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# Aero AT-3

*A Polish attempt to produce a simple Limbach-powered JAR/VLA basic trainer to sell for around $50,000. Geoff Jones liked it, and found it 'a machine any student would soon master'. Photos by the author.*


A NEW company, 'Aeroplane Design & Manufacturing Air Services', Aero for short, is seeking to break PZL's dominance of Poland's aviation industry. The AT-3 is their new two-seat all-metal trainer, which received its Type Certificate in May.

The AT-3 is designed to be a basic affordable trainer, able to operate safely from Poland's rough grass airfields, and to have good performance though without a high-speed cruise.

In Poland a Cessna 172 costs about 500 zl. (£83) per hour to hire, which is considered exorbitant. The aim with the AT-3 is to reduce this to 200 zl. (£33). The other advantage to an AT-3 operator in Poland is that as the structure and aircraft is new-build, under current Polish regulations and JAR/VLA there are no overhaul restrictions, with no limit on the airframe. A Wilga currently has to have the usual fifty- and 100-hour checks (as does the AT-3), but at 1,000 hours a major check on the Wilga's airframe structure is necessary, costing 60,000 to 70,000 zl.

You may have noted a similarity between the Aero AT-3 and the SG Aviation Storm (*Pilot*, March 1999) and Pottier P.270 (*Pilot*, June 1999, page 15). The reason is that they have common roots: the homebuilt designs of French RSA President Jean Pottier. However, although it looks like—and is unashamedly inspired by—the original Pottier P.220, the AT-3 is a completely different aircraft. It has to be, in the transition from homebuilt to an aircraft with JAR/VLA certification. Changes include modifications to the structure, larger span, a new wing profile, redesigned flaps, a redesigned and larger fin and rudder, control rods and a new undercarriage.

Mastermind of the trio who launched the project is 37-year-old Tomasz Antoniewski (note the initials), a graduate from the Aeronautical School at the University of Warsaw. His first design, the first post-war homebuilt in Poland, was the single-seat taildragger AT-1, the first Polish homebuilt seen in the West. He has sold the AT-1 to help finance the AT-3.

His next aircraft was the AT-2, a Pottier P.220 Panda homebuilt, displayed by Aero at Aero '99 at Freidrischafen. Like the AT-1, it was sold to invest in the AT-3.

JAR/VLA sets some limitations to the construction, and from the user point of view limits the aircraft to two occupants, flights in daytime VFR, an mtow of 750 kilos and a stall of 82.5 kph. It is also a requirement to use a certificated aviation engine. The Limbach 2400EB.3AC rated at 87 hp at 3,200 rpm is the current choice.

The aircraft that I flew at Warsaw's downtown Babice airfield, five miles from the city centre, is a pre-production prototype, used for JAR/VLA certification and therefore basic and not fitted out to the intended production aircraft specification. The main structure is all metal: 0.4, 0.5 and 0.6 mm Dural is used throughout. Use of composites is minimal, being confined to the wingtips and engine cowling. The fuselage is a basic semi-monocoque box structure with a semi-stressed skin and 1.04 m maximum width at the cockpit. It has been considerably strengthened from that of the AT-2.

The canopy is in two pieces, the forward part being hinged from the fuselage longeron close to the firewall, and opening upwards and forwards for cockpit entry. The rear section is fixed and the front is secured to it with a solid turn-latch. These are currently bought in from Pottier in France.

The constant-chord wing halves have a NACA 4415M profile and use a laminated aluminium main spar that narrows to the tip. The spars locate in substantial fixings within the fuselage and are secured by eight bolts. The flaps are one area where the earlier Pottier design has been extensively modified, the flaps being used to change the L/D coefficient and reduce the AT-3's minimum speed for JAR/VLA. They are activated mechanically from a handbrake-type lever in the centre of the cockpit and deflect fifteen and forty degrees. The tail features an all-flying stabilator of 2.72 m span. The trim tabs have been redesigned to give greater deflection and the fin raised and strength-


**Though 'unashamedly inspired' by the Pottier P.220, the AT-3, seen *left* in formation with the earlier AT-2, is completely different.**


ened to give better pilot protection in the event of a roll-over accident.

