King Air

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

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The Fastest King Air

Pilot Report on Blackhawk's XP67A 350

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Matthew McDaniel

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The Fastest King Air: Blackhawk's XP67A 350

by Matthew McDaniel

Blackhawk Sales Manager Chris Dunkin departs Gwinner, North Dakota's (GWR) runway 16 on a hot and blustery June day.

The Pratt & Whitney Canada PT6A-67A turbo-propeller engine. That's a mouthful! However, for an experienced King Air pilot, the various versions of the iconic PT6 powerplant roll off the tongue with ease. Memorizing which version they operate and the shaft horsepower (SHP) and equivalent SHP (ESHP) ratings of it are mandatory for King Air pilots. Not only is such information sure to be asked during the oral exam portion of any checkride, it is also one of the first conversation points between various King Air pilots crossing paths at airports. For years, the most powerful PT6 version used on King Airs has been the -60A model used on the Super King Air 300/350 series. However, thanks to one of the leading companies in turboprop aircraft modification and performance enhancements, Beechcraft's famous family of rugged turboprops has a new ruling monarch. Meet the fastest King Air in the world – the Blackhawk XP67A 350.

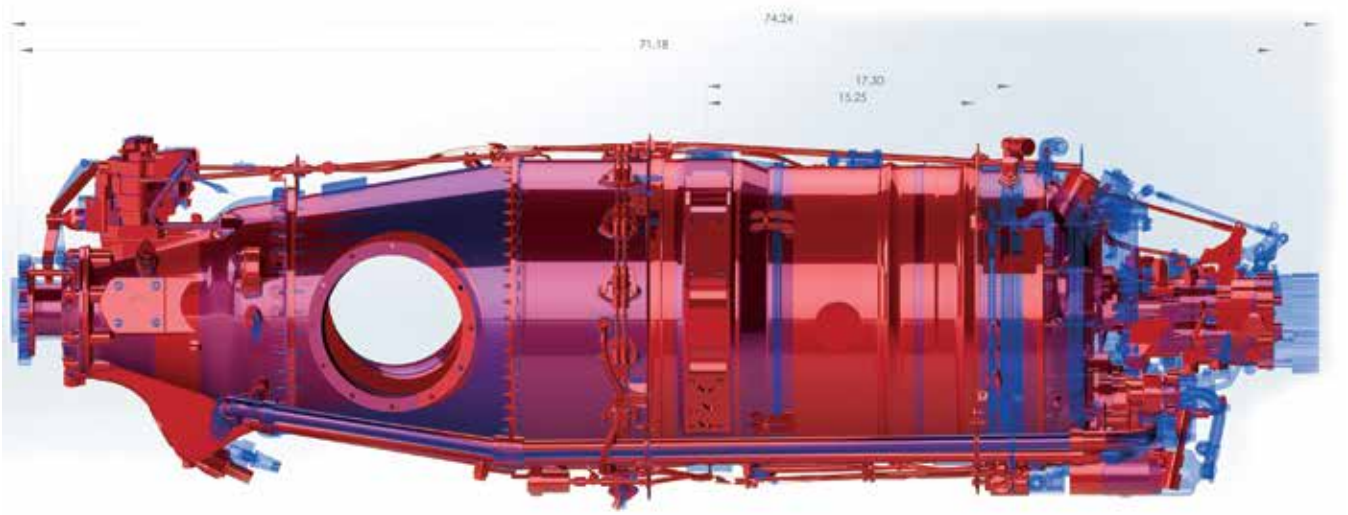
A Quick Look Back

While detailing the long history of the King Air isn't necessary for readers of *King Air* magazine, a quick reminder of how the 300/350 came to be might be in order. The first King Air was flown in 1964 and exactly one decade later the first production model Super King Air 200 was delivered. Fast forward another decade and the success of the 200-series spawned the Super King Air 300. First delivered in 1984, the 300 was the first model to utilize the PT6A-60A, which has retained the same 1,050 SHP rating on every production 300/350 model since. The 300 was also the first model to exceed 12,500 lb. Maximum Gross Weight (MGW), making it the first King Air to require its Pilot in Command (PIC) to hold a specific type rating. In 1990, the 300's fuselage was stretched 3 feet, winglets were added and MGW increased to 15,000 lbs. to create the B300 model (more commonly referred to as the Super King Air 350). Today, two variants of the 350 remain in production, the 350i and the 350ER. However, the moniker "Super" was dropped from all King Air marketing materials in 1996.

Blackhawk Modifications is an after-market company, founded in 1999. Based in Waco, Texas, they have become a star player in the turboprop enhancement market. While they offer a number of upgrades for various King Air models, they also offer similar modifications for a wide variety of other turboprop aircraft (both single and twin engine). In fact, as the holder of the most STCs for such aircraft, they've become the largest non-OEM purchaser of PT6 engines in the world. Blackhawk calls their turnkey performance packages *XP Engine+ Upgrades*. It is such a package they successfully certified in August 2017 for the King Air 350 line with about a dozen installations completed so far.

10 Gallons of Engine in a Nine-Gallon Cowl

No transport category aircraft modification program is ever as simple as it may seem. Minor modifications can quickly cascade into a series of required changes. The swap of the -60A engine for the -67A seems straightforward to the casual observer. Until you learn that the -60A was already a tight squeeze within the KA 350 cowlings and that the -67A is three-plus inches longer still! So, how do you install a longer engine without setting off an avalanche of other changes? Blackhawk's solution is elegant in its simplicity. The -67A engine was mounted so that the prop is in nearly the same position (relative to the wing's leading edge and C.G.), as that of the -60A. This prevented any negative changes in handling, controllability, or weight and balance (W&B). But, this caused the engine's air intake (which is at the rear of the PT6's reverse-airflow design) to extend aft of the existing cowl's sealed air intake section. The solution: Blackhawk designed and manufactured an extension to move the cowl's interior air



An overlay of the PT6A-60A (red) and the -67A (blue) engines shows the extra length of the -67A that needed to be wedged into the same cowling as the original -60As. (COURTESY BLACKHAWK)

intake seal far enough aft to fully encase the air intake section of the longer -67A engine without requiring any associated exterior cowl modifications.

Exploring New Limits

More powerful engines are the obvious solution to boosting performance, but often more power comes with more weight, which can offset much of the power-driven gains. Not so with the XP67A upgrade. Yes, the -67A engine is heavier than the -60A; the reason for that is the extra length necessary to accommodate a fourth compressor stage (versus three stages in the -60A). It's this extra stage of compression that is primarily responsible for pumping up the SHP capability from 1,050 (-60A) to 1,200 (-67A). However, the modification also includes swapping out the old 4-blade Hartzell metal props for 5-blade MT composite props. Not only do the lighter MT propellers offset the weight of the heavier engine, they offer many other advantages. In addition to their reduced vibration, noise and drag, they also offer unlimited blade life. Specific to the 350 installation, the MT props reduce the risk of foreign object damage (FOD) due to their extra 2.6 inches of ground clearance. Additionally, the minimum idle speed limitation imposed on the Hartzells (due to resonance frequency issues) is eliminated with the MTs. Finally, let's be honest, hanging those 5-bladed MT props on any airplane increases its ramp appeal by at least a factor of two!

While the -67A engine is rated at 1,200 SHP, to comply with the airframe limitation of the BE-300 series, the engine is flat rated back down to 1,050 SHP. Yet, with so much power in reserve, the XP67A 350 can maintain full power all the way to FL250 (a full 10,000 feet higher than the -60A). This provides a much quicker time-to-climb and more power on-hand at cruise altitude. A keen eye might notice the addition of a fixed flap just ahead of the oil cooler air discharge port on the bottom of each cowl. This flap enhances airflow through the oil coolers, increasing cooling efficiency. This is one of the major factors allowing the -67A to be operated at higher temperature limits than the -60A. Since the most common limiting factor on PT6 engines is Interstage Turbine Temperature (ITT), increasing those limits is more than just marketing fluff; it's probably the single biggest reason the XP67A 350 has the fastest cruise speeds of any King Air variant.

The King Air used for this article's flight evaluation was a 2003 model 350, recently converted to a XP67A 350 by Blackhawk.

The 5-bladed, composite MT propellers perform as good as they look. They offer a number of advantages over the stock, 4-blade metal props, not the least of which is offsetting the weight penalty of the heavier -67A engines.

For our quick evaluation flight, Blackhawk's Regional Sales Manager Chris Dunkin and I departed tiny Gwinner, North Dakota, (GWR) on a hot and blustery day in the northern Plains. The Outside Air Temperature (OAT) was ISA +19 on the surface. Using a climb schedule of 160 KIAS to 10,000 feet, then 140 KIAS to level off, we were able to climb directly from GWR's 1,260-foot elevation to 28,000 feet (FL280) in only nine minutes and 25 seconds! That's an average rate-of-climb of 2,838 Feet Per Minute (FPM), compared to the book figures of approximately 17 minutes or 1,600 FPM for a standard King Air 350 (at comparable weight and atmospheric conditions). During this climb, a maximum ITT of 820° F was flown. While 840° F is the published ITT cruise climb limit (versus 785° F for the -60A engine), 820° F is a suggested maximum in-flight ITT for prolonging engine life. Upon level off, where OAT was ISA +11, cruise speed quickly settled in at 335-340 KTAS (and Mach 0.55-0.56). Book figures for a -60A equipped 350 in those same conditions would be 280-290 KTAS. That's a 13-18 percent boost in cruise performance! Of course, there is a fuel penalty associated, but most of it is offset by the quicker climb to the most fuel-efficient altitudes combined with the shorter flight times achieved through an average 15.5 percent increase in cruise speed.

Although the fastest flat out TAS for the XP67A will be achieved in the FL250-FL280 range, where maximum torque/power is available, few operators will likely linger at those altitudes. Assuming the aircraft has current Reduced Vertical Separation Minimums (RVSM) certification, FL320-330 will likely be the XP67A pilot's sweet spot. At those altitudes, typical cruise speeds of 325-330 KTAS can be achieved at 725 Pounds Per Hour (PPH) fuel flows, at/below the suggested 820° F ITT limitation, all with a comfortable cabin altitude of around 8,500 feet. Pilots who choose to operate at the maximum certified altitude of FL350 (which the XP67A can reach without even breathing hard), will experience even better fuel efficiency, but will also have to contend with less comfortable cabin altitudes in the 10,000-foot range.

