# King Air

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

SEPTEMBER 2020 • VOLUME 14, NUMBER 9 • $6.50

## Raising the flag(ship)

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September 2020 Volume 14 / Number 9
A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

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**SUBSCRIPTIONS**

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

**COVER PHOTO**
Courtesy of Textron Aviation




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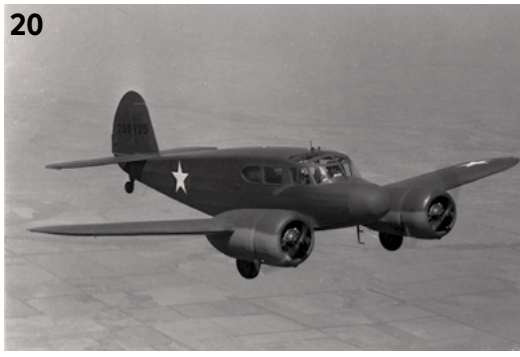
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THE NEXT LEVEL

# New King Air 360

## gets technology & comfort upgrades

by MeLinda Schnyder

Two major upgrades in the Pro Line Fusion avionics-equipped cockpit are the IS&S ThrustSense Autothrottle and the new digital pressurization controller.

In a sign of these pandemic times, Textron Aviation last month launched the new flagship of the Beechcraft King Air family with online fanfare only.

On Aug. 4, the company posted a 10-minute recorded video on its social media channels followed by distributing a press release with details of the King Air 360 and 360ER, a blockpoint change incorporating new features and structural updates on the 300-series production line. The new model is currently in production and the company expects deliveries to begin this fall.

Based on the timing of the announcement, there's a good chance that anyone attending the King Air Gathering scheduled for the end of August in Wichita would have heard this announcement in person if COVID-19 had not interrupted plans for the event.

## Raising the flag(ship)

The video announcement featured three company executives, beginning with Rob Scholl, senior vice president of sales and flight operations. He reviewed recent product investments Textron Aviation has made across its product line. When mentioning the King Air line, he said:

"We are always listening to our King Air customers and longtime operators to push the envelope and help their missions. Leveraging their feedback, we have chosen to take a closer look at the different King Air variants currently in production and ask ourselves some serious questions about the aircraft's legacy and, more importantly, its possibilities."

Ron Draper, president and CEO, Textron Aviation, officially announced the King Air 360 and 360ER stating that the enhancements were incorporated through many conversations and the company's collaborative effort and "was the catalyst behind the innovation and next generation capabilities you'll see in the King Air 360."

## Cockpit upgrades, including autothrottle STC

The company says the two major upgrades in the cockpit would improve the overall aircraft operational experience. The Innovative Solutions & Support (IS&S) ThrustSense Autothrottle provides a full regime system that computes and controls the appropriate power levels from the takeoff roll through the climb, cruise, descent, go-around and landing phases of flight. It provides envelope protection that adjusts the power output of the operating engine during engine-out scenarios, which improves overall pilot control and allows the aircraft to accelerate and climb single-engine. The autothrottle is controlled by the new electronic standby instrument.

Textron Aviation also announced it had special type certification (STC) approval of the IS&S autothrottle on King Air 300 series aircraft equipped with Pro Line Fusion avionics and new production King Air 360 turboprops. This is in addition to the STC that was received in 2019 for Pro Line 21-equipped King Air 200 series aircraft.

Another update in the cockpit is the new digital pressurization controller, which automatically schedules cabin pressurization during climb and descent, reducing pilot workload and increasing overall passenger comfort.

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**"We are always listening to our King Air customers and longtime operators to push the envelope and help their missions."**

**Rob Scholl**
**Senior Vice President**
**Sales and Flight Operations**

The pressurization gauges have been integrated with the Collins Aerospace Pro Line Fusion flight deck.

"Structural changes have allowed us to increase the maximum cabin pressure, which results in a 10% lower cabin altitude compared to the King Air 350i," Scholl said. "For example, while flying at 27,000 feet, cabin altitude is just 5,960 feet. Another added benefit of the digital pressurization system is that it allowed us to eliminate some of the various indicators above the throttle. For example, the cabin pressurization gauges, along with the flap indicator, have been integrated into an electronic readout at the bottom of the Collins Aerospace Pro Line Fusion MFD."

## New seats and a complete cabin redesign

During the video announcement, Christi Tannahill, senior vice president of customer experience, which includes interior design and engineering, marketing, customer accounts and deliveries, called out other comfort improvements beyond improved cabin altitude levels. She described the changes as a collection of small refinements that make a big difference: additional legroom, increased table heights and higher sidewall armrests.

You'll feel a greater sense of openness in the cabin and will notice the all new interior schemes. The complete cabin redesign also features custom-built cabinetry, partitions and side ledges, and upgraded materials and finishes. Other amenities that come standard on the entire King Air lineup include pull-out work tables, standard power outlets, USB charging stations and a private aft lavatory.

*King Air* magazine reached out to get more insight on the cabin redesign from Tannahill, who joined Beechcraft in 1999, working within customer support

The King Air 360ER will primarily be used for special missions purposes, including aerial survey, air ambulance, surveillance and utility transport.

## KA360: A Closer Look at the Details

The base price for the King Air 360 is $7.9 million, with the 360ER listed at $8.8 million. Textron Aviation says the aircraft has the same specifications as the 350 models, with no changes to range or weight.

