

FLIGHT TEST

THERE ARE
MAGAZINE FLIGHT
TESTS - AND THEN
THERE ARE REAL
FLIGHT TESTS



The King Air's PT-6 is a free turbine. This means that even when fully feathered the propeller continues to turn and only a camera can stop it

FLIGHT TESTING

AN UPGRADED

STORY & PICTURES
GUY LEITCH

KING AIR

REAL FLIGHT TESTS

RThe 'flight tests' we do in SA Flyer are not really tests. They are mostly superficial reviews of the aircraft. The review normally goes into the aircraft's background and development and then the key features of its handling and performance. In contrast, a real flight test wrings the aircraft out through the extremes of its performance envelope. These flight tests need to be flown by a qualified test pilot.

Amongst Larry Beamish's many skills, he is a CAA approved test pilot. And so, when NAC needed a pilot to undertake a test flight to CAA standards on a King Air 200, they called Larry.

It was a typical week for Larry. On the Tuesday he had flown the Challenger 300 he manages to Kinshasa. The return had been delayed and he had got to bed around midnight Wednesday. At 2.00 pm Thursday he collected a Lear 45 and ferried it across to Rand to pick up The Boss, who had kindly consented to having me along as a freeloader for a ride to Cape Town. For the leg to Cape Town Larry flew as P2 to Gunther Grobe, which meant Larry, as the non-flying pilot, had to make the coffee. Upon arrival in Cape Town he was immediately thrust into a glittering function for the opening of the new Execujet FBO. Being a well prepared pilot meant he had a jacket and tie in his bag.

After an all too short rest in a city centre hotel we met downstairs for breakfast at 6.30 am. Larry filed the flight plan by phone on the drive to the airport. This time the Lear was loaded with the senior brass from Execujet. It was Larry's leg and he treated us to a beautifully scenic departure over the Cape Peninsula.

Back at Lanseria he called a meeting with the Lear's maintenance engineers as he was unhappy that some items had not been attended to. Then it was around on the ring road to NAC on the south side of the airport.

PERFORMANCE TESTING

ZS-PZU was the aircraft that needed to be test flown and it was already waiting for us outside NAC's vast maintenance hangars. NAC's head of avionics Bob Amey and Marc Strange of NAC's Blackhawk conversions stood around like expectant fathers.

The King Air was resplendent in its new paint on the ramp. Inside the cabin still smelled of leather and the carpets and seats were protected by covers. Larry took the left seat while NAC's Thinus Nel settled into the right seat. The CAA Flight

Test Form was readied on a clipboard and Larry loaned his watch to Thinus to use as the all-important stopwatch.

The purpose of the test flight was to officially verify the performance of the upgraded King Air. The venerable 31 year-old aircraft has been rejuvenated by a complete make-over, ranging from a Garmin G1000 instrument panel to the two new strakes beneath the tail.

A key part of the upgrade is the installation of Blackhawk PT6A-61 engines. These 'Dash 61s' have much improved the climb and high altitude capability of the King Air and so new performance figures have to be determined.

The size of the improvement claimed by Blackhawk can be seen from the graphic. The question was – were Blackhawk's performance claims to be believed?

THE G1000 AVIONICS UPGRADE

During a ferry flight earlier in the year of a new G58 Baron from Wichita to Lanseria, Larry had the flight time to get intimately acquainted with the Garmin G1000 integrated avionics package. This in-depth knowledge was essential, as ZS-PZU has benefitted from the whole nine yards of a complete G1000 avionics update.

From the pilot's perspective, the key features are two 10-inch PFDs and between them a 15-inch, landscape-configured MFD with integrated engine instrument displays. All three displays were easy to read in the various lighting conditions in the cockpit, even when the sun shone directly on the screens.

Fortunately Garmin doesn't expect pilots to be computer programmers, and so the G1000 system is more logical and intuitive than most older systems. This is especially so with the addition of a separate alpha-numeric key pad in the centre console. In essence, the G1000 combines all of the easy to use features of a light aircraft system with large aircraft performance capabilities.

