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Weather related event involving a Boeing 737, VH-YFF

Gold Coast Airport, Queensland, 28 January 2013

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Addendum

Page	Change	Date

Weather related event involving a Boeing 737, VH-YFF

What happened

Gold Coast Airport

Source: Google earth

On the evening of 28 January 2013, a Boeing 737 aircraft, registered VH-YFF, was being prepared for a scheduled passenger service from Canberra, Australian Capital Territory to the Gold Coast, Queensland. The captain was designated as the pilot flying.

The crew were aware of adverse weather conditions being experienced at the time in south-east Queensland, associated with ex-tropical cyclone Oswald, and had been monitoring the weather at the Gold Coast throughout the day.

In preparation for the flight, the crew assessed the weather forecast for the Gold Coast, which indicated strong winds, rain, and reduced visibility. Consequently, they selected Brisbane as an alternate airport and elected to carry additional fuel. The captain also contacted the duty operations controller to discuss the conditions and was advised that the weather had improved and that company aircraft had been landing. The aircraft subsequently departed Canberra at about 2151 Eastern Daylight-saving Time.[1]

Prior to commencing the descent into the Gold Coast, the crew listened to the automatic terminal information service (ATIS), which indicated reduced visibility, low cloud, and wind from 030° (Magnetic) at 30 kt. They also conducted an approach brief, which included a possible diversion to Brisbane due to the weather conditions at the Gold Coast.

During the descent, the crew changed to the Gold Coast Tower frequency early to obtain more information on the weather and were advised that the conditions were below the landing minima. The crew entered a holding pattern and continued to discuss the conditions with Gold Coast Tower air traffic control (ATC) and Brisbane Approach ATC. The crew were advised of two other company aircraft also in a holding pattern. The crew also asked Approach ATC if aircraft had been landing and were advised that they were the first aircraft to arrive for some hours. The crew had been of the prior understanding that aircraft had been arriving and departing.

About 15 minutes later, the crew were advised by ATC that the conditions had improved and were now above the landing minima. At about 2215 Eastern Standard Time, [2] the crew commenced the runway 32 area navigation global navigation satellite system (RNAV (GNSS)) approach into the Gold Coast. Due to the weather conditions, the crew configured the aircraft early for landing.

During the approach, the crew reported that they were in cloud and experiencing rain and a strong right crosswind of about 40-50 kt, resulting in a 15-20° drift angle.[3] The Tower controller advised the crew that the crosswind on the ground was 21 kt. The captain reported that he was mindful of the wind conditions and was prepared to initiate a go-around.

At about 1,000 ft above mean sea level (AMSL), the crew became visual with the runway. As the aircraft was on the desired approach path, the crew elected to continue the approach.

At about 300-400 ft AMSL, the captain disconnected the autopilot and manually flew the aircraft.

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1 Eastern Daylight-saving Time (EDT) was Coordinated Universal Time (UTC) + 11 hours.
2 Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.
3 Angle between heading (course) and track made good.

