some it may sound familiar. You recognize it because in September 2006, it happened. Without question, in this scenario, having a higher liability limit is beneficial. A high liability limit policy will keep the attorney fees on the insurance company's payroll, instead of yours, for quite some time, and when the jury finally decides how to distribute the money, there will be plenty to hand out.

So, how much liability coverage should you carry? Hopefully, the examples and policy definitions of what is covered will help make that decision a little easier for you. However, information on where the "herd" is going may be useful for you, too. Personally owned King Air operators typically carry between $10,000,000 and $25,000,000 of liability coverage. Corporate operators typically purchase $50,000,000, with some even going up to $100,000,000, and beyond. Charter operators should take a look at their client's needs. In today's market they can easily purchase $25,000,000 to $50,000,000 and still maintain single pilot authorized operations for far less than what they were paying a decade ago.

It is difficult to provide premium examples in today's market due to the numerous variables at play. However, consider this – to raise your liability coverage from $10,000,000 to $25,000,000 could cost you as little as $1,500 more per year for a Part 91 operator or $2,000 more for a charter operation. To increase from $5,000,000 to $50,000,000 could probably be done for an additional $4,000 per year for Part 91 operators and $5,000 for a charter operation. It truly is a buyer's market. KA

Kyle P. White, an aviation insurance specialist, is CEO of Aviation Solutions, a Marsh & McLennan Agency LLC company. He has professionally flown King Air 90s and B200s, and holds an ATP and Multi-Engine Instrument Instructor License. You can reach Kyle at *kylewhite@aviationsolutions.aero*.

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The Silent Killer

by Dr. Jerrold Seckler

Runny nose, irritated and watery eyes, sneezing and general stuffiness are symptoms we all experience from time to time. These symptoms result from the release of a chemical called histamine from specific cells of our immune systems as a response to an external irritant or allergen. Histamine has many physiologic effects, including dilating blood vessels, making the walls of capillaries more permeable and being generally responsible for most of the symptoms associated with inflammation. Significantly, histamine is also found in the brain, and among other things, inhibits sleepiness. Because these symptoms are so common, it is not surprising that many of us routinely use a class of medications, antihistamines, to relieve our misery when those symptoms appear. So what does any of this have to do with pilots? As you'll see, plenty. A few years ago, I was part of a group that assisted in analyzing all the fatal accidents of a specific aircraft model, with the aim of finding "root causes." We weren't interested in, for example, that a pilot lost control on approach, but rather, what factors may have made a loss of control more likely.

One of the interesting and disconcerting findings of our study was that a surprising number of accident pilots, 21 percent, had a variety of unauthorized drugs in their system – legal, illegal, prescription and over the counter (OTC). We wondered whether these specific pilots were unique, or whether there was an already known association with fatal accidents and the presence of drugs in the blood of the accident pilots. A literature search led me to a series of articles from the Civil Aerospace Medical Institute – a branch of the FAA. These articles analyzed the results of toxicology studies on pilots killed in aircraft accidents over several five-year periods. The most recent study analyzed fatalities from 2004-2008 and compared the findings with those of the prior studies.[1] All pilots killed in aviation accidents during that time period had their blood analyzed for the presence of Controlled Dangerous Substances (CDS), Schedules I-II (these include heroin, LSD, marijuana, ecstasy codeine cocaine, morphine, Demerol, Dexedrine, Ritalin and hydrocodone); Controlled Dangerous Substances, Schedules III-V, (including pain killers with less than 90 mg of codeine per tablet, cough medications with less than 200 mg of codeine/100 ml, Xanax, Darvocet, Valium, Ambien and Lomotil); Prescription Drugs, Nonprescription Drugs and alcohol (which was considered positive only if it was found above the FAA limit of 0.04 percent). The results were compared with the results of the previous studies. The breakdown of the percentage of pilots with positive toxicology findings is shown in Table 1.

As you can see, the percentage of pilots who died in aviation accidents and were found to have Controlled Dangerous Substances or alcohol in their system remained fairly constant over the series of studies. The number of pilots found to have prescription medications rose continually. There was no information presented in this study to suggest that the presence of these drugs was in any way related to the accident sequence. It may simply be that as pilots age and require medication for conditions like hypertension, blood lipid control, etc., more of them are on prescription medications. There was no effort made to distinguish between prescription medications that were authorized (the drugs were approved by the FAA and listed on the pilot's FAA medical application) and those that were not. Interestingly, the most common drug found on the toxicology screens

Years of Study	CDS Schedules I-II	CDS Schedules III-V	Prescription Medications	Nonprescription Medications	Alcohol
1989-1993	4%	2%	6%	11%	8%
1994-1998	5%	3%	14%	18%	7%
1998-2003	7%	3%	20%	16%	6%
2004-2008	6%	4%	29%	13%	7%

Table 1: A breakdown of the percentage of pilots with positive toxicology findings in fatal accidents.

was diphenhydramine (Benadryl) which was found in 6.1 percent of the dead pilots. Diphenhydramine is available as a prescription medication, as well as over the counter, and in the FAA study was listed as a prescription medication. This listing of diphenhydramine as a prescription drug can also, at least partially, explain the apparent significant percentage of accident pilots on prescription medications versus nonprescription OTC preparations.

The finding of diphenhydramine in the blood of accident pilots is of very real concern. Diphenhydramine is a first generation antihistamine – a drug that counters the effects of histamine. Of significance is that diphenhydramine crosses the blood brain barrier and therefore counteracts the effects of histamine in the brain. Remember that in the brain, histamine impairs sleep and in doing so promotes alertness. Diphenhydramine therefore, in addition to calming the symptoms of colds and allergies, is also a fairly potent sedative, and, in fact, is used in a significant number of OTC sleep medications. What's worse is that the effects of diphenhydramine last longer than most pilots might think. In an interesting study done at the University of Iowa's driving simulator,[2] driving abilities under the influence of different medications were monitored in four similar groups of drivers. One group, the placebo group, was medicated with a nonpharmacologically active agent, the second group was given alcohol sufficient to raise the blood alcohol concentration to 0.1 percent (legally impaired in all states), the third group was given 50 mg of diphenhydramine and the fourth group got a second generation antihistamine (fexofenadine, trade name Allegra™) which does not cross the blood brain barrier and therefore is non-sedating. The results of this study should give pause to all pilots who think OTC medications are safe to use when flying. The groups taking fexofenadine or placebo performed similarly and performed all driving tasks satisfactorily. The alcohol group performed significantly worse in tasks such as lane keeping, maintaining a specified distance from a preceding automobile and response time to avoiding a lane blocking vehicle. The diphenhydramine treated drivers performed uniformly worse than the alcohol impaired drivers, indicating that even relatively small doses of diphenhydramine affects driving ability more than an alcohol level consistent with the legal definition of drunk driving. Also of note is that there was no correlation between a feeling of drowsiness and driving ability in the diphenhydramine group. Meaning the diphenhydramine drivers performed poorly regardless of whether they felt drowsy or fully alert.

