Australian Government
Australian Transport Safety Bureau

Hard landing involving ATR 72, VH-FVZ

Canberra Airport, Australian Capital Territory | 19 November 2017

Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2017-111
Final – 12 November 2019

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

Publishing information

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Addendum

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Safety summary

What happened

On 19 November 2017, a GIE Avions de Transport Regional ATR 72-212A aircraft, registered VH-FVZ, was being operated by Virgin Australia Airlines as flight VA646 from Sydney, New South Wales to Canberra, Australian Capital Territory. On board the aircraft were the captain, first officer, a check captain, two cabin crewmembers and 67 passengers.

During the landing approach, the aircraft speed increased above the maximum allowable and the first officer (the pilot flying – the captain was the pilot monitoring) assessed that the aircraft was overshooting the desired approach profile. In response, the first officer reduced engine power to idle at a height of 118 ft above the runway elevation, leading to an increasing descent rate and reducing speed.

The aircraft subsequently landed heavily on the main landing gear, tail skid and underside of the rear fuselage. No persons were injured, however the aircraft sustained substantial damage.

What the ATSB found

During the late stages of the aircraft's approach to land, the approach became unstable in speed and then in power setting. The flight crew did not recognise the unstable approach, however the pilot monitoring recognised the incorrect power setting and called for an increase in power then physically intervened shortly before touchdown. However, these actions were not effective in preventing the hard landing.

The aircraft also encountered a change in the wind direction and strength immediately before touching down, which increased the descent rate. This, combined with the already high descent rate, increased the amount of damage sustained by the aircraft.

What's been done as a result

Following this occurrence, the operator strengthened its guidance on the effects of sustained low power settings during approach and landing and the importance of avoiding that situation. These aspects are also being reinforced in training.

The operator also added additional criteria to its operational monitoring program to detect instances of low power settings at low level.

Safety message

Unstable approaches continue to be a leading contributor to approach and landing accidents and runway excursions. This occurrence demonstrates the importance of crews adhering to standard operating procedures and conducting a go-around when an approach becomes unstable. It also highlights the risks associated with the incorrect handling of an approach to land and the need for prompt and decisive action as the available time to remedy the situation is limited.

The occurrence

At about midday Eastern Daylight-saving Time [1] on 19 November 2017, a GIE Avions de Transport Regional ATR 72-212A aircraft, registered VH-FVZ, was being operated by Virgin Australia Airlines as flight VA646 from Sydney, New South Wales to Canberra, Australian Capital Territory. A captain, first officer, check captain, two cabin crewmembers and 67 passengers were on board the aircraft.

The first officer was pilot flying (PF), and the captain was pilot monitoring (PM).[2] The check captain was positioned in the observer seat on the flight deck, conducting an annual line check of the captain along with a six-month line check of the first officer.

Prior to commencing descent for Canberra, the first officer briefed the captain for the approach and landing. The first officer advised that the calculated target approach speed was 113 kt, the expected landing weight was 21,600 kg and that the reported weather indicated a crosswind from the right of 15 kt for a landing on runway 35. He also advised the captain that due to the heavy aircraft weight and the possibility of a tailwind at times during the approach, he would slow the aircraft earlier than normal to ensure the approach commenced at the target speed.

At 1319, the flight crew were conducting a visual approach to runway 35 at Canberra in conditions of light turbulence and with the autopilot engaged. As the aircraft descended through about 400 ft above the airport elevation, the first officer disconnected the autopilot and continued flying the approach manually. Later, as the aircraft descended through 265 ft above runway level in conditions of light turbulence, the aircraft speed reduced. In response, the PF increased power.

As the aircraft descended through 193 ft, the turbulent conditions combined with the increased power setting to increase the speed further. Eight seconds later, the speed had increased to 127 kt – 4 kt above the stabilised approach criteria upper limit (see the section titled *Approach and landing*). At this time, the aircraft was 118 ft above the airport elevation. The PF did not recognise the stabilised approach criteria exceedance. However, having assessed the presence of overshoot windshear,[3] he reduced the engine power to idle. The selection of idle power at that stage of the approach also did not comply with a further stabilised approach criteria requirement. As a result of the power reduction, the descent rate increased and the speed reduced. At about this time, the check captain recognised that the power setting was too low, but assessed that input from him would not assist in the recovery of the approach.

At 1320:56, five seconds prior to the touch down, the PM recognised the inappropriate power setting and advised the PF to 'ease on a bit' [of power], the PF verbally responded to the advice, but did not increase power.