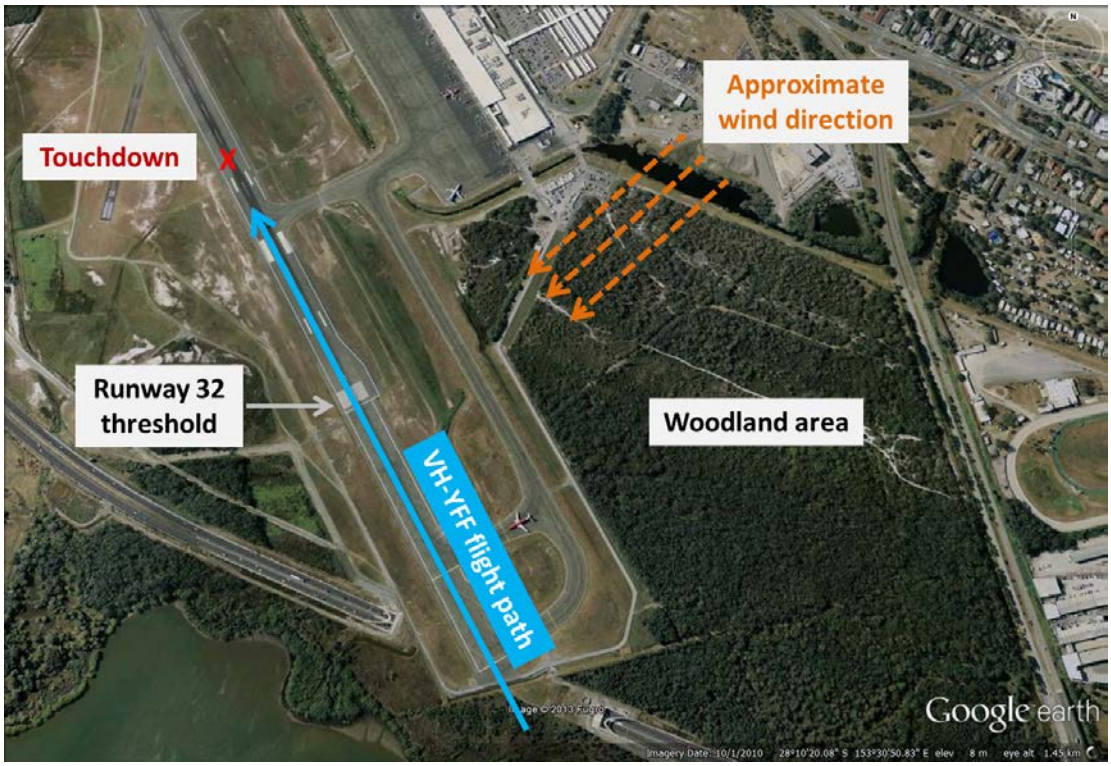
The captain stated that they were experiencing moderate turbulence and he was still prepared to commence a go-around; however, as the turbulence settled, the aircraft was aligned with the runway centreline, and the airspeed was stable, he again elected to continue with the landing.

At about 100 ft, the captain noted that the airspeed trend vector[4] was indicating a 20 kt decrease, likely the result of undershoot windshear.[5] The captain momentarily increased engine thrust to maintain the target approach speed.

During the landing flare, the captain applied left rudder and rolled the aircraft marginally to the right to align with the runway centreline. The aircraft floated briefly as a result of the additional engine thrust applied. The first officer (FO) stated that the aircraft drifted to the left of the centreline and the captain had to apply more control inputs to maintain runway alignment.

At about 2229, the aircraft touched down about 200 m further along the runway than intended (Figure 1). The autobrakes activated and the captain selected reverse thrust. The FO recalled the aircraft touched down on, or slightly right of the runway centreline. At that time, they were experiencing light rain.

Figure 1: Gold Coast Airport and VH-YFF touchdown location



Source: Google earth

After touchdown, the captain perceived that the aircraft was close to the left side of the runway, due to the proximity of the runway edge lights. The captain immediately applied right rudder, however, he inadvertently overcorrected, resulting in the aircraft veering to the right side of the runway. The captain applied left rudder and the runway centreline was regained. Shortly after, the captain overrode the autobrakes and commenced manual braking. The aircraft was slowed to taxi speed and taxied to the terminal.

While taxiing, the captain noted that there was a significant amount of standing water on the ground; however, there were no reports of standing water on the runway at that time.

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[4] An arrow on the primary flight display (PFD), which indicates the predicted airspeed in the next 10 seconds based on the current airspeed and acceleration.

[5] Windshear is a change in wind speed and/or direction. Undershoot windshear occurs when there is a reduction in the aircraft's airspeed from windshear, which results in the aircraft descending below the desired approach path.

The FO advised ATC that the wind during the flare was 'quite extreme with severe horizontal windshear'. Following aircraft were advised by ATC of the conditions.

Due to the weather conditions and high workload at the time, the captain was not certain if the aircraft was pointing towards the runway edge before touchdown or if the aircraft aquaplaned after touchdown. The FO reported that it felt like the aircraft aquaplaned and drifted to the left. However, after reviewing the flight data, the captain believed that the aircraft flared on centreline and drifted left before touchdown.

