



Australian Government

Australian Transport Safety Bureau

Runway excursion involving De Havilland Canada DHC-8, VH-QQB

at Chinchilla Airport, Queensland on 23 May 2022

ATSB Transport Safety Report

Aviation Occurrence Investigation (Short)

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Addendum

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Executive summary

What happened

On 23 May 2022, a De Havilland Canada DHC-8-102, registered VH-QQB and operated by Skytrans, was conducting a scheduled passenger flight from Brisbane to Chinchilla, Queensland. Approaching top of descent, the flight crew were alerted to an engine control unit (ECU) failure on the right engine. The ECU failure meant that reverse thrust would not be available on the right engine to assist in decelerating the aircraft on landing, but they assessed it was safe to continue with the planned approach.

During the landing, the aircraft veered to the left of the runway centreline. Towards the end of the runway, the left main landing gear ran off the runway.

What the ATSB found

The ATSB found that, after experiencing an ECU failure on the right engine, the flight crew opted to continue with the planned flight in accordance with the guidance in the available operator's procedures.

Upon landing with a tailwind and further down the runway than usual, the flight crew experienced reduced braking effectiveness when the anti-skid system activated after the outboard right main wheel locked up after touchdown for unknown reasons. The system released brake pressure on the outboard wheel on both main landing gears, extending the landing roll.

While assessing the available braking performance, the crew missed a standard call that would have prompted the captain to transition to the tiller to provide directional control as the aircraft decelerated. In an attempt to slow the aircraft, the captain applied reverse thrust on the left engine which produced asymmetric deceleration. The aircraft veered slightly left, and the captain elected to use the emergency brake to slow the aircraft on the relatively short runway. Due to the runway being narrow, the left wheels departed the sealed runway surface in the final stages of the landing roll.

The investigation identified that the procedures permitting the flight crew to continue the flight after the ECU failure did not include consideration of other factors that could increase the required landing distance, including a tailwind and a wet runway, or that a narrow runway increased the risk of a veer off due to asymmetric thrust.

The investigation also found that the acceptable means of compliance guidance material for the Civil Aviation Safety Regulations 1998 relating to required landing performance did not clearly convey the intent of the regulations relating to the discontinuation of an approach to a runway when surface conditions were unexpectedly wet.

What has been done as a result

In response to this incident, the operator updated their procedures for continued flight following an ECU failure to prohibit the use of a narrow runway unless operationally required in an emergency.

Revisions to the operating procedures also prohibited the use of short runways with a tailwind.

The Civil Aviation Safety Authority have also added extra explanatory text to the guidance material to better explain the intention of the regulations around the assurance of landing performance and how these requirements can be met.

Safety message

Pilots and operators should remain mindful that unexpected events can combine to produce undesirable outcomes. Procedures for managing an equipment failure should take into account factors that may influence performance or other operational considerations. These could include

tyre lock up, runway surface condition or the presence of a tailwind when landing on a short and narrow runway. Increased safety margins in procedural documentation can help ensure flight crew make appropriate decisions when managing unexpected events.

The investigation

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 investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

The occurrence

On 23 May 2022 at 0720 local time, a De Havilland Canada DHC-8-102 aircraft, registered VH-QQB and operated by Skytrans, departed Brisbane Airport on a scheduled passenger flight to Chinchilla Airport, Queensland with 3 crew and 26 passengers on board. The captain was pilot flying (PF), and the first officer was pilot monitoring (PM).¹

At 0740, when approaching the top of descent, the flight crew noticed the engine control unit (ECU) warning light illuminate alerting them to an ECU failure on the right engine. Failure of the ECU meant reverse thrust would not be available on that engine on landing. The flight crew consulted the company procedures for managing an ECU failure, which permitted continuing the flight to Chinchilla. The flight crew checked the weather conditions for landing and elected to conduct a straight-in approach to runway 32,² with a tailwind of about 5 kt that was within acceptable limits. They also noted that there were some showers in the area.