At present the 64-litre fuel tank is between the panel and the firewall; in production AT-3s tankage will be increased to 100 litres, carried in two wing-root tanks with only a small balancing tank behind the firewall. Aero is currently flying the aircraft on unleaded mogas, but the Limbach engines are quite capable of using either mogas or 100LL avgas or a mixture of the two.

The Limbach 2400EB.3AC is a four-cylinder four-stroke, carburetted air-cooled engine carried on a steel tube engine mounting attached to the firewall. The same engine is used in many other light aircraft, including the Grob 109 and Taifun motor-gliders. Limbach is giving Aero considerable support—nearly 500 hours running of this engine has been achieved both on the ground and in flight testing for JAR/VLA.

A fixed-pitch Hoffman HO14 propeller is used. A pitch of 100 mm has been chosen, to give better take-off performance. There is 400 mm ground clearance from the prop tip. The cowling halves are held in position around the engine with eleven screws and can be removed for a thorough engine inspection in a couple of minutes.

The tricycle undercarriage has been designed to absorb large amounts of energy in heavy landings and can deflect as much as 200 mm. Whilst Aero admits that the free-castoring nose-wheel doesn't look attractive, it is a practical shock-absorber. The main landing gear legs are spring steel, attached separately to a cleverly designed roll box in the base of the fuselage. The Cleveland disc brakes are activated independently from toe-pedals on the rudder pedals, for both pilot and co-pilot. These enable the AT-3 to turn within its own wingspan, making it one of the most easily manoeuvrable light planes I've come across on the ground. Wheel spats can be fitted, if required.

Stepping on the wing walkways, over the 'no step' section above the flaps, access to the cockpit is easy. The seats aren't yet adjustable, but in production they will be. There's a sizeable baggage shelf behind the seats that can take thirty kilos. The control stick has dual talk and transmit buttons (most Polish pilots don't have voice-activated headsets). Everything comes fairly easily to hand and the visibility all around is tremendous. When I flew the temperature in Warsaw was pushing 30°C and a glare or sun patch on the roof of the canopy would have been appreciated—it is possible to taxi with the canopy slightly open, and this relieved the discomfort ➤

of the heat until we were ready for take-off.

Start up is easy, no choke being required. The two master switches and then the fuel pump are switched *on*, the key inserted and the ignition turned. At present no parking brake is fitted, so you have to be careful to throttle back immediately or keep your feet on the toe-brakes when the engine fires—a ground crew with chocks is the other option, but Aero must fit a park brake for serious flight-training and for engine and systems warm up in cold weather operations.

There's minimal equipment fitted to worry about for VFR flight, although with the high temperatures during my flight the oil temperature, which should be 80° to 90°C, was already at 110°. The cylinder-head temperatures of 180° to 190°C were close to the maximum allowed of 220°. A large military-style PZL-manufactured artificial horizon dominated the panel, and it took a while to get used to the units on this and the other PZL instruments—m/s and Cyrillic script (VSI), km/h (ASI) and m (altimeter).

We'd already flown from Babice to the almost deserted ex-military airfield at Modlin 45 miles north, following the Vistula River. Here we would be away from any of Warsaw's air traffic control and environmental restrictions and have the luxury of 9,000 feet of deserted runway. The only distraction was the farmers' horses and carts that occasionally crossed the taxiway!

Dual push-throttles are fitted, and after a brief pre-flight check I pushed them forward to the wall and we accelerated smartly. We'd selected fifteen degrees of flap. Quite a bit of rudder was required to keep straight in the slight crosswind as we passed the 50 kph mark with 3,100 rpm indicated and rotated at 80 kph after a run of 800 feet. It was very hot and we were quite heavy.