Diphenhydramine can be a silent killer. It is important for pilots to be very careful about any medications they take. For prescription drugs, check with your doctor and AME to ensure they are compatible with safe flying. For OTC medications, consider that if you feel poorly enough to take something, you probably shouldn't be flying at all. If you do choose to fly when taking OTC medications, read the list of ingredients and be especially aware of drugs with sedating effects including pain killers, first generation antihistamines, sleep aids or anything with codeine or hydrocodone (many cough preparations). If there is any question, consult your physician or AME. If an OTC preparation contains a caution not to use the drug while operating dangerous machinery, consider that an airplane is potentially a very dangerous machine. Also note that the FAA recommends you wait until at least five times the interval between the recommended dosing interval has passed after you stop taking an OTC medication until you fly. For example, if the recommended dose is one tablet every 12 hours, wait 60 (12 × 5) hours from your last dose until you advance the throttle. This issue is real. Many OTC (and prescription) medications can significantly impair your ability to fly your aircraft safely. The accident statistics speak for themselves. For an excellent overview of the issue of drugs and aviation safety, the NTSB has produced a document that I encourage all pilots to review.[3] As they say, the life you save may be your own. KA

NOTES:

1) Canfield, Dennis V., et.al. Drugs and Alcohol in Civil Aviation Accident Pilot Fatalities From 2004-2008. FAA Aeromedical Institute. 2011. *https://www.faa.gov/data_research/research/med_humanfacs/ oamtechreports/2010s/media/201113.pdf*

2) Weiler, JM et.al. Effects of fexofenadine, diphenhydramine, and alcohol on driving performance. A randomized, placebo-controlled trial in the Iowa driving simulator. Annals of Internal Medicine; 2000 Mar 7;132(5):35463. Abstract available at: *http://www.ncbi.nlm.nih.gov/pubmed/10691585*

3) Drug Use Trends in Aviation: Assessing the Risk of Pilot Impairment: NTSB Safety Study 14/01. *http://www.ntsb.gov/safety/safety-studies/ Documents/SS1401.pdf*

Dr. Jerrold Seckler is retired after practicing medicine (urology) for over 40 years and an active AME for 25 years. He has over 6,000 total hours, 2,200 of those in his 2001 Cirrus SR22. He is an ATP, CFII, former COPA Board Member and a ground instructor at CPPPs. The items discussed in this column are related to experiences by Dr. Seckler in his many years as an AME, and made hypothetical for the article. Any information given is general in nature and does not constitute medical advice.

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The Cabin Altitude Governor

by Tom Clements

Did the article's title cause you a moment of uncertainty? That was my intent: To change the name of a well-known King Air system component so as to turn it into a description of its function. As most of you have likely figured out by now, this article is about the Pressurization Controller … which has one purpose – to govern cabin altitude.

In "The King Air Book," there is a section comparing two governors: the less-familiar PT6's FCU (Fuel Control Unit) to the more familiar PPG (Primary Propeller Governor). The section tries to make the FCU's operation easier to understand by comparing it to the good ol' prop governor. One of the discussion points was that any governor is attempting to govern – or maintain constant – some parameter. In the case of the PPG it is Np; in the case of the FCU it is N1. However, no governor is perfect and neither can govern the parameter 100 percent of the time. For example, when we reduce power and airspeed for our landing flare, the propeller blade angle becomes fixed at its lowest setting (the Low Pitch Stop); when that takes place the governor is no longer capable of maintaining the selected propeller speed and RPM starts to decrease.

In a similar fashion, if a Power Lever gets positioned to Idle at a higher altitude – say, FL200 – with the Condition Lever at Low Idle, N1 will not decrease to the Low Idle speed expected. Instead, the Minimum Fuel Flow Stop prevents the fuel flow from going low enough to compensate for the reduced compressor drag of the thin air it is now experiencing.

Allow me to take this governor comparison one additional step further. The Pressurization Controller is nothing more than a governor of cabin altitude. These altitudes, by the way, are always pressure altitudes, always referenced to an altimeter setting of 29.92 in Hg at sea level.

Here is perhaps a new way of defining the Controller: To the best of its ability, the Pressurization Controller will climb or descend the cabin altitude, at the rate set by the Rate knob, to the altitude dialed into its face and then will maintain that cabin altitude to the best of its abilities. It is nothing more nor less than a governor of cabin altitude.

I should probably specify here that I am talking about normal **in-flight** operation: Normal power settings on the engines, proper air inflow from two good Flow Packs

or a Supercharger, an airplane without excessive air leaks, and the control switch not selected to Dump. The automatic dumping action that occurs based on a weight-on-wheels (WOW) switch, nullifies the Controller's action totally when we are on the ground.

The range of cabin altitudes that may be selected on the Controller go from negative (minus) 1,000 feet to a positive 10,000 or 15,000 feet MSL, depending on your King Air model and the Controller it contains. The 10,000 feet covers all airports in the United States, but enough complaints came in from operators in places like La Paz, Bolivia, that Beech switched to the 15,000-foot controllers for all 300- and later 200-series.

Here's a good operational challenge for you to consider: How do you land at 14,000 feet in your model 200, without popping your passengers' ears, when flying with a controller that only goes to 10,000 feet?

It is rare to find a controller that will yield identical rates of cabin climb and descent when the Rate knob remains in one position. Almost always, a slightly higher setting – like the one o'clock position – yields a 500 fpm climb while a lower setting – more like 11 o'clock – yields a 500 fpm descent. Also, the results you get in one airplane with its controller rarely will be the same as what you find in another airplane with its controller. Make sure to monitor cabin rates of climb and descent on the Cabin's VVI and adjust the Rate knob to what you desire.

There are two situations that prevent this governor from governing. As mentioned before, when the propeller slows down in the landing flare or Low Idle speeds are observed to increase with altitude, nothing is wrong. Instead, the Prop Governor or the FCU has merely reached a limit of its ability to govern.

Before I present the answers, give yourself a quiz: What are the two situations, both perfectly normal, when the Controller cannot maintain the selected cabin altitude?

Tick-tock-tick-tock-tick-tock … got your answers yet?

The first situation in which the governor cannot govern is when the airplane descends below the selected cabin altitude. This should happen once on every flight as the airplane, on final approach, descends below the cabin. If this did not take place, then the outside pressure would be higher than the interior cabin pressure. The airplane is not designed to handle these types of compression forces, not to mention that it would be difficult to open the cabin door on the ramp if the higher pressure outside were still pushing in!

From your training, you may recall that the technical description of this first inability to govern situation is due to the fact that both the Outflow and the Safety valves contain a ***Negative Differential Pressure Relief*** function. When the outside pressure tries to exceed cabin pressure – because the airplane is descending below the cabin altitude – both valves allow themselves to be pushed open, permitting outside air to freely flow into the cabin, equalizing the pressures.

The other situation in which the controller fails to maintain the selected cabin altitude, even though it is working perfectly? That comes into play when the airplane climbs high enough that the ***Maximum Differential Pressure Relief*** function of the Outflow or Safety valve is reached. If the cabin were to remain low while the airplane climbs too high, the excessive expansion forces acting on the airframe could eventually lead to damage. Hence, at the normal Maximum Differential Pressure value, the valve opens automatically to expel enough air to cause sufficient cabin climb so that the maximum design Differential Pressure, ΔP, is never exceeded.

Every cabin pressure corresponds to a different cabin altitude, so it follows that governing cabin altitude is the same as governing cabin pressure. The pressure inside any fixed-volume container depends on (1) how much air is in the container, and (2) the temperature of that air. Since cabin temperature is held fairly constant (we hope!) most of the time, cabin pressure depends on how much air is in the cabin. More air, higher pressure, lower altitude. Less air, less pressure, higher altitude.