The aircraft landed at 0806 and both flight crew reported that the aircraft touched down further along the runway than intended, but still within the company's permitted touchdown zone.³ Upon touchdown, the PF reported putting both propellers into beta range⁴ and applying the brakes, but little or no braking occurred. The PF announced 'no brakes' to the PM, and the flight crew verified the brake hydraulic pressure indicators were indicating within the normal range. The PM also attempted to apply the brakes, but the aircraft was not slowing at the expected rate. In response, the PF moved the left thrust lever to reverse, and the aircraft deviated left of the runway centreline.

The PF reported the main concern at that point was stopping the aircraft. To avoid locking up the wheels, the PF made 3 applications of the emergency brake,⁵ which was effective at slowing the aircraft. The PM recalled that, as the aircraft decelerated, they did not make the standard 60 kt call that would have prompted the PF to release the control column to the PM and assume directional control using the tiller⁶ once the aircraft had slowed to around taxi speed. The PF reported that they did not use the tiller to assist in maintaining directional control because at the time they did not think they were at risk of a runway excursion.

After stopping the aircraft on the turning pad⁷ at the end of runway 32, the flight crew taxied the aircraft to the apron via the normal taxiway and the passengers disembarked. The crew were alerted by a cabin crew member that the outer right wheel did not rotate during the landing roll. The PF then conducted an inspection of the aircraft and noticed the outer tyre on the right-side

¹ Pilot Flying (PF) and Pilot Monitoring (PM): 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.

² Runway number: The number represents the magnetic heading of the runway. Runway 32 indicates a heading of 320°.

³ Touchdown zone means the portion of a runway, beyond the threshold, where landing aeroplanes are to first contact the runway.

⁴ In beta range, the power lever directly controls propeller blade angle. Beta range of operation consists of power lever positions from flight idle to maximum reverse.

⁵ The emergency brake system provides a means for applying brakes should the normal brake system fail.

⁶ The tiller, located on the left side panel of the left seat, is used for directional control of the aircraft on the ground.

⁷ Turn pad: A defined area on a land aerodrome adjacent to a runway for the purpose of completing a 180-degree turn on a runway.

landing gear was deflated, with a flat spot that extended fully through the tyre (Figure 1). There was also mud on the left wheels.

Figure 1: Deflated outer right tyre



Source: Skytrans

The PF then walked the length of the runway and saw tyre marks indicating that the aircraft had deviated off the left side of the runway just before the runway turning pad (Figure 2), and that the outer right tyre had 'dragged' on the runway from the point of touchdown.

Figure 2: Tyre marks showing runway excursion to the left of runway

Source: Skytrans, annotated by the ATSB

Context

Flight crew information

The captain had been flying for over 30 years and had about 20,000 hours of aeronautical experience with about 6,500 hours on DHC-8 aircraft. The first officer had been flying for about 20 years and had about 7,500 hours of aeronautical experience, which included experience flying DHC-8 aircraft. Both flight crew had experienced an engine control unit (ECU) failure in flight prior to this incident.

Aircraft information

General

The De Havilland Canada DHC-8-102 aircraft is a high-wing, pressurised airframe powered by 2 turboprop engines, each driving a four-blade constant speed propellor. Skytrans had operated VH-QQB since 2007.

Engine control unit

Each aircraft engine was fitted with an ECU. The primary function of the ECU is for fuel flow regulation and torque management to optimise performance while protecting the engine from operational hazards such as exceedances of certain engine parameters, including temperature and RPM. The ECU monitors the engine operating condition through various engine and airframe inputs. It also commands the torque motor in the engine hydromechanical unit⁸ to optimise fuel

⁸ Hydromechanical unit: Regulates fuel flow to the fuel nozzles in response to power requirements and flight conditions.

flow to the engine and set a reference torque indicator 'bug' on the associated engine torque gauge in the cockpit instrumentation.

In the event of an internal fault, the ECU will drop offline, and engine management will revert to manual control. In manual mode:

- the pilot assumes fuel control
- the ECU MANUAL mode light will illuminate on the caution panel
- there will normally be a difference between the 2 engine power lever positions for the same torque
- engine response will be slower above 15,000 ft and for torque settings below 50%
- engine surging is possible above 15,000 ft
- there are limitations on the use of lower power lever settings, especially after landing, due to the engine under-speed governor, normally controlled by the ECU, being unavailable.