As the aircraft descended through about 50 ft above the runway, the recorded descent rate increased to 784 feet per minute, above the normal descent rate for the approach of about 575 feet per minute. At 1320:59, at a height of 27 ft and two seconds prior to touch down, the aircraft encountered a wind shift (see the section titled *Recorded flight data*) which further increased the descent rate. The PF and PM both reported that they felt a sudden increase in descent rate at that point. In response, the PM immediately called more urgently for an increase in power and manually intervened by advancing the power levers slightly, increasing power on both engines from 1.5 per cent torque to 3 per cent torque. Two seconds later, anticipating a bounced landing, the PM instructed the PF to commence a go-around. However, almost immediately the aircraft touched down at a normal pitch attitude, but heavily on the main landing gear, tail skid and

1 Eastern Daylight-saving time (EDT): Coordinated Universal Time (UTC) +11 hours.

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 upcoming stages of the flight. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.

3 Overshoot windshear: A sudden change in wind direction and/or strength resulting in an increase of headwind.

underside of the rear fuselage (Figure 1). The aircraft did not bounce and the PM cancelled the go-around, took control and completed the landing roll.

Figure 1: Occurrence touchdown

Source: Aircraft Operator

The flight crew then taxied the aircraft to the gate. After shutting down the engines, the flight crew reviewed the recorded landing data which indicated that a hard landing had occurred, requiring maintenance inspections. The captain also inspected the aircraft and tail skid.

No persons were injured during the hard landing, however the aircraft sustained substantial damage.

Context

Flight crew

Captain

The captain held an Air Transport Pilot Licence (Aeroplane), an instrument rating for multi-engine aircraft and a Class 1 Aviation Medical Certificate. He had over 8,160 hours of flying experience, of which over 1,900 hours were on the ATR 72.

The captain also held the role of a training captain with the operator. In that role, he had undertaken operational training of other flight crew, including the first officer. During this training, the captain found the first officer to be a ‘good operator’.

First officer

The first officer held an Air Transport Pilot Licence (Aeroplane), an instrument rating for multi-engine aircraft and a Class 1 Aviation Medical Certificate. The first officer had over 1320 hours of flying experience, of which over 320 hours were on the ATR 72.

The first officer completed ATR 72 aircraft-type training and began flying the aircraft type 6 months prior to the accident flight.

Fatigue

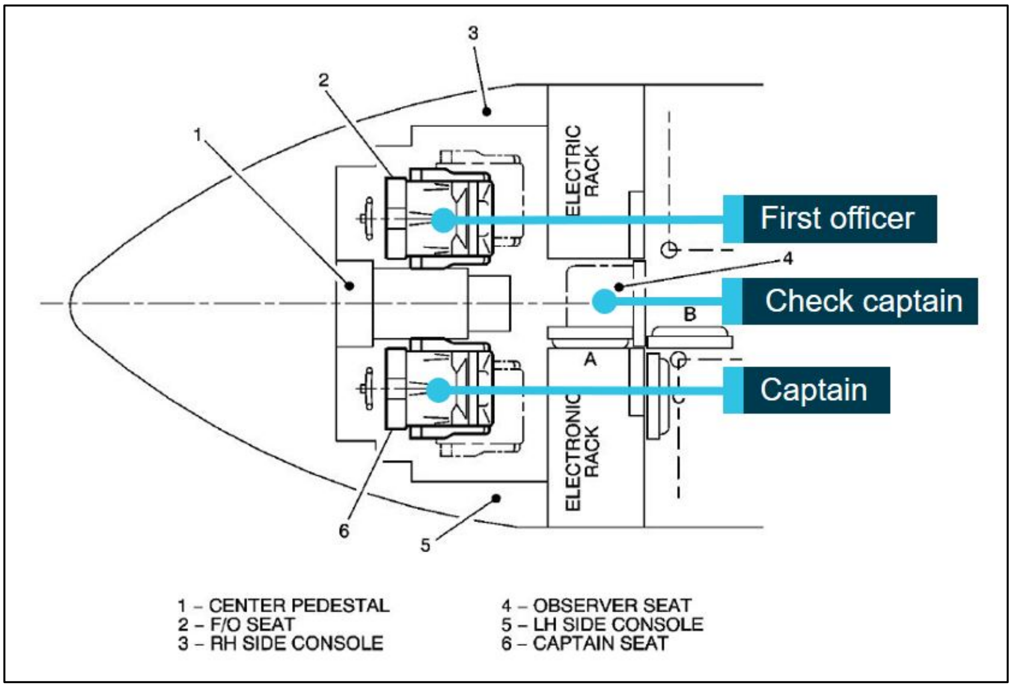
While prior to the day of the occurrence, the captain had two rostered days off and good sleep opportunities for the two previous nights, he later recalled that at the time of the occurrence he was feeling ‘a bit lethargic and a little tired’.

The ATSB examined the effect of fatigue on the performance of the flight crew and determined that the captain and first officer were not experiencing a level of fatigue known to have a demonstrated effect on performance.