As in most other aircraft pressurization systems, the inflow of air into the *pressure vessel* – the fancy term for the cabin and other pressurized parts of the fuselage – is held relatively constant so the regulation of total air mass in the vessel depends on how much is flowing out. The *outflow* is controlled by the position of the *Outflow Valve* … duh! It follows that the Controller's job gets accomplished by its management of Outflow Valve position.

Left alone, the Outflow Valve is closed with springs applying the force to close the moving poppet against its seat. It is suction applied to the valve that overcomes the spring force and causes the valve to open … the greater the suction, the larger the opening.

The Controller has three lines connected to it. The first is filtered cabin air; the second is instrument suction; the third is a line going to the Outflow Valve. A reference chamber in the Controller has air being sucked out by the suction line and air flowing in from the cabin. Based on the setting of the Altitude knob, the suction this chamber feels can be stronger or weaker. The stronger the suction, the lower the reference chamber pressure. It is this reference chamber pressure that is felt by the Outflow Valve through the line that connects the two.

The overall result is that every cabin altitude dialed into the Controller equates to a different reference pressure for the Outflow Valve and that valve then modulates cabin air outflow so as to maintain a constant cabin pressure, cabin altitude.

"Delta P" (ΔP), Differential Pressure, as the name indicates, is simply the *difference* between inside and outside pressures. The inside pressure is cabin pressure; the outside is ambient. The Controller, as we have presented, *determines only cabin pressure.* It is the airplane's altitude that determines ambient pressure. The Controller, therefore, does not determine the *amount* of ΔP, the *amount* of pressurization, taking place. No! A Controller can be working perfectly while ΔP can be anything from zero to maximum!

I would make an educated guess that for every Controller that was sent in for exchange or overhaul, only a third or less were actually found to be defective. Instead, the problems that the crew was observing had to do with lack of inflow or too much outflow – too many cabin leaks. Either of these abnormalities can cause the inability to achieve maximum ΔP.

So before you or your mechanic concludes the Controller is at fault, perform this simple test. Set the controller for, say 5,000 feet, and then fly to 9,000 feet. This will yield a ΔP of about two psid, such a low amount that even the leakiest of airplanes can probably maintain it. Dial in a cabin altitude that's about 1,000 feet lower. Set the Rate knob at Minimum and see if the cabin descends very slowly, less than 200 fpm or so. Now spin the Rate knob fully clockwise to Maximum and see if the descent increases to well over 1,000 fpm. Dial the cabin back up to 5,000 feet and repeat the Rate control checks for a climbing cabin. So far, so good?

Next, do some airplane maneuvering: Climb 500 to 1,000 feet, then descend an equal or greater amount, while maintaining a reasonably high and constant power setting. Did the cabin obediently maintain 5,000 feet while you did this? If so, then your Controller is fine, doing exactly what it is supposed to do … acting as the governor for cabin altitude. So look for excessive leaks or weak inflow, don't waste money on exchanging the Controller.

In closing, what, to me, shows that a King Air pilot is really on top of his pressurization system? First, that he is diligent in monitoring the cabin rate of climb and descent and tweaking the Rate knob as needed to get the desired amount … almost always 400 to 500 fpm. Second, that he observes if and when the maximum attainable ΔP is reached … when the cabin starts climbing above the selected value. Third, that before landing, he verifies that ΔP is at zero and the cabin is descending with the airplane.

By the way, did you formulate a plan for landing at the 14,000-foot elevation airport with a 10,000-foot controller? Here's one method: In the descent, when at about 15,000 feet above the airport, turn off one Bleed Air switch. There should be a momentary cabin climb followed by a recovery back to 10,000 feet. Next, reduce the other side's Power Lever while monitoring the cabin VVI. As the inflow of bleed air is reduced due to the slower compressor speed, the cabin will start to climb. You can regulate the climb rate – keeping it in the 500 fpm vicinity – by regulating Power Lever position. If you have planned carefully and have a little luck on your side, about the time the cabin reaches 14,500 feet or so, the airplane will be at traffic pattern altitude. Now turn off the remaining Bleed Air switch, use both Power Levers normally, and complete the landing. One other thing! Before the cabin exceeds 12,500 feet, pull the Oxygen Control circuit breaker to prevent the cabin's oxygen masks from deploying!

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

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

The Air Capital of the World: EXPANSION

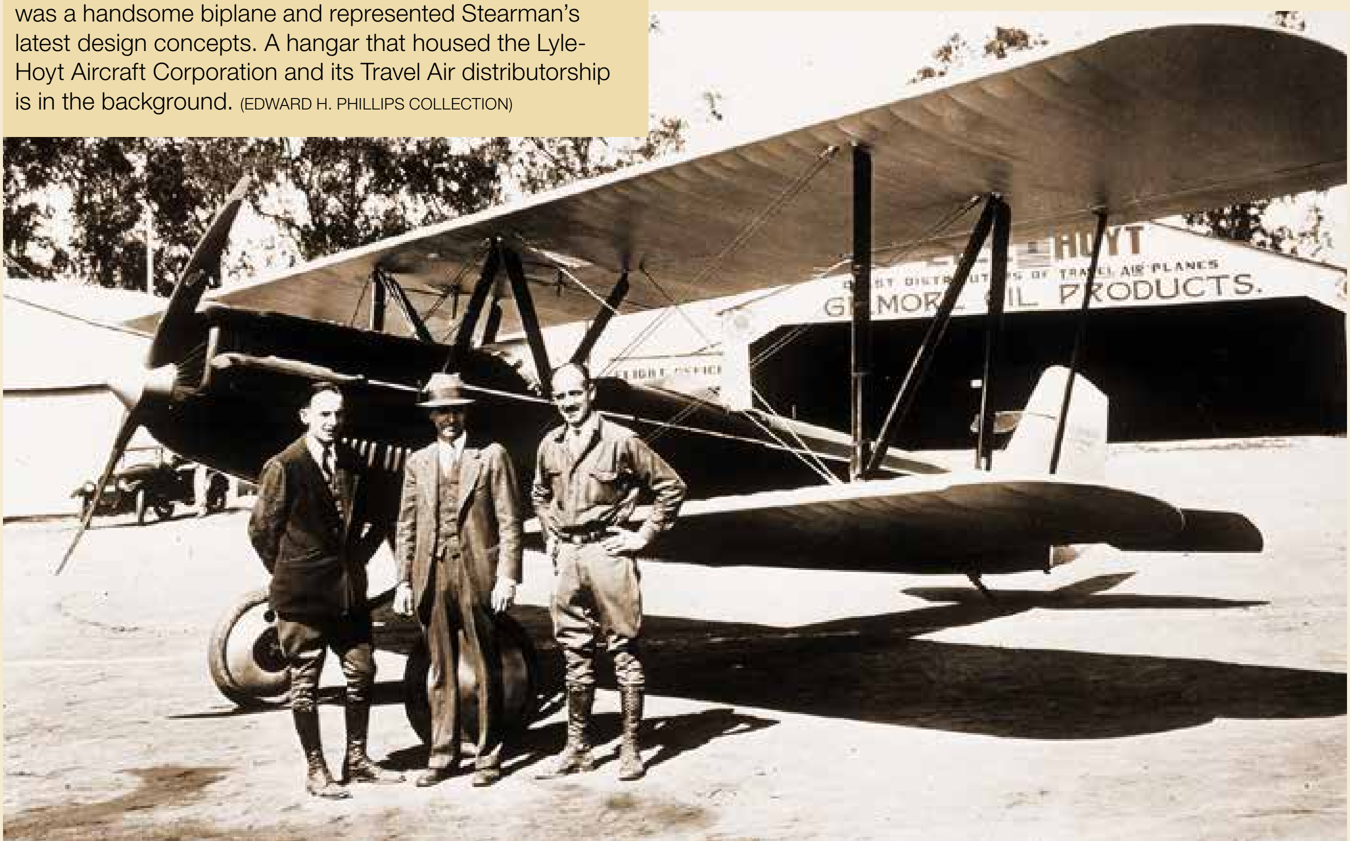
"Lucky Lindy's" transatlantic flight in May 1927 electrified the world. In the wake of that epic crossing, Wichita's airframe builders feasted on fat order books for two years until famine struck Wall Street and drove a stake into the heart of the nation's economy.

