



FINANCIAL ANALYSIS

OF THE BLACKHAWK
KING AIR 200 XP₄₂ ENGINE UPGRADE

INTRODUCTION

Blackhawk Modifications, Inc. has an engine modification program to upgrade the PT6A-41 engine of the King Air 200 to a PT6A-42 engine. The PT6A-42 engine upgrade offers several advantages

- More power at altitude
- Faster cruise speed at altitude
- Potential for reduced operating costs
- Potential for enhanced resale value

This report examines each in turn.

Note: The costs and assumptions used are typical estimates based on known costs and market conditions. These calculations do not represent any financial guarantee of return.

ENHANCED PERFORMANCE

Up to about 14,000 feet at ISA, the PT6A-41 delivers its full take-off torque. At recommended cruise¹ this is 2,230 ft/lbs per engine. Above this altitude, the engine loses torque and at 28,000 feet produces only 1,346 ft/lbs torque. This yields 267 KTAS for a mid-weight King Air 200.

At normal cruise, the PT6A-42 produces 2,230 ft/lbs torque up to 16,000 feet². At 28,000 feet it still produces 1,580 ft/lbs torque – 17% more power than the PT6A-41.

We calculated a 600 NM trip with four passengers and NBAA IFR fuel reserves for a 200 NM alternate. Cruise altitude was 26,000 feet at 1800 RPM. The trip was calculated based upon the standard operating performance of the King Air.

	King Air 200	Blackhawk King Air XP ₄₂
Trip Distance	600 NM	600 NM
Altitude	FL 260	FL 260
Time (take off to touch down)	2 hr 16.2 min	2 hr 10.3 min
Average Speed	264 kts	276 kts
Average Fuel Burn	91 GPH	99 GPH

Based on this data, we calculated the annual hours for 100,000 NM utilization – typical for a productive turboprop.

	King Air 200	Blackhawk XP ₄₂
Flight Time for 100,000 NM/Yr	378.3 hrs	362 hrs
Fuel for 100,000 NM/Yr	34,508 gallons	35,963 gallons
Cost per NM	\$4.62	\$4.20

Even though the fuel burn is increased with the XP42, the cost per NM is 9% lower.

¹ Beechcraft Super King Air 200 performance, page 5-65

² Beechcraft Super King Air B200/B200C performance, page 5-85



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Thus, at a King Air 200 PT6A-41 overhaul, the engine conversion to the Blackhawk XP₄₂ would avoid a potential PT6A-41 overhaul expense of \$750,000 for a pair of engines.

REDUCED OPERATING COSTS

The significant item is the reduction in engine costs. A King Air 200 with a PT6A-41 is somewhere around its second or even third overhaul period. Depending on the engine cycles, there are significant engine life limited components (LLC) that will increase the cost of the overhaul. The PT6A-42 also has a longer time between overhaul (TBO) of 3,600 hours versus 3,000 hours for the PT6A-41. Engine set-asides are estimated as follows.

ENGINE SET-ASIDE

PT6A-41	Cost	Interval	
Mid-life	\$34,500	1500 hrs	
2nd or 3rd Overhaul (w/LLC)	\$375,000	3000 hrs	
<i>Total for two engines</i>	<i>\$819,000</i>		\$273.00 per hr set-aside \$227.50 with 3600 hr TBO

Blackhawk XP ₄₂	Cost	Interval	
Mid-life	\$40,000	1800 hrs	
1st Overhaul	\$279,000	3600 hrs	
<i>Total for two engines</i>	<i>\$638,000</i>		\$177.22 per hr set-aside

Using the *Conklin & de Decker Life Cycle Cost* data, we calculated the average hourly costs for a King Air 200 and a Blackhawk XP₄₂. To be conservative, we used a guaranteed engine maintenance program cost rather than the hourly set aside above. This then assumes the PT6A-41 engines have been accruing for their LLP since new. This is the standard way Conklin & de Decker calculates engine costs in their reports.