**Standard Features:**

IS&S ThrustSense Autothrottle
Digital Pressurization Indication
Collins Aerospace Pro Line Fusion Avionics Suite
Three 14-inch touchscreen displays
Synthetic Vision
Graphical Flight Planning
Integrated Charts and Maps
Engine Indicating and Crew Alerting System (EICAS)
Dual Flight Management System (FMS)
Multi-Scan Weather Radar System (WXR)
Integrated Terrain Awareness and Warning System (ITAWS)
Traffic Alert and Collision Avoidance (TCAS II)
Automatic Flight Guidance System (AFGS)
Dual Navigation and Communication Radios

| | |
|---|---|
| **Dimensions:** | |
| Length | 46 ft, 8 in (14.2 m) |
| Height | 14 ft, 4 in (4.4 m) |
| Wingspan | 57 ft, 11 in (17.65 m) |
| Wing Area | 310 sq ft (28.8 sq m) |
| Wheelbase | 16 ft, 3 in (4.95 m) |
| Tread | 17 ft, 2 in (5.23 m) |
| **Cabin Interior** | |
| Height | 57 in (1.4 m) |
| Width | 54 in (1.37 m) |
| Length | 19 ft, 6 in (5.9 m) |
| Maximum Occupants | 11 |
| **Baggage Capacity** | |
| Weight | 1,150 lbs. (522 kg) |
| Volume | 71.3 cu ft (2.02 cu m) |
| **Weights:** | |
| Maximum Ramp Weight | 15,100 lbs. (6,849 kg) |
| Maximum Takeoff Weight | 15,000 lbs. (6,804 kg) |
| Maximum Landing Weight | 15,000 lbs. (6,804 kg) |
| Usable Fuel Weight | 3,611 lbs. (1,638 kg) |
| Usable Fuel Volume | 539 gal (2,040 l) |
| Basic Empty Weight | 9,955 lbs. (4,516 kb) |
| Useful Load | 5,145 lbs. (2,334 kg) |
| Maximum Payload | 2,545 lbs. (1,154 kb) |
| Full Fuel Payload | 1,534 lbs. (696 kg) |
| **Performance:** | |
| Maximum Cruise Speed | 312 ktas (578 km/h) |
| Maximum Range | 1,806 nm (3,345 km) |
| Takeoff Field Length | 3,300 ft (1,006 km) |
| Landing Distance | 2,692 ft (821 m) |
| Maximum Operating Altitude | 35,000 ft (10,668 m) |
| Maximum Climb Rate | 2,700 fpm (823 mpm) |
| Maximum Limit Speed | 263 kias (487 km/h) |
| Stall Speed | 81 kcas (150 km/h) |

A complete cabin redesign for the King Air 360 features custom-built cabinetry and upgraded materials and finishes, as well as additional legroom and increased table and sidewall armrest heights.

and eventually leading that team. At Textron Aviation, she led the turboprop aircraft and interior design organizations before broadening her responsibilities in her SVP of customer experience role.

"We have spent a lot of time gathering feedback from customers around overall comfort in the cabin," she told us. "The team has done a lot of research to help determine what variables add or detract from customer comfort, such as seating."

Her team digitally pressure mapped the seats in order to relieve hot spots under the tail bone and add additional support under sit bones and thighs. The process started in the development shop where the team put together a cushion buildup. A test subject sat on the cushion using the pressure mapping for an allotted time period. The team analyzed the captured data to determine hot spots and continuously tweaked the design and retested with the test subject until they had a cushion buildup with the right support in the proper areas.

Two other test subjects were tested on the seat design to ensure it supported other body frames, then the team took the final seat cushion buildup out to customers for evaluation and feedback.

Another change based on customer feedback is reverting to manual pull down window shades with the new model.

Christi Tannahill, senior vice president of customer experience for Textron Aviation says customer feedback aided in improving seat comfort and reverting back to the manual pull down window shades.

"While the monochromatic shades in the King Air 350i were technologically more advanced, we received some feedback around the usability and maintainability of them," she said. "Many customers just want to quickly adjust the lighting in the cabin and the manual shades give them this opportunity. The manual shades are also easier to maintain."

## In-service yet this year

The King Air is still the best-selling business turboprop family in the world, with nearly 7,600 delivered around the world. The global fleet, which includes about 1,300 of the King Air 350 series, has surpassed 62 million flight hours in its 56 years.

With the King Air 360 already on the production line, it won't be long before it enters service. As we went to print, Textron Aviation was teasing that the launch customer is a first-time aircraft owner and will take delivery before the end of 2020.

Tannahill wouldn't divulge any other plans for the line beyond a warning to stay tuned.

"The King Air series continues to be an important part of our lineup at Textron Aviation and we are committed to investing in the platform," she said. "The announcement also showcases our commitment to our current customers and fielded aircraft with the autothrottle available as an upgrade in the aftermarket at the same time." KA

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# Checklists and CRM

by Deanna Wallace

When I was new to the aviation world, just acquiring my certificates and ratings, I would watch corporate aircraft of all sizes taxi onto the local ramp and enthusiastically greet pilots with my opinion on what a beautiful aircraft they had and how I couldn't wait to fly one myself one day. Every now and then a crew member would make my day by allowing me to climb aboard and take a peek around, teasing me that "if I could get it started, I could take it for a spin." Of course, I knew nothing about starting a turbine engine and their aircraft was safe from a flight by this fledgling pilot-in-training, but it didn't keep me from dreaming about the day I'd be qualified to fly a turbine-powered aircraft myself … or even get the engine started.

Four years after beginning my flight training, I finally got the opportunity to fly right seat in a King Air 300 as a contracted co-pilot. I was not type-rated, but I was a quick learner and decent on the radios. The pilot-in-command (PIC), a wonderful man named Joe Wright, was a flight instructor that took the time to teach me the nuances of the airplane, share stick time, and mentor me in the corporate aviation world he had operated in for decades. He did not legally have to have me in that seat to fly the Part 91 operation, but he utilized me as if I were a required crewmember on every flight, in contrast to a PIC I later flew with that told me to sit on my hands and touch nothing. Both equally shaped my attitude toward flying in a crew environment.

Almost 20 years later, typed and single-pilot qualified on the King Air 300/350 airframe myself, I rarely leave with an empty right seat on trips. There are simply far too many eager aviators looking for a professional mentor and turbine experience for me to depart without a co-pilot, even one not experienced on the airframe. It matters not to me whether my co-pilot holds a private pilot certificate or is an ATP, they add value to the trip, reduce my workload when properly instructed, and, in turn, they gain valuable experience within the corporate sector that is difficult to come by for many aviators. I love introducing pilots to turbine aircraft, new performance considerations, and known, but formerly

(credit: Clint Goff Photography)

unused, phraseology … perhaps you remember the struggle the first time you had to remember to use the term "flight level" for altitudes or "torque" for power settings.