by Edward H. Phillips

As the "Roarin' Twenties" continued to roar into 1928 and 1929, the city of Wichita was being transformed from a 19th century hub for the sale of wheat and crude oil, to America's 20th century epicenter of small airplane manufacture. Thanks to Jake Moellendick's oil money and E.M. Laird's "Swallow," the "Peerless princess of the Plains" was home to airframe builders whose names were fast becoming synonymous with the best airplanes money could buy: Travel Air Company, Cessna Aircraft Company and Stearman Aircraft Company.

How these three businesses came about is an interesting story well worth reviewing, not only because of the famous personalities involved, but also because their passion for the future of commercial aviation brought them together in the right place and at the right time to make history. As Wichita's reputation grew, aviation journalist John T. Nevill, writing for America's oldest aeronautical publication, "*Aviation*," asked the classic question: "How is it … that this comparatively small, mid-plains city ranks alongside New York, Detroit or Los Angeles in the manufacture of the world's newest vehicle of transportation?" We have already learned how Jacob M. Moellendick and E.M. Laird laid down a primitive, but successful aviation foundation upon which other entrepreneurs could build. The time has come, however, to discuss the men who built upon that foundation and made Wichita the "Air capital of the World:" Walter H. Beech, Lloyd C. Stearman and Clyde V. Cessna.

In 1927, Walter Beech had been elected president of Travel Air following the departure of his two associates and principal co-founders of the company, Lloyd C. Stearman and Clyde V. Cessna. The question has often been asked – what happened to cause the trio to go their separate ways?



Lloyd C. Stearman (center) posed for the camera at Clover Field with business associates Fred D. Hoyt (right) and George Lyle after completion of the Stearman C1 in late March 1927. Powered by a Curtiss OX-5 engine, the C1 was a handsome biplane and represented Stearman's latest design concepts. A hangar that housed the Lyle-Hoyt Aircraft Corporation and its Travel Air distributorship is in the background. (EDWARD H. PHILLIPS COLLECTION)

The Stearman Aircraft Company built only a few airplanes during its brief existence in California, including the C2M built for air mail operator, Varney Air Lines. The ship was flown on Contract Air Mail Route 5 between Elko, Nevada, and Pasco, Washington. (WALTER P. INNES, JR., COLLECTION, WICHITA STATE UNIVERSITY LIBRARIES, DEPARTMENT OF SPECIAL COLLECTIONS)

During the past 90 years, much has been written in an attempt to answer that worthy question, but in the author's opinion it comes down to each man's search for success. Walter Beech was the gregarious, energetic, risk-taking aviator. Lloyd Stearman was the talented designer who also demonstrated his affinity for the violin. Clyde Cessna's pioneering aeronautical accomplishments, however, had elevated him to the status of an icon.

The first to leave was Stearman. When only a boy, he had watched in amazement at a local fair as a daring aviator flew his fragile monoplane through a series of figure eights, only 500 feet above the cheering crowds. That aviator was none other than Clyde Vernon Cessna. A native Kansan, Lloyd served as Travel Air's primary engineer until October 1926 when he resigned to answer a new call – "go west young man." Although opinions have varied throughout the past 90 years, research by the author strongly indicates that the chief reason he left Wichita stemmed from a business opportunity Lloyd believed he could not ignore: relocate to California where the economic climate was ripe for designing, building and selling airplanes bearing his name.[1]

One of the most popular biplanes built by the Stearman factory in Wichita was the C3R that was based on the standard C3B biplane. Intended for the sportsman pilot, the C3R shown here was built for R.C. DuPont and delivered in October 1931. (KANSAS AVIATION MUSEUM)

When Stearman relocated his company to Wichita in October 1927, he leased old buildings once occupied by the Bridgeport Machine Company. Although less than ideal, the facilities served Stearman well until 1930 when a new factory was built south of the city. (EDWARD H. PHILLIPS COLLECTION)

The idea was not Lloyd's but that of fellow pilot, friend and Travel Air West Coast distributor, Fred Day Hoyt. Fred operated a flying service at the famous Clover Field in Santa Monica, California. He convinced Stearman that there was money to be made selling airplanes to the rich and famous in Hollywood; wealthy thespians who not only craved expensive, fast automobiles but were attracted by the thrill of flying as well. Lloyd and his family arrived in Venice, California, late in October 1926, and settled into their new abode on Washington Boulevard. Stearman Aircraft, Inc., was incorporated in December, and that month construction began on the first airplane to bear Lloyd's name – the Stearman C1. The local press was quick to report the presence of a new aircraft company in the quiet town of Venice, and Lloyd explained that plans called for building one airplane per week when operations were fully underway. He added that the price of the C1 biplane was $3,000. By the first week of March 1927, three more airplanes were being built.

Lloyd Stearman and Mac Short collaborated on design of the M-2 "Speedmail" that first flew in January 1929. Intended specifically for air mail operations, the large biplane could carry up to 1,000 pounds of mail and small packages. The M-2 was powered by a nine-cylinder Wright "Cyclone" R-1750 radial engine that produced 525 horsepower; cruising speed was about 120 mph. (COURTESY OF THE WALTER HOUSE COLLECTION)

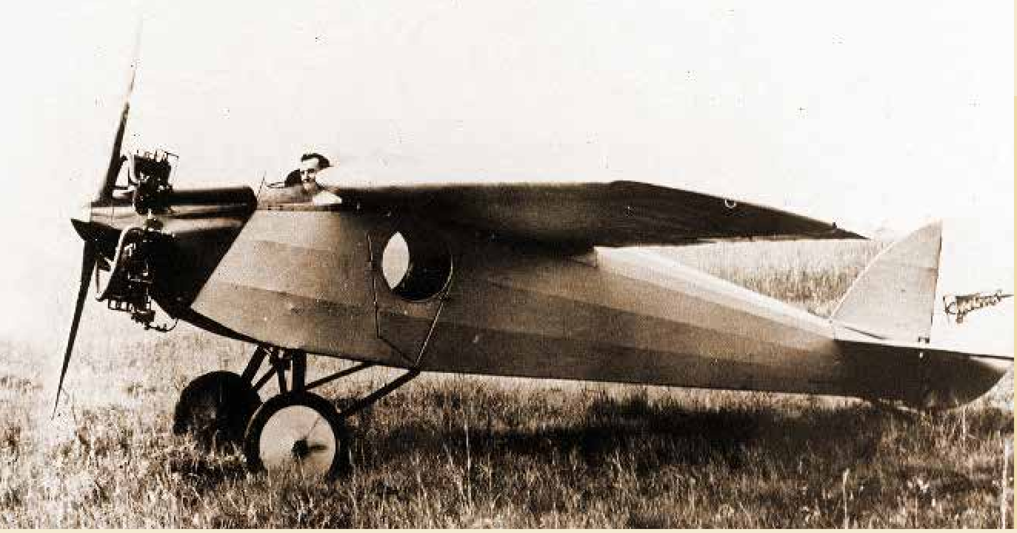
These included the C2, which was a slightly modified version of the C1; the C2C and the C2M. All three ships featured the same basic airframe of welded steel tubing for the fuselage and wood wings, but differed in the type of engines. As with the C1, the C2 featured a Curtiss OX-5 powerplant rated at 90 horsepower, and the C2C used a Wright/Martin Hispano-Suiza engine that produced 180 horsepower. The C2M, however, was designed to haul air mail, not passengers, and in keeping with that demanding mission Lloyd designed the biplane to use the Wright J-4 static, air-cooled radial engine.