Meteorological information

Automatic terminal information service (ATIS)

The Gold Coast Airport ATIS information 'Tango', issued at 2141 on 28 January 2013, advised; surface conditions were wet, wind was 030° (Magnetic) with a minimum of 15 kt and maximum of 30 kt, maximum crosswind of 25 kt, visibility of 6 km and reduced to 2,000 m in passing rain showers, scattered cloud[6] at 600 ft and overcast cloud at 1,100 ft, and severe turbulence forecast below 5,000 ft.

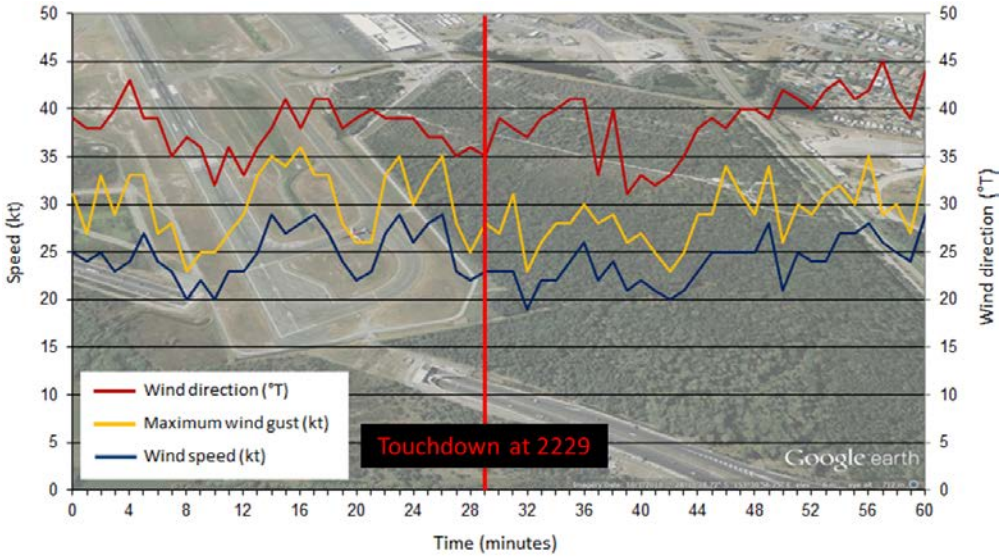
Aerodrome special weather reports (SPECI)[7]

The Bureau of Meteorology (BoM) automatic weather station (AWS) located at the Gold Coast generated aerodrome weather reports. The following SPECI reports were issued:

- At 2210: indicated that the wind was 040° (True) at 23 kt gusting to 33 kt; visibility was 1,600 m; broken cloud at 1,100 ft and overcast cloud at 1,600 ft; 1.0 mm of rain had fallen in the last 10 minutes and 52.2 mm had fallen since 0900.
- At 2230: indicated that the wind was 040° (True) at 25 kt gusting to 35 kt; visibility was 2,000 m; scattered cloud at 900 ft and overcast cloud at 1,400 ft; 0.6 mm of rain had fallen in the last 10 minutes and 53.4 mm had fallen since 0900.

The BoM subsequently provided the Australian Transport Safety Bureau (ATSB) with one-minute interval data recorded by the AWS. A graphical depiction of the wind speed (kt), maximum wind gust (kt) and wind direction (°True) between 2200 and 2300 is shown in Figure 2.

Figure 2: Bureau of Meteorology one-minute data



Source: Bureau of Meteorology

[6] Cloud cover is normally reported using expressions that denote the extent of the cover. The expression Few indicates up to a quarter of the sky was covered, Scattered indicates cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while Overcast means all the sky was covered.

