ACCIDENT

Aircraft Type and Registration:	Aerotechnik EV-97 Eurostar, G-IDOL
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2007
Date & Time (UTC):	9 April 2011 at 1230 hrs
Location:	Damyns Hall Airfield, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, wings, fuselage, left landing gear, fin, nosewheel fairing, engine shock-loaded. Damage to parked car
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	65 years
Commander's Flying Experience:	217 hours (of which 157 were on type) Last 90 days - 7 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and aditional AAIB inquiries

Synopsis

During the takeoff roll, the nosewheel struck a bump on the runway surface, causing the aircraft to lift off prematurely, at a low airspeed. The engine torque and propeller slipstream effects, in combination with a crosswind component, caused the aircraft to turn to the left. The pilot was unable to correct this deviation using the rudder, so he closed the throttle and applied the brakes. Nevertheless, the aircraft eventually collided with a car at the end of a row of vehicles that were parked to the left of the runway.

A subsequent flight test on a similar example of this aircraft type confirmed that it met the requirements of the appropriate design code used to assess its suitability for the issue of a UK Permit to Fly.

History of the flight

The aircraft lined up on Runway 14 and commenced the takeoff roll. After covering approximately 50 m the nosewheel struck a bump on the runway surface, which caused the aircraft to lift off prematurely, without having gained normal flying speed. The aircraft then turned to the left and, although the pilot applied right rudder, it was ineffective in correcting the heading. The pilot closed the throttle and applied the brakes, but the aircraft continued to travel towards the left

side of the runway, beyond which was a row of parked cars. The aircraft was now heading in a direction that left the pilot no option but to apply full left rudder in an attempt to avoid the vehicles; this resulted in the aircraft turning through almost 180º from the takeoff direction. However, the tailgate of the vehicle at the end of the row was open, which allowed the right wing tip to contact the inside of the 'C pillar', causing the aircraft to swing round to the right and collide with the side of the car.

The pilot attributed the accident to the aircraft having become prematurely airborne at a low airspeed, where there was insufficient rudder authority to maintain directional control. He noted that the wind at the time was 110º at 12 kt.

A similar crosswind-related incident occurred to another EV-97 Eurostar aircraft, G-CFVI, at Peterborough on 3 April 2010. This was reported in AAIB Bulletin 9/2010, file reference EW/G2010/04/01.

Flight test

The original investigation of the amateur-built EV-97 type, to assess its suitability for the issue of a UK Permit to Fly, was carried out by the Light Aircraft Association (LAA). The LAA remain the body responsible for the continued airworthiness monitoring of amateur-built examples of the type.

Following the accident to G-IDOL the LAA conducted a flight test on a similar example of the type. The aircraft was evaluated against CS-VLA, which is a European Aviation Safety Agency design code (or Certification Standard) for Very Light Aircraft. It is similar to other codes used around the world and is the most common code for LAA aircraft.

Part 143 General of CS-VLA states that:

> *'(a) The aeroplane must be safely controllable and manoeuvrable during: –*
>
> *(1) Takeoff*
>
> *(2) Climb*
>
> *(3) Level flight*
>
> *(4) Descent*
>
> *(5) Landing (power on and power off) with the wing flaps extended and retracted.*
>
> *(b) It must be possible to make a smooth transition from one flight condition to another (including turns and slips) without danger of exceeding the limit load factor, under any probable operating condition.'*

For the purpose of the test flight, the aircraft was flown solo, with half fuel and no baggage, creating a mid centre of gravity (CG)/mid weight condition, with the lateral CG displaced to the left (the critical direction) due to the pilot occupying the left seat.

The test itself was conducted at an altitude of between two and three thousand feet, with an air temperature of around 20ºC. The aircraft was configured with the flaps retracted and full power, in climbing flight at 70 mph indicated airspeed (IAS). The airspeed was then progressively reduced by raising the nose, while noting the amount of right rudder required to maintain the slip ball in the centre, together with the adequacy of the lateral and directional control. It was found that the amount of right rudder required increased steadily with reducing airspeed, reaching full deflection at 40-42 mph IAS, which was the approximate speed of the power-off stall in this configuration. There was no sign of rudder stall at large deflections and the rudder response was judged to be linear up to full deflection.

Raising the nose higher to reduce the airspeed further led to the slip ball moving to the left, together with a tendency to bank further to the left. However, this could be countered by the use of right aileron up to the onset of the stall at around 35 mph IAS. The behaviour in the stall was not explored due to the possibility of a spin developing with the aircraft in this extreme configuration.

Whilst at full power, at airspeeds of around 40-42 mph, the aircraft was allowed to develop a yaw to the left by using less right rudder than was required to centre the slip ball. It was found that yaw angles up to the maximum slip indicator amplitude could be reduced to zero by using additional right rudder. Throughout this manoeuvre there was no sign of fin stall at high yaw angles, or of rudder stall at high rudder deflections.

The above test was repeated with the flaps at the takeoff and landing settings; it was found that there was no detectable change in the lateral and directional control characteristics except that the stall speeds were slightly reduced compared with the flaps retracted condition. In consequence, greater aileron angles were required to level the wings at the point of stall.

The takeoff behaviour was also assessed, using full power, takeoff flap and a rotation speed of 45 mph rather than the 47 mph recommended in the Pilot's Operating Handbook. This test was conducted on a hard runway in nil wind conditions. There were no directional or lateral control difficulties and the aircraft showed no willingness to be 'hauled off' the ground at airspeeds of less than 45 mph. The effect of crosswinds on takeoff handling was not assessed, although clearly a crosswind from the left would require the application of right rudder.

Finally, the flight test report noted that the aircraft accelerated quickly between 30 and 60 mph on takeoff. However, in view of the risk of departure from controlled flight at low airspeeds, it would not be sensible to attempt to fly out of a bounce or premature takeoff at speeds below 45 mph IAS. The report suggested that, in the event that the aircraft is 'thrown into the air' below this airspeed, the aircraft should be allowed to sink back onto the runway, whereupon it would accelerate to a safe climb-away speed of 45+ mph in a few seconds.

Discussion

Any aircraft with a tractor-mounted Rotax 912 series engine will tend to swing to the left at low airspeed and full power, due to the effects of torque and the propeller slipstream. A crosswind from the left would exacerbate this tendency due to the aircraft 'weather-cocking' into wind. On the day of the accident to G-IDOL the wind was from approximately 30º to the left of the runway heading; any strengthening or backing of the wind vector would, in combination with the aircraft hitting the bump, have added to the pilot's difficulties in controlling the aircraft. Whilst it is not known if full right rudder was applied, the LAA flight test demonstrated that the aircraft is controllable, at least under flight test conditions, at low airspeeds providing full use is made of the rudder.