When the ECU is operating in manual mode, reverse thrust is no longer available for that engine/propeller on landing.

Anti-skid braking

Anti-skid systems are designed to minimise aquaplaning and the potential tyre damage that can occur when a wheel is locked or rotating at a speed which does not correspond to the speed of the aircraft. The system compares the speed of the aircraft with the rotational speed of each main wheel. If the speed of a wheel is too slow for the existing aircraft speed, the brake on that wheel is released momentarily to allow the rotational speed to increase and prevent the tyre from skidding. The anti-skid system in the DHC-8-102 is set for heavy airframe loads and when the aircraft is lighter or in slippery conditions, heavy braking may result in a short-term skid.

The system logic is activated by weight on wheels (WOW) proximity switches that close once the weight of the aircraft settles on the main landing gear after touchdown. These switches work in pairs through 2 channels (WOW 1 and WOW 2) to the skid control unit (SCU). There are 2 wheels on each main landing gear strut. The WOW 1 sensors provide input from the proximity switches of the inside wheel on each gear strut to the SCU. The SCU then controls the brakes on the inside wheel of each main gear strut. Similarly, WOW 2 sensors provide a signal to the SCU for the brake of the outside wheel on each of the main landing gear struts.

In addition, there is a 'spin-up' protection, ensuring brake pressure is not available to the braking system until the wheels are rolling on the runway surface at 35 kt. If a skid is detected, the skid control valve will provide a 3-second delay to allow the wheels to spin up before braking is available. If the skid continues for more than 3 seconds, the system response is to release brake pressure on the corresponding wheel of the opposite gear leg through the WOW channels and the SCU, which reduces the braking performance and extends the landing roll.

Once the spin-up protection is no longer required, anti-skid protection is available down to a design limited minimum speed of 12 kt. Activation of the emergency brake disables the anti-skid system.

Engineering inspection

Engineers visually inspected the right landing gear following the incident and did not identify any defects with the brake pack or axle that would have led to the outer wheel lock up. Both right wheels were subsequently replaced. Significantly, the operator identified that, as the ECU system and the brake system are not connected, the wheel lock up was almost certainly unrelated to the ECU failure.

Managing the ECU failure

The operator used the aircraft flight manual and quick reference handbook procedures to manage an engine with an ECU in manual mode.

The flight crew were alerted to an ECU issue by the illumination of the ‘#2 Eng Manual’ caution light on the caution/warning panel. They then consulted the quick reference handbook for ECU operating in manual mode to determine the required actions. The handbook indicated that the power lever for the affected engine should not be moved below ‘DISC’ on landing, which included to the reverse thrust position.

The flight crew then consulted the Minimum Equipment List in relation to 1 ECU inoperative which stated that:

One [ECU] may be inoperative provided:

- a. operations are conducted in compliance with the Airplane Flight Manual (AFM) supplement 10 OPERATION WITH ONE ECU INOPERATIVE; and
- b. nose wheel steering and anti-skid brake control system operate normally.

The AFM supplement 10 OPERATION WITH ONE ECU stated (in relation to approach/landing with 1 ECU inoperative):

During approach, a maximum torque difference of 10% may be used to reduce POWER lever asymmetry.

Meteorological information

The aerodrome forecast (TAF),⁹ current at the time of the approach, included wind from 120° (true) at 6 kt and scattered cloud at 2,000 ft above the airport, with visibility greater than 10 km. The meteorological aerodrome report (METAR),¹⁰ issued at 0800, indicated that the wind was from 140° (true) at 4 kt with overcast cloud at 10,000 ft. The 1-minute weather data from Chinchilla Airport’s automated weather station recorded a south-easterly wind at 3–4 kt at 0740 (when the aircraft was at top of descent) and an east-south-easterly at 5–6 kt at 0806 (when the aircraft touched down). The maximum wind gust within that period was 6 kt.

