



Australian Government

Australian Transport Safety Bureau

Collision with runway lighting involving Embraer ERJ-135, VH-JGB

Middlemount Airport, Queensland, 8 August 2017

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Addendum

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Collision with runway lighting involving Embraer ERJ-135, VH-JGB

What happened

At about 1615 Eastern Standard Time (EST), on 8 August 2017, the Aerodrome Reporting Officer (ARO) of Middlemount Airport, Queensland, inspected the runway prior to the arrival of two aircraft. The ARO found no abnormalities with the runway or runway lighting.

The first aircraft was an Embraer EMB-135LR, registered VH-JGB, operated by JetGo Australia as a charter flight from Brisbane, Queensland. On board the aircraft was a training captain, a captain under line training, a cabin crewmember and 23 passengers.

The captain under training had recently joined the aircraft operator. This was his second flight with the operator, and first to Middlemount. The flight was also his second flight on the aircraft type, having completed aircraft type training in a simulator.

During the flight, the flight crew reviewed the company briefing package for Middlemount and noted that the runway was not equipped with visual approach slope guidance.¹

At 1643, the captain under training, acting as pilot flying,² positioned the aircraft on the downwind leg of the circuit for runway 11 at Middlemount. The flight crew elected to extend the downwind and final circuit legs beyond the standard length to allow the captain under training to familiarise himself with higher terrain to the north-west of the airport and radio masts in the vicinity of the runway 11 approach path. During the final approach leg, the training captain observed that the aircraft appeared to be slightly below the desired approach profile, but determined that it did not require him to take corrective action.

At 1647, the aircraft landed on runway 11. The flight crew did not detect anything abnormal during the landing. The ARO observed the landing and noted that the aircraft appeared to touchdown early. The aircraft then taxied to parking normally.

A runway inspection was not carried out prior to the arrival of the second scheduled flight. The second flight arrived without incident, the ARO noted that the touchdown point for this flight appeared to be in the normal touchdown zone (Figure 1).

Figure 1: Overview of runway 11 threshold



Image shows the positions of the beginning of the runway, runway threshold lights, aiming point markers and touchdown zone.
Source: Google earth, annotate by ATSB

¹ Visual approach slope guidance systems are ground-based light systems which provide guidance to flight crews to maintain the desired approach angle, typically about three degrees.

² Pilot Flying (PF) and Pilot Monitoring (PM) are procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for descent, approach and landing. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.

At about 1840, the ARO conducted an inspection of the runway prior to the departure of the two aircraft. During the inspection, the ARO identified two damaged runway threshold lights (Figure 2) and fresh tyre marks (Figure 3) about four meters further along the runway from the damaged lights. The ARO immediately proceeded to VH-JGB, and advised the flight crew that he believed they had damaged the runway threshold lights during their landing. The training captain inspected the aircraft tyres and landing gear, and determined that the aircraft had not sustained any damage.

Figure 2: Damaged runway threshold lights



Images shows the damage to the runway threshold lights (left and centre), and a tyre mark on a damaged light (right).
Source: Airport operator, annotated by ATSB

At about 1935, the ARO cleared the debris and determined the runway to be serviceable.

At 1954, VH-JGB departed runway 11 at Middlemount for Brisbane. After the aircraft arrived at Brisbane, an engineering inspection of the aircraft found no damage.

No persons were injured and the aircraft was not damaged in the incident.

Figure 3: Runway 11 threshold

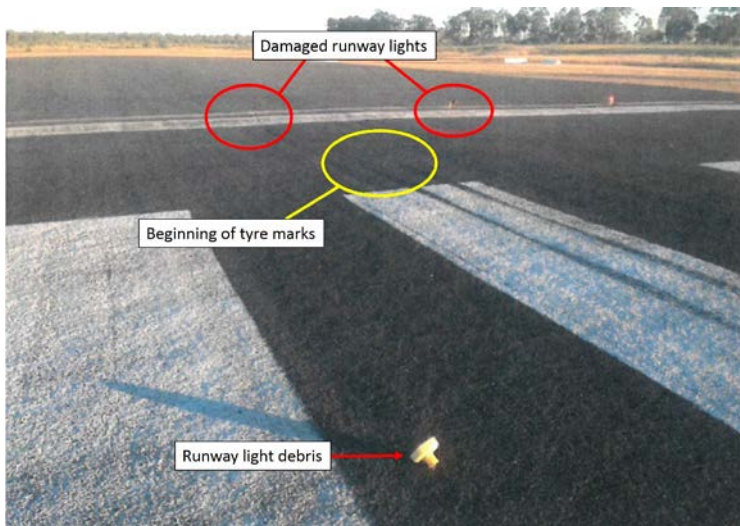


Image shows the damaged runway lights, touchdown tyre marks and runway light debris.
Source: Airport operator, annotated by ATSB

Training captain comments

The training captain made the following comments:

- Middlemount is the only airport the operator regularly serves which does not have visual approach slope guidance.
- The selected touchdown aim point was the aiming point markers.