In terms of historical importance, the C2M was a landmark airplane. It represented a turning point for Lloyd's infant aircraft company because it established Stearman as a builder of rugged, reliable biplanes that could haul up to 400 pounds of mail. Lloyd's first customer was another of his many friends – Walter T. Varney of Varney Air Lines. In April 1926, Varney had begun operating Contract Air Mail (C.A.M.) Route 5 that stretched nearly 400 statute miles from Elko, Nevada, to Pasco, Washington, and eventually all the way to Salt Lake City, Utah, (including a stop in Boise, Idaho). The C2M was a modified C2B that incorporated relatively minor alterations to meet specific requirements spelled out by Varney, including a covered mail compartment that replaced the front cockpit.

By the summer of 1927, the little band of workers at Stearman Aircraft, Inc. were occupied building custom airplanes. Orders for the C2 and C2M were increasing, albeit very slowly. It was becoming increasingly obvious to Stearman, Hoyt and Lyle that if the business was to grow, it had to expand. The company's limited production capacity could not keep pace with demand for the C2 and the C2M. Lloyd's men could not meet tight delivery schedules primarily because the existing facilities were woefully inadequate. The company's chief problem was not a lack of orders but its inability to satisfy those orders.

Although some aviation historians have proposed that Lloyd Stearman's decision to return to Wichita stemmed from having incurred a heavy debt load, the author's research has shown that there is little or no evidence to support that assertion. In the normal course of business, the company would certainly incur debt to acquire engines, component parts and materials necessary to construct airplanes, and there is no known evidence that Stearman Aircraft, Inc., failed to service that debt. What it needed was more capital investment. In the summer of 1927, Lloyd and his associates did not need more business; what they needed was more investors.

In August, Stearman Aircraft, Inc., had a three-month backlog of orders for the C2B and C2M, but the airplanes



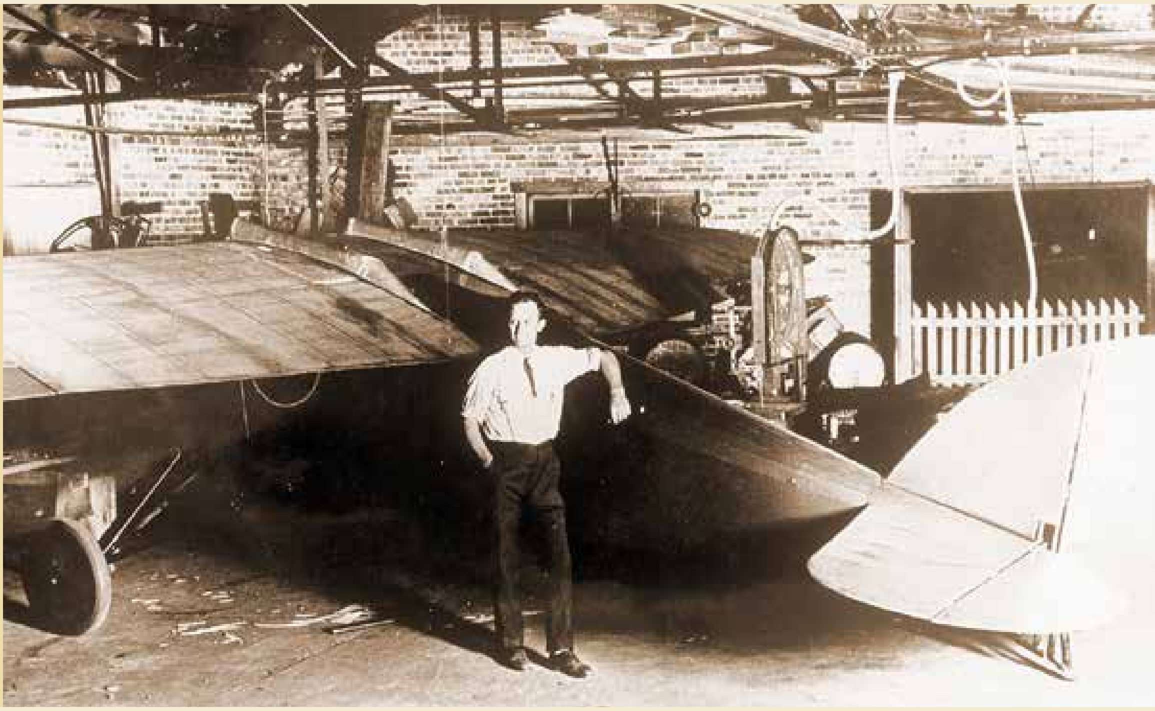
In early 1927, Cessna sold his stock in the Travel Air Company and resigned to build his first airplane he named the "Phantom." It featured a full-cantilever, high-wing configuration Cessna always favored over biplanes. The pilot sat in front of the cabin, which accommodated two passengers. (EDWARD H. PHILLIPS COLLECTION)

could not be completed in time to honor the purchase contracts. Lloyd needed a significant infusion of money to expand the enterprise and he sought to do so as quickly as possible. During the summer, he was actively engaged in discussions with a group of friends and investors in Venice who wanted to keep the company in Southern California. Unfortunately, the group failed to support Stearman. Fortunately, 1,500 miles east his old friend Walter P. Innes, Jr., was not only aware of Lloyd's financial situation but was actively campaigning to bring him back east to Wichita. Assisted by fellow local businessman Harry Dillon, the two men managed to raise about $60,000 in less than a week.

Back in Venice, Lloyd carefully weighed his options: remain in California and keep seeking investors, or relocate to his home state where the money he needed was waiting for him. Stearman chose Kansas. He shut down operations in Venice and in October 1927 resumed production (albeit on a limited scale) in leased buildings once used by the Bridgeport Machine Company north of downtown Wichita. Lloyd Stearman was back, and later he shared his thoughts with local newspaper reporters: "I have always been impressed with Wichita. I cannot say that I don't like California, for I do and I have lots of friends out there. But I can say that Wichita is in an almost ideal location and has better flying weather than California. There are no fogs or mountains here. I've always liked the town and the people in it, and it seems a great deal like coming back home to be here."[2]

When Lloyd Stearman returned to Wichita in the autumn of 1927, he learned that his old friend and fellow co-founder of Travel Air, Clyde V. Cessna, had resigned in January of that year. The Rago, Kansas, native and pioneer aviator wanted to start his own company, and when he informed Walter Beech, the Tennessean wished him well. Clyde had long harbored a desire to build monoplanes featuring a full-cantilever wing, which he firmly believed was far superior to a conventional biplane configuration in terms of both performance and appearance.[3]

Cessna built the handsome "Phantom" monoplane in rented workspace on West Douglas Avenue. The ship was powered by one of Cessna's many Anzani radial engines that he acquired after World War I. (EDWARD H. PHILLIPS COLLECTION)



Cessna made his decision following the sale of his stock in Travel Air to three Wichita businessmen. Profits from that transaction allowed Clyde to move forward with his reentry into the airframe manufacturing business. When news of his departure hit the streets of Wichita, reporters flocked to hear what Cessna planned to do next. Although his exact words have been lost to history, he is reported to have said, "Monoplanes are the only worthwhile type of aircraft." For the past 16 years he had believed that a full-cantilever wing design was the best possible configuration. He rented a small workshop on West Douglas Avenue, and by August he had achieved his goal.