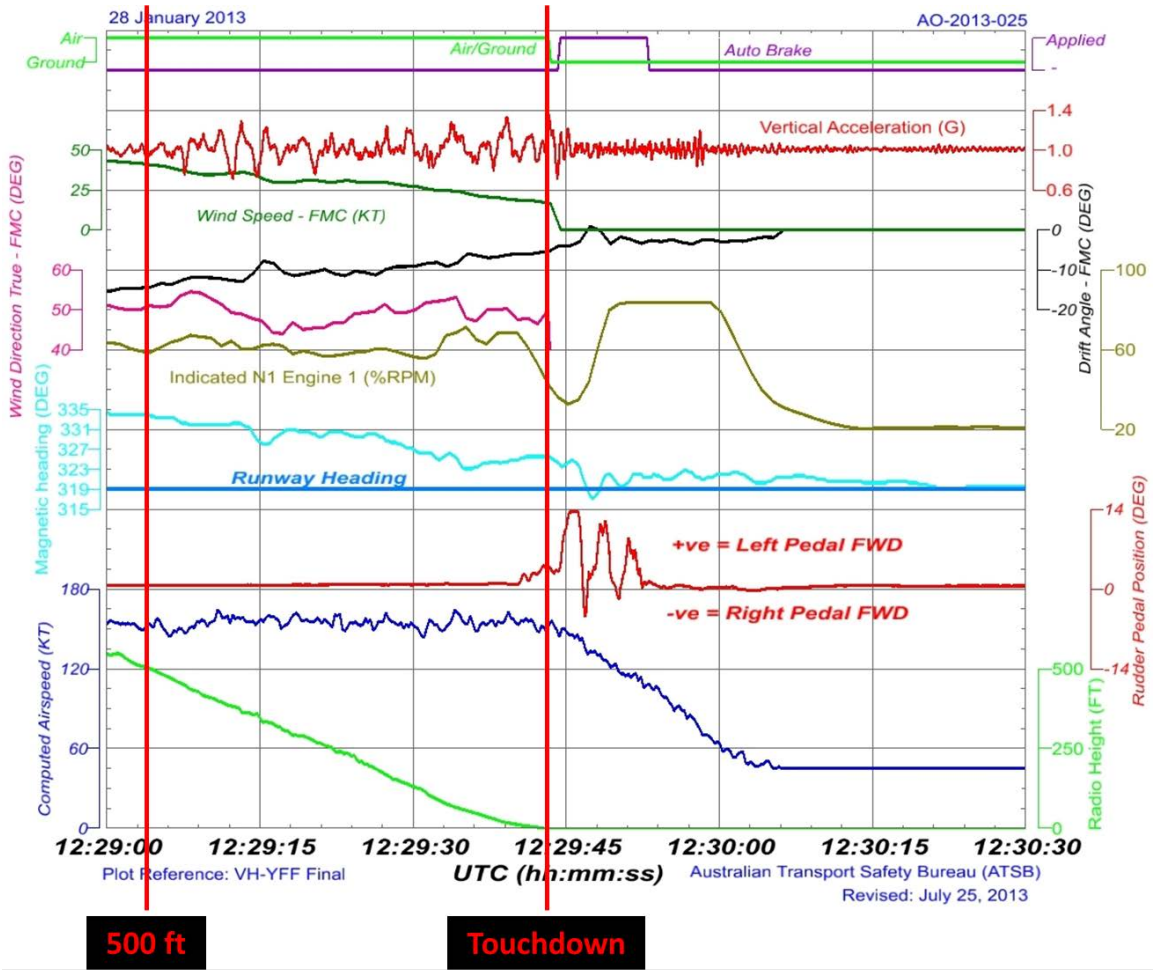
[7] A special weather report used to identify when conditions are below specified levels of visibility and cloud base; when certain weather phenomena are present; and when temperature, pressure or wind change by defined amounts.

Recorded information

The aircraft was fitted with a quick access recorder (QAR) and following the incident, the data was downloaded and provided to the ATSB.[8] The data showed the following (Figure 3):

- The wind speed and direction recorded by the aircraft's flight management computer was about 41 kt and 51° (True) at 500 ft, 25 kt and 52° (True) at 100 ft, and 17 kt and 50° (True) on the ground.
- The recorded values of the vertical acceleration showed that the aircraft experienced mild turbulence during the descent and at about 500 ft, this increased to moderate turbulence.
- At about 115 ft AMSL, engine thrust was increased.
- The autobrakes activated on touchdown and then about 8 seconds later, manual braking was commenced.
- Prior to landing, left rudder had been applied. This application was continued until several seconds after touchdown when right rudder was applied. Over the following 6 seconds, additional rudder movements were made to align the aircraft with the runway centreline.

Figure 3: Summary of flight data



Source: Australian Transport Safety Bureau

[8] The position of the aircraft on touchdown, relative to the runway centreline, could not be determined due to the inaccuracy of the data on the ground.

