Australian Government

Australian Transport Safety Bureau

Runway undershoot involving a Pilatus PC-12, VH-HIG

Coober Pedy Aerodrome, South Australia, 23 September 2014

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2014-156
Final – 26 February 2015

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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Addendum

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Runway undershoot involving a Pilatus PC-12, VH-HIG

What happened

On 23 September 2014, a Pilatus PC-12 aircraft, registered VH-HIG, was arriving at Coober Pedy, South Australia, after a flight from Amata, South Australia. Enroute to Coober Pedy, the pilot listened to the aerodrome weather information service (AWIS)[1] and reviewed the Aerodrome Forecast,[2] but noted nothing of significance. Approaching Coober Pedy, the pilot observed what he described as a line of storm activity in the area. He passed through this weather as he approached the airport, altering track as required to remain clear of significant cloud, but encountered patches of moderate turbulence and vertical wind shear (described as updrafts and downdrafts) in the proximity of the cloud and beneath. The pilot also observed virga[3] extending beneath the cloud from about 12,000 ft down to about 4,000 ft, and blowing dust in the area.

As he arrived in the circuit area, the pilot noted that the aircraft GPS was indicating a wind speed of about 60 kt. He also noted that the aerodrome windsock was indicating that a strong wind was blowing from a northerly direction. There was a considerable amount of blowing dust in the vicinity of the aerodrome, although the dust appeared to remain close to the ground. The pilot positioned for a landing on runway 32, which he assessed as the preferred runway given the strength and direction of the wind. As he descended through about 500 ft above ground level (AGL) on final approach, the pilot lost visual contact with the runway due to blowing dust, and discontinued the approach. As he repositioned for another approach, he noted that there was still blowing dust in the area, but he was satisfied that it had cleared sufficiently to allow another landing attempt.

During the second attempt to land, the pilot recalled that the approach became unsettled as the aircraft encountered increasing turbulence between 300 ft and 200 ft AGL. At this point, the airspeed was about 90 kt, while the ground speed was about 50 kt, and the runway was clearly visible. At about 100 ft AGL, the pilot encountered strong wind shear – the intensity of the turbulence increased, the pilot could feel the aircraft buffeting through the rudder pedals, and the aircraft sink rate increased significantly. Almost simultaneously, the aircraft was engulfed in what appeared to the pilot to be a swirling cloud of blowing dust that swept up from beneath the aircraft. The blowing dust denied the pilot any external visual reference. The pilot contemplated another go-around, but noting the very high sink rate, the intensity of the turbulence and the proximity of the aircraft to the ground, he assessed that he could not execute a go-around safely.

The pilot reacted by pulling the control column back, in an effort to reduce the severity of what he felt was imminent ground impact. The aircraft touched down short of the runway threshold and to the right of the runway centre-line, on a firm surface that was once part of the runway strip. The aircraft passed through a wire aerodrome perimeter fence, and came to a stop after a ground roll of around 150 m (Figure 1). The aircraft also passed through a mound of loose dirt, and clipped a steel post, both associated with the wire fence (Figure 2).