I mention all of this to say: mentors are important, attitudes are everything, and how you were introduced or how you may introduce other pilots to a dual-pilot, crewed cockpit will shape interactions with every other pilot (positively or negatively) in cockpits where crew (or cockpit) resource management (CRM) is a key component of a well-executed flight. Sadly, in cockpits where a single pilot is all that is required, CRM is a vastly underrated resource that many fail to use.

In early August, the NTSB released the full docket of information for the King Air 350 crash in Addison, Texas, on June 30, 2019. While it does not include the final findings on the cause of the accident (that will come later), it gives those that like to study such things a lot of detail and insight into the information gleaned regarding the pilot, aircraft, environment and other potentially contributing factors. As a lifelong student of human factors, accident investigation and analysis has always fascinated me, as the vast majority of accidents have some sort of human factor component as a major or contributing factor. While the NTSB will provide us with the official cause of this accident, a couple of human factor items in the informational docket stood out as something we can all take away regarding CRM and checklist usage.

From the very first flight hour, checklist usage is drilled into student pilots by flight instructors. As pilots progress through training, they memorize mnemonics, phrases, flows and emergency checklist items that keep them on track during high workload times, but there is never a phase of flight when a checklist should not be referenced immediately preceding or immediately following a change in flight conditions. My personal preference is using a "flow" during normal operations and following up with a checklist rather than using the checklist as a line-by-line, to-do list as the pilot is reading it. I believe knowing how your aircraft should be configured, how that configuration makes it behave and what cockpit indications should look like during each phase of flight is important to recognizing when something is abnormal or wrong. With that being said, experience should never be used in lieu of proper checklist usage, as even the most proficient pilot can have contributing factors that cause them to misstep from time to time. A checklist is cheap insurance against missing something critical to a particular phase of flight.

During the course of the investigation into the Addison accident, the NTSB took several witness statements that indicated the PIC disregarded checklist usage as a normal course of action. Statements from known acquaintances and other co-pilots included phrases such as, "pilot did not utilize the checklist during the normal operation of N534FF," "bad about using checklists," "not strong on using checklists" and that the PIC was

"impressed with anyone who could climb into the airplane and take off with minimal use of a checklist." The cockpit voice recorder from the accident aircraft was noticeably void of any audible checklist callouts by either the PIC or co-pilot from the time preceding engine start until they were cleared for takeoff. The PIC was a vastly experienced pilot with over 16,000 hours of total time, most of that in jets, 3,100 hours in turboprops and 1,100 hours in the King Air 300. He was presumably proficient with 200 hours of flight time reported within the last 12 months preceding the accident. With all that experience, he likely knew the airframe procedures well and I can imagine he rarely missed anything critical to a particular phase of *normal* flight, despite his non-use of checklists … otherwise we would have been reading about an accident earlier than this one.

Whether the PIC's disregard of pre-takeoff checklist usage contributed to a missed item critical to the safety of the flight is yet to be determined, but the practice certainly did not help the situation. Checklist callouts and challenges are a great tool in the CRM toolbox when flying with someone in the right seat … even a non-pilot, front seat passenger can read a checklist for verification by the pilot flying. An added bonus is the use of checklists, even abbreviated, is a great tool to help a co-pilot new to the airframe learn aircraft systems, normal configurations and parameters.

Another standout item in the released NTSB documents was the lack of recorded communication between the PIC and co-pilot specific to the operation of the flight. Although the co-pilot was not typed in the 300 series, he did have PIC time in other King Air models and would have been familiar enough to have been of some use in the event of a briefed emergency. On this particular flight, there was no CVR recorded pre-departure crew briefing and acquaintance statements described the PIC as a "'gear up, shut up' kind of guy'" and "the 'old cantankerous captain'." This type of attitude by a PIC lends itself to a marked lack of one of the best CRM tools around, that of the challenge. When a crewmember is led to believe that they are not actually needed, that their input is lesser than the PIC's opinion, or that the PIC should not be challenged, a breakdown in effective cockpit communication occurs and the pilot not flying is relegated to passenger status, not that of a valuable crewmember. A proper and thorough crew briefing prior to takeoff should have included elements pertaining to an engine out scenario prior to and after V1, as well as what is expected of the pilot not flying immediately after liftoff.

Items such as guarding the power levers, adjusting the friction locks, when to raise flaps, turning on the yaw damper, etc., are all items I like to brief prior to the takeoff, especially for co-pilots new to flying with me. If you have a capable co-pilot and are not utilizing them to decrease your workload so you are better able to troubleshoot abnormalities during and immediately following takeoff, I highly recommend you review your procedures and see what duties you may delegate (at your command). Start looking at CRM and proper checklist usage as valuable tools that can be used to safely execute a planned flight, as well as foster an appreciation for safety and communication in other pilots you fly with. KA

Deanna Wallace has amassed over 6,000 flight hours since she started flying in 1997 and is a 20-year Gold Seal CFI/CFII/MEI with more than 2,000 hours dual given. She holds a Bachelor of Aviation Management from Auburn University and a Master of Aeronautical Science from Embry Riddle Aeronautical University. Deanna is single pilot typed in the King Air 300/350 and flies all King Air variants regularly, including the B100 with TPE-331 engines. Through her East Texas employer, Casey Aviation, she flies Part 91 managed King Airs, ferries aircraft worldwide and actively instructs owner-pilots in the PA46 piston and turbine series aircraft.


# Manual Environmental Control Modes

by Tom Clements

If your King Air is a senior citizen built before the late 1970s, I am betting that you are quite familiar with the use of the "Man Cool" and "Man Heat" modes of operation of your environmental mode selector. Why? Because the kinks associated with the Auto mode of environmental control had not yet been worked out and hence the Auto mode was so erratic in its operation that few pilots used that mode. But, by the late '70s, the Auto mode had been quite well-perfected and therefore it was rarely necessary to use the manual modes. But there will come the inevitable day when the Auto mode fails and you must revert to the manual modes. This article's intent is to review and remind you of how to best do that.