- During the late stages of the approach, the demands of acting in the pilot monitoring role and monitoring the captain under training resulted in a very high workload.

Captain under training comments

The captain under training made the following comments:

- In his previous role, the captain under training received extensive training and operational experience in conducting approaches without visual approach slope guidance. These operations were on the Beechcraft King Air 200 turboprop aircraft. He had extensive experience in jet aircraft. However, the incident flight was the first time he had conducted an approach without visual approach slope guidance in a jet aircraft.
- The simulator training provided by the company included narrow runway operations and approaches without visual approach slope guidance. The captain under training also commented that he would have liked to have received more simulator training for visual approaches without slope guidance, and it would be beneficial if these types of approaches were conducted later in the line training phase.
- While the approach appeared to be slightly lower than normal, as the aircraft descended through about 500 ft above ground level, the training captain called 'stable', indicating the approach was within tolerances. This reassured the captain under training that the approach was proceeding normally.
- The demands of operating a new aircraft type, with new operating procedures, to a runway without visual approach slope guidance resulted in a very high workload during the approach.

Aerodrome reporting officer comments

The ARO made the following comments:

- There was no defined procedure in place to conduct runway inspections. However, where possible, runway inspections were carried out before and after JetGo arrivals. The second flight arrived about 15 minutes after VH-JGB. The time period between the two arrivals did not allow for a runway inspection.
- The ARO regularly observed JetGo arrivals and had a good understanding of the expected touchdown point.

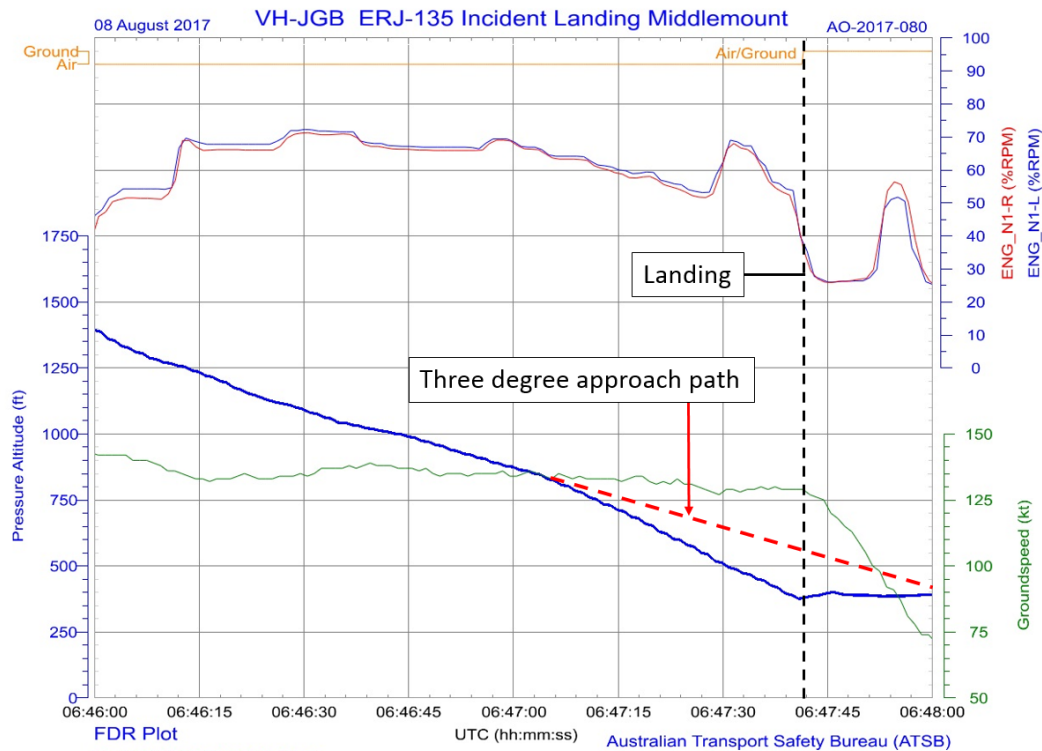
Flight recorders

The aircraft was equipped with a flight data recorder which recorded the flight data associated with the occurrence.

