



A BLACKHAWK CONVERTED KING AIR B200, AND (INSET) JIM ALLMON WITH A PRATT & WHITNEY CANADA PT6A-135A ENGINE

Blackhawk Modifications - Age 10:

Growing stronger with each new program. by Dave Higdon

In 1999, the world's business aviation fleet was already populated with thousands of multi- and single-engine turboprops. Many of those aircraft came into the market with propjet engines offering power and fuel-efficiency numbers well behind the contemporary state-of-the-art level – and that bar continues to move ever higher.

At the time, when operators found it necessary to overhaul or replace those engines, they often experienced a bit of sticker shock. Reworking the original engines could cost more than newer powerplants of the day. Sometimes the costs of engine hot-section

rebUILds and other necessary powerplant maintenance challenged the residual value of the aircraft.

But using newer engines required a change in the aircraft's certificate, either through a field approval – not a high probability for a propjet – or a Supplemental Type Certificate (STC). Some attempts at STCs for engine upgrades had been made, but they often came with other burdens, or using engines unfamiliar to the operators. Without a path to legally and safely adapt to the new powerplants, the operators of the time faced limited options: Spend a value-challenging amount of money on overhauls, or trade-up – an option with its own cost challenges.

It was in this environment that an engineering company known as Blackhawk Modifications took on the issue.

Blackhawk Modifications quickly earned a worldwide reputation for offering cost-effective, desirable solutions to the dilemma owners faced. And aviation insiders across the business aircraft spectrum credit Jim Allmon for the step-forward. As Blackhawk marketing director Edwin Black succinctly put it, "Jim Allmon helped put engine upgrades on the map.

"Engine upgrades have been around for a long time, but they didn't really get into the public consciousness until Jim Allmon came on board and decided to just focus on



engines and get that market up-and-running.”

Blackhawk’s first STC, for Cessna’s highly regarded Conquest I, ignited a new level of interest among cost-conscious turboprop operators seeking an alternative to buying up in order to improve performance. Today, 10 years later, nearly one in five Conquest I airframes sport the Blackhawk engine upgrade.

Yet that was merely the beginning... Other STCs followed covering Piper’s Cheyenne I and II, and all but the 350 Series of the most-produced propjet line in history, the Beechcraft King Air. By October 2006, the company had upgraded nearly 100 Beechcraft, Cessna and Piper aircraft. Further, at that same time, Blackhawk confidently ordered 650 new PT6A propjet engines from Pratt & Whitney Canada for use on existing and upcoming programs.

In the years since, Blackhawk has stayed with its core philosophy and not moved beyond simply offering efficient alternatives to those original powerplants of a variety of flavors, all of them built around improving the original aircraft with better overall performance and lower specific fuel-consumption numbers.

This year the number of Blackhawk-upgraded aircraft flying exceeded 240 – a count that continues to grow... and for good reason:

As anyone who writes checks to operate an airplane will tell you, few things make them feel better about the money spent than

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getting in return an airplane that cruises and climbs faster, while using less fuel per mile in the process. Couple those benefits with the higher maintenance intervals and lower overall service costs of today’s engines, and it’s not difficult to understand why Blackhawk Modifications continues to thrive and grow.

A company of just 23 people, Blackhawk Modifications seems adept at finding the right fit to make old birds fly better, stronger, and less expensively.

ECONOMIES OF SCALE

Allmon’s approach – indeed, Blackhawk’s overall philosophy – embraces the belief that improving the speed and efficiency of an airplane can pay dividends. Embracing those improvements can be cost effective as a stand-alone decision, aside from the financial benefits of the efficiency gains. But too often, operators may view such upgrades through

the prism of isolated snapshots of information rather than seeing the entire tapestry of the proposed change.

Viewed as a whole, the tapestry can reveal a vastly different image. Black explains, “People know they have to spend money on overhauling their engines at some point. People want to know about fuel burn...they’re more sensitive because of that huge run-up in fuel. The key to this is the non-variable operating costs, the time you put on the airframe, the time you put on the engines.

“For not much more than an overhaul on older, more-expensive engines, operators can get brand-new engines, with new-engine warranties.”

The increase in performance can be dramatic, with significant gains in climb rate, speed at altitude and total fuel efficiency – even when a snapshot glimpse of the upgrade may reveal higher hourly fuel flows.

“The reality is the speed gains more than offset the higher hourly fuel figures so that the operator is getting more miles per gallon,” Black noted.

Indeed, the upgrade itself has worth beyond its operating benefits. “That upgrade can increase the residual value – the resale value,” Black noted.

But Blackhawk Modifications doesn’t expect everyone to take its words at face value – or for operators considering an upgrade to decide on the basis of anecdotal

information from past customers. “That’s one of the reasons we had Conklin & de Decker do that analysis - to show the lower costs-per-mile,” Black explained.