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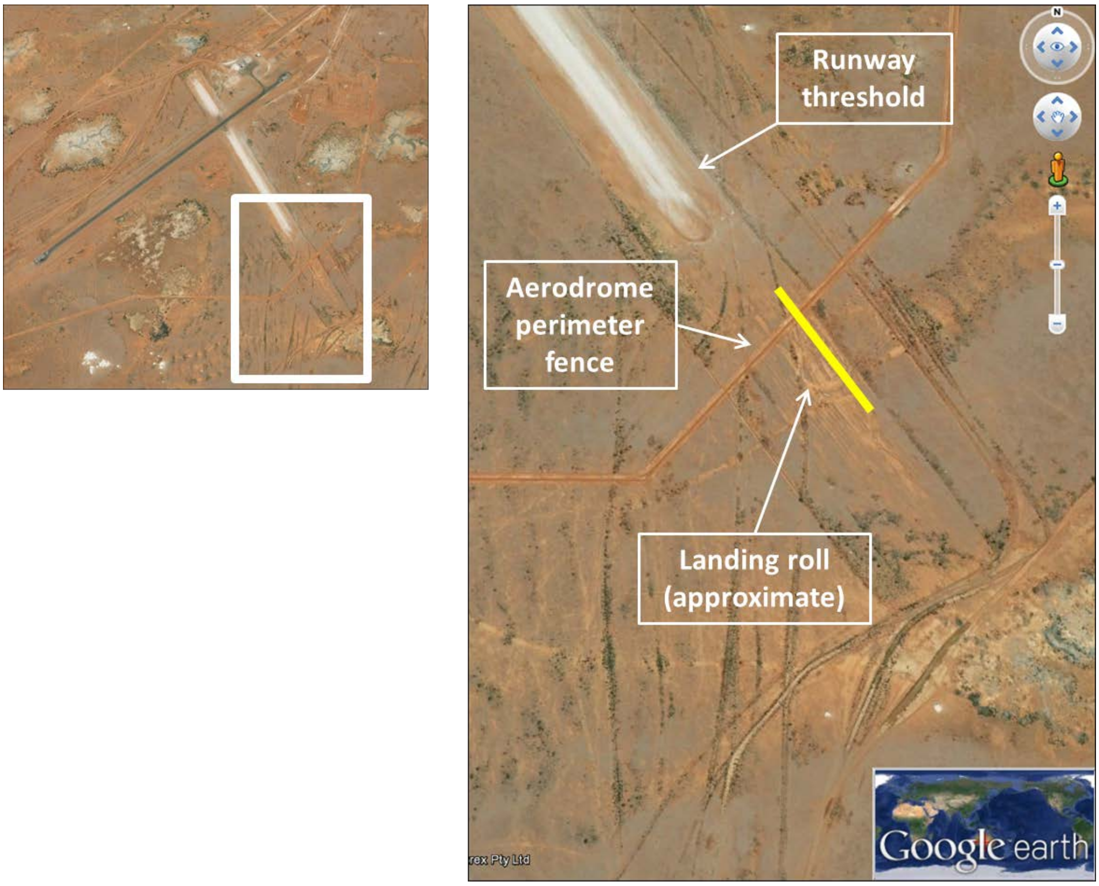
1 The AWIS provides actual weather conditions, via telephone or radio broadcast, from Bureau of Meteorology automatic weather stations.

2 Aerodrome forecasts are a statement of meteorological conditions expected for a specified period in the airspace within a radius of 5 NM of the aerodrome.

3 Virga is defined as precipitation that evaporates before it reaches the ground.

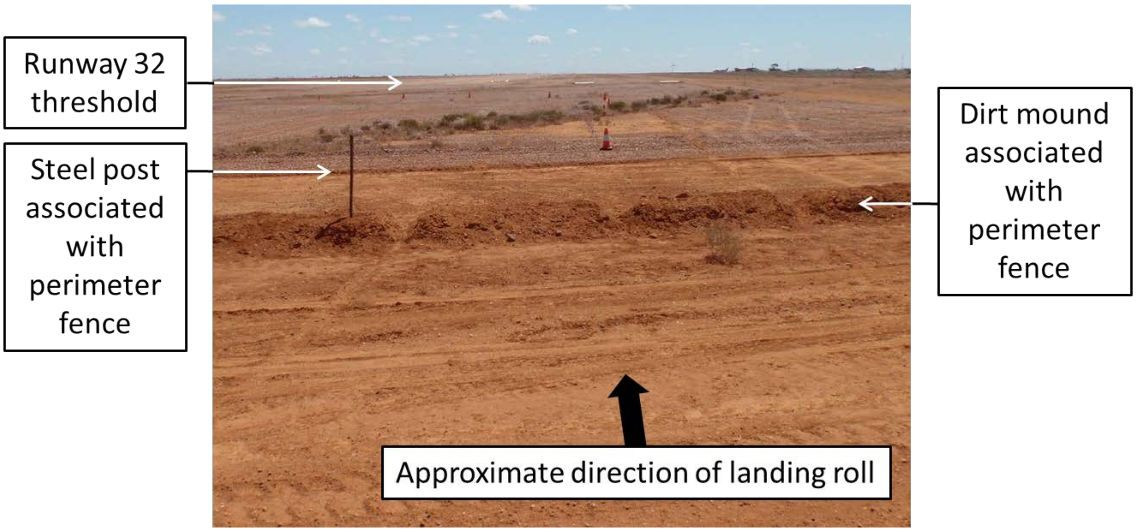
During the ground roll, the aircraft continued to buffet, and the pilot was unable to see outside the aircraft, until it had almost come to a stop. The pilot later commented that the touchdown had not been heavy, and apart from the buffeting and intense wind noise, he did not feel anything unusual during the ground roll. The pilot was not aware at that time that the aircraft had passed through a fence during the landing roll.