Other minor changes in operating limitations exist between a standard 350 and Blackhawk's XP67A. To be fair, some are not positive, such as slightly lower maximum ISA operating limits (3-6° F lower than the ISA +37 limit for the -60A engine, depending on altitude). Yet, those are extreme limits that certainly encompass only a tiny percentage of operating hours. Another is that POH/AFM takeoff speeds and field lengths are increased by one percent and landing distances are increased by two percent with the XP67A modifications. All fairly small sacrifices for the overall dramatic increase in performance. Also, Blackhawk will likely, in time, undertake a more extensive flight test program to revise such limitations via additional data, as these increased limits are simply buffers that were mutually acceptable by the FAA and Blackhawk in order to simplify the initial certification process.

Mission Flexibility

Regardless of the aircraft type in question, a primary goal for owners or pilots is always mission flexibility. Of course, one of the hallmarks of the entire King Air family has been just that since the first King Air 90s rolled off the line over a half-century ago. Each successive

A closer look at the new fixed flap and modified oil cooler air exit port, which helps improve oil cooling, allowing higher ITT limits.

A close-up of the modification Blackhawk designed and manufactured to extend the internal air intake seal far enough aft to fully encase the air intake section of the longer -67A engine.

model and sub-model of King Air has only ratcheted up that enviable trait, with the 350 being arguably the most flexible in terms of range, speed and payload. Blackhawk's 350 Engine+ Upgrade further increases mission flexibility by increasing climb performance, allowing more cruise altitude options, and increasing the operational speed envelope, all without sacrificing payload or range.

A perfect example of a day in the life of the XP67A 350 is the day of the evaluation flight for this article. The original plan was for the author to visit Blackhawk's home based in Waco. But, when the airplane and Blackhawk's pilot were available, I was going to be in North Dakota for family commitments (not exactly immediately adjacent to Texas). No problem, Dunkin would be doing some

It would take a very detailed eye to distinguish a standard 350 from an XP67A, based solely on the engine and minor cowl differences. However, the aggressive look of the 5-bladed MT props is difficult to miss.

demo work with a recently converted 2003 model 350 near Jackson Hole, Wyoming, anyway. So, arrangements were made and in a one workday mission, Dunkin made a late-morning departure from western Wyoming to meet me at the far eastern edge of North Dakota. After we flew the evaluation flight within North Dakota, he had to reposition the aircraft to Aberdeen, South Dakota, to refuel. Then, he continued on to Waco and was home for dinner. That's four separate flights, each of different lengths, into airports big and small, at both high and low elevations, covering a sizable portion of the United States (and seven of the larger states), within standard banker's hours. Any way you slice it, that's pretty impressive for any turboprop, much less one with the creature comforts, number of seats and payload of a 350. The XP67A upgrade is sure to make any current or would-be owner of a King Air 350 reconsider any thoughts they might have of moving to a jet. The performance enhancements of the Blackhawk XP67A upgrade bridges a lot of the gap between large cabin King Airs and similar-sized jets, while retaining all the attributes that have kept the King Air 300/350 in continuous production for three and a half decades. KA

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Matthew McDaniel is a Master & Gold Seal CFII, ATP, MEI, AGI, & IGI and Platinum CSIP. In 25 years of flying, he has logged over 17,500 hours total, over 5,500 hours of instruction-given, and over 2,500 hours in various King Air models (from the model 90 through the 1900D Airliner). As owner of Progressive Aviation Services, LLC (www.progaviation.com), he has specialized in Technically Advanced Aircraft and Glass Cockpit instruction since 2001. Currently, he is also an Airbus A-320 series captain for an international airline, holds 8 turbine aircraft type ratings, and has flown over 90 aircraft types. Matt is one of less than 15 instructors in the world to have earned the Master CFI designation for 8 consecutive two-year terms. He can be reached at: *matt@progaviation.com* or (414) 339-4990.

(Photos by Matthew McDaniel)

Blackhawk Late Breaking News

by Kim Blonigen

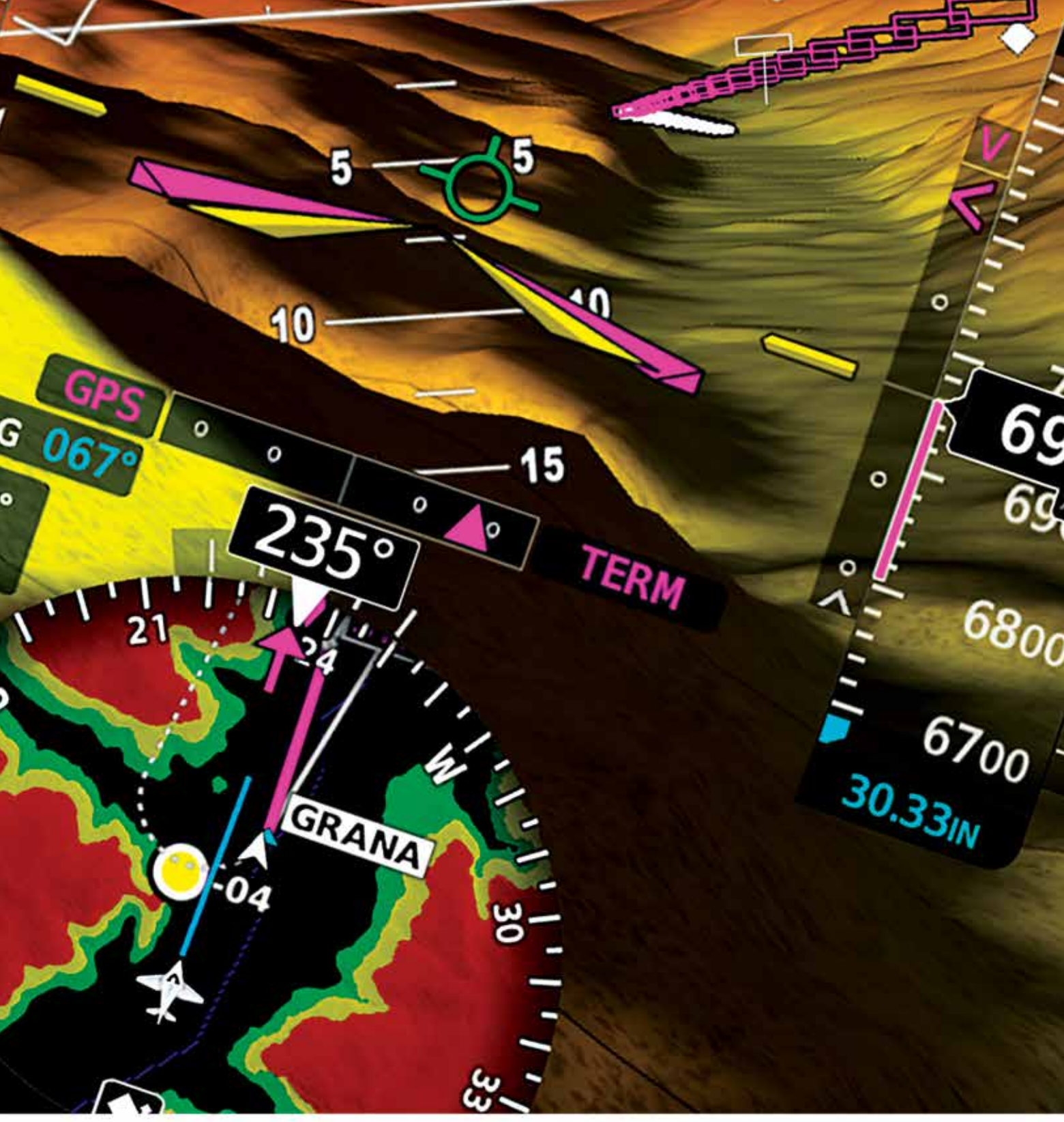
A few weeks after this pilot report was written, Blackhawk Modifications announced that it had received FAA Approval of the Garmin G1000 NXi with the XP67A Engine+ Upgrade for King Air 350. This Supplemental Type Certificate (STC) allows engine parameters from the Blackhawk upgrade to be properly displayed on the glass panel interface. The Rockwell Collins Pro Line 21 panel is also approved for the Blackhawk XP67A.

For the remainder of 2018, Blackhawk will continue to offer a $50,000 avionics upgrade credit as part of the XP67A package. Contact Blackhawk to find an Authorized Installation Center near you and to reserve your 2018 delivery position.

Also, Blackhawk Modifications launched the XP67A Engine+ Upgrade for the King Air 300 series and will begin certification efforts in August. The upgrade is expected to dethrone the current fastest-King-Air title holder – the XP67A-powered 350s – with expected maximum cruise speeds of 345-350 knots true airspeed (KTAS). Climb performance is expected to be equally impressive, with a projected time to climb from sea level to FL350 in less than 17 minutes. Blackhawk says the performance benefits of the XP67A also help to improve the bottom line. Flying in Reduced Vertical Separation Minimum (RVSM) airspace can extend range and endurance, which may also lower total fuel consumption, and reduced block times will lower operational costs.

Blackhawk engineers anticipate the FAA STC for the King Air 300 will be issued during the second quarter of 2019. Pre-certification orders are now being accepted for XP67A delivery positions. Qualifying core PT6A-60A engines will be issued generous credit at $70 per hour/per engine for time remaining to the 3,600-hour TBO. Blackhawk will be offering a $50,000 pre-certification discount for orders placed prior to the STC approval.

Contact Blackhawk for pricing details, engine credits, and rebates available for the King Air 300 at +1 (254) 755-6711.



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King Air Gathering III

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

by Kim Blonigen

There are still a few spots remaining for King Air Gathering III, presented by the King Air Academy. Even if you've attended a previous Gathering, attendees always learn something new from the seminars, and sometimes from other pilots and operators they meet.