In high detail, the Conklin & de Decker analysis reveals the operating and residual costs advantages of one of Blackhawk’s most-popular engine upgrades - the modification known as the Blackhawk Super XPR61 Engine Upgrade. You can view the report here: www.banyanair.com/pdf/ConklinXPR61-B200.pdf

SIMPLICITY DRIVEN

One singular element of Blackhawk’s product line is its focus on the simplicity of its upgrades. Almost all of Blackhawk’s engine upgrades involve relatively simple bolt-on engine swaps involving no airframe modifications - only the engines themselves and the instrumentation for each powerplant.

Although not exactly an exception, Blackhawk’s partnership with legendary airframe-enhancer Raisbeck Engineering does offer operators the option of employing performance-improving airframe modifications with Blackhawk’s powerplant upgrades, however.

The initial partnership involved the Super XP61 Engine Upgrade program that embraced as a package King Air 200-series airframe mods from Raisbeck Engineering as well as the Blackhawk STC’d engine upgrade to the PT6A-61 engines. Now, according to Edwin Black, Blackhawk’s King Air power upgrades can all work with Raisbeck mods for the same airframe as an option.

“We also produce flight-tested performance supplements for the POH (Pilot Operating Handbook), so the pilots have accurate information to work with flying the airplane,” Black explained.

By and large, however, as mentioned above, Blackhawk’s power-enhancing packages involve bolt-on replacement packages for the airframe involved. “That helps minimize downtime and installation expense,” Black detailed, “and it helps eliminate problems in the maintenance shops, because everything is where it was on the original and in the same cowl.”

One change does come to the cockpit, though - a Blackhawk Hawkeye DigiLog for each engine. These instruments combine the familiar format of the round, two-inch analog gauges normally found in the propjet panel with microprocessor-based signal processing and digital-display technologies for the best of both worlds. Data is presented in both analog dial format and digital display, alarms for parameter exceedence display with an indicator, and the gauges are available for all six parameters normally monitored in propjet engines, from torque to inter-turbine tem-



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– Edwin Black

perature, fuel flow, separate prop and gas-generator RPM, and oil pressure and temperature combined.

THE JURY IS IN...

“We’re motivated to make sure people understand the benefits of these conversions,” explained Black. With one, for example, performance alone helps sell the upgrade. “In the King Air B200 you can have 300 + knots just by bolting on new engines. People want performance...they also recognize value.”

The most popular, according to Black, is not a surprise: “Our most-popular is the Super XP61 for the King Air 200 and B200 fleet.” (A variant known as the Super XP52 and the XP42 upgrades are also popular for the King Air 200 series.)

Blackhawk offers popular engine enhancements for the King Air 90 series, including the XP28 upgrade, XP21 upgrade and XP135A, among the company’s newest. Blackhawk also offers an innovative Fuel Locker upgrade for the 90 Series King Airs - the company’s

only airframe mod - which adds more than 80 gallons of fuel capacity, a healthy 20 percent above standard.

In addition to the Beechcraft propjets and the Cessna Conquest I, Blackhawk also offers the XP135A upgrade for Piper’s Cheyenne I, IA, II and IIXL models of twin propjets. But if you think that twins are the only propjets to garner interest from Blackhawk’s team, one of the company’s latest products should put a stop to that.

GOING SINGLE

Without exception, Blackhawk’s twin-engine propjet upgrades followed the bolt-on philosophy. Of course, exceptions can be good things, and so seems the case with Blackhawk’s latest program, the XP42A for Cessna’s venerable 208 Caravan.

Blackhawk launched its business with an upgrade to a Cessna, and now for its 10th year, Blackhawk is again focused on a Cessna turboprop - the wildly successful 208 Caravan series and all its incarnations, with the XP42A upgrade for the Caravan.

Not too many years back, Cessna itself updated the Caravan with a power upgrade to 675 shp from the original 550. The results were as you’d expect - improved performance in climb, payload and speed.

Now Blackhawk’s XP42A upgrade for the Caravan kicks it up a couple of further notches - to 850 shp with the P&WC PT6A-42A engine. The choice of another PT6A wasn’t the exception; the exception comes in Blackhawk’s execution of the upgrade:

Instead of a bolt-on engine swap with no change required of the cowling, Blackhawk opted for a firewall-forward approach that replaces, or reworks every significant system from the firewall forward.

For example, the engine mount gets a new four-point horse collar ring in place of the original three-point mount. The XP42A gets a new oil cooler - one 40 percent larger than the original - as well as a new induction system, complete with a redesigned inertial separator for maximum protection from foreign-object damage.

Black explained, “The new oil cooler means you don’t have to watch your temperatures between idle and take off, so it’s particularly helpful on the ground.”