For the Auto mode to work properly – giving you the desired cabin temperature – it must know three things: (1) the desired cabin temperature; (2) the current cabin temperature; and (3) the temperature of the air flowing into the cabin. Let's say you are filling the bathtub before the kids get in to bathe. Those same three parameters (but now dealing with the bath water temperature instead of the cabin air temperature) are being checked by you. (1) you know from past experience what the desired water temperature is; (2) you swish your hand in the tub to see what it currently is; and (3) you place your wrist under the faucet to gauge the temperature of the new water flowing in. Right?

In the King Air, the desired cabin temperature (1) is set by the position of the Cabin Temp rotary knob. It is quite common to find that placing the pointer on the knob between the 6 o'clock and 8 o'clock positions will give a comfortable, 72-degree-like, cabin temperature.

The current cabin temperature (2) is detected by a sensor almost always located in the cabin's headliner. This sensor has a small fan attached to it that draws cabin air up and over the sensor to allow it to get a more accurate reading. Since the sensor is only a couple of inches away from the aluminum skin at the top of the fuselage, at cruise altitude it would tend to feel a temperature significantly colder than actual cabin temperature were it not for the fan.

Finally, the temperature of the incoming air (3) is detected by a sensor located in the duct that comes from the mixing plenum under the copilot's rudder pedals. The mixing plenum, or chamber, is so-named since it is where new incoming bleed air mixes with recirculated cabin air. The temperature sensor is installed in the branch going from the plenum to the cabin floor outlets.

If any of these three sensors goes bad, it makes the Auto mode operate poorly. In fact, one of the most common malfunctions is caused by failure of the fan in the ceiling. This leads to that sensor feeling too cold and thus the Auto system makes the cabin too hot as it tries to correct the too cold cabin temperature it now senses. Given enough hours flying the King Air, I can guarantee that your Auto mode will malfunction and lead you to use Man Heat or Man Cool until the problem is found and corrected. Let's talk about those modes.

There are a few meaningful differences in the operation of the manual modes depending on the King Air model being discussed. Specifically, the model 200- and 300-series differs from the 90- and 100-series. I will begin by discussing the 90- and 100-series. From the first C90, LJ-502, to the latest C90GTx – including all E90s, all of the F90-series, and all of the 100-series – their environmental systems are virtually identical.

Three components can and do affect the cabin temperature in this group of airplanes. First, bleed air. The air that has been compressed – and thereby heated – by the engine's compressor is known as "P3 Air" since it originates from the engine station #3, the "Combustion Chamber Inlet" which is also the compressor outlet. A relatively small portion of P3 air is tapped off of the engine and sent to the Flow Control Unit (flow pack) mounted inside the cowling on the forward side of the firewall. The flow pack often mixes some ambient air with the bleed air before sending it to a junction in the leading edge of the wing's center section. Following one of the two paths at the junction finds the air going directly to a device called the bypass valve. Following the second of the two paths finds the air flowing across the metallic fins of an air-to-air heat exchanger. Flowing across the other side of the fins is ambient air that has entered the ductwork containing the heat exchanger from

a large hole in the wing's center section leading edge. Similar to an automobile's radiator – where the engine's hot water transfers energy to the colder ambient air flowing across its fins – the air-to-air heat exchanger allows the bleed air's thermal energy to be transferred into the ambient air which heats up and then blows harmlessly overboard through slots in the bottom of the wing's center section.

The Y-shaped bypass valve controls the temperature of the air feeding into the cabin during the majority of flight time.

The bypass valve is a Y-shaped device, shaped like a slingshot. One of the two tops of the Y is fed by the air from the flow pack that followed the path that did *not* contain the heat exchanger. Of course, this air is relatively hot since it never transferred any of its energy into ambient air. The second of the Y's two tops is fed by the air that flowed across the heat exchanger's fins, lost energy to the ambient air flowing across the other side of the fins and is therefore relatively cold.

Mounted inside each of the two tops of the Y is a "butterfly valve." The dictionary defines butterfly valve as: *A valve consisting of a disk rotating on an axis across the diameter of a pipe to regulate the flow, as in the throttles of many engines.* The two butterfly valves in the bypass valve assembly are operated through 90 degrees of travel by a single electric motor and a gearbox assembly mounted on the top of the bypass valve, the Y-shaped assembly. As one of the two butterfly valves is rotating to open, the other is rotating closed. The motor can stop both valves' travel at any place. Therefore, the flow that leaves the bypass valve assembly – flowing out the handle of the slingshot, you might say, and then on into the cabin – can consist of 100% hotter air that bypassed the heat exchanger and 0% of the cooler air that flowed across the heat exchanger's fins. Or it could be 83% hot and 17% cold; or 50/50; or 25/75; or full cold: 0% hot and 100% cold.

I often teach that a good analogy of a bypass valve is a modern single faucet feeding a sink. By moving the handle, we can control how much water from the hot water line under the sink and how much water from the cold water line mix to feed the faucet. That's what the two – left wing and right wing – bypass valves accomplish in the airplane: They control the temperature of the air feeding into the cabin. At cruise altitude we never need an electric heater nor a refrigerant air conditioning system since the heat we want is readily available from the proper amount of bleed air heat. Do you see why the bypass valves are our "Mighty Little Giants?" They alone control cabin temperature during the majority of our flight time.

Say we are in cruise using our normal procedure of being in Auto mode, the cabin is colder than we desire, and turning up the Cabin Temp rheostat control has had no effect. Time to try Man Heat mode.

We rotate the mode selector to Man Heat and then hold the Man Temp switch up to the "Incr" position for 15 seconds. Why 15? The exact number is not critical but it's a good place to start. To drive both left and right bypass valves from one extreme to the other – full hot to full cold bleed air or vice versa – requires one full minute, 60 seconds. Since going to either extreme is likely unnecessary, that's why I suggest starting with one-fourth of the full travel: 15 seconds. If we use less than that, the change may be so little that we cannot tell if our attempt achieved anything. If we use much more we may overshoot and find that we have a very warm cabin.