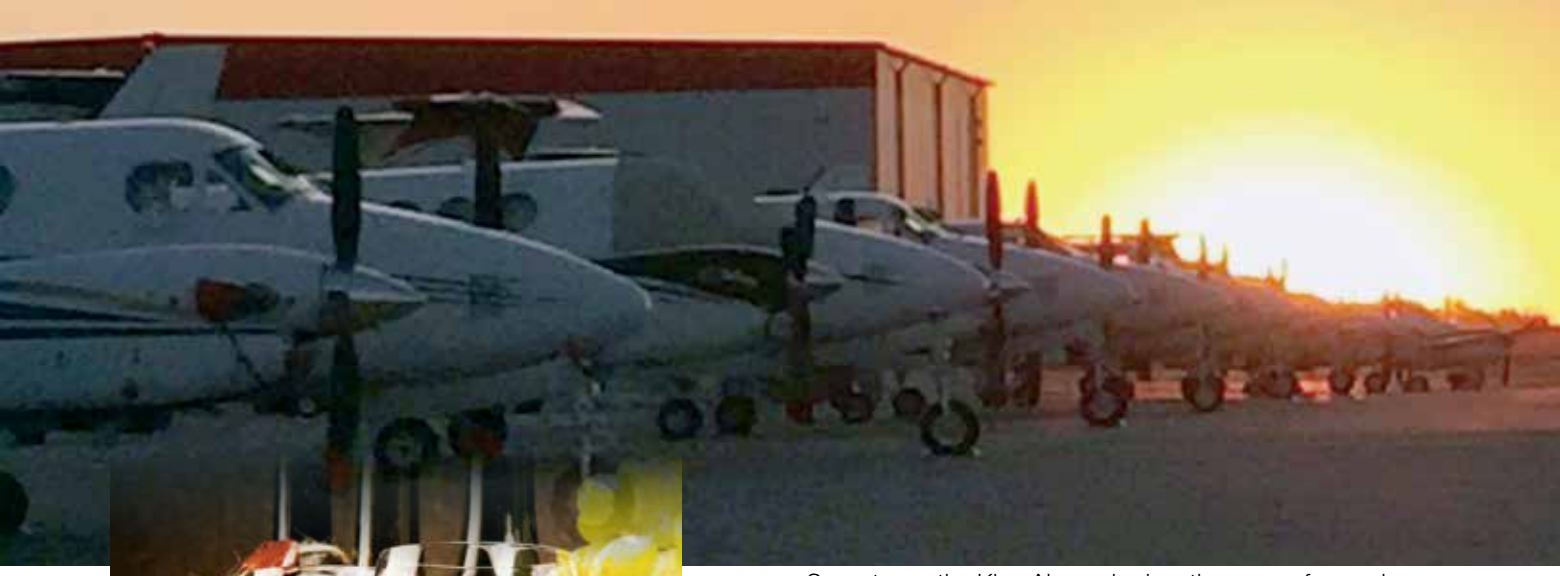
The seminars are scheduled for September 28-29, 2018 at the Hangar Hotel Conference Center located right on Gillespie County Airport (T82) at Fredericksburg, Texas. For those who can arrive early, a golf tournament is being held on Thursday, September 27, at 1:00 p.m. at the Lady Bird Golf Course, which recently went through a $2 million renovation and is located near the airport.

Also, due to some requests, activities for spouses and guests have been added. On Friday, they will be able to visit Main Street Fredericksburg that offers over 150 boutiques, 12 art galleries and nine wine tasting rooms, as well as enjoy lunch at one of the wonderful restaurants located there. Saturday, guests will visit Wildseed Farm, the nation's largest working wildflower farm where visitors can see the blooming fields, plant nursery and stop in the gift shop. After that, a six-course lunch and sample wine pairing will be offered at the Woodrose Winery. Transportation will be provided and the cost is included with a paid attendee fee.

King Air expert Tom Clements speaking at the King Air Gathering held in Dayton, Ohio.

For those attending the seminars, there will be two full days of presentations given by King Air experts.

KAG III attendees can stay at the unique Hangar Hotel built to resemble a World War II hangar on the exterior. The seminars will be held at the conference center, conveniently located right next to the hotel. (HANGAR HOTEL)



Sunset over the King Airs parked on the ramp of a previous King Air Gathering.

Activities planned for spouses and/or guests include wine tasting at a local winery.

Friday will focus on upgrades and modifications, from avionics and engines, to performance and fuel and weight enhancements, as well as an ROI perspective. Saturday, experts will discuss planning for cost-effective maintenance, the use of maintenance consultants, the importance of acceptance inspections and flights (pre-buy, maintenance, etc.), how to efficiently run your engine, and more.

Keynote speakers for the event are King Air Expert, Tom Clements, author of *The King Air Book* and the "Ask the Expert" column in this magazine, who will discuss 40 years of flying the King Air – piloting best practices, why non-events turned catastrophic, as well as answering your questions. King Air modifications legend James Raisbeck will review the history of Raisbeck Engineering and the impact its products have had on the King Air. Back by popular demand, Dr. David Strahle will provide a wealth of information when he presents "Advanced Weather Planning and the Use of Available Resources for your Next Flight."

Hotel rooms are available, but limited, at the Hangar Hotel located right next to the Conference Center. Built to resemble a World War II hangar, it features airplane memorabilia, model airplanes and USO history, and is located adjacent to the airport. Other hotels with discounted rates are also available and listed on the website.

Go to *www.kingairgathering.com* to register and for more detailed information.

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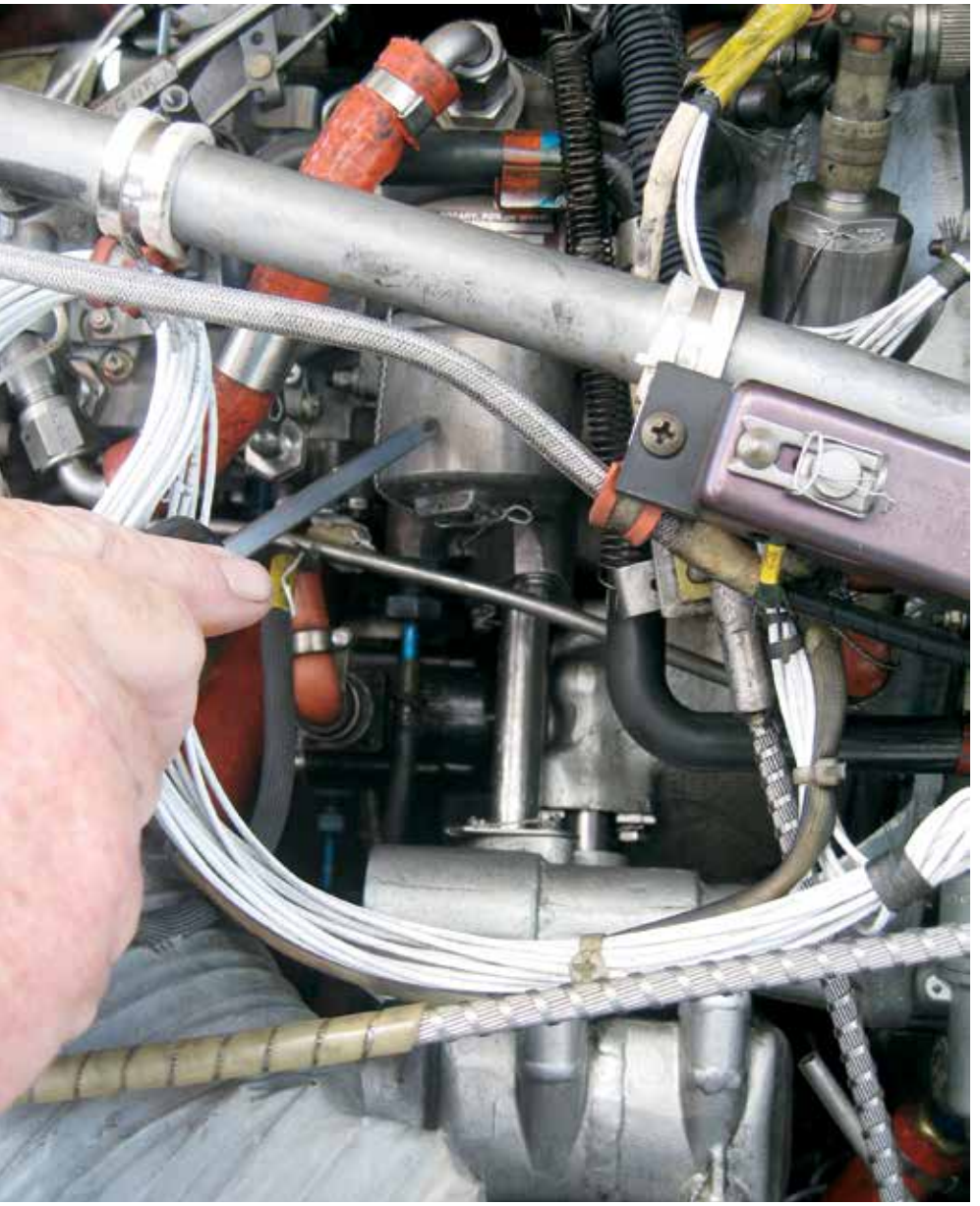
Summer Heat and Engine Problems (Reprise)

by Dean Benedict, A&P

Recently, I've heard from several King Air owners who read this magazine and called me about my articles. All of these guys are fairly new to the world of King Airs and asked if someof my earlier articles could be run again. Even some longtime readers of this magazine requested a "refresh" on some of my old articles. What follows is the article from the July-August issue of 2012. It addresses an engine problem that can crop up when the OAT is scorching hot.



