

ACCIDENT

Aircraft Type and Registration:	Embraer EMB-145MP, G-CGWW	
No & Type of Engines:	2 Allison AE 3007A1 turbofan engines	
Year of Manufacture:	2000 (Serial no: 145362)	
Date & Time (UTC):	5 December 2015 at 2019 hrs	
Location:	Newcastle Airport	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 4	Passengers - 19
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Left wingtip and aileron scraped	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	36 years	
Commander's Flying Experience:	5,002 hours (of which 1,234 were on type) Last 90 days - 96 hours Last 28 days - 34 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

Synopsis

The aircraft's left wing touched the runway surface during a night landing in strong, gusty wind conditions. Just before touchdown, the aircraft rolled rapidly left, probably as a result of a sudden wind shift. The pilot tried to counter this with a control wheel input to the right but the left wing made contact with the runway. An air traffic controller saw a spark from the aircraft's vicinity when it landed and damage to the left wingtip and aileron was found after the flight. Scrape marks were also found on the runway. The accident was not notified immediately to the AAIB and no action was taken to preserve the data on the CVR. The aerodrome operator and aircraft operator have amended their procedures to provide better guidance for the actions to be taken in the event of an accident or serious incident.

History of the flight

The commander was Pilot Flying (PF) for a commercial flight from Stansted Airport to Newcastle Airport. The forecast surface wind at Newcastle was from 230° at 28 kt, gusting to 38 kt, with a 40% probability that the strength could temporarily increase to 38 kt, with gusts to 55 kt.

This night-time flight proceeded normally and the aircraft was established on an ILS approach for Newcastle's Runway 25. The runway was reported as damp, with the surface wind from 240° at 30 kt, gusting to 43 kt when landing clearance was given. ATC provided further surface wind checks of 240° at 37 kt and then of 240° at 27 kt, two minutes and one

minute before touchdown, respectively. The pilots reported that the approach felt bumpy but not unduly turbulent, and they were satisfied that neither the operator's maximum crosswind limit of 30 kt nor the maximum operating wind speed of 50 kt were likely to be exceeded.

The aircraft was configured with the flaps set to 22° for landing, and the target approach speed (V_{APP}) was 139 kt, 15 kt greater than the calculated reference speed (V_{REF}) to allow for the wind (see *Landing performance*). The pilots recalled the wings were kept almost level until the flare commenced, with the aircraft's nose pointing slightly left of the runway centreline, to compensate for the crosswind. Just before touchdown, the aircraft rolled left rapidly. The PF turned the control wheel right, to counteract what he and the co-pilot both perceived to be a sudden gust from the right, and they thought that the aircraft subsequently touched down smoothly. Neither of the pilots heard any aural warnings and they proceeded to a parking area where the aircraft was shut down and the passengers were disembarked.

An ATC controller thought he saw a spark from the vicinity of the aircraft when it landed and asked an airfield operations officer to investigate. A technician, working abeam the touchdown zone, told the operations officer that the aircraft had seemed to roll to one side while landing. The operations officer inspected the runway and found witness marks, which started approximately 270 m from the displaced threshold and 1 m to the left of the runway centreline (Figure 1). The operations officer passed this information to ATC and visited the parked aircraft, where the crew had discovered scuff marks and abrasions to paintwork on the left wingtip.



Figure 1

Witness marks on Runway 25, viewed looking east towards the landing threshold

Aircraft damage

Following the accident, surface abrasions were noted to the left wingtip fairing and the left aileron (Figure 2). Subsequent examination proved that the wingtip fairing could be repaired but the aileron was damaged beyond acceptable limits and was replaced.



Figure 2

Damage to the left wingtip and aileron of G-CGWW
(photographs courtesy of Newcastle Airport)

Flight data

Due to the elapsed time between the accident and notification to the AAIB on 5 January 2016, evidence from the Flight Data Recorder (FDR) and CVR was not available.

However, the operator was able to provide recorded flight data from their Flight Data Monitoring (FDM) program, which recorded a copy of the FDR data (Figure 3).

As the aircraft descended through 50 ft agl, the Computed Airspeed (CAS), which was sampled every second, was increasing between 137 and 148 kt. At the same time, the recorded groundspeed was 100 kt, magnetic heading was 244° and the roll attitude was (-)2.9°¹ to the left. Left and right aileron and rudder surface positions were not recorded, nor were they required to be. The exact touchdown point could not be established but at a radio altitude of 4 ft, the recorded localiser deviation showed the aircraft deviating to the right of the runway centreline, with its heading decreasing to 236°M. It rolled to a

Footnote

¹ The minus sign (-) denotes a roll to the left.

maximum of (-)12.8° to the left, with a nose-up pitch attitude of approximately 5°. At the same time, the CAS reduced to 126 kt and the groundspeed to 97 kt. Full control wheel (40°) was applied to the right to counter the roll to the left, together with 7° of right rudder pedal².