Well, hallelujah! It is indeed getting a little warmer! So, we wait 15 minutes or so to see what final cabin temperature we have. Still a little chilly? Then let's hold the Man Temp switch up to "Incr" for, oh, 10 seconds. A half-an-hour later, the cabin is a little too toasty? Then hold down to "Decr" for 5 seconds. Ah … perfect!

Each bypass valve requires 30 seconds of continuous motor running time to drive the butterfly valves from one extreme to the other. The two bypass valves, left and right, run sequentially not simultaneously. For heating – getting more bypassed air and less air from the heat exchanger – the left bypass valve heats first and the right bypass valve heats second. For cooling, it's the opposite: Right side goes full cold before the left side leaves the full hot position. As a pilot there is little need to know which valve heats or cools first. Yet, it explains

why the Emergency Procedure for Environmental Smoke in the cabin directs us to close the *left* Bleed Air switch first. You see, that is always the hotter of the two sides unless they are both in the full hot position … and that occurs very rarely.

What's the difference between Man Heat and Man Cool? In both modes we have identical manual control of bleed air temperature as we have been discussing. The difference involves the other components that can contribute to cabin temperature control: The freon air conditioning system and the electric heater system.

In the example I just presented – of having a chilly cabin in cruise and reverting to Man Heat mode to correct – I never mentioned that the electric heater would also be activated and the cabin would likely get much too warm. Well, wouldn't it?! Probably not. Why? Because the electric heater didn't come on. Quiz time: Why not?

If you, like most King Air pilots, turn the windshield heat on before the OAT drops below freezing – many of us do it passing 10,000 feet – then that action locks out the electric heater. Remember that the electric heater pulls so much electric power that the system designers never wanted this "comfort" item to rob electricity from more important "safety of flight" items. Hence, there are two or three "lock out" items that render the heater inoperative: Windshield Heat, Prop Heat and – for the earlier "Chin Style" cowling airplanes – Lip Boot Heat. On the other hand, if none of these lock out items are on, then yes, you should move the Electric Heat switch down to Off before selecting Man Heat so that the heater cannot come on and subsequently make the cabin too warm.

(Landing at Fairbanks in January using Man Heat? I suggest turning off the lock out items once you are in VMC to allow the electric heater to join in the fun!)



Before I continue to discuss Man Cool, time for another quick quiz. What malfunction can lead to lack of sufficient heat in cruise that *cannot* be remedied by switching from Auto to Man Heat?

There are two common answers. The first answer is lack of bleed air. If one flow pack is very weak or fails completely so that it is supplying no air into the cabin, very often this failure will be noted first by lack of heat not by lack of pressurization. Either flow pack alone *should* be able to maintain maximum Differential Pressure (△P), even though a lot of King Airs have excessive leaks that prevent this from happening. So, realize that a lack of heat that cannot be remedied by use of Man Heat often points to a dead flow pack.

The second common reason for why the use of Man Heat will not solve the problem of a too cool cabin is that a bypass valve motor has failed. When and if that happens then regardless of whether the command for more heat comes from the automatic controller – often referred to as the "Barber-Coleman" box – or from the Man Temp switch, the butterfly valves cannot move. They are locked in their last position. Since the valves move sequentially, the failure of one valve will prevent the other valve from ever receiving a signal to move.

Now for Man Cool. Identical to Man Heat, this mode gives the pilot control of Bleed Air temperature and Bypass Valve position via the "Man Temp Incr – Decr" switch. But now, instead of asking for the electric heater to join in, the air conditioning system is told to operate continuously.

Returning to our discussion of using Man Heat in cruise. As we now begin our descent into Houston in July, we have been holding the Man Temp switch down to Decr periodically until we are sure the accumulated time of use has surpassed 60 seconds … the bleed air is as cool as it can get. Yet the cabin is getting noticeably warm.

Time to select Man Cool and let the air conditioning come on.

When you move the mode selector to Man Cool it's a good idea to watch the load meters. You hope to observe a very major electrical load increase since the compressor motor pulls nearly 150 amps. Ah … here comes the cool air out of the vents! It is unlikely, but possible, that the cabin will actually get a bit too cold. If so, hold the Man Temp switch up to the Incr position for a few seconds to warm up the incoming bleed air. As you continue the descent to your landing it will be typical to again hold the Man Temp switch to Decr until you know the bleed air is as cool as possible.

I often teach that there are actually three, not two, modes of Manual temperature control. The first one is using Man Cool to run the AC continually but with manual regulation of bleed air temperature. The second one is using Man Heat to run the normal electric heat grids continually but with manual regulation of bleed air temperature. The third one – and the one that will likely be used the most – is using Man Heat to allow manual regulation of bleed air temperature but with the Electric Heat switch in the Off position so that no heater grids may operate. Of course, having any of the lockout items on accomplishes the same thing as moving the Electric Heat switch to the Off position.

I will close by discussing the differences in the 200- and 300-series. (Realize that the B300s [350s] after serial number FL-500 have a totally new and different environmental system: The "Keith" system. Our discussion does not apply to them.) The manual control of bleed air temperature via the Man Temp switch stays the same: 30 seconds per side to go from one temperature extreme to the other; left side heats first, right side follows; right side cools first, left side follows. There is no electric heater in the first 1,400-plus of the BB-series except for the puny radiant heat panels in the cabin ceiling. These play no role in either the Auto or Man Heat modes of operation. They have their own On-Off switch that functions without any tie-in to any other environmental control. When grid heaters in the forward and aft underfloor environmental ducting replaced the radiant heat panels in 1993 – and which all 300s and the earlier 350s have – they were designed to be a ground use item only. They do not operate in flight since bleed air should always be sufficient to supply the desired heat. (But not when a flow pack is dead!)