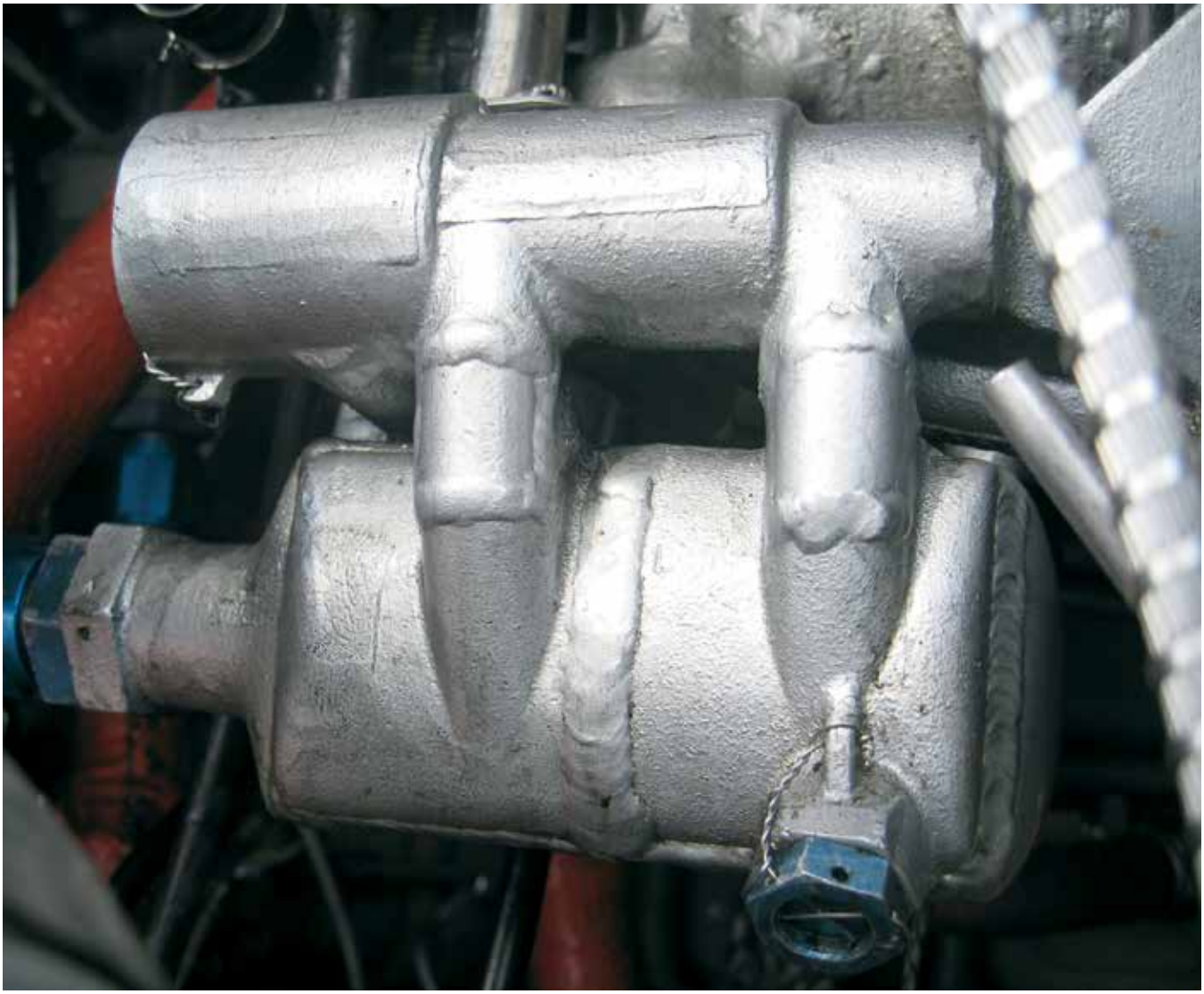
The author pointing to the fuel bowl of the high-pressure fuel pump; the oil-to-fuel heater can be seen below it, behind a wire bundle. The most expedient way to troubleshoot the oil-to-fuel heater is to check the temperature of the fuel bowl after the engine has run for 10 minutes.

Hot weather conditions happen every day somewhere in the world, but right about now in the desert Southwest of the United States, we are feeling it big time. I received my first heat-related panic call back in May from a King Air pilot. He was at an airport near me, trying to take off and return home. One engine would not accelerate when he took the runway. He said he fire-walled the power lever but nothing happened, and to add to his concern, the idle was starting to decrease. Not a good sign. He returned to the ramp and conferred with a couple mechanics from a local tour operator who had suspicions about his fuel control unit (FCU), but suggested he give me a call.

As soon as I heard him recount his steps and symptoms, I knew exactly what was wrong. It happens every summer around here. The problem is with the oil-to-fuel heater. Yes, you read that right, the oil-to-fuel heater and no, I haven't lost my marbles. Trust me, I have seen this happen many, many times.

Most people would immediately suspect a problem with the FCU, or maybe a P3 problem (bleed air going into the FCU) or possibly a P_y problem (air going from the FCU to the prop governor). But before I "accuse" the FCU of any wrongdoing, I want to go upstream to the oil- to-fuel heater and look around.

The oil-to-fuel heater has a vernatherm inside which should



If the vernatherm inside the oil-to-fuel heater is bad, it continues to heat the fuel as if the aircraft was at altitude and not on the ground with a triple digit OAT. This doesn't allow the FCU to function and the engine will not make power.

shut off the oil-to-fuel heater during extreme heat conditions. If this vernatherm is bad, then the oil-to-fuel heater doesn't get the message to shut off, so it continues to heat the fuel as if the aircraft was at altitude and not on the ground with a triple digit OAT. Super-heated fuel lacks the correct viscosity, and the FCU does not know what to do with it. The FCU cannot function and the engine will not make power.

There are a number of factors that contribute to this scenario: (A) You are on the ground, it's really hot outside, and the heat radiating off the ramp can be 140° F, so your oil temperature is already up there. (B) If you are in a King Air 200 with 4-blade props you no doubt have your ice vanes deployed (down) to protect against FOD, but this also opens the rear bypass door and prevents airflow across the oil-cooler; now your oil temp climbs even higher. (C) You taxi out, maybe you sit in line waiting to take off, and if the vernatherm in your oil-to-fuel heater is not working, the fuel becomes super-heated and the engine won't make power. So, you taxi back to the ramp in hopes of finding some maintenance.

To make matters worse, the problem could appear intermittent because in the time it took to find some assistance, everything has cooled off just enough to work properly. As soon as you get a mechanic there to diagnose the situation, you fire up the problem engine and everything works just fine! OK, you think it was just some glitch so you load everyone back in the aircraft, taxi back out to the runway and again, no power on that engine.

Troubleshooting

The most expedient way to troubleshoot the oil-to-fuel heater is to run the engine for about 10 minutes; shut down and open up the R/H rear cowl door. You are going to check the temperature of the fuel bowl on the high-pressure fuel pump. The HP fuel pump will be just forward of the FCU and its fuel bowl is above the oil-to-fuel heater (see photo, opposite page). BE CAREFUL! If the vernatherm in the oil-to-fuel heater is not working, this fuel bowl will be hotter than a poker!

Use great caution in checking the fuel bowl or you will erase your finger prints in the process. Warm is normal, but too hot to touch is the sign that your oil-to-fuel heater is the culprit.

Now what? Well, unfortunately for all of us, Pratt & Whitney does not allow the vernatherm to be changed in the field. The oil-to-fuel heater unit must be removed and exchanged. First you have to find a suitable exchange unit and get it shipped to wherever you are; then it's about a four- to five-hour job for an experienced mechanic.

If you are in the boondocks, however, there is one other option. *Keep in mind that this problem only happens on the ground, and that if you are able to get fuel streaming through the FCU, it will keep going.* In other words, if you can keep your oil temperature from going too high, you'll keep your fuel temperature in a viable range and the FCU will kick into action. Once the FCU gets going, it won't quit.

The labyrinth of diaphragms inside the FCU cannot operate properly with super-heated fuel. The goal is to keep the fuel from becoming too hot before the engine is asked for full takeoff power, then the FCU will do its job and keep going. Once the FCU is operating, there is so much fuel going through the oil-to-fuel heater that there is no time for the fuel to become super-heated.

So, what about that King Air the pilot called about? Here is what he did: He asked the tower for at least one minute after receiving clearance to take off. He taxied out on one engine only with his ice vanes stowed (up). After receiving clearance for takeoff, he started his "problem" engine. In doing so, he kept the oil temp down enough for the fuel temp to be acceptable to the FCU. The engine came up to full power and he was good to go.

He had suggested flying over to my shop (this was back when I had one), but I told him he would be better off flying home and having his oil-to-fuel heater addressed there. He did so. Safely home, he called me and thanked me profusely.

A Safe Work-Around

Before I go any further, let me stress that I am all about safety. I do not advocate risky procedures or maverick bravado in the cockpit in any way, shape or form. However, if you understand the systems that operate your King Air, there are certain instances where you can safely work around a problem until proper maintenance can be done. This is one of those instances, *provided you diagnose it correctly.*

First you must troubleshoot the fuel bowl on the HP fuel pump. *Do not, under any circumstances, simply assume that you have an oil-to-fuel heater problem.* You must carefully check that fuel bowl after a 10-minute ground run. If it's boiling hot, then let everything sit to cool down. Your oil temp needs to get down to at least 40° C.

Let the tower know that you'll need about a minute to get going after receiving takeoff clearance. Taxi out on one engine with the ice vanes up (this helps keep your oil temp from red-lining, which in turn keeps your fuel from super-heating). Once you receive clearance, fire up the other engine. If you get all the proper indications and you see that engine is now making power, it means you have ample fuel streaming through the oil-to-fuel heater and it won't have time to super-heat on its way to the FCU. Once you are airborne, the cooler air going over the oil cooler will keep the oil temp down and the engine will operate normally.

Many of you who operate routinely in cooler climates could have a bad vernatherm in an oil-to- fuel heater and have no clue. It will never rear its ugly head until you get into really hot conditions on the ground.

Don't be Reckless

I cannot emphasize strongly enough that I do not advocate reckless operation of any kind. A little knowledge can be a dangerous thing, and so it is with a measure of trepidation that I even address this topic of working around a bad vernatherm in an oil-to-fuel heater. I strongly suggest that you continue learning about your King Air every day.

When in doubt, don't go. This is my mantra. If I was unclear about how an FCU operates, I wouldn't go. If I didn't understand what the oil-to-fuel heater does and why, or if I couldn't say how the oil cooler works, then I would stay on the ground.

If you run into a no-power situation on the ground in hot weather and you feel it has been correctly identified as an oil-to-fuel heater problem but you are still not comfortable with the work-around procedure, then wait until early the next morning when the OAT is at its lowest. See if that engine fires up normally. If it does, then use your best judgement on how to proceed. If you have any doubts – don't go. Do whatever it takes to get a knowledgeable mechanic on the aircraft to take care of things.

