ACCIDENT

Aircraft Type and Registration:	EV97 Teameurostar UK, Eurostar, G-CDNI
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2005 (Serial no: 2321)
Date & Time (UTC):	27 February 2016 at 1128 hrs
Location:	Peterborough/Conington Airport, Cambridgeshire
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Serious) Passengers - N/A
Nature of Damage:	Damaged beyond economic repair
Commander's Licence:	N/A
Commander's Age:	41 years
Commander's Flying Experience:	39 hours (of which 39 were on type) Last 90 days - 4 hours Last 28 days - 2 hours
Information Source:	AAIB Field Investigation

Synopsis

The student pilot was flying solo visual circuits when the aircraft experienced an upset, probably as result of a gust of wind, at a low height that caused the left wing to rise. The student elected to go-around during which the aircraft track diverged across a field of crops that bordered the runway. The aircraft subsequently pitched nose-up followed by the left wing dropping. The aircraft rolled inverted before impacting the ground and the student was seriously injured.

History of the flight

The student pilot had flown with the same instructor on all his previous instructional flights over the preceding 13 months, other than an air experience flight in January 2015. This included being sent on his first solo on 17 January 2016.

Prior to the accident flight the student pilot conducted a flight with a different instructor to consolidate his visual circuits. Before getting airborne, the instructor read his training notes and briefed the student not to do anything different from what he had previously been taught. Runway 10 was in use and the instructor reported that the wind was from 070° to 110° at 8 to 10 kt.

The start-up, taxi, take off and climb into the circuit were all flown by the student pilot without event. On the first approach the aircraft encountered two areas of 'sink' at about 300 ft and

50 ft agl in which the aircraft descended unexpectedly. As a result the instructor advised the student to add 5 mph to the threshold speed of 65 mph. The next circuit and final approach were better with the aircraft landing "on the numbers" albeit a little fast. The third circuit and landing were better than the previous one. Consequently the instructor directed the student to taxi the aircraft back to the tower, where he briefed him to fly some solo visual circuits, and made his way up to the tower to monitor his flying.

The student stated that his first takeoff was, as the instructor had advised, steeper and faster than with two people on-board, due to the reduced takeoff weight. He found this circuit challenging, due to the wind, but landed without any problems. The instructor commented the first takeoff, positioning downwind and on finals, all appeared to be good and the landing looked "perfect" with a "nice hold-off" prior to touching down. However, on the touch-and-go, as engine power was applied, the aircraft yawed slightly to the left. The instructor then went to his office, on the first floor of the tower, and initially monitored the student's progress around the circuit by listening to a hand-held transceiver. Upon hearing the student's "FINALS" transmission he went to the window at the end of the corridor to monitor the next approach. The student stated that the second circuit was easier than the first. The instructor described this second circuit as "textbook".

The student described the third approach as "reasonable" at an IAS of just under 70 mph with the aircraft in trim. At about 100 ft he felt a strong gust of wind which lifted the left wing and he decided to go around. He believed he applied full power and applied right rudder to compensate for the effect of the propwash. The student stated that the aircraft continued to bank left, and the nose lifted, before rolling left to an angle of bank of approximately 60°. The instructor described seeing the nose of the aircraft lower slightly with the aircraft then flying level and accelerating across the field of crops that border the runway, at about 20 ft. Shortly thereafter the aircraft's nose started to rise. When the aircraft attitude reached approximately 40° nose-up, and at about 50 ft agl, the left wing dropped. The aircraft impacted the ground inverted at an angle of approximately 45°, coming to rest inverted in the field of crops.

The student released his seatbelt but realised his legs were trapped under the aircraft's instrument panel. The airfield's fire tender was quickly on the scene. The first responders rolled the aircraft upright and freed the student from the wreckage. The local emergency services arrived on the scene soon thereafter. The pilot was subsequently taken to hospital by road.

Student pilot's comments

The student pilot commented that while he was happy with his flying performance during the three circuits, as he had an instructor with him, he was a little surprised to go solo.

On the go-around he believed he did not lower the nose to increase the IAS as he had been taught. While he believes the aircraft stalled, he did not feel any buffet through the airframe.