In addition to the three big screens, the G1000 system, as installed on ZS-PZU, integrates with dual audio panels with marker beacon receivers, dual Mode S transponders, Garmin's GWX 58 digital weather radar, an integrated FMS and Garmin's acclaimed G700 digital autopilot with high-torque, "smart" pitch trim servos. There is also a Mode S transponder-based traffic information system and a Terrain Alerting and Warning System (TAWS).

The whole thing is driven by two independent and thus redundant hub computers which contain GPS WAAS receivers, VHF nav/comm radio modules, flight director computers and system interface boards. Importantly for this 'better than new' King Air's ability to operate above FL280, the two digital air data computers are RVSM-capable.

Carrying out the upgrade was immensely complex. At its heart are two engine/airframe converters which enable all the various sensors on the aircraft to forward data to the G1000. Dual solid-state AHRS and twin flux valve units provide attitude, heading and magnetic north information. The use of flux valves is important in Southern Africa as the earth's weak magnetic field in this region has caused problems for conventional compass driven AHRS units.

Performance testing requires an uninterrupted climb of at least five minutes and Larry made this requirement clear when he filed the flight plan. The planned route was from Lanseria to HBV (the Hartebeestpoort VOR), and then westwards to Mafeking and back to Lanseria. He had no problems entering the flight plan into the G1000 through the key pad and its trackball cursor.

When we were taxiing out the G1000 automatically selected its 'SafeTaxi' airport surface diagram feature. This pops upon the MFD when display range is decreased to 200 metres or less or when either the aircraft or cursor is near the airport. There's no need to call up the airport diagram from a menu list. In theory SafeTaxi displays the aircraft's position on the airport surface, plus it should provide all runway and taxiway labels depicted on Jeppesen charts. Unfortunately for our test flight, this software had not yet been purchased and so the only ground features that were displayed in detail were the runways.

The MFD also provides complete special-use airspace graphics, cartographic imagery including roads, rivers, bodies of water, railroads and political boundaries, plus towns with name labels. Similar to other manufacturers' MFDs, the Garmin unit also can display a complete array of waypoints, including airports, nav aids and intersections, along with airways. Garmin's 'ChartView' also provides high-resolution arrival and departure, plus geographically referenced terminal area, approach procedure and airport diagrams, along with, in the USA, text NOTAMS.

One of the key spatial awareness benefits of the G1000 installation is its ability to show shaded terrain contours depending on your height and thus the likelihood of conflict with terrain.

Engine instrumentation, with caution and warning colour cuing, is also displayed on the MFD. But Garmin has not developed a crew alerting system, including caution and warning annunciations, because it would have been too costly. And so as with the new B200GT, the Garmin G1000-equipped B200 retains the original warning lights panels.

The key component of the performance test was a detailed record of the climb performance under various

conditions. Once past HBV and in clear airspace the autopilot was engaged and we climbed to 14 000 ft. Garmin's flight management system is impressive. It's capable of providing roll-steering or tracking guidance for virtually all procedures, including arcs, holding patterns and procedure turns, plus vectors to final. Autopilot coupled, multiple waypoint vertical guidance is available using both published "cross at" altitude constraints and user-defined crossing altitude restrictions. Vertical guidance is provided for ILS/VOR/WAAS instrument approach procedures.

PUTTING THE KING AIR THROUGH IT PACES

Once we had cruise-climbed normally to FL140 it got interesting. Larry pulled the power all the way back on the left engine, as it is the critical one in terms of propeller rotation. The nose yawed left, even though he had anticipated it with right rudder. Although the propeller was fully feathered, the PT-6's free turbine allowed the propeller to continue to turn. Only a camera could see that the blades were at right angles to the airflow.