Keep your cool and fly safely. KA

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

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Ask the Expert

"War Stories" – PART 2

by Tom Clements

Based on feedback from last month's article in which I related some interesting personal experiences – "War Stories" – I am continuing with additional tales this month. I hope you find them enlightening and enjoyable.

Split Flaps in an A90

In the early 1980s my company, Flight Review, Inc., received a call from a fellow who had just bought a used 1967 A90 and wanted to schedule initial training for both his hired pilot and himself. At that time, I was living in Hayward, California, but spent hundreds of days a year traveling to conduct on-site training. This gentleman also lived in California and the airplane was going through a pre-buy inspection at the Beechcraft West facility in Hayward, so we arranged to complete the ground school in one of Beechcraft West's conference rooms. Ah, I could sleep in my own bed for a change!

The five days of ground training went well and then the flight training phase began. The owner was the first to fly, while his pilot rode as an observer in the cabin. I decided to head northeast out of the San Francisco Bay Area to utilize the not-too-busy airspace and airport in Marysville, about 90 miles away. This was the owner's very first time flying a King Air. We began with a thorough preflight inspection, both interior and exterior, started the engines, taxied to the run-up area and ran through all the system checks. We took off in lovely VFR conditions, avoided the SFO Class B airspace, and climbed up to 15,500 feet. We discussed and demonstrated setting up cruise conditions, talked about descent planning, used the autopilot a bit (the old H-14 unit didn't have lots of modes to demonstrate!) and came down to 8,500 feet to do some air work – steep turns, slow flight and stalls. We never got past the slow flight.

I assigned a heading and altitude and asked the owner to slow to 90 KIAS, clean. Next, approach flaps and 80 knots. All was going well, and the owner was doing a good job. "Landing gear down, full flaps, slow to 70," were the next instructions I gave. As is my habit, I had my eyes on the flap position indicator as it started to move from Approach to Down.

Oops; that ain't right! The needle went to about 60 percent then became a blur as it danced rapidly and when it stabilized, it was in the Up position. The owner said, "This doesn't feel right!" as he was holding a lot of right aileron and right rudder to maintain the heading. From the cabin, the pilot yelled, "The flaps just broke!" Somewhere in that confusion I heard a snap. The flap motor circuit breaker on the aft end of the pedestal had just popped. I directed the owner to start a gradual descent. He was having no problem controlling the plane. We examined the flaps visually and confirmed that the two left segments were fully down as was the right outboard segment. But the right inboard was fully up. I knew this would be the case since the right inboard is the "master" flap because it contains both the position indicator's transmitter and the limit switches. Since it was now Up, the Down limit switch was never activated. Hence the motor kept running, overloaded the circuit and tripped the circuit breaker (CB).

The three of us discussed the situation and it was suggested that we put the flap handle in the Up position and reset the CB. I agreed to try this good plan but also stated that it likely would not work. Why? Because the "Up" limit switch, activated by the broken segment that was now up and "telling" the motor not to run in the Up direction since it believed the flaps were already there. Handle Up, CB in – it stayed in fine – but no response.

We were now right over the airport at 5,000 feet. We were holding about 120 KIAS in our descent. We set up for a left downwind to Runway 32. There was no one else in the pattern. The owner had trimmed out the roll forces easily and was doing fine so I suggested he make the landing. He declined because he had never landed a King Air previously and asked me to take over. I did so and was pleasantly surprised that the airplane flew perfectly in this "three-down, one-up" situation. No more than half-travel of the aileron trim wheel was necessary to fly the airplane hands off. Unlike the 200- and 300-series with their longer wings, the 90- and 100-series have no split flap protection system since the planes were flight tested to demonstrate that any one flap section stuck up or down could easily be handled. My personal experience can now confirm this.

I carried an extra 10-15 knots into the flare since we had over 6,000 feet of runway. The landing was a nonevent and we taxied to the ramp and shut down. I asked the pilot to see if he could find any tools from anyone – it was a Saturday, so I was not very optimistic – and he left the plane to start his search.

The owner and I rolled back the aisle carpet in the cabin to start the process of gaining access to the flap gearbox, or transmission, mounted on the forward side of the rear spar beneath the floorboards. If we could disconnect the drive cables from the gearbox, we could then manually turn them to retract the other three segments and fly back to Beechcraft West for repairs, making a no-flap landing there. It had not yet dawned on me that what we had experienced was not what I was thinking. The most common reason for split flaps is that the jackscrew actuator is not operating, probably because the drive cable came loose at one of its ends. If this happens, the flap is locked in its last position.

"Hey, come look at this," the pilot yelled to us through the open cabin door. We exited to see what he was talking

about. A fellow had been watching airplanes operate at Marysville that day – must have been bored with so little traffic – and observed this King Air land and taxi in with its weird flap condition. He strolled over to ask the pilot what had happened. As they talked, the fellow walked up to the retracted right inboard flap, took the trailing edge in his hands, and freely moved it down and up on its tracks!

Whoa! When I saw that the flap could be easily moved I realized that this was not a case of a jackscrew not being driven by its cable. Instead, it must have broken entirely and we were probably wasting time trying to access the gearbox. With the bad flap segment down, the Up limit switch would no longer be contacted so the motor might now operate … except without knowing when to stop. So here was the plan: I'd go to the cockpit, pull the CB, turn on the battery and make sure the flap handle was Up. Then I would carefully push the CB in just enough to make contact and see if the motor operated. If it did, then I would "bump" the CB in and out, in and out, until those outside yelled to tell me that the other three flap segments looked to be fully up.

All of this happened as I described. I now left the CB pulled. We rustled up some duct tape and taped the right inboard segment's trailing edge to the fuselage to keep it from dropping down until we had enough airspeed to blow it up. We did an uneventful flaps-up flight back to Hayward – with the owner again flying – and told our tale of woe to the shop foreman who had overseen the work that was just completed during the pre-buy.

Do you think the fact that the flap system had been overhauled that week played any role in this event? Nah, me neither!

BB-11's Strange Rudder Boost

It was a true blessing in my life to be assigned as the first Beech factory ground and flight instructor on the 200-series of King Airs. What a learning experience! What a thrill!

BB-1 and BB-2 were the factory's test machines. BB-1 has a very interesting story that I may relate in a future article and BB-2 eventually became a testbed aircraft for Pratt and Whitney of Canada – makers of the PT6. BB-3, 4 and 5 were U.S. Army airplanes with some secret "stuff" that prevented our Beechcraft Training Center people from having anything to do with them. BB-6 was Mrs. Beech's airplane and a factory demonstrator. BB-7 and BB-8 had a large camera window installed in the belly and they went to the government of British Columbia, Canada, to be used for ground mapping as well as executive transportation. BB-9 was the first one sold to an actual civilian customer – Tom Watson, the Chairman of the Board of IBM at that time. I was not involved with BB-10 and am not sure of its early history. But then came BB-11. Rod Rodriquez, a wonderful gentleman, excellent pilot and an exceptional Beechcraft salesman in the Beechcraft West office in Van Nuys, California, sold this airplane to the government of Bolivia, to be added to that country's "Air Force One" fleet.

Two Bolivian Air Force pilots, a Major and a Lieutenant Colonel, showed up at the Training Center as BB-11 was nearing its delivery date. They completed our five-day ground school before starting their flight training in the actual airplane, and I was the instructor assigned. The plane would be based in the executive capital city, La Paz, at an elevation of 13,300 feet! (The Major had grown up there and hence was very accustomed to thin air. He told me that when he did his first altitude chamber ride at Randolph Air Force Base while training with the U.S. Air Force, it was decided to agree that he was experiencing no symptoms of hypoxia after two hours in the chamber at 25,000 feet!)

As we performed the run-up before our first flight in the airplane, I found that the Rudder Boost was installed backward! When we added enough power on the left engine to trigger the system's differential pressure switch, the right rudder jumped forward, not the correct, left one. (Good foot; good engine. Remember? How did that discrepancy get through Production Flight Test?!)

We taxied back to the Delivery Center and told to get a cup of coffee while the crew there corrected the error. In less than an hour, they asked us to try again. This time all was well and the training proceeded to completion with no further glitches.

For some reason – I am not sure, but I think the Van Nuys sales office had made an agreement to use BB-11 as a demonstrator for some period of time before it departed for South America – I was assigned to do another pilot checkout in this same 200 about six months later, out of KVNY. I airlined out there and met the student with whom I would be working. As we do our initial run-up, guess what? The Rudder Boost is backward again! Back we go to the shop for another discussion.

Here's what we discovered. The original design of the 200's rudder boost system called for plastic tubes being used to connect the regulated bleed air source to the appropriate left or right solenoid valve and then to the actual pneumatic rudder boost servo. It was found that the plastic tubes had enough length and flexibility that the left and right ones could be reversed. Not a good thing. Why? Because during single-engine operation the pilot would not get any help on the correct rudder pedal but instead the system would be applying force to the opposite pedal! So, Beech changed the design and now it called for metal lines that could only fit one way: left to left and right to right. There were so few King Air 200s at this time that I believe no AD or Service Bulletin was ever issued. Instead, the factory simply sent personnel out to the few airplanes in existence to make the switch from plastic to metal lines.

When BB-11 had its initial problem that I discovered in Wichita, it was because the plastic lines had been reversed. However, the fix that had been made then was to reverse the contacts on the Differential Pressure switch. In effect, two mistakes that now existed were canceled out and all was well. What's the old saying? "Two wrongs make a right?" That was certainly true in this case.

So, when the Beech team came to BB-11 at Van Nuys and installed the correct metal lines, we went back to reversed rudder boost. Damn! Are mechanics and pilots so clueless that they don't verify the system works properly after a modification like this? In some cases – like this one – I guess not!

The $10,000 N Number

In my Flight Review, Inc. days, I went to Portland, Oregon, to conduct recurrent training for the owner-pilot of a nearly new B200. This lawyer's first and last names began with the initials T and W and his nearly new B200 was N1TW. Cool!