Based on the METAR, TAF and recorded observations, the prevailing wind produced an approximate 5 kt tailwind for an approach to runway 32 around the time of landing. The maximum acceptable tailwind stated in the flight crew operating manual was 10 kt. The pilot flying elected to conduct a straight-in approach despite a light tailwind because they assessed it was easier to manage a stabilised approach with the failed ECU. The tailwind component was within the operational limits, and they assessed sufficient runway distance available for a safe landing.

While no rain was forecast for the scheduled time of arrival, the area forecast indicated the presence of light showers in the area. These showers may not have produced sufficient rainfall to have been recorded with the METAR observations indicating there had been no rainfall in the 24 hours prior to the occurrence. The flight crew advised that at the time of landing, the runway was ‘damp’, and that the aircraft braking would be at or close to normal. Photographs of the runway taken after the occurrence (Figure 2) showed moisture on the runway surface. It was not shiny and there was no visible standing water.

A briefing note from the Flight Safety Foundation, *FSF ALAR Briefing Note 8.5 – Wet or Contaminated Runways* stated that a runway is considered damp when ‘the surface is not dry, but when the moisture on it does not give it a shiny appearance’.

Runway surface condition definitions

At the time of the occurrence, operators were required to operate in compliance with Civil Aviation Safety Regulations (CASR) Part 121 (Australian air transport operations - larger aeroplanes) performance requirements. During the 6-month transition period from the commencement of Part 121 on 2 December 2021, a deferral provision allowed operators to rely on their existing

⁹ Terminal Area Forecast (TAF): A TAF is a coded statement of meteorological conditions expected at an aerodrome and within a radius of five nautical miles of the aerodrome reference point.

¹⁰ Meteorological Aerodrome Report (METAR): A routine report of meteorological conditions at an aerodrome. METAR are normally issued on the hour and half hour.

operations manual, written to comply with Civil Aviation Order (CAO) 20.7.1B Aeroplane weight and performance limitations – specified aeroplanes above 5 700 kg – all operations (turbine and piston-engined), supplemented by annexures to bring their document suite into compliance with the new Part 121.

CASR Part 121 MOS did not recognise 'damp' as a runway condition.

The runway surface condition definitions in Part 121 (Australian larger aeroplanes) Manual of Standards included:

dry: a runway is dry if the surface area required for a take-off or landing:

- a) has no visible moisture;
- b) is not contaminated.

wet: a runway is wet if the surface area required for a take-off or landing:

- a) is not dry; and
- b) is not contaminated.

contaminated: a runway is contaminated if more than 25% of the surface area required for a take-off or landing is covered by any of the following:

- a) water or slush more than 3 mm deep
- b) loose snow more than 20 mm deep
- c) compacted snow or ice.

Landing performance

A briefing note from the Flight Safety Foundation, *FSF ALAR Briefing note 8.3 - Landing distances* stated that actual landing distance is affected by various operational factors, with those relevant to this incident being:

- runway condition (dry, wet or contaminated by standing water, slush, snow or ice)
- wind conditions
- type of braking (pedal braking or autobrakes, use of thrust reversers)
- anti-skid system failure
- system malfunctions (e.g. increasing final approach speed and/or affecting lift-dumping capability and/or braking capability).

Civil Aviation Safety Regulations (CASR) 1998 Part 121 Chapter 9 Division 2 – Landing performance outlined the required factors to be applied to landing performance calculations to account for runway surface conditions. This was based on approved weather reports or forecasts,¹¹ or a combination of weather reports and forecasts. CASR Part 121 – Dictionary defined what constituted an approved weather report and who could provide one. Licensed pilots were included in the list.

CASR Part 121 – Manual of Standards (MOS) Chapter 9 made the distinction between pre-flight and in-flight requirements when calculating the landing performance. This required the crew to obtain the latest forecast and reports to ascertain the runway surface conditions for the time of arrival. The Civil Aviation Safety Authority's (CASA's) Acceptable Means of Compliance and Guidance Material for Part 121 of the CASR referenced the United States Federal Aviation Administration's (FAA's) [Safety Alert For Operators \(SAFO 19001\)](#) which defined 'at time of arrival' as a point in time close enough to the airport to allow the crew to obtain the most current

¹¹ *Civil Aviation Safety Regulations 1998* Dictionary defines approved weather forecasts as those made by the Bureau of Meteorology (BOM), and approved weather reports as those made by the BOM for aviation purposes, an automatic weather station at an aerodrome approved by the BOM, a pilot or a person appointed by the aerodrome operator to make visibility assessments under CASR Part 139 – Manual of standards.

meteorological and runway surface conditions considering pilot workload and traffic surveillance, but no later than the commencement of the approach procedures or visual approach pattern.