Four months in the making, Cessna's "Phantom" featured a full-cantilever wing that spanned 37 feet four inches, tip-to-tip, and a two-place, enclosed cabin with the pilot sitting forward in an open cockpit. Powered by a 10-cylinder Anzani static, air-cooled radial engine that generated 90 horsepower, the Phantom flew for the first time in August 1927 with local pilot Romer G. Weyant at the controls. At a gross weight of only 1,200 pounds, the airplane could accommodate a payload of 722 pounds and had a maximum speed of about 100 mph.

Cessna soon joined forces with a motorcycle dealer from Omaha, Nebraska, named Victor H. Roos, who had seen the Phantom and was impressed with its appearance as well as its performance. Roos was an excellent salesman, and in September he and Clyde formed the *Cessna-Roos Aircraft Company*. A new factory was soon built at the juncture of First Street and Glenn Avenue west of the Arkansas River, and plans called for building 12 airplanes. Cessna's chief challenge, however, centered on certifying the Phantom and in particular, its all-wood, full-cantilever wing.[4]

Cessna realized that he could not perform the required stress analysis computations that would be necessary to attain an Approved Type Certificate from the Department of Commerce. By 1927, the science of stress analysis as it applied to airplanes was still evolving. Fortunately for Clyde, he was able to obtain assistance from the highly respected Joseph S. Newell, professor of aeronautical engineering at the prestigious Massachusetts Institute of Technology. It was his strong reputation as a recognized expert in aeronautical structures that encouraged Cessna to seek his help.[5]

Cessna's association with Victor Roos was relatively brief. By November 1927, growing tensions between the two men and other company officials were exacerbated when the board of directors proposed changing the name of the business to the *Cessna Aircraft Company,* Roos vehemently objected to the change, claiming it would be detrimental when production of Model AA monoplane was about to begin. His objections fell on deaf ears. Roos immediately resigned, but soon found work across town as manager of Jake Moellendick's former *Swallow Aircraft Company*.[6]

From a historical standpoint, it is important to note that after December 1926, the Department of Commerce (DOC) was charged with responsibility to license all airmen and mechanics as well as ensuring that all airframe and engine manufacturers applied for and received an Approved Type Certificate (ATC). A year later, it fell to the DOC's Bureau of Aeronautics Division to certify about 285 different types of aircraft already being built in the United States.

Joseph Newell had completed the stress analysis required by the DOC, and by the end of 1928 the Cessna Aircraft Company's product line included six versions of the same basic airframe. These monoplanes differed chiefly in the make and model of the static, air-cooled radial powerplants. Only two were awarded an ATC; the remainder were approved under the less stringent Group Two system:

1. Model AA (Anzani, 120 horsepower, $5,750, ATC 65)
2. Model AC (Comet, 130-150 horsepower, $7,500, Group Two Approval 2-407)
3. Model AF (Floco, later Axelson, 150 horsepower, $7,500, Group Two Approval 2-237)
4. Model AS (Siemens-Halske, 125 horsepower, $7,500, Group Two Approval 2-8)

Associates who helped Clyde V. Cessna create the Cessna Aircraft Company are shown in this photograph taken in 1927 beside the modified "Phantom." Cessna is second from left, with local pilots Romer Weyant to his right and Francis "Chief" Bowhan to his left. George Bassett and George Siedhoff (forefront) were Wichita businessmen who helped finance Cessna's dream of becoming an airframe manufacturer. Meade Hargiss (far right) was Cessna's first assistant sales manager. (EDWARD H. PHILLIPS COLLECTION)

5. Model AW (Warner, 110 horsepower, $7,500, ATC 72)
6. Model BW (Wright *Whirlwind*, 225 horsepower, $9,800, Group Two Approval 2-7).

Of these, only 13 examples of the Model BW were built before production terminated, while three or four of the Model AS were sold. Company records indicate that Cessna sold 13 of the Model AA, one Model AC and three Model AF. The Model AW, however, emerged as the preferred airplane and at least 50 were sold during 1928. In September of that year, local pilot Earl Rowland flew a stock Model AW to victory in the New York-Los Angeles Air Derby, winning first place in the Class A division.

By autumn 1928, the small factory at First Street and Glen Avenue was producing less than two airplanes per week instead of 10, as demand for the Model AW skyrocketed in the wake of Rowland's success in the air derby. As the fateful year 1929 dawned, Clyde Cessna found himself caught between the blessing of high demand for his airplanes and the curse of inadequate cash and capital to expand production. Cessna stock was a hot commodity on Wall Street, selling at $150 per share compared with only $10 a few months before. Finally, Cessna was able to secure the funds needed to move the company forward. Capitalization was increased to $500,000 from the original $200,000, and a new, much larger factory would be built on Franklin Road a few miles east of downtown Wichita.

Meanwhile, Clyde's engineers were buried completing drawings for a Wright *Whirlwind*-powered monoplane designed to carry six people in comfort. The ship was, at least to some degree, Cessna's answer to business aviation operators whose company officials preferred fully enclosed cabins to open cockpits. A number of manufacturers were building such ships, including Travel Air with its Type 6000 cabin monoplane that Walter Beech had put into production in response to customer preference for an enclosed cabin airplane.

Designated the *Cessna CW-6* ("C" indicating the third series of Cessna designs, "W" for the Wright radial engine, and "-6" for the number of seats), the prototype first flew in November 1928. Hot on the heels of the CW-6 came the improved DC-6 series that debuted early in 1929. Two versions were offered – the DC-6A powered by a 300-horsepower Wright J6-9 radial engine, and the DC-6B powered by a 225-horsepower Wright J6-7 engine. Government certification was awarded in September 1929. The DC-6A cost $11,500, while the DC-6B sold for $10,000.