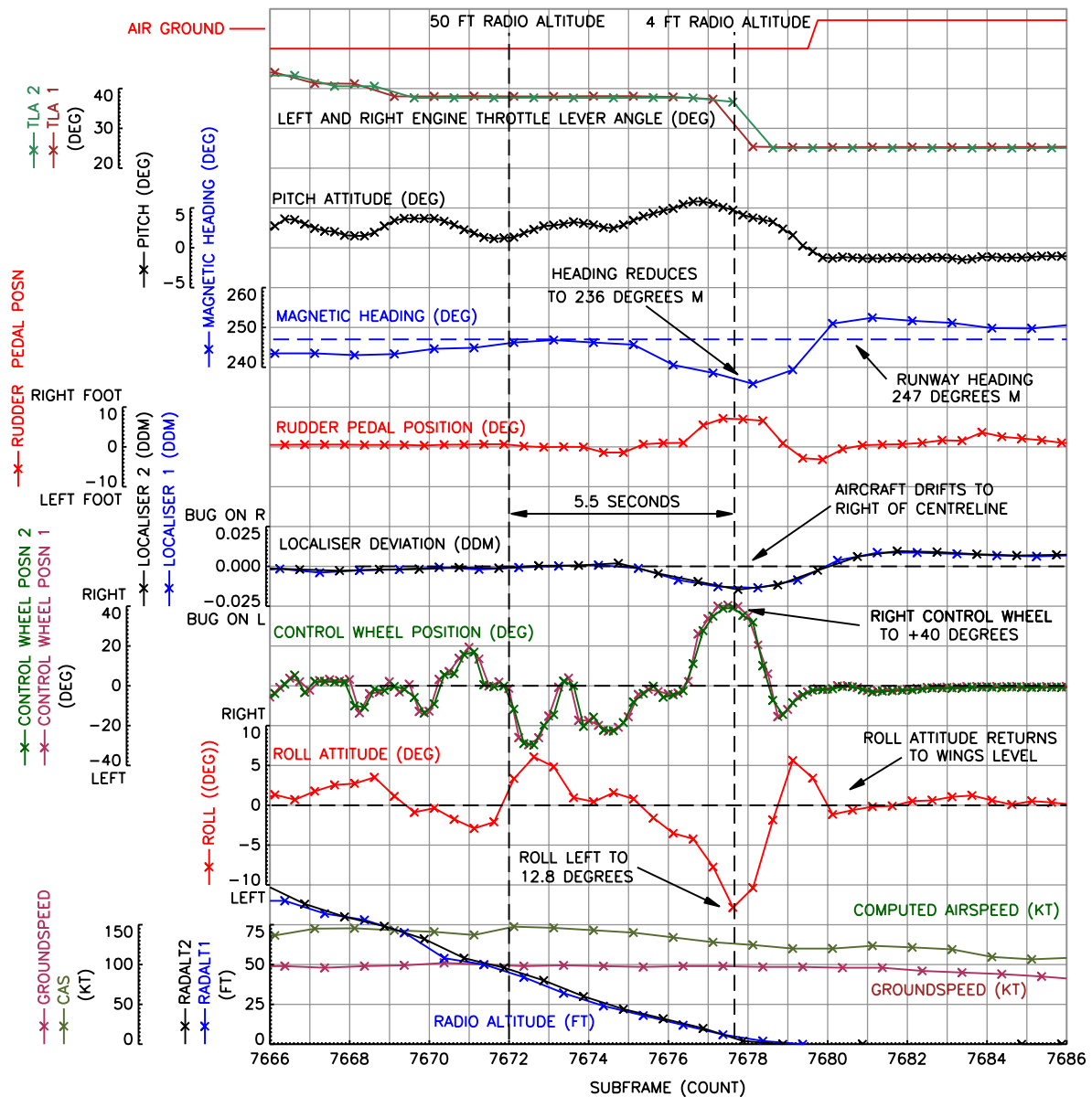


Figure 3
G-CGWV FDM data

The EGPWS in the Embraer 145 produces an aural '*Bank Angle*' warning when a high angle of bank is detected close to the ground. From 30 ft to 5 ft agl, an angle of bank of

Footnote

² Maximum rudder pedal travel is +8.8° and -9.03°.

$\pm 10^\circ$ initiates the warning but it is de-activated below 5 ft agl. Due to the sampling rate, the exact roll attitude at 5 ft agl could not be established but the recorded roll to the left was increasing from $(-)7.7^\circ$ to $(-)12.8^\circ$.

Surface wind data

The relevant wind data was taken from an anemometer situated south of the Runway 25 touchdown zone. The aerodrome authority is unaware of any obstacles or local effects that may cause a south-westerly wind to veer or gust in the vicinity of the touchdown zone.