CASA advised:

It is not acceptable to do an in-flight landing performance check at top of descent (or earlier) that is based on an expectation that the runway should be dry and then land on a runway that is known to be wet (other than dry) without ensuring (by calculation) that the wet (other than dry) landing performance is assured.

The operator's manual required landing distance calculations be conducted in-flight. These calculations were to be based on weather reports or observations from an approved source.¹² The procedure to complete the in-flight landing performance check was defined in the Regulated take-off weight manual (RTOW)¹³ for the DHC-8. The RTOW calculation required the use of the latest METAR and ATIS¹⁴ or AWIS¹⁵ information to assure the landing performance. The requirement to conduct this in-flight check complied with Part 121 MOS Chapter 9.13 Landing distance – in-flight requirements.

Recorded flight data

The aircraft had an onboard flight data recorder that had been modified by a previous operator. This resulted in difficulties extracting the FDR data, and inconsistencies found in some of the downloaded parameters brought the reliability of the data into question. Consequently, where suspect values could not be resolved and an alternate reliable source of information was available, the FDR data was not used.

The FDR did not record any parameters for the wind at Chinchilla Airport, however, the GPS data recorded the equivalent of a 12 kt tailwind when the aircraft touched down. This was inconsistent with the recorded weather observations (see the section titled *Meteorological information*), which indicated a steady 5–6 kt tailwind for a landing on runway 32. While both sets of data indicated that a tailwind was present for the landing, the magnitude of the FDR-derived value was considered potentially suspect, so the Bureau of Meteorology recorded observations were utilised to determine the likely conditions. From the recorded data available the following key information was determined:

- the ECU failure occurred at 0740:30
- the aircraft touched down at 0806:15
- upon touchdown the indicated airspeed was about 90 kt which was consistent with the target airspeed.

The touchdown point could not be definitively determined however, the weight-on-wheels and squat switch parameters indicated the aircraft touched down approximately halfway down the runway (approximately 510 m beyond the runway 32 threshold). Further analysis of the data showed multiple vertical and longitudinal acceleration spikes along with GPS altitude reaching ground level coinciding with a large pitch rate oscillation approximately 4 seconds before that position. This indicated that touchdown may have occurred about 300 m beyond the runway 32 threshold. This was consistent with photographs of the main wheel skid marks on the runway.

¹² The operator's manual defined approved sources of domestic forecasts and reports as those generated by Air Services Australia or the Bureau of Meteorology.

¹³ Regulated take-off weight (RTOW) manual – Document to determine the maximum weight in which an aircraft can take off from a particular runway under specific conditions (winds, weather, specific aircraft configuration, etc.).

¹⁴ Automatic terminal information services (ATIS): Operational information required by aircraft for take-off or landing is broadcast on a dedicated frequency and/or on the voice channel of radio navigation aids.

¹⁵ Aerodrome weather information service (AWIS): actual weather conditions, provided via telephone or radio broadcast, from Bureau of Meteorology (BoM) automatic weather stations, or weather stations approved for that purpose by the BoM.