When he was ordering his new B200 he wanted N1TW to be the registration number in the worst way. Yet that number was already assigned. Not to be deterred, my client found who owned that airplane through the FAA registry and contacted him. It turned out that the fellow with whom he spoke operated an air freight business using Piper Navajos and this was one of those airplanes. Why the N number? Because the previous owner of this Navajo was Tammy Wynette, the country-western singing star.

Ten thousand dollars later, our lawyer had his number!

BB-1's Drag Chute

Before the BE200 made its appearance, about the only T-tailed airplanes were the Boeing 727 and the Learjet, both of which, in their original states, had horrid stall characteristics. Understandably, Beech was worried about how the T-tail would affect the King Air. Even though wind-tunnel tests appeared to indicate that the T-tail would not be a problem on this turboprop, straight-wing airplane, nevertheless flight testing proceeded with a prudent level of caution. Before stall testing began, the prototype airplane, BB-1, was fitted with a parachute system installed in a canister that replaced the normal tail cone beneath the rudder. This drag chute was designed to be deployed in the event that a deep-stall or spin condition developed, and its drag would lift the tail, point the nose down, reduce the wing's angle-of-attack and correct the out-of-control condition. Then, explosive bolts would be activated to release the chute and let the airplane return to Beech Field safely.

Before the actual stall tests began, Beech wanted to ensure that the chute could both be deployed and then jettisoned properly. On the first test flight, the deployment went as planned. But the jettison? No luck! For some reason, the chute stayed attached to the fuselage. Using nearly full engine power and with careful altitude management, Bud Francis managed to land BB-1 back at Beech Field safely, although it came uncomfortably close to the telephone lines at the end of the runway!

By the way, the chute was never needed during the stall testing phase. The 200 exhibited no stall condition in which forward elevator travel would not lower the nose, reduce the angle of attack and allow normal recovery.

Garrett's Own B100 … and its Weird Engine

As you probably know, the King Air B100 is the only model powered by the Garrett TPE331 powerplant instead of a version of the PT6. This came about following a prolonged workers' strike at Pratt and Whitney that caused the flow of PT6s to nearly cease at the Beech factory back in the mid-1970s.

Around 1982, while performing King Air training on my own through my company, Flight Review, Inc., I received a call from the chief pilot of Garrett's Los Angeles operation. They were operating the second B100, BE-2, primarily as a shuttle airplane transporting employees between their Phoenix and Los Angeles locations, usually making two round trips a day between KLAX and KPHX.

The department had a co-pilot they were wishing to upgrade to a captain position and wanted me both to flight train and evaluate this fellow to gauge his suitability for the change.

I showed up at their Los Angeles International office – then at the FBO owned and run by Garrett – and had a meeting with the chief pilot, the upgrade candidate, and also with one of their B100 captains who would be riding along as an observer. (Probably to make sure I didn't do anything stupid!)

We began the flight training by heading away from the Los Angeles basin to proceed to a less-crowded area … over the desert between Thermal and Blythe. All was going well and we made a lunch stop at Bermuda Dunes (KUDD) near Palm Springs. After the break, we were ready to do some one-engine-inoperative practice.

We climbed to 9,500 feet on our way east toward Blythe. We shut down the left engine per the TPE331 procedure and looked at single-engine "Magic Numbers" as we did a simulated approach and go-around. Now came time for the airstart. All went well but the engine did not start. Hmmm … did we miss a step on the checklist? We redid the procedure but with the same results. Namely, as the unfeather pump put oil into the propeller dome and the propeller blades came out of feather, relative wind provided rotation and at 10 percent engine speed, fuel and ignition were automatically activated. We could verify this by observing the ignition annunciator illuminating and the fuel flow gauge showing flow. But no light-off. About the only logical guess was that the ignitors were both bad or the ignition exciter unit had failed. As we feathered the prop again and scratched our heads some more, the captain who had been assigned as my observer woke up from his after-lunch nap and came up to the cockpit. "Golly, Tom. I'm sorry. I should have told you that we've never been able to airstart this engine. Just land and it'll start fine on the ground."

"What?! Now you tell me?!" I said in disbelief. "Heck, you guys make these engines! But you can't do an airstart?!" "Nope. Never have been able to on this left engine."

So now a simulated emergency has turned into a real emergency and we are faced with a single-engine landing at Blythe. No big deal at all, but so damn unnecessary had I been properly briefed. The student flies an excellent visual pattern and we touch down at KBLH with no problem, even making our way to the ramp on one engine. We take

a quick bio-break and return for the ground start attempt. As you may or may not know, the fixed-shaft TPE331 design requires that the propeller be out of feather, on the low pitch "Start Locks" before doing a ground start. No problem, we merely use the unfeather pump to drive the oil into the dome so as to flatten the blades. It doesn't work. No blade movement takes place.

Then it dawns on me why. Those fruitless attempts in the air had pumped all of our oil out of the reservoir and into the engine via the prop, but since the engine did not continue to run the oil scavenge pumps did not have time to return that oil to the reservoir. The unfeather pump was seeking oil from an empty tank. Ah, but there is an easy fix.

We exited the cockpit, went to the feathered left prop, and started turning it by hand in the normal direction. The engine rotation caused the scavenge pumps to slowly but surely return the oil into the tank. Maybe 100 or more propeller revolutions were required before the tank finally showed a normal oil level reading. Then back to the cockpit we went to find that the unfeather pump could now do its job successfully and the ground start proceeded without further problems.

Back at KLAX, I let the chief pilot know in no uncertain terms that I was less than impressed with their weird engine and with their lack of proper briefing to me!

An interesting follow-up: A few months later I received a call from the chief pilot. "Hey, Tom, just wanted to let you know. We don't have to worry abut the engine anymore. It blew up yesterday, destroying itself, on takeoff for the flight back to Phoenix. The co-pilot you trained was in the left seat and he handled it perfectly. Thanks for your training."

Golly! When the engine manufacturer itself cannot find and fix a problem on their own engine, who can? Don't get me wrong; I have come to like the TPE331 as an excellent alternative to the PT6, but what a strange event this was!

Stay tuned for more War Stories from ol' Tom. 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." He is a Gold Seal CFI and has over 23,000 total hours with more than 15,000 in King Airs. For information on ordering his book, contact Tom direct at *twcaz@msn.com*. Tom is actively mentoring the instructors at King Air Academy in Phoenix.

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

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Cessna's Last Stand

Part Three

As the United States plunged deeper and deeper into economic depression during 1930, the Cessna Aircraft Company designed gliders and small, lightweight aircraft in a last-ditch effort to generate revenue.

by Edward H. Phillips

America's love affair with "Flying Fever" went into an inverted flat spin after the collapse of Wall Street that began in October 1929 and continued into 1930. Since 1927, in the wake of Charles A. Lindbergh's solo transatlantic flight from New York to Paris, the nation's commercial aircraft industry had experienced phenomenal growth.

Throughout 1928 and the first nine months of 1929, airframe and engine manufacturers were swamped with customer orders, and the aviation business in Wichita, Kansas, was no exception. The Stearman Aircraft Company had recently relocated from an old facility to a new, large factory and was busy building air mail ships as well as biplanes for the sportsman pilot and businessman.

Across town on East Central Avenue, Walter Beech was leading the Travel Air Company to new heights in terms of sales, and the 600-man workforce was operating two shifts and completing 25 airplanes per week but needed to build 50 per week to meet demand. The Swallow Airplane Company was rolling out biplanes for flight training at a feverish pace, and the Cessna Aircraft Company was hurrying to ramp up production in its new factory.

In addition, Wichita was home to five aeronautical investment organizations, three airport engineering companies and one export corporation. By late 1929, 16 airframe manufacturers and six engine manufacturers were doing business in the city and investors had poured more than $10 million into the town's largest industry.

On a national scale, sales of new aircraft soared and the stock market found prospective buyers eager to loosen their wallets and invest in aeronautical ventures. Among those affecting Wichita directly were the giant Curtiss-Wright Corporation and the United Aircraft and Transport Corporation that in 1929 absorbed Travel Air and Stearman Aircraft, respectively, into their expanding portfolios.

Looking back on the industry's health in 1929, the 1930 edition of the Aircraft Year Book reported that 96 aircraft manufacturers had built more than 6,000 commercial and military airplanes worth $44.5 million. Commercial production of aircraft had increased 51 percent compared with 1928. By contrast, at the end of 1930 the Aeronautical Chamber of Commerce of America reported that production of new aircraft had fallen by nearly 50 percent from 1930 levels to only 2,684 commercial and military ships. Total value of those aircraft fell to about $21.5 million.

During the early autumn of 1929 the Cessna company's board of directors met to decide on a strategy that would help them cope with an increasingly weak and uncertain marketplace. One of the first actions taken by the board was to cancel a contract with the Curtiss Flying Service that had placed orders for hundreds of

Clyde V. Cessna cranks the inertia starter on the Cessna-Roos Design No. 2, powered by a Wright J-4 static, air-cooled radial engine developing 200 horsepower. By 1929 sales of Cessna monoplanes were increasing, particularly the Model AW. (TEXTRON AVIATION)

Cessna monoplanes. Those orders were quickly cancelled as Curtiss officials also agreed to sever their relationship with the Cessna Aircraft Company. As of November, Cessna had delivered more than 35 Model AW, four DC-6B and three DC-6A aircraft.

Without Curtiss as its largest customer, Clyde Cessna and his staff scrambled to reinforce its existing nationwide dealer and distributor network, and thanks to the hard work of general manager Harold Wehrle, eight new franchises were established. In the November 1929 issue of "*Aviation*" magazine, Cessna Aircraft Company printed a notice stating what Clyde Cessna considered to be the most important message of that year. Basically, the notice reassured readers that the company was financially strong and was led by men with significant experience in the aviation industry.

In addition, the company had created a new sales organization that was ready to do more business than ever before. Unfortunately, less than 30 days later Cessna Aircraft's financial base was beginning to show signs of crumbling. For example, company stock that had sold for $100 per share in 1928 was selling for only $18, and there were fewer and fewer buyers.