Pilot in command comments (captain)

The captain provided the following comments regarding the incident:

- The turbulence and undershoot windshear experienced prior to landing was due to the high ground and woodland area located to the east of the runway 32 threshold (Figure 1), which had the effect of reducing the aircraft's airspeed.
- Gold Coast Airport did not have trend forecast (TTF) capabilities, which would have been advantageous.
- He had concerns regarding the notification, receipt and distribution of critical meteorological information to crews regarding high crosswind conditions. The captain stated that it would have been useful to have had a more detailed discussion with the company prior to the commencement of the flight to determine if the weather conditions were in fact suitable for the operation. Also, in hindsight, he could have spoken to the company meteorologist, if available.
- He suggested that the company would benefit from obtaining feedback from crews that were operating into airports during marginal conditions.
- He believed that the crosswind during landing was greater than that advised by ATC.
- The incident occurred on the last sector of an 11-hour 17-minute day. The captain reported that he was starting to feel tired, however, he felt on top of things when they commenced the approach.
- If the aircraft had in fact veered to the left after touchdown, accumulated rubber on the touchdown zone from landing aircraft may have affected the sideways movement of the aircraft.

Trend forecast (TTF)

A TTF is an aerodrome weather report to which a statement of trend, for the elements wind, visibility, weather and clouds, is appended, forecasting the conditions expected to affect the aerodrome for the validity period of the TTF, which is normally 3 hours. The TTF supersedes the aerodrome forecast (TAF) for its validity period. The BoM advised the ATSB that the airline industry determines whether an airport receives a TTF service. At present, a TTF service can only be provided by the BoM if it is supported through manual observations by qualified observers at the airport. There are currently no qualified observers based at the Gold Coast Airport.

Gold Coast Tower wind information

Wind was displayed to both the Tower and Surface Movement Controller positions, which included the mean wind, crosswind, and headwind/tailwind components. This information was fed from the BoM AWS, which was located on the western side of runway 14/32, about midfield.

Gold Coast Airport runway information

The Gold Coast Airport advised the ATSB that runway 14/32 had a grooved asphalt surface. The runway grooves were visually inspected annually, with the last check conducted in mid-January 2013 and the results reported as 'good'. Surface friction inspections were also conducted every 6 months, with the last inspection performed in August 2012. The results indicated that the runway met, and exceeded the Civil Aviation Safety Authority (CASA) and International Civil Aviation Organization's (ICAO) requirements. Rubber removal was conducted on an as-needed basis, with the last removal performed in July 2012.

Virgin Australia investigation

The aircraft operator conducted an internal investigation into the incident and determined the following:

- **Following company aircraft:** The captains of the two following aircraft reported that the conditions on the night were the worst they had flown in during their time with the company. Both captains advised they were prepared to go-around and divert to Brisbane if required. One captain had to conduct a go-around, but landed successfully on the second attempt. The captain who landed on the first attempt queried the accuracy of the wind readings in the tower.
- **Inflight weather information:** Crews can request weather information from the company via the aircraft communications addressing and reporting system (ACARS), provided the crew had been appropriately trained in the use of the system.
- **Suspension of flights:** The weather experienced on the east coast had a significant impact on scheduled flights. Earlier in the day, two company aircraft operating to the Gold Coast had diverted and subsequent flights were suspended until mid-afternoon. The incident flight was the first company flight into the Gold Coast after the suspension.
- **Woodland area:** The woodland area located near the runway 32 threshold can affect the flow of wind when a strong right crosswind exists.

Safety message

Through its SafetyWatch initiative, the ATSB is highlighting an increasing trend in problems with aircraft handling and flight profile when unexpected events arise during the approach to land. When compared to other phases of flight, the approach and landing has a substantially increased workload. Further details are available at www.atsb.gov.au/safetywatch/handling-approach-to-land.aspx.

General details

Occurrence details

Date and time:	28 January 2013 – 2229 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Weather related event	
Location:	Gold Coast Airport, Queensland	
	Latitude: 28° 09.87' S	Longitude: 153° 30.28' E

Aircraft details

Manufacturer and model:	The Boeing Company 737-8FE	
Registration:	VH-YFF	
Operator:	Virgin Australia Airlines	
Serial number:	40994	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – 6	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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.