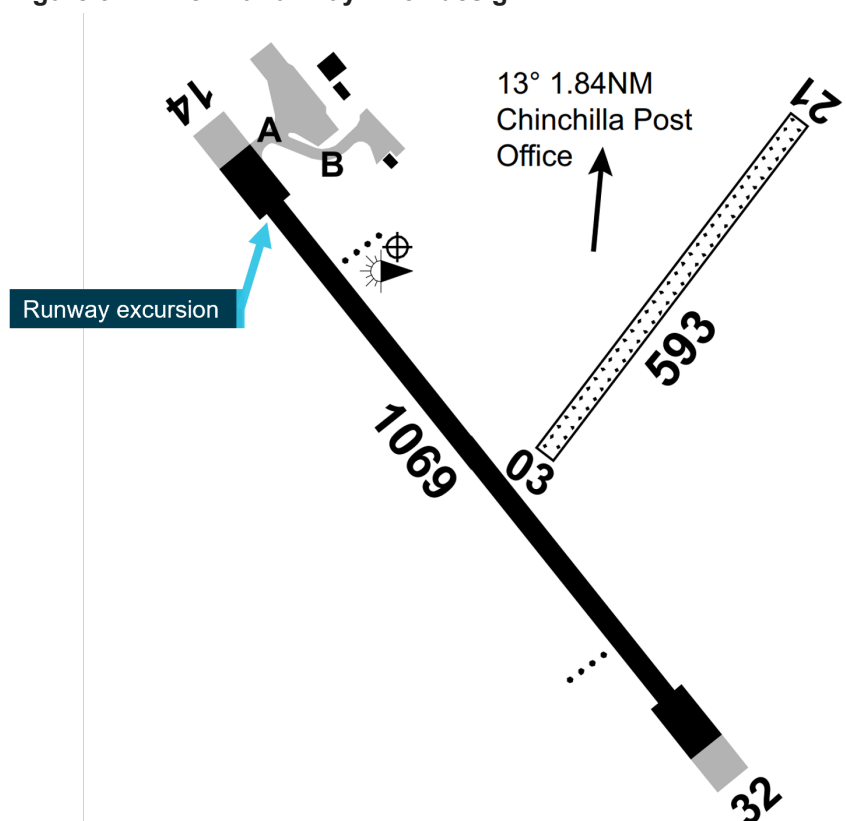
The rotation speed at touchdown and the point that the right outer wheel deflated could not be determined from the recorded parameters.

The manufacturer was provided with a copy of the data from the flight data recorder for their analysis, however they were unable to interpret the data. Given the basic landing parameters that were available, the manufacturer calculated that the crew would have needed all remaining runway to stop from a normal approach if the touchdown point was as indicated by the weight on wheels squat switch parameters. This calculation was based on the flight manual performance data for a dry runway.

Runway dimensions

Chinchilla Airport is a certified non-controlled aerodrome located in south-eastern Queensland. The airport has 2 runways, one clay runway (runway 03/21) unsuitable for use by a Dash 8 aircraft, and one sealed runway 14/32. This runway was 1,069 m in length and 18 m wide with a turn pad at each end of the runway (Figure 3). Part 139 (Aerodromes) Manual of Standards (MOS) 2019 stated that 18 m was the minimum runway width for aerodrome design.

Figure 3: Chinchilla runway 14/32 design



Source: Airservices, annotated by the ATSB

Runway 14/32 had undergone rehabilitation works that included resurfacing in 2015. Technical documentation indicated that a symmetrical crown existed for the first 300 m of runway 32 with a 5 cm drop from the runway centreline to both runway edges. The remaining 769 m possessed a uniform 1.5% downward slope from left to right across the runway. This transverse slope was within the permitted range specified in section 6.08 of the Civil Aviation Safety Regulations - Part 139 (Aerodromes) Manual of Standards (2019), and opposite the direction of the runway excursion.

A technical inspection of the aerodrome was conducted in February 2023 as part of the ongoing certification requirements of the airport. This inspection found that the runway surface contained minor rutting at the north-western end of runway 14/32 but the ruts did not hold water and were not considered a safety issue.

Safety analysis

After experiencing an ECU failure on the right engine during flight, the flight crew consulted the operator procedures and opted to continue with the planned flight based off that guidance. The pilot flying (PF) had also experienced ECU failures before and was comfortable managing the limitations associated with the failure. The flight crew knew they would not have reverse thrust available on the right engine to assist with slowing the aircraft upon landing, however they had a plan for how to manage that limitation.

The aircraft landed longer than the flight crew intended, but probably still within the touchdown zone. However, this reduced the runway length available to stop the aircraft. The tail wind and the wet runway may have also increased the stopping distance required.

