

# Superior parrot

This classic New Zealand military trainer has been up-engined and fitted with Raytheon electronics

By Bob Grimstead

**A**ir force students in the Southern hemisphere should shortly be very privileged indeed. Pacific Aerospace has come up with a complete reworking of its CT-4 Airtrainer, the 'Plastic Parrot' (Pilot Flight Test March 2006). It's called the CT-4F Akala.

Akala is the aboriginal word for parrot – continuing the Aussie joke that started when the yellow-and-green-painted Airtrainer got its Parrot nickname. The Airtrainer replaced the bigger and more powerful Winjeel as the

RAAF's trainer, and Winjeel is aboriginal for 'Young Eagle'.

The Akala now has a 300hp, fuel-injected Lycoming AEIO-540 with a fully inverted oil system, driving a three-blade Hartzell constant speed propeller. The Airtrainer had 210 hp.

To compensate for this heavier motor the Akala's wing has been moved forward seven centimetres, but the C of G remained too near the nose for ideal handling. Fortunately the other major improvement – a comprehensive fit of the latest Raytheon military and flat-

screen electronic equipment – restored the C of G to an ideal position.

The demonstrator airframe I'm to fly today is the prototype, and has a number of heavy modifications, including under-wing hard points, and yet it carries all this equipment, plus full fuel and two 200lb (90 kg) pilots and still has capacity left for fifteen kilos of baggage. Raytheon expects to be able to add air conditioning and still have payload to spare. Air conditioning counters the old Airtrainer's biggest criticism from



Military engine controls really do 'fall to hand' on the side wall

instructors of an unnecessarily hot cockpit on the ground. The production version's seats will also be improved, by making them adjustable and using conformal foam cushions.

Currently certificated in the Aerobatic Category, this airframe has yet more capacity if operated in Utility Category, since its original structural analysis was unduly conservative. Modern calculations allowed a weight increase from 2,450lb to 2,600lb (1,112kg to 1,179kg) with no reduction in its +6G/-3G strength. The Akala's wing relocation and longer cowlings are virtually unnoticeable, so that big, three-bladed Hartzell prop is the main clue to its redesign. The generous fuel tanks are unchanged, so the aeroplane's maximum range drops a little from 700 to a still useful 520 nautical miles. Its endurance at 75 per cent power is still more than three-and-a-half hours – long enough, I would suggest, for any training detail.

Inside the cockpit, everything except the controls is different from the Akala's predecessor. The mid-grey instrument panel has a simple, quickly-understood layout, with an air of military efficiency, heavy with acronyms. It is dominated by the three big five-by-seven inch back-lit liquid crystal (LCD) MFD screens

***"Its endurance at 75 per cent power is more than three and a half hours"***

(all of which are compatible with night vision goggles).

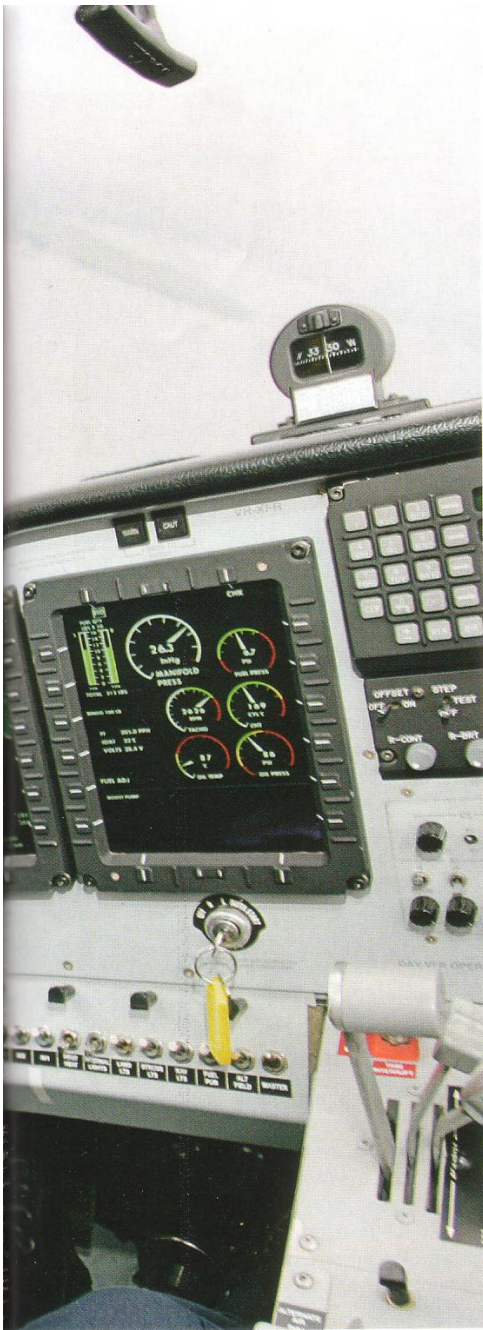
Those electronics may be the Akala's brain, but its heart is that big, husky Lycoming, which started promptly, though warm. I found the