Figure 1: Coober Pedy aerodrome with approximate position of the aircraft ground roll relative to the aerodrome perimeter fence and runway threshold



Source: Google earth – modified by the ATSB based on information provided by the aircraft operator

Figure 2: Aircraft track through aerodrome perimeter fence



Source: Aircraft operator – image cropped and modified by the ATSB

The dust cleared as the aircraft slowed during the later stages of the landing roll, allowing the pilot to orientate himself with respect to the runway. He taxied the aircraft onto the runway surface, then to the terminal area for a refuel. As he taxied, the pilot looked back toward the area short of runway 32 and noticed the continued presence of blowing dust in the area. After shutting down the engine, the pilot inspected the airframe and propeller, and did not identify any damage, or see anything unusual.

The refuelling agent commented to the pilot that the onset of the weather had been quite sudden. The pilot also noticed the line of stormy weather moved over the aerodrome while he was on the ground at Coober Pedy, following which the wind eased considerably.

Following the refuel and satisfied that the aircraft was undamaged, the pilot continued to Adelaide, South Australia. The pilot commented that there was no indication of any abnormal condition until descent into Adelaide, when an unsafe nose landing gear caution light illuminated. When the pilot subsequently lowered the landing gear, the caution light extinguished and three green lights illuminated, indicating that the landing gear had extended normally. The pilot continued for an uneventful landing.

Initial inspection of the aircraft following the flight identified that a micro-switch adjustment was required to address the nose landing gear indication problem. Closer inspection however revealed some damage in the area where the nose landing gear meets the aircraft structure, and scoring damage to the underside of the left wing and flap surface, just outboard from the left main landing gear. Scoring damage to the underside of the left wing and flap surface was probably the result of the wing and flap contacting the steel post visible to the left of the wheel track marks in Figure 2.

Relevant weather information

The Aerodrome Forecast valid at the time of the incident indicted that the pilot could expect strong and gusty winds from the north-east at the time he arrived at Coober Pedy, but the forecast made no reference to the possibility of reduced visibility. The relevant Area Forecast[4] indicated that areas of blowing dust could be anticipated, and that visibility may be reduced to as little as 1,000 m in thick blowing dust. The Area Forecast also indicated that cumulus (with a relatively high base) and altocumulus cloud be expected in the area at the time of the incident.

The aerodrome weather reports around the time of the incident suggested that there was a significant amount of middle-level cloud in the area, consistent with the pilot's observations. No wind speed information was available because the wind speed monitoring capability of the automatic weather station at Coober Pedy Aerodrome was not operational on the day of the incident. The temperature at the Coober Pedy Aerodrome was about 24 °C at the time of the incident.

Pilot comments

The pilot commented that the onset of the extreme conditions was dramatic and unexpected, leaving little time to assess the circumstances. Having been engulfed in the dust cloud and noting the high sink rate and turbulent conditions, the pilot believed that the safest course of action was to allow the aircraft to touch down, rather than attempt a go-around. His decision to allow the aircraft to touch down was also influenced by his knowledge that the area in which the aircraft would touch down was once part of the runway strip, and that the surface was likely to be firm and clear of significant vegetation. The pilot was unaware that the aerodrome perimeter fence now crossed the area.

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4 An area forecast is issued for the purpose of providing aviation weather forecasts to pilots for operations at or below Flight Level 200. Australia is subdivided into a number of forecast areas.

The pilot also commented that he would not have flown the aircraft to Adelaide after the incident if he was aware that the aircraft had passed through a fence, or that the aircraft had sustained any damage. He carefully inspected the aircraft after the incident before departing Coober Pedy, paying particular attention to the propeller, but could find no evidence of damage.