Upon landing the outer right tyre locked up, causing the anti-skid system to activate and release brake pressure on both outboard wheels. The reason for the lock up could not be determined, but it resulted in only the inboard wheels providing a braking force. The reduced braking effectiveness was a surprise to the pilots as they were not expecting any issues with braking performance, other than the lack of reverse thrust on the right engine. In response, the main focus of the flight crew became stopping the aircraft before the end of the runway.

That focussed attention resulted in the flight crew missing a standard call, which would have prompted the captain to transition to the tiller for directional control. As the crew did not assess that the aircraft was at risk of a lateral runway excursion, this missed call was not detected and their focus remained on stopping the aircraft in the remaining runway. However, as they were landing on a narrow runway the margin for error was reduced, and in the final stages of the landing roll the left landing gear departed the sealed runway surface. The flight crew were unaware of the runway excursion until after conducting a walk around of the aircraft and seeing mud on the tyres.

The operator's procedures for managing an ECU failure that were utilised by the flight crew when assessing whether to continue with the planned flight were ineffective at prompting the crew to consider other unrelated factors that could affect landing distance. For example, there was no consideration of the impact of a tailwind, a wet runway, or the risk of a runway excursion off a narrow runway due to the asymmetric deceleration associated with the ECU failure.

The operator had a procedure that required the crew to calculate landing performance for the reported runway surface conditions. The expectation was that these would be checked in-flight and provide the assurance of landing performance prior to arrival.

Part 121 MOS that replaced the CAO under the regulatory reform, required the crew to perform an in-flight performance calculation based on reports and forecasts valid at the time of arrival. In explanatory documentation produced by CASA,¹⁶ which included reference to FAA SOFO 19001, it was acceptable to conduct an in-flight planning check during the descent, but not after the commencement of the approach procedures or visual approach.

CASA advised that this should be interpreted to mean that where an arrival takes place to a runway that is forecast and reported to be dry, but upon arrival is found to have visible moisture on its surface, then the landing must not be continued until the wet landing performance is known. This may require a missed approach to allow time for the crew to confirm, by calculation, that the wet performance can be assured prior to landing.

However, the explanation in the acceptable means of compliance guidance material did not clearly convey this intention and did not make the requirement to discontinue the approach clear in the event the runway surface was unexpectedly wet.

¹⁶ [Part 121 Australian air transport operations – larger aeroplanes AMC-GM](#)

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition 'other findings' may be included to provide important information about topics other than safety factors.

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

From the evidence available, the following findings are made with respect to the runway excursion involving a De Havilland Canada DHC-8, VH-QQB at Chinchilla Airport, Queensland on 23 May 2022.

Contributing factors

- After landing, the anti-skid system activated when the outer right main wheel locked up, resulting in reduced braking effectiveness.
- While managing the combination of unrelated technical failures affecting directional control, the aircraft veered off the narrow runway.

Other factors that increased risk

- The operator's procedures for managing an ECU failure did not include consideration of other factors that could increase the required landing distance, including a tailwind and a wet runway, or that a narrow runway increased the risk of a veer off due to asymmetric thrust.
- The acceptable means of compliance guidance material did not clearly convey the intention of the Civil Aviation Safety Regulations 1998 - *Part 121 (Australian larger aeroplanes) Manual of Standards 2020* subsections 9.10 – 9.13 that landing performance must be assured at all times.

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.

Safety action by the operator

In response to this incident, on 25 May 2022, Skytrans issued 2 flight operations notices (FON) which have since been incorporated into the operations manual:

- *FON 2022-11: Short runway operating requirements* was issued to all pilots which included not to land on a short runway with a tailwind. A short runway was defined as less than 1,101 m for DHC-8 aircraft.
- *FON 2022-12: Operations to narrow runways with ECU in manual mode* was issued to DHC-8 pilots that stated that unless in an emergency, operations to a narrow runway with an ECU in manual mode was prohibited.