He added that in hindsight the wind may have been too strong to fly solo with his level of experience. Until the day of the accident he had only flown one solo circuit in very calm

conditions. Having not flown for a month, he felt he would have benefited from a refresher lesson, with revision of emergencies in the circuit, as he became "rusty" if he had not flown for a few weeks, but did not suggest this to his instructor.

Instructor's comments

The instructor stated that, being aware of the student's previous performance and not having cause to take control during any of the circuits on the flight prior to the accident flight, it was appropriate to send the student pilot solo. He added that in doing so he hoped the student's confidence may have been increased, and that the student seemed to be content with the prospect of flying solo and expressed no concerns or surprise at being sent solo.

Meteorological information

A Met Office aftercast for the time of the accident stated that the weather conditions were generally good, with little significant low cloud. Winds were mostly from 020° to 080° at initially 4 to 7 kt and then steadily increased to between 12 to 14 kt by 1300 hrs. RAF Wittering, 12 nm north-west of Conington, recorded the wind from 080° at 10 kt at 1050 hrs, and from 060° at 11 kt at 1150 hrs. Cambridge, 22 nm south-east, recorded the wind from 060° at 9 kt at 1050 hrs and from 060° at 10 kt at 1120 hrs.

The tower, where the Aerodrome Flight Information Service Officer was located, was equipped with an uncalibrated computer-based weather station that recorded the wind speed and direction every 10 minutes, as measured by an anemometer located on a pole at the eastern boundary of the airport. A copy of the wind's strength and direction over the period of the two flights is shown at Figure 1. During the instructional flight it recorded wind from about 050 to 060° at 10 to 12 kt gusting 17 kt. During the accident flight it was from about 080° at 11 to 12 kt with gusts up to 16 kt.

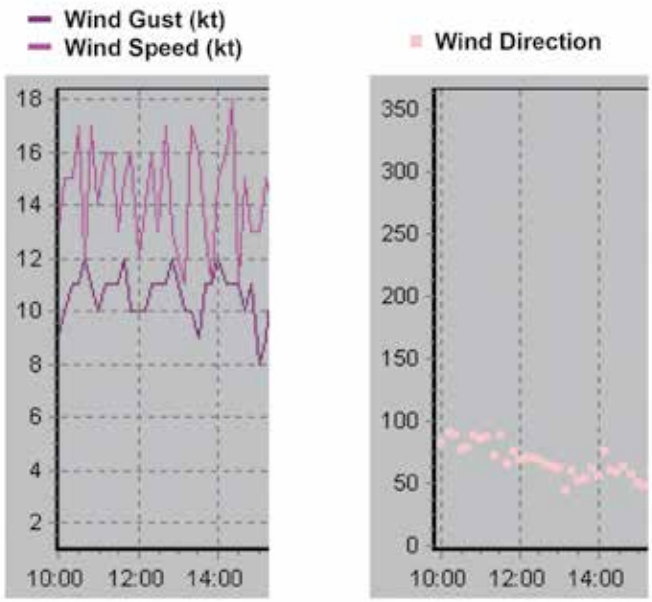

Figure 1

Recorded wind speed and direction at Peterborough Airport

Flying school orders

The flying school's Standing Orders stated:

> ***'4. RESTRICTION OF FLYING***
>
> *(viii) Flying Conditions - Under no circumstances may aircraft be flown … when wind is gusting over 15 knots or with a crosswind component of more than 10 knots[1]…'*

Flight trial

A flight trial was carried out by a test pilot in a similarly powered EV97 and observed by the AAIB. Its purpose was to assess the aircraft's handling qualities, particularly with respect to touch-and-go landings and go-arounds.

The stall characteristics were also assessed. The test pilot reported that there was a distinct and obvious pre-stall buffet about 4 mph above the stall. At the stall the aircraft could be controlled conventionally in roll and while there was a small amount of wing rock there was no tendency to drop either wing. The stall speeds (V_s) were:

Configuration	Power	Scheduled V_s mph	V_s mph
Clean	Idle	44	44
Flap One	Idle	42	43
Flap 30	Idle	38	40
Flap Full	Idle	36	38

The go-around was assessed with the aircraft in all configurations. The aircraft was trimmed at 70 mph in an idle power descent with the controls in an open loop[2] condition; this required nose-up trim. The throttle was then opened fully in 2 seconds. In each configuration there was only a subtle tendency for the aircraft to yaw and in each case the application of power caused the nose to pitch up. With each additional stage of flap the tendency to pitch-up was increased, and as flap was lowered it caused the aircraft to pitch nose-down. This required more nose-up trim at idle power which, with power re-applied, created a greater tendency to pitch nose-up.

