
EXCLUSIVE FLIGHT TEST

KZ IV DANISH WW2 FLYING AMBULANCE

# Pilot

DECEMBER 2008 £3.80

Britain's Best-Selling General Aviation Magazine

EXCLUSIVE FLIGHT TEST

## Travel in style

Bonanza G36 deluxe classic now has a glass cockpit to match

FREE LANDING VOUCHERS WORTH £40

**Turboprop engines**
The smooth way to turn a prop

## Recession bargains
Choose wisely

BUYER'S GUIDE


**TAYLOR MONOPLANE** Huge fun, economical flying for **£6,000**

FLIGHT TEST


**ORION** French homebuilt was ahead of its time

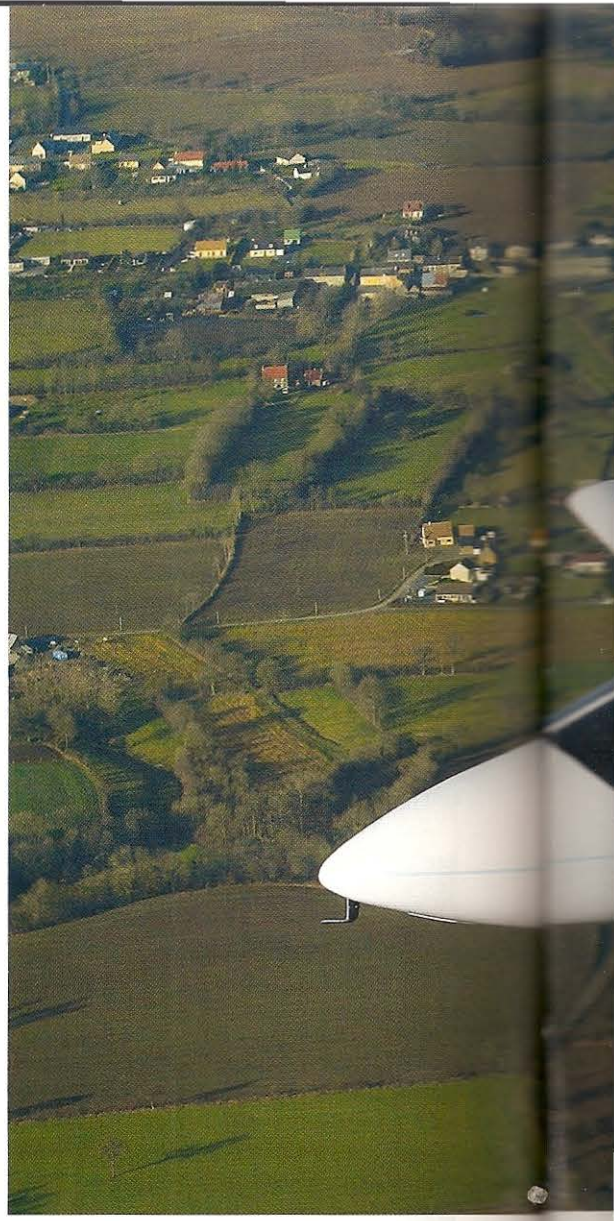
www.pilotweb.aero

9 770300 169141 12

# The trend-setting ORION

## Influential in its day, this unusual two-plus-two retractable still offers a great flying experience

**By Geoff Jones**



Jean Grinvalds's four-seat homebuilt pusher design, the G-801 Orion first flew in 1981. This is a complex aircraft, with a retractable nosewheel undercarriage and a complicated driveshaft between engine and pusher propeller. Originally its compound curves must have been quite a challenge for homebuilders, but a kit version (the G-802) introduced two years later made things somewhat easier with prefabricated major components. The example in this flight test took Jean-Dom Leullier and his wife Pat twelve years to build.

The Orion was well ahead of its time and might have been built in greater numbers than the seventeen currently flying had it not been for a fatal crash of the prototype G-802 in 1985, followed by grounding of the type and wind tunnel tests. This delayed matters at a crucial point and halted the project to produce kits. Ironically, when the aircraft did emerge from testing, it was with a clean bill of health.