The PT6A-42A engine used for the XP42A upgrade employs the dual-exhaust configuration common to the majority of PT6 installations, which gives the airplane a different look compared to the original powerplants’ large single-exhaust stack. In place of the original 106-inch McCauley three-blade constant-speed propeller goes an all-new design four-blade prop from Hartzell. Designated as an “X prop” by Hartzell, the entire design is new and tailored to the XP42A conversion. ➤



EDWIN BLACK WITH BLACKHAWK'S NEW XP42A ENGINE UPGRADE AT THIS YEAR'S OSHKOSH.

At a comparatively small 100 inches in diameter, the Hartzell offers lower tip speeds, and the promise of reduced sound levels and risk of foreign-object damage.

Finishing off the whole package is a hose package, new cockpit instrumentation, and an all-new carbon-composite cowl that weighs in lighter than the original and helps offset some of the weight gain of the conversion. Blackhawk chose carbon composites for the induction-system hardware, as well.

The final product weighs in slightly more than 60 pounds heavier than the original; with the 300-pound gross-weight increase promised, useful load for the Caravan increases by upward of 250 pounds.

Judging by the orders placed in advance of the STC's receipt it appears the conversion holds solid appeal. More than one dozen are already on order. Performance and economy hold the key, as usual, and they are formidable, as Allmon said at the program's public debut at the EAA's AirVenture back in July.

"The takeoff distances are remarkably lower with new climb performance that will exceed an operator's expectations," Allmon said. "This engine is a game-changer for the workhorse Caravan – now it's a powerhouse performer with incredible flexibility. Pratt & Whitney's continuous 850shp factory-new engine says it all in terms of reliability. Blackhawk is proud to have teamed up successfully with Pratt once again."

Here's the performance report from Blackhawk's engineering chief, Corey Eckhart, following the maiden flight of the conversion:

- Takeoff distances are reduced by approximately 45%.
- Climb-rate doubles and uses half the fuel to reach comparable altitudes.
- Less fuel burn at original Caravan power settings (20 lbs per hour).
- Max cruise speeds 35 to 40 KTAS faster.
- Over 300 lbs increased gross weight kit (9,062 lbs).

The above numbers are for the 208B Grand Caravan. Performance on standard days and for the original 208s should shine even brighter. By the time Blackhawk receives the STC it seeks, it won't be surprising to hear that the backlog of orders for the \$500,000-plus conversion has grown.

PARTNERS IN PERFORMANCE

Blackhawk doesn't try to do it alone or be all-things-to-all-people. That, according to the company, lets it stay lean and efficient by focusing on its core strengths: doing the engineering, testing and approval work for smart engine-upgrades focused on cost-efficient performance gains.

In the US, for example, Blackhawk works with more than 50 dealers and distributors who also install the modifications for customers. The diversity of locations means a customer is seldom more than a state away from a Blackhawk partner. Beyond its domestic network, Blackhawk boasts 14 approved distributor/installer partners in 10 countries.

The benefits for customers include nearby access to the mod shop, as well as installers and maintainers intimately familiar with the

upgrade process and the engines installed. If there are issues, the chances are, a Blackhawk partner has seen it or knows of it.

You could also call Pratt & Whitney Canada a partner in the sense that the engine-maker works closely with Blackhawk during development of its STC packages, and, through a special purchase arrangement, treats Blackhawk much like an aircraft OEM, selling engines in large lots to gain maximum purchase advantage to pass on to customers. While that may put the hook on Blackhawk for engines when business slows, guaranteed access to these engines at highly competitive prices helps assure Blackhawk's business can better compete during slow times.

The result: so far this year, Blackhawk's business is running close to even with 2007 after an unexpectedly high, record-setting 2008. "We didn't expect 2009 to match 2008," Edwin Black admitted. "But we've been able to compete well and our business for the year is still ahead of average and expectations, and nobody is unhappy with that."

It seems when you offer a product with demonstrable advantages in performance, operating economics, and in a value-enhancing package, business will come.

Even without an environment that rewards improvements to a company's business hardware with accelerated depreciation, Blackhawk's business model looks strong and results delivered set it up to do well in its next 10 years.

➤ More information from www.blackhawk.aero

STOP PRESS: NEW LIFE TO THE CHEYENNE I

As this publication was going to press, Blackhawk Modifications announced FAA approval of another XP engine upgrade option for Cheyenne I operators at this year's NBAA Convention in Orlando.

The new STC allows for installation of the PT6A-28 engines on the Cheyenne I series in place of the stock PT6A-11. Here, the -28 engines, capable of 620 shp, are flat rated to 500 shp allowing full-power settings to be carried to a much higher altitude.

The new performance improvements include greater climb rates, lower time, distance and fuel to climb and faster cruise speeds. A Cheyenne I with this new Blackhawk engine upgrade will achieve the same performance levels as the Cheyenne II series frequenting 250 KTAS, a 25 knot improvement.

In keeping with most of Blackhawk's other programs, the STC is a simple bolt-on conversion. The existing three-blade propellers can be retained or an improved four-bladed Hartzell or McCauley propeller is an approved option.