The accident occurred during a baulked landing close to the ground with FLAP 30 selected. A rapid application of power without paying attention to the aircraft attitude would result in the aircraft pitching nose-up at about 20°/sec. Forward pressure on the controls could prevent the pitch-up. The force required to maintain a speed of 65 mph in this full power situation was 8 lbf which, although not a large force, was much greater than the very light forces required to fly the aircraft normally.

Footnote

[1] The aircraft's *Pilot's Operating Handbook* stated that 10 kt was the maximum demonstrated crosswind limit.

[2] In this context, 'open loop' means not interfering in the feedback process from the flying controls. This was achieved by relaxing the touch on the control column so as not to restrict its movement following the touch-and-go.

If the pilot was distracted and applied power rapidly without simultaneously pushing the stick firmly forward the aircraft would pitch up to an excessively high nose-up attitude, which would cause airspeed to decay. With full power applied in a high nose-up attitude the aircraft would be more likely to drop a wing at the stall.

The test pilot concluded that the 80 hp version of the EV97 had reasonable handling qualities and stall characteristics albeit exhibiting weak longitudinal static stability. Takeoffs and landings were generally easy to perform with both FULL and FLAP 30. Applying full power on an approach with FLAP 30 selected (when trimmed at 70 mph/idle power) caused the nose to pitch up smartly and required a firm and positive push forward on the stick to prevent the nose getting higher than a safe climb attitude.

Although the EV97 was generally straightforward to fly, the tendency to pitch nose-up when performing a go-around could potentially catch out an inattentive pilot.

Accident site

The aircraft came to rest inverted in a field of crops approximately 144 m from the threshold and 70 m north of Runway 10. First responders advised that the aircraft was subsequently turned upright as part of the emergency response to release the pilot. A single large ground mark indicated the initial contact point of the aircraft. The aircraft was largely intact although significantly damaged, with fragments of the damaged canopy scattered around the ground mark. Two blades of the propeller had also detached, one of which was located within the ground mark.

Aircraft examination

Damage to the aircraft was consistent with a nose-down inverted impact with the ground. This resulted in extensive buckling and tearing of the fuselage and forward rotation of the wings around the leading edge attachment, with associated damage at the wingtips from contact with the ground. There was evidence on the damaged propeller blades of engine rotation at impact. No evidence was identified of a pre-impact mechanical or structural problem. It was not possible to assess the flap position or throttle setting prior to contact with the ground, due to the impact forces and subsequent damage. To the extent it could be assessed given the damage to the fuselage, no evidence was found of a pre-impact flying control continuity problem.

Analysis

As there was no evidence found of a pre-existing fault with the aircraft which may have been causal or contributory to the accident the analysis focusses on the operational aspects of the accident.

The wind during the period of the two flights was from about 050 to 080° at 10 to 12 kt with gusts up to 16 kt. While the exact wind at the time of the accident is not known, the recorded wind information in the tower indicated that during the instructional flight the crosswind component was about 11 to 14 kt and during the accident flight about 6 to 7 kt. This is similar for the wind recorded at RAF Wittering soon after the accident. Although the

crosswind during the instructional flight may have been greater than that stated in the flying club's standing orders, it was probably below the limit during the accident flight, except that the gust limit may just have been exceeded.

The instructor commented that the student had demonstrated his ability to fly three circuits safely in the prevailing conditions, and continued to do so during the first two solo circuits.

On the third circuit the aircraft was probably upset by a gust of wind prior to touch down. The left wing rose and the student decided to execute a go-around. However, as the aircraft track diverged from the runway heading and across the crops at low height, the student may have been distracted from maintaining the required forward pressure on the control column, allowing the aircraft to pitch nose up. He then did not lower the nose as taught. As the angle of attack approached the stall the left wing dropped and the aircraft adopted an attitude that could not be recovered in the height available.