The engine in Jean-Dom's Orion is a 200hp fuel injected Lycoming IO-360 taken from a PA-34 Seneca. The original steel propeller drive shaft was fitted with counterweights and in 1999 the welding of one of these cracked, leading to a deadstick landing and a five-year rebuild. The current transmission train is as follows: engine, flexidyne, sliding sleeve, flector, carbon fibre shaft, flector, cage with a double ring of ball bearings, and finally, constant speed Ivoprop three-blade pusher propeller.

As you'd expect with a pusher, the aircraft has a luggage compartment in the nose.

### AGILITY REQUIRED

Getting seated in the Orion requires a degree of agility. You open the clam-shell doors that stay open on a gas strut and can be left open whilst you are taxiing since the engine and prop wash is all behind the cockpit. Position your behind on the door sill and edge of the front seat and then swing your legs in one at a time. For rear seat passengers it is more of a scramble and crawl.

The seating position is more prone than upright, but quite comfortable, the rudder pedals with toe brakes in an easy position and Jean-Dom has fitted an airliner touch with an overhead panel of switches and circuit breakers. He has also chosen to fit a trim winder in the cockpit roof, just like in older PA-28 Cherokees.

His Orion has a yoke rather than a stick and as a homebuilt neither cleared for IFR or night operation, has rather sparse instrumentation.

> **"While taxiing, the view ahead was almost too good"**

That hasn't stopped Jean-Dom embellishing his panel with tiny, state-of-the-art units to complement the traditional 'T' of horizon, ASI, altimeter and DI. This includes a new Lowrance Airmap 2000 attached to the yoke and an Alpha Systems AOA (angle of attack) instrument. This was to prove useful when I came to make my approach and landing.

Many homebuilts have stallwarners fitted, but the AOA instrument is better. A 55mm diameter instrument is connected to a probe (much like a pitot) beneath the wing and gives indications of exactly when the wing will stall and the slowest possible airspeed allowing full elevator control while maintaining zero vertical speed. A digital bar-type display variant of this instrument is also available.

The two stage flaps (10° and 45°) are electrical and there's a central throttle control.

### PUSHER DIFFERENCES

Having the engine behind does make some differences. The view ahead is amazing and seems almost *too* good while taxiing. Equally disconcerting is having the noise coming from behind. The noise level is quite high in the cabin.

Starting is assisted, and greatly benefited when the engine is hot, by a two unit Klaus Savier electronic ignition system from Light Speed Engineering – this also improves fuel economy in the cruise.

Pre-flights checks are exactly as in a regular light single, although the benefits of fuel injection mean no carb ice to worry about. Taxiing is assisted in tight turns and locations by the toe operated Matco brakes and free castoring nose-wheel.

In tight locations the tail-mounted propeller cuts the risk of a prop-strike or injuring pedestrians. Having the wing behind the cockpit reduces the risk of passengers walking into the propeller when disembarking. The propeller is quite high off the ground, which lessens the other risk with pusher propellers: damage from stones thrown up by the wheels.

## TAKEOFF

Ten degree of flaps is applied for takeoff. The parking brake (on the pilot's side) is released and applying full power to the Orion, the noise and vibration increase and the impression of sitting quite close to the runway is heightened.

Acceleration is slow to start with, but soon kicks in and there is noticeable rudder effect at 25kt and soon after the aircraft says through the elevators and the yoke, that it's ready to fly. The recommended technique is to apply slight forward pressure to the yoke immediately after takeoff to prevent over rotation.

The Orion is not a short field nor a grass runway aircraft – like other contemporary high performance homebuilts and kit aircraft it needs a longish, hard runway. At Caen, in almost still air conditions after an estimated ground roll of 500m (1,640ft) with half tanks and two on board, and the ASI showing 65kt, I make a very gentle pull back on the yoke. This lifts the nose and the Orion is flying.

We are now accelerating in ground effect at about 30ft. A quick jab on the brakes and I retract the undercarriage. Freed of its drag, the Orion climbs at an acceptable 800fpm with the speed building to 80kt with 25map/2500rpm. At about 300ft it's time to stow the electrically actuated flaps by the flick of a switch. The speed moves quickly through 90kt and the vsi winds up to give us a climb of 1500fpm.