Wichita's aviation industry had grown by leaps and bounds during the second half of 1927 through 1928 and was poised to grow further in 1929. City officials were proud that the town was home to one of the largest commercial airframe manufacturing centers in the world, not just the United States. It boasted more factories and ancillary aeronautical enterprises than any other American city, and 1929 promised to propel the Air Capital of the World to new heights of fame and fortune, not dreamed of only a few years before. KA

NOTES:

1. One rumor that has persisted over the decades suggests that Stearman went to California in an attempt to make a fresh start following a fatal accident that occurred during the 1926 Ford Reliability Tour. A Wichita resident was at the East Central flying field with his family to watch the Tour airplanes take off and land. Lloyd was taxiing his Travel Air to the parking area when the propeller struck and killed the man instantly. Two months later, Stearman departed for California. It was a tragic day that Lloyd never forgot, but it did not prevent him from returning to Wichita the next year.
2. Wichita "*Eagle*," October 1, 1927, Page 5. In a letter to the author dated April 25, 2005, Lloyd's son, William L. Stearman, wrote that, "There was little money for aircraft manufacturing in California, but there was in Kansas." He added that the scarcity of capital in California was the chief reason his father relocated his company to Wichita.
3. Decades of "hearsay history" has distorted the truth about Walter Beech's so-called "fondness" for biplanes and Clyde Cessna's affinity for monoplanes. It is not generally known that in 1924 Clyde bought and flew a "*New Swallow*" biplane and gave his nephew, Dwane Wallace, his first ride in that ship. Contrary to fact, Cessna did not resign from Travel Air because of a disagreement with Beech over whether the company should build monoplanes or continue with biplanes. Beech not only embraced Cessna's 1926 design that served as the basis for the Type 5000 cabin monoplane, but by 1929 monoplanes dominated the company's production line. Beech was progressive, not regressive, and embraced what the marketplace wanted. By 1928, it was clear to Walter that monoplanes represented the future of commercial aviation.
4. Cessna's design for a full-cantilever wing was only one of many already in existence. As early as World War I, the single-engine Fokker DVIII fighter featured such a wing, and during the war Hugo Junkers built a ground attack aircraft that boasted a full-cantilever wing of all-metal construction. Other well-known examples of the mid-to-late 1920s include the Ford Trimotor and Fokker airliners and the Lockheed "*Vega*" monoplane designed by Jack Northrop.
5. Perhaps Newell's greatest contribution to the science of aeronautics was a textbook entitled "*Aircraft Structures*," which he co-authored with A.S. Niles in the late 1920s. In the years that followed, it became a standard reference for mathematically analyzing airframe structures such as wings, fuselage, empennage, engine mounts and landing gear under various load conditions.
6. After Walter Beech and Lloyd Stearman departed the Swallow company late in 1924, Moellendick soldiered on as boss and sales remained strong, but in 1927 he interrupted production of the New Swallow to build the "Dallas Spirit" monoplane for the ill-fated Dole race from California to the Territory of Hawaii. The airplane, pilot and navigator disappeared over the vast Pacific Ocean and Jake's company eventually went bankrupt. It was saved from extinction by Wichita businessmen and by the time Roos took command, the company was back in the black.

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, Kansas. 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.

Textron Aviation Completes Expanded Certification of U.S. company-owned service centers and Launches 1Call Team

Textron Aviation Inc. announced that it has attained new certifications allowing each U.S. company-owned service center to support the Beechcraft, Cessna and Hawker brands.

All 14 Textron Aviation-operated service centers in North America have received expanded certifications in the past year, allowing the company to deliver their service across all brands. The company says in addition to investing in its company-owned service centers, it continues to make more resources available for customers who want the flexibility of service at their location. Over the last year, the company expanded its mobile service unit (MSU) fleet to more than 60 vehicles located in North America and Europe. It also recently placed a third dedicated support aircraft in service – its first in Europe – to support maintenance events by transporting technicians and parts to the customer's location.

The company also recently launched 1Call, which provides a single point of contact for Beechcraft, Citation and Hawker customers during unscheduled maintenance events. Customers can access the dedicated 1Call team by dialing +1 (316) 517-2090.

Textron Aviation says customers calling this dedicated line will be able to receive prioritized technical support, order expedited parts, have alternative lift quickly dispatched, or even schedule a mobile service unit. With technical support services available 24/7, Textron Aviation's 1Call team oversees every step of a maintenance event using visual display boards that track all calls, air response aircraft and mobile service units through issue resolution.

Find Textron Aviation service information on their website at *http://txtav.com/en/service*.

Rockwell Collins' Pro Line Fusion® upgrade now certified for Pro Line II-equipped King Air 350

Rockwell Collins has received a Federal Aviation Administration (FAA) supplemental type certificate (STC) for its Pro Line Fusion® avionics upgrade for King Air 350 turboprops originally delivered with Pro Line II avionics. The STC was achieved as part of a collaborative effort with Landmark Aviation Winston-Salem and BHE & Associates, Ltd., and is available now through Rockwell Collins-authorized dealers.

Rockwell Collins' Pro Line Fusion upgrade for King Air 350 turboprops provides turn-key compliance with airspace modernization deadlines and transforms the

flying experience with the largest widescreen primary flight displays available. The upgrade enhances the aircraft's value with the same icon-based, touchscreen technology found on new-production King Airs.

According to the company, the Pro Line Fusion ushers in a new era for King Air 350 owners with:

- A fully loaded package of baseline equipment for operation in modernizing global airspace: ADS-B mandate compliance, SBAS-capable GNSS, localizer performance with vertical guidance (LPV) approaches, radius-to-fix (RF) legs and more
- Three 14.1-inch widescreen LCDs with advanced graphics, configurable windows, and touchscreen interfaces – matching the display configuration of the latest King Air models delivered from the factory
- Market-leading high-resolution synthetic vision as a standard feature, including Rockwell Collins' patented airport dome, and extended runway centerlines with mile markers to better orient the pilot from top of descent through final approach
- Touch-interactive maps with eyes-forward flight planning, high-resolution topography, real-time onboard weather radar overlays, obstacles, and special-use airspace and search patterns for expanded situational awareness and reduced workload
- Geo-referenced electronic navigation charts that display own-ship aircraft position for enhanced situational awareness during approaches
- Easy and fast database updates using a standard USB drive port on the front of the displays

Pro Line Fusion is already certified as an upgrade for King Air aircraft originally delivered with Pro Line 21™ and this upgrade for the King Air 350 with Pro Line II follows a similar approach. The pilot displays and controls are replaced with Pro Line Fusion products while the King Air's reliable autopilot and radios remain on the airplane.

Pro Line Fusion is software upgradeable for easy updates and also provides the backbone for integrating future enhancements such as Rockwell Collins' HGS™-3500 Head-up Guidance System, EVS-3000 Enhanced Vision System, MultiScan™ weather radar and Airport Moving Map.

Advent Aircraft Systems Earns STC for King Air Anti-Skid Braking System

Advent Aircraft Systems, in collaboration with Beechcraft Corporation, a subsidiary of Textron Aviation Inc., has received FAA approval of its advanced-technology GPS/digital anti-skid braking system (Advent eABS™) for installation on Beechcraft King Air B300 series aircraft. This is the first time that a practical anti-skid system has been available for the King Air platform. The STC applies to Beechcraft King Air B300 series aircraft equipped with Rockwell Collins Pro Line GPS 4000S or Garmin G1000/430W/530W avionics.

The Advent eABS may be ordered through all Textron Aviation company-owned service centers, as well as selected independent authorized King Air service facilities (see *www.aircraftsystems.aero/dealers.php*). In anticipation of the STC, Advent has produced a limited number of eABS units that are available for immediate shipment to service centers.

The Advent eABS is a proven, lightweight, low-cost and easily-installed anti-skid braking system designed especially for turbine powered aircraft up to 20,000 lb. MTOW. The system has excellent braking performance and requires no change to existing braking system components. Installation requires minimal downtime, either as a stand-alone installation or during scheduled maintenance.

The Advent eABS adds a new level of runway performance and dispatch reliability for King Air operators by providing better directional control, reduced tire wear and shortened stopping distances on dry runways or those contaminated with water, ice and snow. The Advent eABS will eliminate flat-spotted and blown tires during aggressive stopping and includes touchdown protection and a programmable low-speed cut-off. Improved tire wear and less risk of a flat-spotted or blown tire saves the operator money and the time and expense of an unplanned downtime.