ground steering somewhat heavy, but apparently that's a prototype-only problem.

Any criticism of ground handling is immediately forgotten when I open the throttle for takeoff. That Lycoming roars, giving the aeroplane a sure, steady, inexorable pull forward. Directional control is easy, the all-round visibility is excellent, and we sprint off the ground (in near calm conditions) after no more than 200 metres. The manufacturer's figures say the sea level takeoff run only drops from 224m to 187m with this increased horsepower, but the performance difference seems much greater than that.

Heard from the outside, the CT-4F has a more purposeful, but lower-pitched growl than its predecessors, with a much less noisy propeller rasp, thanks to its engine's lower maximum rpm and the three-bladed prop's reduced diameter.

As briefed by Jon Weichman, Raytheon



**There is no shortage of accommodation in that huge, bulging cockpit**

Australia's director of pilot training systems, who is flying with me today, at 60kt I raise the nose to precisely 12.5 degrees of attitude and we fly off cleanly at 65kt. Retracting flap at 300ft produces a very slight sink, but no pitch change, so that 12.5 degree attitude remains valid to 3,000ft, during which the VSI indicates a steady 1,700 feet per minute. At three thousand we pitch down a little, to nine degrees nose-up, before throttling back to a climb power of 25 inches and 2,500rpm until reaching the 5,500ft full throttle height. Continuing the climb at 90kt to 10,000ft, all at nine degrees nose-up, gets us there in less than ten minutes.

Instructors will love this, for it gives them the opportunity to brief students, but without any wasted time.

The power loading drop from 11.43 lb/hp to 8.67 lb/hp has produced a very noticeable performance improvement – more than those numbers might suggest at a glance, since any aeroplane's climb rate is relative to the excess power available over that required to maintain level flight at the same airspeed. It feels much greater than the 1,350 to 1,830fpm book figure increase. The older model Airtrainer I flew last year climbed at only 800fpm.

The Akala's large EFIS horizon allows it to be flown by attitude, so to level off I merely lower the nose to half a degree above the horizon line and reduce power to 2,300rpm. Our airspeed creeps up to 130kt indicated, equating to nearly 150kt TAS. Thanks to its short wing and that big motor, the zippy Akala's top speed at sea level in ISA is actually a little over 160kt, and these comparatively high speeds (for a piston trainer) will suit students going on to helicopters, while giving the fixed-wing candidates good preparation for their likely next trainer, the Hawker Beechcraft T-6BT-6B turboprop, which cruises at 250kt.

The wing-loading increase gives the Akala a noticeably smoother ride through turbulence than the old Parrot, making it closer in feel to military turboprop machines. The tail's increased moment arm (due to the wing's move forward) combines with the heavier engine to give the CT-4F slightly more pitch and yaw stability than its forebears.

Because of this big Lycoming's increased



**Panel layout prepares pilots for more advanced aircraft such as the T-6B turboprop**

power and torque, the rudder has to be used rather more than on older CT-4s, making that low-g geared electric rudder trim button atop the control column even more useful than before. (Again, this coolie-hat trim button will help prepare rotary pilots for their next mount.)

Despite its greater weight, the Akala remains very manoeuvrable, with an aerobatic capability significantly better than its Airtrainer predecessor. It will now fly a comprehensive sportsman-level routine at 5,000ft without any height loss. Most manoeuvres are started from 150 to 170kt, and its high 207kt Vne and 150kt Va give the aeroplane good margins. At these speeds I find its controls heavy, but not unduly so.