Another pusher effect is that there is no spiral airflow over the tail. Indeed, the propeller acts as a gyroscope. I find that the aircraft will fly as straight as a jet with no rudder input required at all to keep it straight.

The control yoke is quite sensitive, so I have to guard against a tendency to 'porpoise', compensating then over compensating.

Orion pilots must remember at takeoff not to over rotate – a tail-strike is far more critical than in a conventional aircraft, with propeller and engine damage the inevitable consequence. Some Orion builders have fitted a tail-skid to prevent tailstrikes.

However, I found that the Orion flew off the runway in a flat attitude anyway and raising the nose was not conducive to better


performance. In fact, you should let the Orion take off on its own. This is one aircraft that needs time to accelerate to its best climb speed.

## CRUISE

At 3000ft I set the Orion at 23map and 2300rpm for a best economy cruise.

One of Jean-Dom's instrument refinements is an Electronics International Ultimate Analyser. This enables you to determine the hottest cylinder and lean the mixture accordingly. After adjusting mixture, we achieve a fuel burn/consumption of 7.5USgal per hour, which is really good for a 200hp IO-360 engine.

The ASI is now registering 150kt, so the fuel economy is certainly impressive. You can see why this innovative design created such a stir when it was introduced.

Because of the configuration and the gyroscopic effect, rudder isn't required in the cruise at all, and if you want to set up a normal, gentle turn (not exceeding 30°) then it's a strict 'no rudder' rule with input only required from the yoke (ailerons and elevators).

By now the strangeness of engine noise behind rather than in front has diminished.

I find the controls both a little heavy and rather sensitive. However, they are well balanced and the control harmony is good. Best of all is the view; this really is a 'balcony in the skies'.

Over his 360 hours of flight time with the Orion, Jean-Dom has established the best cruise at 155kt, which with its two 130-litre tanks gives the Orion an endurance of eight-plus hours. Just right for a dash to the south of France for lunch?

## SAMPLING THE STALL

I try out the stall and find it quite benign at 65kt clean and 55kt with flaps. Positioned into wind I slowly reduce the throttle and set fine pitch on the propeller. The AOA instrument goes to Alpha and with the vsi on zero 70kt comes up on the GPS. Chopping the throttle completely the Orion slows, the AOA needle falls two increments and there's a slight buffet. The GPS shows 65kt and then at 63kt there's a slight left wing drop. Recovered we've lost little more than 100ft so I decide to repeat the exercise but with full flap and undercarriage down. Again two increments below Alpha on the AOA and there's a slight buffet at 58kt on the GPS with the stall developed at 56kt – again with a wing drop and 100ft height loss.

## LANDING

The approach is at a rather high 110kt to start with. I dump 10° of flap, lower the undercarriage and turn on the landing lights (which are cleverly incorporated on the undercarriage doors and fair in to the rear of the underwing air-scoops when retracted).

Slowing to 95 and then 90kt you have to be careful to keep your speed up, try not to raise the nose and yet slow the aircraft. The AOA instrument was invaluable here, although I found I was mesmerised by keeping my eye on ensuring the needle was in the lower part of the yellow arc, and rather inclined to forget the rest of the instruments. With time, this becomes a part of your normal instrument scan during approach and landing, and a back-up to the essential asi.

On finals the flaps can be lowered to 45°, with the speed now at 70kt. Just before touch down the AOA needle should now be at 'alpha', just between the yellow and red arcs representing 60kt.

If this all works well and keeping the Orion in an almost flat attitude (very limited flare) then it will 'kiss' the runway beautifully, and it comes slowly to taxi speed. If there's a crosswind component then rudder will be required, but the Orion still maintains excellent directional stability – in the still air on the day I flew, the rudder might just as well not have been there.

When Jean-Dom stood back and saw the remains of his Orion after his 1999 crash landing he said, "Well that's the end of the Orion's adventure – I'll see if I can sell the bits and move on". A few days later he changed his mind. I feel sure it was the right choice. ■