Approach path

The flight data shows (Figure 4) that at 16:47:10, the aircraft was positioned on about a three degree approach path. At this time, the descent angle increased until the aircraft flared for landing.

Figure 4: Graphical representation of recorded flight data



The data plot shows the main landing gear air/ground switch position, engine power, ground speed and pressure altitude. A representative three degree approach path and the landing are annotated.
Source: ATSB

Touchdown point

The recorded touchdown point of the aircraft was consistent with the fresh tyre marks observed by the ARO.

Flight crew workload

The flight crew reported that during the approach they experienced a period of very high workload. The flight crew also reported not detecting anything abnormal during the landing and first becoming aware of the incident when notified by the ARO.

The National Aeronautics and Space Administration technical memorandum [Stress, cognition and human performance: A literature review and conceptual framework](#) contains the following information regarding high workload:

Under conditions of stress, an individual's attention will channel or tunnel. Focus on peripheral tasks will be reduced and centralized on to main tasks. What differentiates a main task from a peripheral task depends on what the individual perceives to be of greatest importance or greatest salience. Tunnelling of attention can result in either enhanced performance or reduced performance, depending on the nature of the task and the situation.

Aircraft operator report

The aircraft operator conducted an investigation in to the incident and provided the following observations:

- The flight crew felt no urgency to land the aircraft before the touchdown zone due to performance limitations. The calculated landing distance required was 1,306 m, and the landing distance available was 1,550 m.

- During the landing flare, the captain under training reported having to raise his head to maintain visual contact with the runway, and had difficulty in determining if the landing would be before the aim point. An incorrect seating position likely contributed to the collision with the runway lights.
- Standard length downwind and final circuit legs, along with a correct seating position and corrective callouts by the training captain would have been more representative of the simulator training received by the captain under training.

Safety analysis

During final approach the aircraft descended below the final approach path, and the aircraft landed prior to the selected aim point. Prior to landing, the main landing gear tyres collided with two runway threshold lights.

This was the captain under training's first approach without visual slope guidance in a jet aircraft. Combined with the demand of operating a new aircraft under new operating procedures, resulted in a high workload for the pilot under training during the approach. The training captain also experienced a high workload due to the demands of acting in the pilot monitoring role and monitoring the captain under training.

The high workload of the flight crew during the approach, along with the absence of approach slope guidance, likely reduced the flight crew's ability to detect the flight path deviation.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The aircraft descended below the desired approach path and landed prior to the selected aim point. Prior to landing, the aircraft collided with two runway threshold lights.
- A flight involving a captain under line training, with high workload during final approach associated with the line training, along with the absence of approach slope guidance, resulted in the flight crew not detecting that the aircraft had descended below the desired approach path.

Safety actions

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Aircraft operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they are taking the following safety actions:

Changes to procedures

- Landings at Middlemount will be made by captains only.
- Line training flights will not operate to Middlemount.
- Training for operations without approach slope guidance will be conducted as standalone training following a period of consolidation of line flying after the completion line training.

Flight crew education and training

- Aircrew notices were circulated to all flight crew, providing education on operations without vertical profile guidance and Middlemount operations. The landing technique contained within the FCOM was amended to include addition information regarding runway visual illusions.

- The flight crew involved in the incident underwent additional training in approaches without visual approach slope guidance prior to resuming operations to aerodromes without visual approach slope guidance.

Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry.



The ATSB has identified [*descending too low on approach*](#) as a risk area requiring heightened attention. When compared to other phases of flight, the approach and landing has a substantially increased workload and is traditionally the phase of flight associated with the highest accident rate. Flight crews must continuously monitor aircraft and approach parameters, and the external environment to ensure they maintain a stable approach profile and make appropriate decisions for a safe landing.

The impact of workload can be insidious, the affected individual not realising an increase until it has reached a high level. The best way of managing workload is to reduce the level of work demands and distractions. If the work demands cannot be reduced, then another option is to ensure the flight crew have the experience, skills and techniques to effectively manage their task demands. Overall, high workload can have significant effects on flight crew performance, and needs to be monitored and managed using a systemic approach, particularly for less experienced flight crew, but also flight crew who have recently undertaken a new role.

General details

Occurrence details

Date and time:	8 August 2017 – 1647 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision with terrain	
Location:	Middlemount Airport, Queensland	
	Latitude: 22° 48.15' S	Longitude: 148° 42.28' E

Aircraft details

Manufacturer and model:	Embraer-Empresa Brasileira De Aeronautica EMB-135LR	
Registration:	VH-JGB	
Operator:	JetGo	
Serial number:	145728	
Type of operation:	Charter passenger	
Persons on board:	Crew – 3	Passengers – 23
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.