The inverted systems allow half-Cubans to be flown with a nice big radius, and the high roll-rate easily allows the 45-degree lines and rolling portions of Cubans to be of equal length. Slow, barrel and hesitation rolls can also be either quick or leisurely, depending upon positioning and whim, and there is plenty of energy for a full upward vertical roll, provided you start with a good, firm pull from 190kt. Despite the limited rudder authority, a stall turn is quick and crisp, with little tendency to roll inwards. Rolling circles are beyond me, but certainly not beyond the Akala.

As a formation mount, I have never encountered its superior. With a light and nimble airframe, great control authority (except perhaps in yaw, which is a tiny bit lacking), brilliant, completely unhindered visibility, and good stability, coupled with immediate acceleration and instant deceleration from that powerful engine and broad, three-bladed propeller, you can place the aeroplane within an inch of where you want it, and hold it there easily, both in straight and level flight and throughout prolonged turns.

The Akala would also be good for military



For a military machine, the Akala bears a striking resemblance to US homebuilt designs



Jon Weichman filling one of the two tanks



The noseleg is simple, basic and functional

***“As a formation mount I have never encountered its superior”***

low-level work. Law-abiding civvies like myself don't get much exposure to this stuff, but I have enough experience to know that these crisp controls, the great forward and downward visibility and the precision of the Akala's electronic navigation equipment will combine to make it a perfect first introduction to this arena. For future rotary pilots it will be all they need, since 150kt is as fast as they will likely fly 'nap-of-the-earth' ops.

The machine's broad speed range enables it to fly a comfortable ILS at 120kt, a speed at which Jon told me it was good and stable, and fast enough not to get in the way of the big boys.

According to book figures, the CT-4F's sea-level landing distance over a 50ft (15m) obstacle is 244 metres, with a ground run of 169 metres. I have little chance to validate these figures, since my first landing is in formation and my second has to be continued to a runway intersection. I can say that, providing the approach speed of 75kt is maintained, slowing to seventy at the threshold, and being careful not to reduce power until the flare has been completed, this is an easy aeroplane to land gently after a brief float, with light control forces if trimmed properly, and precise control right the way to touchdown. ➔



Big elevator and rudder assist aerobatics, though the rudder is a touch underpowered





Akala showing off its tapered wings

### NAV/COM FIT

With the excitement of flying over, I turn my full attention to all those military electronics.

Military equipment includes a single mission computer (MC) utilising a 1553 data bus, an embedded GPS/INS incorporating a solid state ring laser gyro, and one dual-channel air data computer (ADC). A dual-channel engine data unit (EDU) feeds the engine display screen.

Production aircraft will have a second comms radio, a radio altimeter, Tacan, DME, and a Traffic Advisory System (TAS). This is like an airliner's TCAS, but without the conflict resolution component.

A helmet-mounted HUD will be available, since the MC already produces HUD data. Production aircraft will also have a full IRS, rather than the MC's current embedded GPS/INS, while both GPS and FMS will move into the MC. It will also have a Mode-S/ADS-B transponder and a forward-facing video camera, probably mounted in the fin. In other words, the production version of the CT-4F will be certificated with the all same equipment as the T-6B except the weapons release capability, its fixed HUD, a second MC and the angle of attack indicator.

The pilot can access all MC data through any EFIS screen, but routinely selects two 'active' pages that can be toggled from one to the other, giving six instantly available displays from a total of ten primary pages, each with multiple sub-pages. Two more sub-pages are being added, with a couple of simple but functional system schematics (probably of the 28-volt electrical and fuel systems) to accustom students to the mass of information available on more complex aircraft.

Each screen has sixteen 'soft' keys around its perimeter. These rectangular buttons have no set function, but a variety of uses depending

upon the 'page' selected, or upon previous button pushes. The normal in-flight mode would probably be with the left screen acting as Primary Flight Display (PFD), the one to its right showing the Engine Indication and Crew Alerting System display (EICAS) and that on the far right selected to the Tactical Situation Display (TSD). This could be replaced with a moving map, perhaps when the pilot is using a helmet-mounted HUD.

Rather than confining its artificial horizon to a finite circular panel, this PFD's attitude instrument background fills the upper screen's full breadth, making the aeroplane's attitude instantly apparent. Again mimicking the T-6B's layout, the Akala's ASI, altimeter, VSI and G-meter all have circular dials – a much better format than the more compact (and so, more common) tape read-outs.



High wing loading and ample power make this a smooth-landing aircraft



Good visibility, especially over the nose, is an asset in any trainer, military or otherwise