There is a significant difference when it comes to Man Cool: The AC system only gets a command to operate when the left Bypass Valve is at or very near the full cold position. This seems to make sense – why engage the compressor clutch, start pumping Freon, and add workload to the right engine until the bleed air is cold? Yet the 90- and 100-series, as we have discussed, allow for AC being on even with full hot bleed air coming in! To recap, in most situations in the 200- and 300-series there is no difference between Man Cool and Man Heat … they both provide manual control of bleed air temperature via the Man Temp switch. You only add in AC when in Man Cool *and* the Man Temp switch has been held to DECR long enough to send the bypass valves fully cold.

I hope this review has given you a good reminder of how the Manual modes operate and some tips that will prove to be worthwhile when and if you must revert to their use. KA

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*" and "*The King Air Book II*." 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 books, 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*.

# Cessna's First Twin

Cessna Aircraft Company's commercial Model T-50 was designed for airlines and air taxi service but evolved into one of the best twin-engine military trainers of World War II.

by Edward H. Philips

In June 1939, officials of the Cessna Aircraft Company announced a major expansion of facilities that would allow for increased production of the single-engine *Airmaster* and the Model T-50 – Cessna's first twin-engine airplane. The final assembly building would make 28,000 square feet of floor space available at a cost of $50,000.

Although the Airmaster had sold well, it had reached its limit of development. What Cessna needed, according to its leader Dwane L. Wallace, was a twin-engine ship that could carry five people at speeds approaching 200 mph and sell for $30,000. It would be aimed chiefly at air taxi and small airline operators. Wallace, however, realized that if the war raging in Europe spread to the United States there would be great demand for training aircraft, and a military version of the T-50 could be a prime candidate.

The prototype Cessna T-50 made its first fight in March 1939 with Dwane L. Wallace at the controls. The V-shaped windshield was used only on the prototype. (Robert J. Pickett Collection)

Introduction of the Cessna T-50 marked the company's entry into the light, twin-engine market. The monoplane represented Wallace's determination to expand Cessna's product line. It was the right airplane at the right time. (Textron Aviation)


A Royal Canadian Air Force Crane 1 leads a U.S. Army Air Corps AT-17 during a production test flight. The colorful stripes on the AT-17's rudder began to disappear from production airplanes early in 1942. (Robert J. Pickett Collection)

Two years earlier, in the autumn of 1937, Wallace put Tom Salter and his engineering staff to work developing concepts for a twin-engine Cessna. After 18 months of work, much of it supervised by Wallace, the prototype T-50 was ready for its first flight. On Sunday, March 26, 1939, Wallace and factory manager William "Bill" Snook climbed aboard the monoplane for a 20-minute jaunt into the blue skies above Wichita, Kansas. Satisfied with the initial flight, the next day Dwane took the airplane up for a one hour, 40-minute excursion that carefully probed handling characteristics, high and low speed performance, stalls and systems operation.

A six-month flight test program was conducted and a few changes were made that included replacement of the V-shaped windshield with two panels of curved glass and enlarging the aft cabin windows. In March 1940, the Civil Aeronautics Authority (CAA) issued Approved Type Certificate (ATC) 722 for the Model T-50. The CAA then ordered 13 airplanes that were assigned to inspectors responsible for overseeing manufacturers located in different regions of the nation. Another seven airplanes were purchased by private pilots and air taxi operators.

There was nothing revolutionary about the T-50. It was a fabric-covered cabin monoplane with a one-piece wood wing and a fuselage built of welded steel tubing, conventional landing gear and was powered by two, seven-cylinder Jacobs L-4MB static, air-cooled radial engines each rated at 225 horsepower turning Curtiss-Reed metal, fixed-pitch propellers. At nearly 10 feet in length, the cabin was spacious with more than enough room for the pilot and four passengers. Entry and exit was through a door on the left side of the fuselage.

By 1940 America was gearing up for war. It was supporting Great Britain with massive amounts of weapons and equipment as diplomatic relations with Japan deteriorated. In May of that year President Franklin D. Roosevelt asked Congress for money to build 50,000 airplanes, and in July the War Department awarded Cessna Aircraft Company an order for 33 twin-engine advanced trainers designated AT-8. The contract

was worth more than $800,000 and was the largest order the resurrected company had received up to that time.

The AT-8 was one of the first airplanes built for the U.S. Army Air Corps for training pilots to fly multi-engine aircraft. It was nearly a direct copy of the commercial T-50 except for the addition of small windows in the cockpit roof, and replacement of the Jacobs engines for nine-cylinder Lycoming R-680 powerplants, each rated at 290 horsepower and equipped with two-blade Hamilton-Standard constant-speed, non-feathering propellers. In addition, government furnished equipment (GFE) such as radios, headsets and instrumentation were included, along with an overall aluminum color paint scheme.

As Great Britain reeled under the might of Germany's Luftwaffe, it needed pilots by the thousands to carry the war to Adolph Hitler. As a result, England, Canada and Australia formed the British Commonwealth Air Training plan designed to pool resources of the three countries. Foremost among these was Canada – a continent-sized airbase that stood little chance of being attacked. In the summer of 1940, just as the Battle of Britain was heating up, the Royal Canadian Air Force (RCAF) sent a contingent to Wichita to evaluate the T-50 as a potential advanced trainer. It appealed to the RCAF for a number of important reasons: Cessna's twin was a modern design, well suited to the task, possessed economy of operation, was manufactured of non-strategic materials, could be easily repaired in the field and, most important of all, it was ready for mass production. Convinced that the T-50 was the right airplane for the job, the RCAF soon issued a contract for 180 airplanes designated Crane I. These ships featured 225-horsepower Jacobs engines, wood, fixed-pitch propellers and special cold weather equipment.

During the autumn of 1940, the Cessna Aircraft Company held an order backlog worth more than $5 million but lacked insufficient floor space to build airplanes. Making matters worse, the Army Air Corps expected its first AT-8 before December 31 and the RCAF wanted the first Crane I by Christmas.