After adjusting the trim-wheel, located between the seats, we soon settled in a modest climb. By the time we crossed the end of Modlin's runway we were at 650 feet—not exceptional, but it was very hot and climb rate wasn't being pushed—we didn't want to overheat the oil or engine. Best climb rate is between two and three metres per second (400 and 600 fpm).

The AT-3 was quite stable in pitch, a good attribute for its intended training role. Once I'd mastered the flap lever's operation—it incorporates a clever safety feature to avoid any risk of it disengaging—the AT-3 trimmed out nicely for level cruise flight at about 2,700 rpm and 160 kph indicated. Fuel consumption was showing at 15 to 17 litres per hour at these settings.

Aileron authority was good—they are linked by rods to the control stick—and although they are only relatively small, gave a moderate rate of roll. The excellent visibility made turning safe and easy, and bleeding in some more power, turns of various angles of bank could be executed with ease and precision.

Overhead Modlin we tried some stalls, first clean and with the nose high at 82 kph; there was some stick shake and buffet, no wing drop and some aileron and rudder effectiveness right through. There's no stall warning device fitted. With the full forty degrees of flap the nose attitude at stall is remarkably high, and exact speed difficult to note due to the calibration of the ASI, but the stall came at around seventy kph followed by a fairly pronounced buffet and nose drop. The AT-3 is not approved for intentional spinning or aerobatics, JAR/VLA applying only to aeroplanes intended for non-aerobatic operation. However, the AT-



**The 87 hp Limbach also powers motor gliders. Heavily damped nose-wheel is free-castoring, the whole undercarriage notably robust. Production seats will be adjustable. Cockpit visibility is 'tremendous'.**





**Main structure is metal, the fuselage a semi-monocoque box. The split flaps extend to forty degrees. In cruise the AT-3 is stable with good aileron authority. Cruise speed is 100 mph at 3.4-3.8 gph.**

3 has been spun in many configurations.

In the circuit the AT-3 was honest and true, a perfect training aircraft. Turning base leg for the runway, and pulling out the throttle to reduce the speed, some more response at the lower ranges of adjustment would have been nice—but this is a minor niggle. At 120 kph the flaps were deployed and the trim adjusted as I turned onto final. Over the threshold the speed was reduced to 100 kph, aiming for eighty at touchdown, with little tendency to float at this speed. The undercarriage was certainly forgiving, and despite drumming from the metal structure we were able to land firmly and positively, before retracting the flaps and applying power for another circuit, working the rudder pedals to keep us straight.

I really liked the aircraft, a chirpy chappie in character and a machine that any student would soon master, learning the honest skills of piloting as they did. Aero now has the monumental task of the transition from prototype and JAR/VLA approval to production. They've not taken any orders yet, but have prospective agents and sales outlets in both Germany and Switzerland. Negotiations are at an advanced stage for production facilities and tooling in southern Poland. With a basic selling price of the proposed initial batch of five AT-3s at around the $50,000 mark, the aircraft has to be an attractive proposition.

**Aero AT-3**

| *Dimensions* | |
|---|---|
| Wing span | 7.32 m |
| Wing chord | 1.27 m |
| Wing area | 9.3 sq m |
| Length | 5.9 m |
| Height | 2.19 m |
| Wheelbase | 1.36 m |
| Wheel wheels | 2.26 m |
| Tailplane area | 1.89 sq m |
| *Weights and loadings* | |
| Mtow & landing weight | 582 kg |
| Empty weight +/-3% | 354 kg |
| Fuel (100 l in production) | 64 l |

| *Performance* | |
|---|---|
| $V_{ne}$ | 228 kph |
| Max speed | 202 kph |
| Cruise speed | 157 kph |
| Min speed at mtow | 82.5 kph |
| Stall with flaps | 72 kph |
| Climb rate | 2.2 mps @ 134 kph |
| Take-off roll | 190 m |
| Take-off to 50 ft at 15°C | 480 m |

*Engine:* Limbach L2400EB.3AC 87 hp @ 3,200 rpm. *Propeller:* Hoffman 1,500 mm fixed-pitch.

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