Between 2010 hrs and 2020 hrs, the average recorded wind was from 230° at 30 kt, varying in direction between 200° and 256° , and between 16 and 51 kt. Between 1950 hrs and 2050 hrs, the recorded wind did not veer beyond 262° . The Met Office studied the Newcastle area weather reports but found no evidence of a sudden, strong gust from an angle more than 20° right of the centreline.

Aircraft information

The aircraft manufacturer has calculated that an angle of bank of 16.4° is needed for the left wingtip of an Embraer 145 to make ground contact, when the left wheel is in ground contact, without the oleo compressed and the aircraft in a 5° nose-up attitude. The manufacturer's calculation does not account for wing flexing due to aerodynamic loads and assumes a level surface.

The aircraft touched down to the right of the centreline, on a runway which slopes away from the centreline for drainage purposes. The wingtip touched the runway 1 m left of the centreline in a position where the elevation was higher than that at which the left wheel made contact. Therefore, it was possible for ground contact to be made by the wingtip with an angle of bank of less than 16.4° .

Landing performance

Either Flap 22 or Flap 45 can be used for normal landings of the Embraer 145. The manufacturer recommends the use of Flap 22 in windshear conditions and the operator advocates this flap setting when strong winds are reported, subject to runway performance considerations. The manufacturer states that V_{APP} is to be calculated by adding a minimum wind correction of 5 kt³ and a maximum wind correction of 20 kt (Flap 22) or 15 kt (Flap 45) to V_{REF} . Cards were provided on the flight deck by the operator to help the crew to calculate V_{REF} and V_{APP} but these only stated a maximum wind correction of 15 kt. The appropriate V_{REF} for this approach was 124 kt and the V_{APP} was 144 kt.

Landing performance calculations assume aircraft are at a 50 ft screen height and at V_{REF} when passing the runway threshold. The manufacturer's Standard Operating Procedures Manual states a 10 kt increase in V_{REF} increases the required landing distance by approximately 16%. The operator's policy is for airspeed to be reduced below V_{APP} in the

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³ The wind correction is calculated by taking half the reported surface wind and adding all of any reported gust factor.

latter stages of the approach, in order to cross the threshold at V_{REF} . From the recorded data, the aircraft's airspeed was approximately $V_{REF} + 20$ kt at the 50 ft screen height and this reduced to $V_{REF} + 2$ kt at 4ft. On this occasion, the declared landing distance available on Runway 25 was not limiting.

Notification and preservation of evidence

The commander immediately contacted the operator and was told the operator would inform the AAIB the following day. However, this action was subsequently overlooked and no action was taken to preserve CVR data. An occurrence report was submitted to the CAA on 7 December 2015 but this made no mention of damage to the aileron.

The UK Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996 state that when an accident or serious incident occurs in the UK, or to a UK registered aircraft, the commander is responsible for informing the AAIB. However, the operator's Operations Manual (OM) states that the operator's management will notify the AAIB when an accident occurs in the UK.

The OM also states that if there is doubt about the classification of an occurrence it is to be treated as an accident and that '*Accidents must be notified to the Company and the Authority via the quickest means.*'

EU Commission Regulation No 965/2012 (Air Operations Regulations section CAT.GEN.MPA.105 '*Responsibilities of the commander*' section 10) states that the commander shall:

(10) ensure that flight recorders:

- (i) are not disabled or switched off during flight; and
- (ii) in the event of an accident or an incident that is subject to mandatory reporting:
 - (A) are not intentionally erased;
 - (B) are deactivated immediately after the flight is completed; and
 - (C) are reactivated only with the agreement of the investigating authority;

The operator's OM provided guidance to commanders on the isolation of a CVR following an accident but not after a serious incident.

The UK Regulations also require the aerodrome authority to inform the AAIB of any accident or serious incident that takes place on or adjacent to an aerodrome, by the quickest means of communication available.

Discussion

The pilot's impression was that there was a sudden, large gust of wind from the right while flaring to land. Recorded data suggested the aircraft's roll to the left during the flare was

more likely caused by a sudden slackening of the strong gusty wind, from slightly left of the runway centreline.

The maximum angle of bank recorded was 12.8° at 4 ft radio altitude; less than the angle calculated by the manufacturer for a wingtip strike with the left wheel touching the ground. However, this calculation does not allow for aerodynamic loads and does not account for the runway sloping away from the centreline.

The AAIB was not informed of the accident until a month later. Meanwhile, the CVR had not been preserved but flight data was available from the operator's FDM programme.

Safety actions

The aerodrome operator has reviewed its guidance to try to ensure any future serious incident which is suspected to have occurred on or adjacent to Newcastle Airport, will be notified to the AAIB without delay.

The aircraft operator has updated its guidance concerning serious incidents and has clarified company procedures in the event of an accident or suspected serious incident. The guidance provided to assist crews to calculate their approach speed has been amended.

Following this accident the aircraft operator intends to include appropriate go-around practice during pilots' recurrent simulator training.