In September, the company announced a second expansion program to build a final assembly building 400 feet in length and 200 feet wide to be completed before Thanksgiving. As the manufacturing campus expanded, so did the workforce. The payroll increased


Beginning in 1941 and continuing through 1944, the Cessna Aircraft Company manufactured 5,399 twin-engine advanced trainers, including this AT-17 Bobcat photographed on a post-production test flight. (Robert J. Pickett Collection)

from 200 in July 1940 to more than 500 and then 700 by November. Although many of the people were Kansas natives, a growing number hailed from every state in the union as Cessna, Beech Aircraft Corporation, Boeing Wichita Division and many other small companies in the city and surrounding areas clamored for more workers to build the wings of war.

The Air Corps accepted its first AT-8 on schedule and the first Crane 1 flew north in December. Before the end of the year the RCAF had ordered another 360 trainers bringing the Crane I backlog to 540 aircraft. In May 1941, the 100th Crane I was delivered and Cessna's payroll had increased to 1,900 hard-working men and women. To keep pace with growing demand for the AT-8 and Crane I, in June Wallace announced a third expansion program to provide an additional 3,750-square feet of space for woodworking and assembly. The building was completed in August.

The new facility was humming with activity when in the autumn 1941 the War Department placed an order for 450 Cessna trainers designated AT-17 powered by Jacobs R-755-9 engines. In keeping with the practice of naming military airplanes, such as Hellcat, Wildcat, Corsair and Flying Fortress, Wallace held a contest to choose a name for the AT-17. Hundreds of suggestions were submitted, but the winning entry was "Bobcat."[1]

By December 1941, the Cessna factory complex had been expanded yet again, this time by 20,000 square feet, bringing total floor space to 360,000 square feet. In the wake of Japan's surprise attack on the United States Navy base at Pearl Harbor, Territory of Hawaii, on December 7, commercial production of the Airmaster and T-50 slowed dramatically and had ceased altogether by June 1942 as the company prepared for all-out war production.[2]

One month before the pivotal naval battle of Midway in June, the Cessna factory was placed on a 24-hour work schedule, six days a week. When Christmas rolled around that December, the company had built 1,839 AT-17 and Crane I trainers. The two airplanes were identical except that the RCAF ships had slightly different electrical systems. Only the early production AT-17 airplanes were delivered with Hamilton-Standard constant-speed propellers. Hartzell wood propellers equipped the vast majority of the AT-17 fleet in an effort to save steel and aluminum for combat aircraft.

In 1942 the RCAF ordered another 550 trainers but because of America's entry into World War II, only 182 were delivered to the Canadians. The remaining 368 were built as AT-17A, AT-17C, AT-17D and UC-78C, differing only in minor equipment. The first C-78 airplanes were built in 1942 for light cargo duty before the designation

was changed to UC-78 for utility and cargo missions. Later in the war 67 were transferred to the U.S. Navy and Marine Corps and operated as the JRC-1.

The largest number of the military T-50 model built during the war was the UC-78B, of which 2,156 were manufactured by the time production was halted late in 1944. The AT-17B was produced in 1942 with an order for 655 airplanes, but the last 189 were redesignated UC-78B before delivery. A number of these ships were limited to a gross weight of 5,300 pounds as the AT-17G. The AT-17C production run of 60 trainers was originally to be lend-lease to the RCAF, but the Army Air Corps absorbed the entire order. If gross weight was limited to 5,300 pounds, the AT-17C became the AT-17H. In addition to the 1,052 AT-8 and AT-17 series, and the 3,160 C/UC-78 and JRC-1 airplanes, all 40 of the commercial Model T-50s sold were moved by the military for the duration of the war and received Air Corps serial numbers.[3]

Cessna was not only busy building new airplanes, in 1943 an overhaul facility was operating in a leased hangar at the Hutchinson airport north of Wichita. It was charged with rebuilding, repairing and maintaining AT-8, AT-17 and UC-78 aircraft. The War Department snapped up the opportunity for Cessna to work on its own airplanes, thereby releasing military personnel for other duties. The overhaul depot closed in 1945.

In late 1944 as the war turned in favor of the Allies, the War Department began terminating contracts for all types of airplanes, including trainers. With Germany fighting a hopeless war on two fronts and Japan retreating from the Pacific Ocean toward their homeland, there was no need to keep building the wings of war. At Cessna, the production lines slowly grew more and more quiet, no longer crowded with AT-17, UC-78 and Crane I aircraft awaiting delivery. After workers had built 5,399 twin-engine airplanes from 1940-1944, production shifted to a peacetime footing. Thanks to Dwane L. Wallace and his team of executive management and Tom Salter's engineering staff, the Cessna Aircraft Company had made a significant contribution to the war effort that eventually brought Germany and Japan to their knees.[4] KA

Production of the C/UC-78 during the war exceeded 2,000 airplanes, making it the most numerous military version of Cessna's versatile twin-engine T-50. (Edward H. Phillips Collection)



## Notes:

1 Technically, the name "Bobcat" only applied to the AT-17. The most common nickname applied to any T-50 is "Bamboo Bomber."

2 By early 1942 the company had delivered 25 commercial T-50s including six to the CAA and another 14 to the Pan American Airways System. The PAA ships were built to the same standard as the Crane I.

3 The U.S. military also impressed a small number of Airmasters and aging Cessna DC-6 cabin monoplanes from 1929-1930. The C-34 and C-37 ships were designated UC-77B and UC-77D, while the C-165 was operated as C/UC-94. The old DC-6A and DC-6B were UC-77 and UC-77A.

4 In 1941 Dwane L. Wallace married his long-time secretary, Velma Lunt. He became the company's Chairman of the Board in 1964 and retired in 1982. He died in December 1989. Wallace is remembered as one of America's visionary aviation leaders who played a key role in making Wichita "The Air Capital of the World."

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.

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## Textron Aviation Offering King Air Live Technical Review Sessions

Textron Aviation is inviting King Air owners and operators to a live one-hour technical session with King Air aircraft experts. The sessions will demonstrate resources to streamline your account, review service bulletins and maintenance practices, address FAQs posed to its product support lines and take questions from the audience.