To raise money the board of directors sold the old factory in Wichita for $50,000, and although new airplanes were rolling off the assembly line at the new facility, prices were reduced in hopes of attracting buyers. Back east on Wall Street, the stock market was riding a financial roller coaster during the next few weeks with prices rising and then suddenly falling to new lows.

Prices for new aircraft were falling almost as fast as the values of Cessna company stock. A few examples are in order here to illustrate the deteriorating situation faced by the board of directors:

- A factory-fresh Model AW normally retailed for $7,200 but despite slashing its price to a mere $3,400, there were no buyers.
- Another new Model AW with (ferry time only from Wichita to New York City) was offered for $3,700 under retail but sat on the ramp unsold.
- A new Model DC-6A cabin monoplane (Cessna's latest and best design to date) carried at price tag of $11,500 but could not attract a buyer despite a bargain price of $9,800.

Early in 1930 Clyde Cessna himself came under attack from stockholders who were furious at losing so much money in so little time. They filed a petition citing mismanagement by Mr. Cessna as the chief reason the company finished 1929 $100,000 in the red, despite having sold $750,000 worth of new airplanes and selling more than $300,000 worth of stock.

In the summer of 1929 the Cessna Aircraft Company relocated to a new factory southwest of downtown Wichita. Unfortunately, the debacle on Wall Street that began in October of that year would destroy Clyde Cessna's long-time dream of manufacturing airplanes and brought Wichita's lucrative aviation enterprise to its knees. (TEXTRON AVIATION)

During the winter of 1930, sales of new Cessna aircraft continued its downward trend, and in February 1930 the price of one share of stock was only $10. That month a meeting of the board of directors was held and plans were made to completely reorganize the business model. At that time, two prominent Wichita businessmen, Charles Yankey and M.L. Arnold, arrived on the scene. They promised Clyde Cessna $50,000 to recapitalize the company. In return, Arnold was placed on the board as vice president and treasurer. Soon after the meeting Arnold informed the local press that "sweeping cuts" would be made to prices of the Model DC-6A to $9,750 from $11,000, but Clyde knew that what the company really needed was not more price cuts but aircraft designed to sell in what was rapidly becoming a severely depressed market.

Clyde's son, Eldon, had been working on such an aircraft since late 1929, and by Christmas the first CG-1 (Cessna Glider-1) was completed and another was nearing completion. Since 1925 Eldon had been a student in mechanical engineering at the Kansas State Agricultural College. In 1928 his father called him back to Wichita to work at the Cessna factory. Clyde was an enthusiastic supporter of the glider program and had high hopes that a $398 price tag would result in sale of hundreds or even thousands of the rudimentary aircraft.

A production version was quickly developed and designated as the CG-2. Constructed primarily of wood, the aircraft featured a wingspan of 35 feet, an area of 157 square feet and a benign wing loading of only 1.82 pounds per square foot. Empty weight was 120 pounds. The CG-2 could be launched by a team of people, towed aloft and released, or launched using a shock cord. Flying speed was about 25 mph and landing speed was a gentle 15 mph.

Each glider was shipped in a crate and could be easily assembled without special tools and came with an instruction manual, shock cord, a seat belt and an automatic release mechanism for manual launching or aerial towing. Both Arnold and Clyde Cessna wanted to advertise the CG-2 to the world, and one was included in the company's display at the aeronautical exposition held in St. Louis, Missouri, in March 1930. The humble CG-2 drew more attention at the show than the majestic DC-6A and DC-6B cabin monoplanes.

Unfortunately, other struggling airframe manufacturers, among them Alexander Eaglerock in Colorado, WACO in Ohio, and the Detroit Aircraft Company, were excellent building gliders of their own design and depressed sales of the CG-2. According to Cessna company records, only 84 gliders can be verified as built and sold despite claims that 300 were completed. In addition to the CG-2, company engineers had been busy designing and building the CS-1 (Cessna Sailplane—1) that featured a glide ratio of one foot down for every

During 1930, the Cessna Aircraft Company was among many aircraft manufacturers building gliders in the United States. The CG-1 was replaced by the improved CG-2 shown here. Eldon Cessna is the pilot. (ROBERT PICKETT COLLECTION/KANSAS AVIATION MUSEUM)

30 feet forward. Wingspan was a generous 47 feet and empty was only 150 pounds. As with the CG-2, the CS-1 could be launched by a team of men pulling on a rope or towed into the air by an automobile (the preferred method). During a series of test flights in the spring of 1930, the aircraft had remained aloft for up to three minutes. Although such a short duration of flight pales by comparison to modern sailplanes, the CS-1 could attain only a few hundred feet of altitude at best, leaving very little time to glide.

As 1930 progressed sales of new aircraft nationwide continued to decline. Production of the CG-2, however, was increased to more than one per work day. In May Eldon Cessna installed small floats on a CG-2 and conducted experimental flights of his "Hydro-Glider" on a man-made lake near the campus of the Braley Flying School. Ever the innovator, Eldon mounted a tiny, two-cylinder Cleone piston engine on the fuselage of another CG-2, added a five-quart fuel tank and bolted a welded steel tube landing gear to the airframe.

Eldon dubbed his creation the CPG-1 (Cessna Powered Glider – Model 1) and conducted many successful flights during May and June before the engine was relocated forward ahead of the pilot seat, which was shielded from the propeller blast by a curved piece of Pyrolin. The little ship soon became a common sight near the Cessna factory, buzzing through the sky at an estimated 25-30 mph.

Encouraged by his success with the CPG-1, Eldon modified a CG-2 by covering the fuselage with fabric, adding a tiny door on the right side of the fuselage and a windshield in front of the pilot, thereby creating a semi-enclosed cockpit for the pilot. Next, he installed a Cleone engine (rated at 25 horsepower) and propeller to complete the CG-2's transformation from glider to airplane.

Only one example was built and served as the prototype for the EC-1 monoplane, designed chiefly by Eldon and demonstrated successfully to the company board of directors. They approved further development and two additional EC-1 ships were built that summer but serial production never materialized. By March 1931, however, the EC-1 had evolved into the EC-2 – a two-place airplane powered by a two-cylinder, air-cooled Aeronca engine that developed 30 horsepower. Cessna records are unclear, but apparently only one EC-2 was built and was destroyed in a crash in 1933. Overall the little ship was a good design and lent itself well to production, but the company was essentially broke and the EC-2 became the final product of the original Cessna Aircraft Company.

In addition to the EC-1 and EC-2, the few company engineers remaining on the skinny payroll designed a two-place, high-wing monoplane powered by an inline, inverted Cirrus engine rated at 95 horsepower.

The Cessna EC-1 was designed by Eldon Cessna as an affordable, lightweight two-place monoplane that evolved from his experiments with powered gliders. (ROBERT PICKETT COLLECTION/KANSAS AVIATION MUSEUM)

Known as the FC-1, its cantilever wing spanned 33 feet and the fuselage length was 21 feet. Maximum gross weight was 1,458 pounds. It was sold to a private owner in June 1930.

Meanwhile, Clyde Cessna clung to his belief that the once lucrative aviation business would not recover for a long time (he was correct) and strongly advocated a conservative approach to preserving the company until better days arrived. Clyde and the board of directors took a hard look at the situation and had to accept the raw reality before them – the Cessna Aircraft Company was on the verge of bankruptcy. During a meeting of the board in October 1930, directors from the Fourth National Bank in Wichita told company officials they were calling in some of the debt owed. Unfortunately, there was no cash in the company coffers.

To pay those debts, it was proposed that vice president M.L. Arnold buy four unsold airplanes along with land still available at the old factory on First Street and Glenn Avenue. Arnold wrote a check for $22,000 and kept the wolves at bay for a little while longer. By January 1931 the company's financial condition was destitute, and stockholders began to call for closure of the factory. What happened next took an emotional toll on Clyde Cessna. Not only was the aviation pioneer caught in the crosshairs of investors and bankers, but even some board members were prepared to call for his dismissal. As a result, Thad C. Carver, a banker from Pratt, Kansas, and a long-time supporter of Wichita's aviation industry, was elected president relegating Clyde to the office of vice president.

The board, however, remained optimistic that the business climate would improve during 1931 and boldly announced that a new series of Cessna monoplanes would be introduced during the year. Plans called for the diminutive EC-2 to be equipped with a 50-horsepower Continental powerplant and offered under the name *Baby Cessna* but the market was already flooded with small, low-powered ships built by a number of companies struggling to survive.

The final nail in the coffin of the Cessna Aircraft Company was driven home in March 1931 when the board met to decide on a new course of action. After discussions they decided that because of almost non-existent sales and that no profit could hope to be made under the current economic conditions, and to avoid bankruptcy and receivership, the factory should be closed, locked and the remaining employees eliminated from the

In 1932-1933, while Walter Beech was building biplanes in Clyde's factory, Clyde and Eldon were building monoplane racers in Walter's empty Travel Air factory. Their first creation, the CR-1 shown here, evolved into the CR-2 and CR-3 that were victorious in regional and national air races.
(ROBERT PICKETT COLLECTION/ KANSAS AVIATION MUSEUM)

payroll, including Clyde Cessna. Not surprisingly, Clyde vehemently objected but the die was cast. The board also agreed that all inventory on hand would be sold.

Mr. Cessna was saddened by the turn of events that had so swiftly overtaken him. He had worked diligently to keep the doors open, but he had no choice but to accept the board's decisions. Plagued by a deepening Great Depression, attacked by grumbling stockholders and outgunned by the board of directors, Clyde Cessna fought the good fight but lost because of conditions beyond his control. He could only reflect on the brief period of success he had achieved. During the company's time in business beginning in September 1927, records indicate that about 240 airplanes were sold with the majority bought by the Curtiss Flying Service.

Perhaps lesser men would have succumbed to defeat, but not Clyde Cessna. He chose to retreat and regroup. In 1932 he and Eldon would team up to form the C.V. Cessna Aircraft Company and wage their own war against the tough economic times in aviation by creating custom-built monoplanes for air racing. For Clyde Cessna it was not the end but a new beginning. KA

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

Raisbeck Announces STC Approval for Beechcraft King Air 300/300LW Propellers

Raisbeck Engineering, Inc. announced it has received Supplemental Type Certificate (STC) approvals from the Federal Aviation Administration (FAA) for the company's five-blade composite swept propeller and four-blade aluminum swept propeller for the Beechcraft King Air 300/300LW aircraft.