To complete certification, a new King Air 350i and flight test support were provided by Beechcraft under a collaborative agreement with Advent. During functional testing typical of day-to-day operations, Beechcraft test pilots reported enhanced responsiveness and directional control in landing and accelerate/stop tests on both dry and wet runways with the eABS-equipped King Air 350i, to include a heavy weight landing on a dry runway that resulted in a reduction of about 400 feet in landing distance. In addition to the B300 series, Advent intends to pursue approval for the King Air B200 series "in the near future."

The collaborative agreement with Beechcraft included company testing designed to explore, under a separate STC, a revision to the B300 Pilot Operating Handbook (POH) offering reduced landing distances and takeoff field length, which can in turn offer increased payload/range options. Current B300 landing and accelerate/stop distances were certified under FAA regulations which preclude any benefit from reverse thrust in the calculations. However, FAA regulations do allow the use of anti-skid brakes in certifying landing and accelerate/stop performance.

Compared to existing POH distances, data gathered during company performance testing demonstrated a reduction in B300 landing distances and takeoff field lengths of approximately five percent and 10 percent respectively with the Advent eABS installed and without the use of reverse thrust in dry runway conditions. Once approved by the FAA, the new shorter distances could be of significance to B300 FAR Part 135 and Part 91 subpart K operators in planning for destination or departure airports. For landing, these operators must apply a factor of 1.67 to the published POH dry runway landing distances when selecting a destination airport. In wet or contaminated runway conditions, these same operators must apply an additional factor of 1.15 to the computed dry runway distance and the required effective runway length becomes even greater. Reduced takeoff field length can offer range/payload benefit for a given runway length or allow shorter field lengths for a given aircraft weight. For both Part 91 and Part 135 operators, a Single Engine Inoperative landing increases initial POH calculated dry landing distances by about 20 percent before applying any other factors.

FAA Certifies Raisbeck Swept Blade Propellers for King Air 350s

Raisbeck Engineering announced the FAA certification of its 4-Blade Swept Propellers for the King Air 350 family. The FAA certification follows a four-year development program, including two-and-a-half years of flight testing of five different designs, including three five-blade versions. Since launching the Swept-Blade program, Raisbeck's engineers have flight-tested 12 different propeller designs on King Airs.

The company's engineers are now developing a companion EPIC Performance Package for the 350,

which includes a target increase in Maximum Power Cruise Speed of over 10 knots. It will be an option for 350 prop purchasers, and only offered with the Swept Blade Propellers. Current buyers of 350 propellers will be offered a very special price if they desire the EPIC Performance Package at a later date.

For more information about Raisbeck Engineering and its products, visit *www.raisbeck.com*.

Icarus Introduces Voice Alert System for Loss of Cabin Pressurization

Icarus Instruments has introduced VAS, Voice Alert System, which warns pilots of a slow loss of cabin pressurization. VAS provides redundancy by verbally annunciating the need for supplemental oxygen through the pilot's headset.

The pilot sets the alert threshold to any altitude between 7,000 and 15,000 feet, normally slightly above the normal maximum cabin altitude. Should the cabin reach this altitude, a "Don Oxygen Mask" message is heard well before hypoxia can impair the pilot.

VAS has an internal, solid state pressure sensor, which continuously measures the cabin altitude. Pressing a button on VAS annunciates the current cabin altitude as a backup to the panel ECS instruments.

VAS installs in-line with any active noise reduction headset using the standard six-pin plug. To ensure reliable ATC communication, VAS internally connects the headset directly to the audio panel, bypassing all of its active electronics until a VAS message is needed. Powered from the aircraft, VAS does not use batteries.

An optional installation kit allows the Master Warning and Master Caution lights to be connected to VAS. Should either of these lights illuminate, a "Check Master Warning" or "Check Master Caution" alert will be heard.

Icarus Instruments has been providing altitude warning products for 28 years. Its new VAS is the first device to provide voice alerts for pressurization failures.

The VAS device is priced at $395 and the optional install kit for the Master Warning/Caution lights is $49. VAS is available through the company's website.

For more information or to purchase, visit *www.donmask.com*.

King Air Technically...

RECENT SERVICE BULLETINS, ADVISORY DIRECTIVES AND SAFETY COMMUNICATIONS

From King Air Communiqué 2016-01

Issued: January 2016

ATA 00 – Introduction of Block Point 2015 King Air with New Fusion Avionics C90GTi, B200GT/B200CGT (250), B300/B300C (350i)

NOTE: The Block Point 2015 Fusion Equipped Airplanes have a different inspection program. Please study the appropriate manual to become familiar with the differences between the inspection programs.

The King Air Fusion avionics upgrade was announced early in 2015. The first Fusion King Air was delivered the fourth quarter of 2015.

The serial effectivity for the Fusion upgrade is as follows:
Model C90GTi King Air is LJ-2129 and after Model B200GT/B200CGT (250) Super King Air is BY-207, BY-239, BY-250 and after; BZ-1 and after Model B300/B300C (350i) Super King Air is FL-954, FL-1010, FL-1031 and after; FM-66 and after.

The King Air Fusion airplanes will have a new set of Maintenance Manuals and Wiring Diagram Manuals. However, the Illustrated Parts Catalog, Airworthiness Limitations Manual, Structural Inspection and Repair Manual and Component Maintenance Manual will be the same as the non-Fusion King Airs.

The part numbers of these new manuals are as follows:

Model C90GTi King Air:
Maintenance Manual: 434-590171-0009
Wiring Diagram Manual: 434-590171-0011

B200GT/B200CGT (250):
Maintenance Manual: 434-590168-0009
Wiring Diagram Manual: 434-590168-0011

Model B300/B300C (350i) Super King Air:
Maintenance Manual: 434-590169-0009
Wiring Diagram Manual: 434-590169-0011

NOTE: Older King Airs upgraded to the Fusion Avionics via STC will NOT be covered by the manuals listed above. These airplanes will still be covered by their original manuals and any Information for Continued Airworthiness (ICA) associated with the STC.

Other notable items contained in the Block Point 2015 that are worth mentioning ***(corrected from King Air Communiqué 2016-2):***

- The Venue System in the B300 (350i) will be removed
- All three King Air models will have electronic window shades
- Wi-Fi will be available as an option on C90, Standard on B300/B300C (350i) and B200GT/B200CGT (250) (Operator must choose between Domestic or International)

- New Inspection Program
- New Emergency Locator Transmitter (ELT) – Now: C406-N which transmits GPS Location (Latitude & Longitude)

From King Air Communiqué 2016-02

Issued: February 2016

ATA 00 - FAA Flight Standardization Report (FSB) & EASA Operational Suitability Data (OSD)

The FAA Flight Standardization Reports (FSB) and EASA Operation Suitability Data (OSD) for the King Air aircraft are accessible on the Textron Aviation Support web site. Direct your browser to *www.txtavsupport.com* and follow the steps shown to gain access to this information. You will first need to create an account on this web site if you do not have one already.

ATA 28 - Service Bulletin 2037 Rev. 1, Correction Effectivity Listed in SB

Service Bulletin 2037, Rev 1 provided a figure with Fuel Probe Wiring Diagram. This figure listed the part numbers of the drain tubes, 101-120208-57 and 101-120208-83. These part numbers were listed in the Service Bulletin in error. The correct part numbers are 101-12010857 and 101-120108-83 respectively.

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

KingAir

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Photo courtesy of Beechcraft