The technical review session for the King Air is scheduled for **Wednesday, Sept. 23 at 10 a.m. (CDT). To register, go to**: *https://register.gotowebinar.com/register/5767556821919663884*

There is also a review session specifically for the new King Air 360, set for **Wednesday, Sept. 30 at 10 a.m. (CDT). To register for this session, go to:** *https://register.gotowebinar.com/register/7600146936794595596*

Textron Aviation noted that they are utilizing a new Citrix Webinar application for the live events, so allow an extra 15 minutes prior to the meeting start time to sign-in allowing the webinar software to install the app plugin, this is on all platforms.

If you have any questions/comments regarding the events, please contact *txtavsupport@txtav.com.*

## Blackhawk Announces XP67A Engine+ Upgrade and G1000 NXi Compatibility for King Air 300s

Blackhawk Aerospace recently announced the Federal Aviation Administration's (FAA) approval for the integration of the Garmin G1000 NXi with the XP67A Engine+ Upgrade for King Air 300 series aircraft. This Supplemental Type Certificate (STC) allows engine parameters from the Blackhawk conversion to be properly displayed on the fully integrated glass panel interface.

The XP67A Engine+ Upgrade for the King Air 300 includes two factory-new Pratt & Whitney PT6A-67A engines and Hartzell 5-bladed composite propellers. This power pairing delivers maximum cruise speeds as high as 343 knots true air speed (KTAS) with an initial rate of climb up to 4,000 feet per minute (FPM). This results in a time to climb from SL to FL350 of 19 minutes – cutting the time to climb by more than half over the stock King Air 300.

For more information about the XP67A Engine+ Upgrade, visit *blackhawk.aero/ka300-xp67a/* or call +1 (254) 755-6711 to receive a personalized quote.

## AvFab Receives STC Approval for Pleated Window Shades in King Air 300 series

Aviation Fabricators (AvFab) is pleased to announce they have received STC approval from the FAA for the installation of its Regal Pleated Window Shades in the King Air 300, B300 and 350 model aircraft, an option for replacing the factory window polarizers. (An STC has been available for the King Air 90 and 200 models since 2011.)

These shades can remain closed on the ramp, unlike the polarizers, and have documented a 10-plus degree Fahrenheit decrease in cabin temps.

The STC'd kit includes everything necessary to convert an aircraft from the polarizers to the AvFab Regal window shades, which weigh a total of 2.2 pounds per window.

Installation time for the 300 model is estimated at 35 hours per ship set, and 45 hours for the B300 and 350 models, all depending on the installation facility's experience-level with window shades.

For more information, go to *https://avfab.com/products/view/king-air-pleated-regal-window-shades/* or call (660) 885-8317. KA



## *Service Bulletin MTB-33-01R: Lights – Replacement of Entry and Ice Light Sockets*

**Original Date:** October 7, 2019
**Revision 1 Date:** July 28, 2020

**Effectivity:** Revision adds Model A200CT (C-12D), Serial Numbers BP-046 through BP-071.

**Reason:** To provide a spares replacement for faulty entry and ice light sockets.

**Original Compliance – OPTIONAL:** This service document can be accomplished at the discretion of the owner.

**Revision Compliance – NO EFFECT:** Airplanes previously modified by this service letter are not affected by this revision.

## *Service Letter MTL-25-02: Equipment/ Furnishings – Aft Curtain Placard Inspection*

**Date:** August 12, 2020

**Effectivity:** This service document is only applicable to the airplanes that have an aft toilet installed.

Super King Air B300, Serial Numbers FL-1 through FL-1224 and Super King Air B300C, Serial Numbers FM-1 through FM-85;

The equivalent of this service document has been incorporated on production airplanes B300, Serial Numbers FL-1225 and on and B300C, Serial Numbers FM-86 and On.

**Reason:** An incorrect placard may have been installed for the aft curtain divider.

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

## *From Multi-Engine Turboprop Communiqué ME-TP-0021*

**Date:** July 2020

### ATA 34 King Air Weather Radar

**Effectivity:** BY-324 and after; FL-1140 and after and FM-76 and after

As of 2019, there are two weather radar options available on the King Air 200 series and 300 series: the standard RTA-852 WXR or the optional MultiScan RTA-4112 WXR. The MultiScan Weather Radar combines several radar scans to display an optimized weather picture. While operating, the radar scans automatically and provides additional information such as turbulence detection and ground clutter suppression. Technicians need to be aware of the model and interface differences when troubleshooting or re-installing a weather radar. System data plates are located at the bottom of the base of the radar.

The RTA-582 WXR provides a single output that is daisy-chained to all AFD's. The MultiScan RTA-4112 WXR provides data to each side of the flight deck display system. If the connectors or the wiring for these systems become switched, the system will not function properly. Many of the same receptacles are used throughout the wiring harnesses for both systems. Utilize the notes on the wiring diagrams to verify that the correct connectors are paired.

### ATA 34 King Air Weather Radar SB8

**Effectivity:** BY-324 and after; FL-1140 and after and FM-76 and after

Communiqué ME-TP-0016 described potential for the RTA-4112 weather radar to lock up and display an error message after 300 flight legs without a manual reset. This is due to non-volatile memory (NVM) capacity management.

Collins has released Service Bulletin RTA-41XX-34-8 Digital Signal Processor (DSP) Communication (COM) Fault Reliability Improvement to prevent faults caused by non-volatile memory re-writes.

Previously, Collins released information document (IDOC) 0168-19 titled Information and Usage of the RTA-41XX NVM Erasure Tool. The IDOC contains procedures and lists equipment to allow the NVM to be cleared in the field prior to it reaching this limit.

To ensure ongoing operation of the RTA-4112, Textron Aviation recommends that operators with this radar either clear the NVM during routine inspections using the procedures in IDOC 0168-19 or incorporate SB RTA-41XX-34-8 so that resets will no longer be necessary.

The RTA-4112 was installed in production as standard equipment beginning at FL-1161 and was a factory option on BY-324 and after. Any Phase 3 B200GT, B200CGT, B300, B300C aircraft could have also had the radar installed post-delivery.

*The information provided in this column may be abbreviated for space purposes. For the entire communication, go to* www.txtavsupport.com.

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