The aircraft was trimmed and with the remaining engine at climb power, we continued upwards. Initial climb with the new Blackhawk engines was an impressive 500 fpm, gradually reducing to 380 fpm as we approached 16 000 ft. Every thirty seconds Larry read out the altitude and the outside air temperature, plus the Torque and RPM and the Turbine Outlet Temperature readings. Just getting all this information down within the 30 seconds allowed was a tough job for Thinus.

With the Climb Test completed, the Handling and Functioning Test began. The King Air was slowed down to a full stall with the flaps set to approach and landing gear down. The Indicated airspeed of the stall, being 74 knots, was duly noted on the form, as was the 340 ft height loss. Then the controls were checked for friction and backlash. The elevator and rudder trimmers were run both ways and the landing gear cycled. All the systems, temperatures and pressures were continuously monitored and the details noted.

It was not necessary for the official flight test to determine the top speed of the 'Dash 61'



Steep turns - Putting the aircraft through it paces



Garmin G1000 has great graphics however taxi-ways absent from African database



Situational awareness - the huge MFD in the centre of the panel contains all the engine instrumentation, avionics and navigation info



Impending stall with flaps up the King Air is indicating just 73 kts at 15 000 ft



NAC are Southern African BlackHawk agents - Marc Strange is the person to talk to



BlackHawk modifications include dual aft strakes which make it easily identifiable

equipped King Air. We were still below 20,000 feet and to do a speed test would have required a climb to the mid 20 flight levels. Blackhawk claims a speed of over 300 k at FL310 and judging from its performance in the climb testes there is no reason to doubt this.

And so with the key handling items of the flight test completed, the routing to Mafikeng was abandoned and we turned left and headed back to Lanseria. There was however still one item outstanding and that was the propeller feathering test.

Larry pulled the power back on both engines and moved the propeller control levers all the way back to the feather.

WE INSTANTLY BECAME A 10 000 POUND GLIDER AT 15 000 FEET

Instantly we became a 10,000 pound glider at 15,000 feet. There were towering cumulo-nimbus clouds all around and we glided gracefully down between and around them, with the only sound being the rush of the slipstream at 140 knots past the cockpit windows. Rate of descent was 1000 fpm

After what seemed a long time gliding, Larry unfeathered the props and off we went. I confess I was relieved to see them both un-feather seamlessly. It was back to Lanseria for a smooth touchdown on 06L and an easy turn off on taxiway Charlie to NAC.

The aeroplane had performed faultlessly, which is a strong credit to the quality of NAC's workmanship in converting old aircraft to as good as - if not better - than new condition.

Back in the NAC boardroom the forms were checked for completeness and signed off, while Larry's overworked cellphone got a much need recharge. NAC's Nigel Forrester popped his head in the door and asked about top speed. He was disappointed when we said that we hadn't checked it as he had seen a true airspeed of 312 knots in ZS-PZU.

The performance figures achieved were compared with the Blackhawk performance manuals and everyone was pleased to see that ZS-PZU had comfortably met or exceeded the book figures. As NAC's Blackhawk salesman, Marc Strange was jubilant and did not miss the opportunity to sales pitch the now proven improvements to Larry who just so happened to be in the market for a replacement for his company's flight department King Air 200, which had given then sterling service.

Marc trotted out the key financial numbers of the upgrade and they made for an interesting debate. Early B200s, in good condition, can be purchased for as little as U\$1m. The three-part Raisbeck/Blackhawk/Garmin package costs about U\$1.5 million, so it can more than double the total investment in an older B200. The resulting ultimate King Air 200, however, can outperform a new B200GT and has comparable, if not superior, avionics capabilities. And it costs less than half the price of the new 200GT.

But Larry was sceptical, pointing out that it's unlikely that the owner could recoup more than half the cost of the improvements at resale, so a typical net US\$750,000 cost is tough to justify on a pure economic basis. But he admitted that the performance and avionics improvements gave the venerable King Air a whole new capability that was worth a lot.

Larry then jumped in his car and rushed off to Rand Airport, where he had to prepare his son Jason for his initial formation aerobatic display rating. It was all in a days work. 📍