Check flight

The accident flight was the last of four flights on the day comprising a routine annual operational line check of the captain and six-month operational line check of the first officer by a check captain. The check captain was positioned in the observer seat at the rear of the flight deck (Figure 2). The check captain was assessing the competency of the flight crew as part of regular cyclical checks and his role did not include participation in the normal operation of the flight.

Figure 2: Flight deck seating positions



Source: Operator

Prior to the first of the four flights comprising the check, in accordance with the operator's procedures, the check captain briefed the flight crew of his observation and non-participatory role in the conduct of the flight and to operate the flight 'as if he wasn't there'.

The captain later reported that during check flights, he had a tendency to modify his behaviours and allow first officers more margin than normal when correcting deviations in the operation of the aircraft. He did this in order to allow the first officer an opportunity to rectify any deviations. The captain advised that during normal operations, he would intervene more quickly after identifying a deviation from the desired operation of the aircraft.

Check captain intervention

The operator provided the following guidance to check captains acting in an examiner's role:

> When the check is conducted with the examiner on the jump seat the examiner should only intervene to ensure that flight safety/company regulations and/or policies are not breached.

The check captain later stated that he would have intervened in the conduct of the flight if he felt that the safety of the flight was compromised. However, after recognising that the approach had become unstable, the check captain assessed that the landing would be 'untidy', but not unsafe. He stated that at that stage, input from him was outside of his role, might distract the flight crew and would not assist in the recovery of the approach.

Post-flight assessment

The check captain's assessment for the performance of the first officer during the check flight was 'unsatisfactory'. The check captain assessed that the performance of the captain was 'satisfactory'. However, the operator required both flight crew to undergo retraining prior to resuming normal flying duties.

Meteorological information

The Canberra Airport automatic terminal information service (ATIS) provided the flight crew with the following weather information:

A north-easterly wind of 12 kt prevailed, which was all crosswind for runway 35 with an occasional tailwind of up to 3 kt. Visibility exceeded 10 km with scattered[4] cloud at 4,500 ft.

Recorded weather observations at Canberra Airport at the time of the accident were broadly consistent with the ATIS, wind conditions being a north-easterly wind of 12 to 16 kt and scattered cloud at about 7,000 ft.

The approach to runway 35 passes in proximity to undulating ground, which can be a source of mechanical turbulence[5] and windshear leading to minor excursions in speed from the target speed. The flight crew reported that they regularly experienced turbulence at all stages of approach and landing at Canberra Airport.

Aircraft information

The ATR 72-212A is a twin-engine, high-wing, turboprop regional airliner with a maximum take-off weight of 23,000 kg and maximum landing weight of 22,350 kg. At the time of the landing, the aircraft gross weight was about 21,700 kg

VH-FVZ (Figure 3) was manufactured in 2013 and first registered in Australia in May 2013. The aircraft was configured with 68 passenger seats.

[4] An amount of cloud covering the sky of three or four oktas (eighths).

[5] Interaction between flowing air and terrain, in particular irregular terrain and man-made obstacles, causes turbulence known as mechanical turbulence.

Figure 3: VH-FVZ

Source: ATSB

The twin-engine turboprop configuration of the aircraft was such that a reduction in power to idle during approach would result in a significant increase in drag, as described in the United States Federal Aviation Administration publication, *Airplane Flying Handbook Chapter 14: Transition to Turbopropeller-Powered Airplanes*:

> Landing some turboprop airplanes can result in a hard, premature touchdown if the engines are idled too soon. This is because large propellers spinning rapidly in low pitch create considerable drag.