The costs calculated were 10-year averages for the following items:

- **Fuel.** Fuel burn was calculated for a 600 nautical mile trip using the manufacturer's aircraft performance manuals. It was assumed that four passengers plus bags (200 lb each) were on board, fuel reserves were based upon an NBAA IFR 200 NM alternate. Standard conditions (ISA), no-wind were used.
- **Maintenance Labor.** This is the labor required to accomplish scheduled and unscheduled maintenance on this aircraft.
- **Parts.** This is the cost of parts required to accomplish all unscheduled and minor scheduled maintenance on this aircraft.
- **Inspections.** This covers set-asides for the estimated cost of major airframe inspections.
- **Engine Restoral.** N.A.
- **Engine Guaranteed Mx Plan.** The cost per flight hour shown for the engine guaranteed maintenance plan using the JSSI "Complete" program. Includes warranty rate for the new PT6A-42 engines versus out of warranty rate for the PT6A-41.
- **Parts Guaranteed Mx Plan.** N.A.
- **Airframe Guaranteed Mx Plan.** N.A.
- **Avionics Guaranteed Mx Plan.** N.A.
- **Component Overhaul (All).** This covers set-asides for the estimated cost of major component overhauls. This includes the propellers.
- **Life Limited Components (All).** This covers set-asides for the estimated cost of major life limited components.



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The average *Non-fuel Variable Costs* were calculated and then the fuel savings were calculated separately. The non-fuel variable costs are detailed in Appendix A and are:

	King Air 200	Blackhawk XP ₄₂
Non Fuel Cost/Flight Hour	\$783.49	\$688.99

Fuel Cost/Gallon	\$4.75
King Air 200-41	
NM Flown/Year	100,000 NM
Hours	378.3 hrs
Variable cost/hr—no fuel (Maintenance reserves, misc. costs)	\$783.49
Fuel cost/hr	\$437.00
Average variable cost/hr	\$1,220.49
TOTAL variable cost/year	\$461,411.27
King Air 200 Blackhawk XP₄₂	
NM Flown/Year	100,000 NM
Hours	362.0 hrs
Speed Advantage at Cruise	12 KTAS
Variable cost/hr—no fuel (Maintenance reserves, misc. costs)	\$688.99
Fuel cost/hr (\$4.75/gal)	\$470.25
Average variable cost/hr	\$1,159.24
TOTAL variable cost/year	\$419,644.88
Annual Operating Cost Savings	
Stock vs. Blackhawk Super XP₄₂	\$42,067.39

At \$4.75 per gallon average fuel cost, the typical annual cost savings of a Blackhawk XP₄₂ is over \$40,000 per year.

WHEN TO DO THE CONVERSION?

The typical cost of the Blackhawk conversion is \$820,000 installed (\$795,000 for the engines plus \$25,000 for installation parts & labor).

Conversion at Overhaul

(2) PT6A-41 overhaul avoided	(\$750,000)
(2) PT6A-42 conversions	<u>\$820,000</u>
Net Cost	\$70,000

When accounting for the PT6A-41 overhaul costs avoided, the Blackhawk conversion has a net cost of only \$70,000.

Blackhawk gives a \$50/engine-hour credit for any remaining time to overhaul on a PT6A-41 at conversion.

Conversion at Mid-life

(2) PT6A-41 mid-life avoided	(\$69,000)
\$50/hr Engine credit	(\$150,000)
(2) PT6A-42 conversions	<u>\$820,000</u>
Net Cost	\$601,000

While the cost seems substantial compared to waiting until the PT6A-41 overhauls are due, these costs and savings ignore the added value in the market of a PT6A-42 powered King Air 200. The cost avoided is the Hot Section Inspection.

POTENTIAL FOR ADDED RESALE VALUE

The Blackhawk XP₄₂ program is new and insufficient sales exist to draw a conclusion. However, they have a similar conversion program for the King Air C90 family. The performance and cost enhancements of the C90 conversion are similar in nature to that provided by the Blackhawk XP₄₂.

