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The Fastest King Air

Pilot Report on Blackhawk's XP67A 350

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.

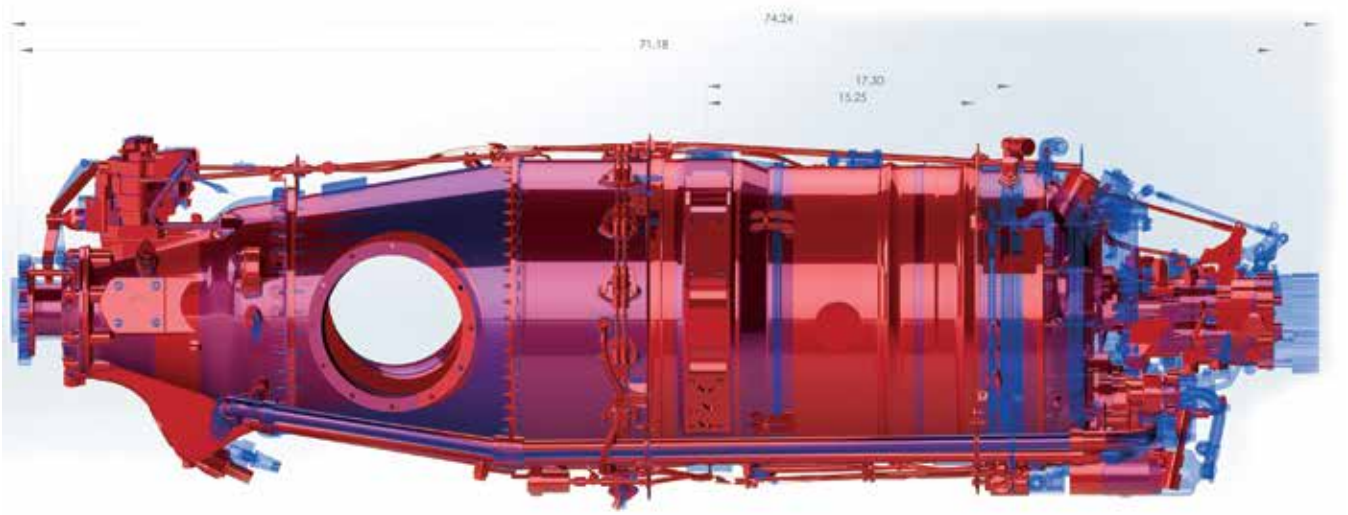
A Quick Look Back

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

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.