Safety action by the Civil Aviation Safety Authority

To clarify the expectation around the calculation of landing performance data, and to provide guidance on how the regulatory requirements can be met, the Civil Aviation Safety Authority has drafted an amendment to the Civil Aviation Safety Regulations 1998 - *Part 121 (Australian larger aeroplanes) Acceptable means of compliance and guidance material (AMC/GM)* for inclusion in an upcoming revision. This revision includes the following text:

In-flight monitoring of runway surface conditions (dry, wet or contaminated)

Section 9.13 of the Part 121 MOS requires the PIC to ensure, during the flight and before landing, that the landing performance requirements specified in this MOS section are met for the aerodrome of intended landing. An element of these requirements is determining whether the runway to be used is dry, wet or contaminated.

The determination of the runway surface condition is required to be based on any weather report or forecast, or any combination of weather reports and forecasts. For the avoidance of doubt, the words in the MOS "...during the flight and before landing..." do not indicate that a singular determination can be made once during the flight and relied upon for the entire remainder of the flight. To satisfy their obligations regarding ensuring the safety of the flight under regulation 91.215 of CASR, PICs [pilots in command] are expected to check for updated forecasts and reports at regular intervals throughout the flight and base their determination of runway surface condition on these reports and forecasts.

The intent is that landing performance is assured at all times. This can be achieved by the operator evaluating the effect of multiple runway surface conditions for the most limiting aircraft configuration and including appropriate procedures in the exposition. This is particularly recommended where the aircraft landing configuration is restricted due to, abnormal or emergency situations encountered during flight and/or a narrow runway and/or the runway length is minimal.

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- flight crew
- aircraft operator
- aircraft manufacturer
- Bureau of Meteorology

References

Civil Aviation Safety Authority. (2019). Civil Aviation Safety Regulations 1998 - *Part 139 (Aerodromes) Manual of standards 2019*. Australian Government.

Civil Aviation Safety Authority. (2020). Civil Aviation Safety Regulations 1998 - *Part 121 (Australian larger aeroplanes) Manual of Standards 2020*. Australian Government.

Flight Safety Foundation 2000a 'ALAR briefing note 8.3 – Landing distances', *Flight Safety Digest*, August-November 2000

Flight Safety Foundation 2000b 'ALAR briefing note 8.5 – Wet or contaminated runways', *Flight Safety Digest*, August-November 2000

Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

An initial draft of this report was provided to the following directly involved parties:

- the flight crew of VH-QQB
- Skytrans Pty Ltd
- Bureau of Meteorology
- The Transportation Safety Board of Canada
- DeHavilland Aircraft of Canada Limited
- Civil Aviation Safety Authority

Submissions on that draft report were received from:

- the flight crew of VH-QQB
- Skytrans Pty Ltd
- DeHavilland Aircraft of Canada Limited
- Civil Aviation Safety Authority

After changes, a revised draft report was provided to the directly involved parties.

Submissions on that draft report were received from:

- Skytrans Pty Ltd
- Civil Aviation Safety Authority

The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

General details

Occurrence details

| | | |
|------------------------|---|---------------------------|
| Date and time: | 23 May 2022 – 0804 Eastern Standard Time | |
| Occurrence class: | Incident | |
| Occurrence categories: | Engine failure or malfunction, Runway excursion, Control issues | |
| Location: | Chinchilla Airport | |
| | Latitude: 26° 46.130' S | Longitude: 150° 36.889' E |

Aircraft details

| | | |
|-------------------------|--|-----------------|
| Manufacturer and model: | De Havilland Canada DHC-8-102 | |
| Registration: | VH-QQB | |
| Operator: | Skytrans Pty Ltd | |
| Serial number: | 4 | |
| Type of operation: | Part 121 Australian air transport operations – Larger aeroplanes – Standard Part 121 | |
| Activity: | Commercial air transport – Scheduled - Domestic | |
| Departure: | Brisbane Airport | |
| Destination: | Chinchilla Airport | |
| Persons on board: | Crew – 3 | Passengers – 26 |
| Injuries: | Crew – 0 | Passengers – 0 |
| Aircraft damage: | Nil | |

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

independent investigation of transport accidents and other safety occurrences

safety data recording, analysis and research

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, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

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

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

identifying safety issues and facilitating safety action to address those issues

providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.