A popular aircraft value reference, *Vref*, in their appraisal points for the King Air C90 adds **\$615,000** to the aircraft value for Blackhawk conversion³. That price happens to be the *full cost of the conversion* with installation with no discount.

For our analysis, we conservatively assumed that the Blackhawk XP₄₂ conversion would add 90% of the cost of conversion to the value of the aircraft.

³ *Vref* for Windows, 2009 — Volume 3.



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So, if performing the conversion at the time the PT6A-41 engines are due for overhaul:

Conversion at Overhaul with Enhanced Value	
(2) PT6A-41 overhaul avoided	\$750,000
(2) PT6A-42 conversions	(\$820,000)
Change in Aircraft Value:	
Added Value of Blackhawk Conversion	\$738,000
Avoided Value of -41 Overhaul to King Air 200	(\$246,000)
Return at Conversion	\$422,000

Even if doing the conversion at mid-life, there are positive returns:

Conversion at Mid-life with enhanced value	
Net Increase in Aircraft Value at Conversion	\$738,000
Net Conversion Cost at Mid-life	(\$601,000)
Return At Conversion	\$137,000

It is not reasonable to assume that an operator will perform the conversion just to sell their King Air immediately afterwards. However, if required, there is a very high likelihood of enhanced value should that occur.

What about over a period of time? Return on Investment has a number of ways to be calculated. In this analysis we used the following considerations:

- Conversion at mid-life with a net conversion cost of \$601,000.
- Four years operation at 100,000 NM per year with operating cost savings.
- A reduction in the enhanced value of the Blackhawk XP₄₂ engines based upon the Vref value adjustment method for engine time of a PT6A-42 of \$68.33 per engine hour. (First overhaul estimate of \$246,000 divided by 3600 hours).

After four years operation, there is still a net excess return over the initial investment of the Blackhawk XP₄₂ conversion.

Return on Investment	Blackhawk XP ₄₂	Total Operating Cost Savings	Return
Enhanced value			
At Conversion	\$738,000		
After Year 1	\$688,527	\$50,767	\$739,294
After Year 2	\$639,053	\$101,535	\$740,588
After Year 3	\$589,580	\$152,302	\$741,882
After Year 4	\$540,107	\$203,070	\$743,176
		Initial Investment	(\$601,000)
		Added Residual Value	\$540,107
		Operating Costs Saved	\$203,070
Excess return over initial investment if converted at mid-life			\$142,176

CONCLUSION

Our analysis shows that for a King Air 200 operator whose next engine overhaul requires replacement of time and cycle limited components, an engine upgrade to the PT6A-42 is the preferred alternative. The operator need not wait until that overhaul to realize the financial advantages of this program, which are significant.



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APPENDIX A KING AIR 200 VS. BLACKHAWK XP₄₂

Direct Cost (average)	Used Hawker Beech King Air 200	Used Hawker Beech King Air 200 Blackhawk XP ₄₂
Fuel	-	-
Fuel Additives/Lubricants	-	-
Maintenance Labor	\$242.31	\$242.31
Parts	\$188.15	\$188.15
Inspections	\$48.06	\$48.63
Engine Restoral	\$273.00	\$177.22
Engine Guaranteed Mx Plan	-	-
Parts Guaranteed Mx Plan	-	-
Airframe Guaranteed Mx Plan	-	-
Avionics Guaranteed Mx Plan	-	-
Component Overhaul (all)	\$19.65	\$20.01
Life Limited Components (all)	\$12.32	\$12.67
Other Services	-	-
Flight HourCost	-	-
Fixed Cost	-	-
Landing/Parking Fees	-	-
Crew Expenses	-	-
Small Supplies	-	-
Total Direct Cost per Hour/10 yr. avg.	\$783.49	\$688.99

Calculated with Conklin & de Decker Aircraft Cost Evaluator (Win)
Type of Operation: Corporate; Program Length: 10 years