The pilot also commented that ongoing work in the aerodrome environment may have loosened the surface in some areas, thereby making the aerodrome environment more susceptible to blowing dust when strong winds prevailed.

ATSB comment

The Bureau of Meteorology publishes a range of information about weather phenomena that may be hazardous to aviation (see www.bom.gov.au/aviation/knowledge-centre/). Noting the weather conditions in the area at the time of the incident, the following two documents may be particularly relevant:

- *Hazardous Weather Phenomena – Wind Shear.* This document discusses wind shear formation and detection. With respect to the detection of wind shear, the document comments:

  > External clues that may be directly visible to the pilot include … virga from convective cloud, because downdrafts may still exist and reach the ground even though the precipitation itself has evaporated.

- *Hazardous Weather Phenomena – Thunderstorms*. This document discusses the nature and development of thunderstorms, and the associated aviation-related hazards. Following is an extract from the document that discusses the nature of a dry microburst:

  > In a dry microburst, precipitation at the surface is either very light or does not occur at all, although virga (precipitation falling from a cloud but evaporating before reaching the ground) may be present. They develop in environments with weak vertical wind shear, dry low levels and moist mid levels. The dry microburst is initiated by evaporative cooling. If the air underneath a cloud is relatively dry then rain and ice crystals falling from the cloud will quickly evaporate and chill the air. The cooled air will be heavier than the surrounding environmental air and will therefore accelerate downward. Dry microbursts can develop in the absence of lightning and thunder. High-based cumulus and altocumulus have been observed to produce damaging dry microbursts.

Flight Safety Foundation (FSF) Approach and Landing Accident Reduction (ALAR) Briefing Note 5.4 – Wind Shear comments that 'Flight crew awareness and alertness are key factors in the successful application of wind shear avoidance techniques and recovery techniques'. The Briefing Note also comments that visual observations such as blowing dust, rings of dust and dust devils, are often indications of wind shear. The Briefing Note also includes a range of considerations associated with wind shear avoidance, recognition and recovery. Briefing Note 5.4 can be accessed via the SKYbrary FSF ALAR Toolkit website at www.skybrary.aero/index.php/Flight_Safety_Foundation_ALAR_Toolkit

In October 2012, a Fokker 100 was approaching Nifty Aerodrome in the Pilbara region of Western Australia. At the time, there were high-based cumulus cloud and isolated thunderstorms in the area. The aircraft encountered wind shear and landed heavily, touching down almost 300 m short of the normal touch down point. The ATSB investigation found that:

> … when the aircraft was on approach to land at about 80 ft above ground level, the flight path almost certainly coincided with the strong outflow of a dry microburst, resulting in a performance-decreasing windshear that led to the rapid drop in airspeed, high sink rate, undershoot and a hard landing.

The ATSB report dealing with this accident is available on the ATSB website at www.atsb.gov.au/publications/investigation_reports/2012/aair/ao-2012-137.aspx

Safety action

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 the occurrence.

Aircraft operator

As a result of the incident, the operator is reviewing procedures and plans to incorporate information into the Operations Manual to highlight the nature of some hazardous weather phenomena, particularly wind shear and thunderstorms.

Safety message

This incident highlights the hazardous nature of wind shear and blowing dust. Wind shear can be exceptionally powerful, dramatically affecting aircraft controllability and performance. Similarly, blowing dust can instantly and significantly reduce visibility. The combined effect of wind shear and blowing dust presents a particularly significant hazard to aviation. Pilots are encouraged to carefully review relevant weather forecasts and monitor the environment for any signs of hazardous weather. Pilots operating in remote areas should be particularly cautious, noting that the threat presented by some hazardous weather phenomena may not be readily apparent.

General details

Occurrence details

Date and time:	23 September 2014 – 1345 CST	
Occurrence category:	Serious incident	
Primary occurrence type:	Runway undershoot	
Location:	Coober Pedy Aerodrome	
	Latitude: 29° 02.65’ S	Longitude: 134° 43.63’ E

Aircraft details

Manufacturer and model:	Pilatus PC-12/47	
Registration:	VH-HIG	
Serial number:	772	
Type of operation:	Aerial Work	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	

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 fare-paying passenger operations.

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.