The company says the propellers provide added performance, efficiency and a quieter cabin. The advanced design of the five-blade carbon composite swept propeller blades allows for unlimited blade life and reduced maintenance costs while providing the strength and durability expected from modern composites. As an alternative, Raisbeck is bringing its four-blade aluminum swept propeller, which has already been approved for the King Air 90, King Air 200 series and King Air B300 series, to the King Air 300/300LW.

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

CenTex announces King Air 200 HST Package

CenTex Aerospace has introduced an addition to their lineup of King Air conversions called the King Air 200 HST Package, which combines the Halo 275 and ST120 Saddle Tank conversions. The company states that the package offers unprecedented performance at an unbeatable price – the kit price of $260,000 (does not include installation) provides a savings of $25,500 over Halo 275 and ST120 kits bought separately.

For King Air 200s with high flotation landing gear, the HST Package offers a MTOW of 14,000 pounds with a Maximum Landing Weight of 13,500 pounds. For serial numbers BB-1444 and after – the Maximum Zero Fuel Weight is increased to 11,500 pounds; payload is an impressive 3,000 pounds; maximum fuel capacity is 4,450 pounds, and there is an increase to the Mmo to .58 Mach.

This all adds up to an airplane that has the capability to fly 2,200 NM, or an endurance over nine hours, and still carry what you need inside or outside of the cabin. The ST120 Saddle Tanks offer over nine cubic-feet of wing storage which is good for aircraft supplies, suitcases and crew bags.

For more information, contact CenTex Aerospace by phone at (254) 752-4290, email at *info@centex.aero*, or personally visit the corporate office in Waco, Texas (KACT).

MT-Propeller's 5-bladed MTV-27 Turboprop Series Increases TBO

MT-Propeller has announced that the TBO for all 5-bladed MT-Propellers MTV-27 series has increased to 4,000 hours or six years, whatever comes first. This overhaul interval is one of the longest in the industry standard.

The company says there is no intermediate maintenance, like re-greasing bearings and filing blades, needed with the MT system, which makes it one of the lowest maintenance cost propeller systems in the world. There are also no life-limited parts installed.

There is a MT-Propeller factory certified network of 62 service centers all over the world. For questions, contact *marketing@mt-propeller.com,* technical questions will be forwarded to engineering.

Garmin® International recently had several announcements:

Introduction of GWX 75 Aviation Doppler Weather Radar

The GWX™ 75 is a new addition to Garmin's suite of weather radars. Intended for a wide range of aircraft, the Doppler-based, solid-state GWX 75 incorporates exceptional range and a new, enhanced color palette that features more color contouring than traditional weather radar on the market. Optional features such as turbulence detection and ground clutter suppression are also available with the GWX 75.

The company stated that the GWX 75 provides pilots with a source of on-board weather information to assist in the analysis of convective weather threats, which aids in situational awareness and helps reduce aircraft operational costs. Pilots can tailor a unique weather picture on each individual display in the cockpit, offering superior customization.

Boasting a solid-state design, the GWX 75 offers reduced power consumption and extended life compared to earlier generation, magnetron-based weather radars. The GWX 75 offers a range of 320 nautical miles, horizontal scan angles of up to 120 degrees and to focus on an area of interest, pilot-adjustable sector scanning. The GWX 75 also retains vertical scan capabilities, which allows the pilot to focus on storm tops, gradients and storm cell build-up at various altitudes.

Utilizing the GWX 75, pilots can more confidently navigate around challenging weather with optional features such as Doppler-enabled turbulence detection and ground clutter suppression. Turbulence detection identifies turbulence in air containing certain particulates, such as precipitation, while ground clutter suppression allows the GWX 75 to separate radar ground returns and remove them from the display. Additionally, Garmin's exclusive WATCH® (Weather Attenuated Color Highlight) helps to identify shadowing effects of short-range cell activity and highlights areas where radar returns are weakened or attenuated by intense precipitation to allow for more precise weather interpretation.

Additionally, Garmin is launching a new Weather Radar Operations eLearning course, which is available immediately via the flyGarmin® website. This course helps pilots get the most out of a Garmin weather radar by discussing a variety of topics and reviewing operational techniques, such as tilt and range management, weather radar display interpretation, as well as automation and task management. An interactive session also allows pilots to manipulate the controls of the weather radar as various features and settings are reviewed within the PC-based course. This course is available for $149 and comes with a two-year subscription. For additional information, visit *https://fly.garmin.com/fly-garmin/.*

The GWX 75 is designed as a direct replacement for the GWX 70 or as a new installation in a wide variety of aircraft and is compatible with select Garmin integrated flight decks, the GTN™ 650/750 series touchscreen navigators, the TXi series and G500/G600 flight displays. Customers can later upgrade from the GWX 75 to the GWX 80 weather radar with ease. Garmin has received Technical Standard Order (TSO) certification for the GWX 75 weather radars, which are expected to be available in August starting at a suggested retail price of $21,995. For additional information, visit *www.garmin.com/GWX75* or contact *aviation.sales@garmin.com.*

Garmin Pilot App Adds Features to Apple and Android Devices

There are several new additions to the Garmin Pilot™ feature set for Apple and Android mobile devices. Among the updates, wireless

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real-time display and play-back of engine data is available within Garmin Pilot via Flight Stream 51 when the app is paired with an EIS-capable TXi flight display or the G1000® NXi integrated flight deck.

For Apple devices, a new document viewer provides easy access to the Garmin aviation library, as well as access to popular cloud storage providers, and the addition of weather improvements further enhance the app. New for Android, weight and balance calculations and several more features aid in flight planning. These new capabilities offer greater utility within a single application and more integration within the Garmin ecosystem.

Garmin Pilot for Apple mobile devices

Exclusive to Garmin, customers will be able to utilize Garmin Pilot on Apple mobile devices to view real-time engine information via Flight Stream 510 when the app is paired with an EIS-capable TXi flight display or the G1000 NXi integrated flight deck. Upon landing, the flight data log is wirelessly uploaded to the flyGarmin website and is stored securely within the app and on flyGarmin. Within the flyGarmin website, pilots can access detailed information related to any flight, play back the flight and download data logs. Pilot-configurable exceedances can also be set within the flyGarmin website. In the event an exceedance occurs, pilots can receive an email alert that details that particular exceedance. Utilizing Garmin Pilot alongside an EIS-capable TXi flight display or G1000 NXi, pilots are provided with a comprehensive, in-depth look at engine performance and trend data and can more easily troubleshoot and identify potential issues.

Best-in-class document viewer

The new document viewer within Garmin Pilot helps pilots better organize and access a variety of informational products, including the latest Garmin library of manuals such as pilots guides and cockpit reference guides, aviation handbooks and more. The premium version of Garmin Pilot allows customers to access popular cloud storage sites like DropBox to create and add their own documents such as an aircraft flight manual (AFM) in PDF, JPG and PNG formats. Additionally, pilots can bookmark all electronic documents and highlight them for easy recall within the app.

Additional enhancements expected to be available for Apple mobile devices:

- The flight profile view within the app displays Pilot Reports (PIREPs) alongside airspace, terrain, obstacles, TFRs and weather.
- Pilots can view the Area Forecast Discussion (AFD) within Garmin Pilot, which is a plain-English narrative developed by meteorologists at the National Weather Service.
- Model Output Statistics (MOS) are accessible within the app, which displays a forecast similar in format to the Terminal Aerodrome Forecast (TAF). The MOS is updated hourly and the forecast extends 72 hours into the future.
- Within the U.S. and Europe, pilots can view base reflectivity radar, which utilizes the lowest elevation scan to display precipitation falling from the clouds better than other radar scans.
- Transitioning across multiple Apple mobile devices or adding a new device to an existing account is easier as user preferences such as weight and balance, charts, settings, downloads and more are saved to the flyGarmin website.
- The new D2™ Delta PX aviator watch connects wirelessly to the app to display wrist-based Pulse Oximeter[1] and heart rate data in the navigation bar and within the Connext® menu. Garmin Pilot also supports wireless flight plan transfer to the new D2™ Delta aviator watch.
- Pilots can create a custom map shape file on a computer to design a customized map so it's easier to reference their position relative to a specific geographic area, such as a practice area. This map file is transferred from a computer via email and then uploaded within the app.

Garmin Pilot for Android mobile devices

Garmin Pilot on Android mobile devices incorporates weight and balance calculations into a flight plan or a saved trip, taking into account fuel burn and more. Pilots can take advantage of pre-loaded aircraft types or enter aircraft weight and balance figures manually, noting the arm, moment and station of each point from the Pilot's Operating Handbook (POH). Center of gravity (CG) is easily referenced in the application relative to an active flight plan. In the event CG limits entered within the app are not loaded within the envelope, pilots receive a notification. Additionally, customized weight and balance profiles can be shared across multiple Garmin Pilot accounts.

Additional features expected to be available for Android mobile devices:

- Storm cell movement displays the projected path of a storm. An orange circle paired with a line that extends from the strongest storm cells shows its potential path in 15, 30, 45 and 60-minute intervals. If hail or tornadic activity is present, a corresponding icon will also be displayed alongside the particular storm cell line.
- Pilots can also view the Area Forecast Discussion (AFD) that is disseminated in a plain-English narrative within the app.
- The new D2™ Delta PX aviator watch and Garmin Pilot connect to display Pulse Oximeter[1] and heart rate data in the navigation bar and within the Connext® menu. Wireless fight plan transfer to the watch is also supported by the app.

The newest release of Garmin Pilot for Apple and Android mobile devices was expected to be available at the 2018 EAA AirVenture fly-in, in Oshkosh, Wisconsin, July 23-29. For new customers, Garmin Pilot is available from the Apple App Store and Google Play Store as a free download for the first 30 days. After the 30-day trial period, customers may purchase an annual subscription of Garmin Pilot starting at $74.99. Visit *www.garmin.com/aviation* for additional information.

1. This is not a medical device and is not intended for use in the diagnosis or monitoring of any medical condition; see *Garmin.com/ataccuracy*. Pulse Ox is not available in all regions.

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