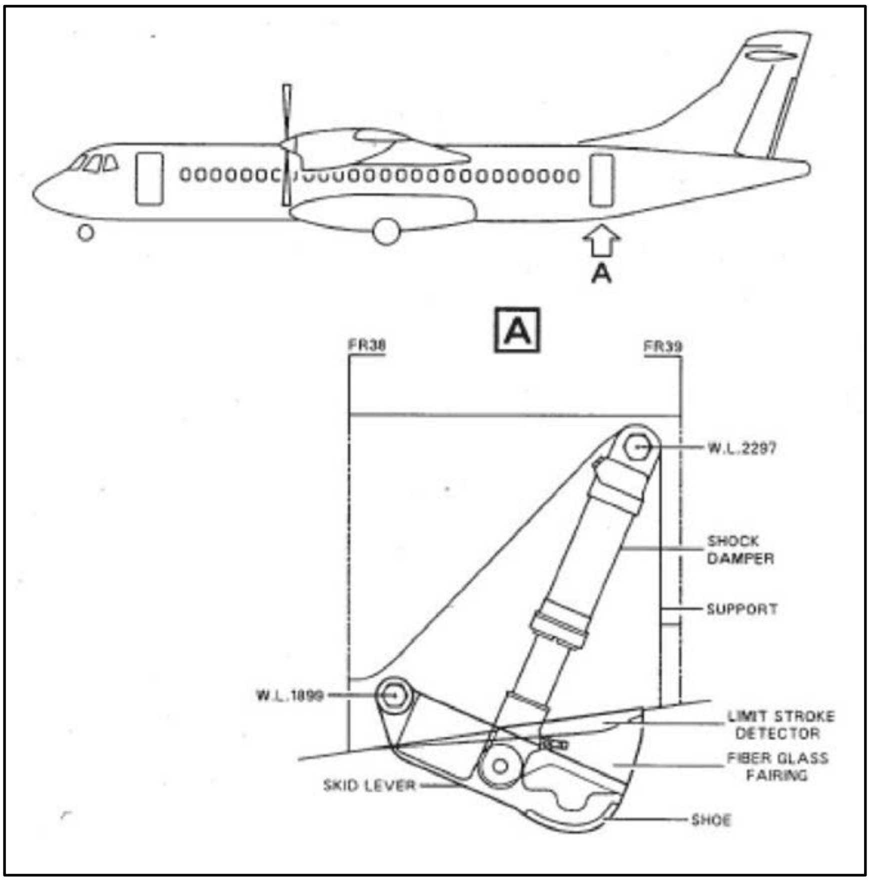
Landing gear

The ATR 72 landing gear and associated structure is designed to absorb energy equivalent to a maximum descent rate of 600 feet per minute when landing at the aircraft's maximum landing weight. The landing gear is designed to absorb reserve energy equivalent to a descent rate of up to 720 feet per minute when landing at the maximum landing weight.

Tail skid

The aircraft is equipped with a non-retractable tail skid on the underside of the rear fuselage to avoid fuselage contact with the runway when the take-off or landing pitch angle is 8° or more (Figure 4). Pitch attitudes of 5.5° or more accompanied with a high rate of descent may also result in ground contact.

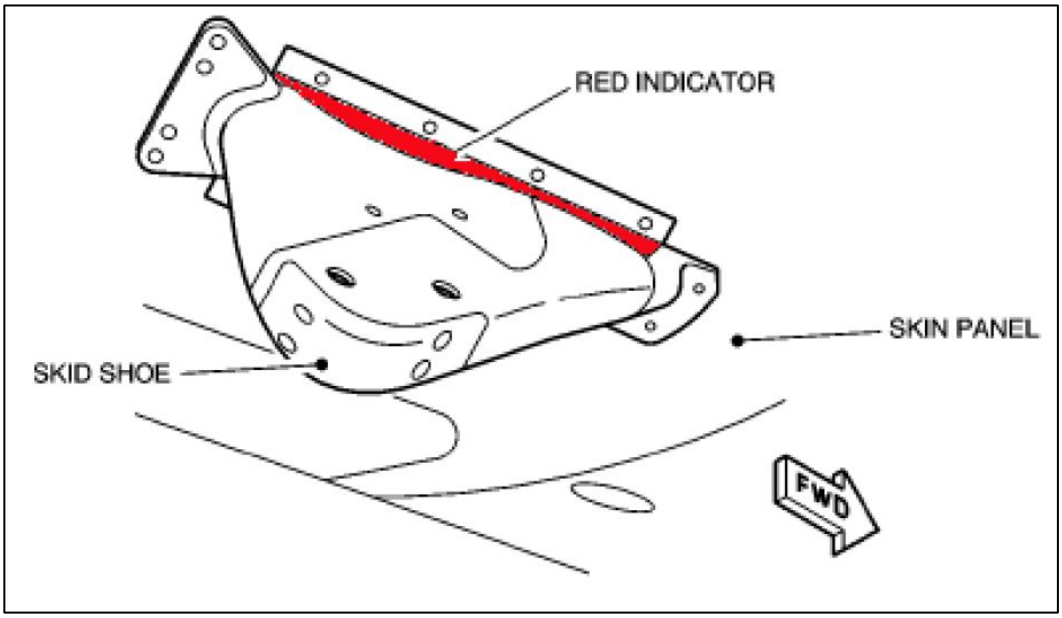
Figure 4: ATR 72 Tail skid



Source: Operator

On both sides of the tail skid, the fuselage is equipped with red painted limit stroke detectors (Figure 5). The limit stroke detectors deform when the tail skid compression is greater than 112 mm to provide a visual indication of tail skid compression.

Figure 5: Tail skid limit stroke detector



Source: Operator

The flight crew operating manual provides the following guidance to flight crew regarding tail skid inspection:

> At each walk around, inspect skid shoe.
>
> If it is stripped, check the red indicator
>
> If this indicator does not show evidence of wear, aircraft can be dispatched.
>
> If this indicator shows evidence of wear, maintenance action is required.

Inspection and damage

Flight crew inspection

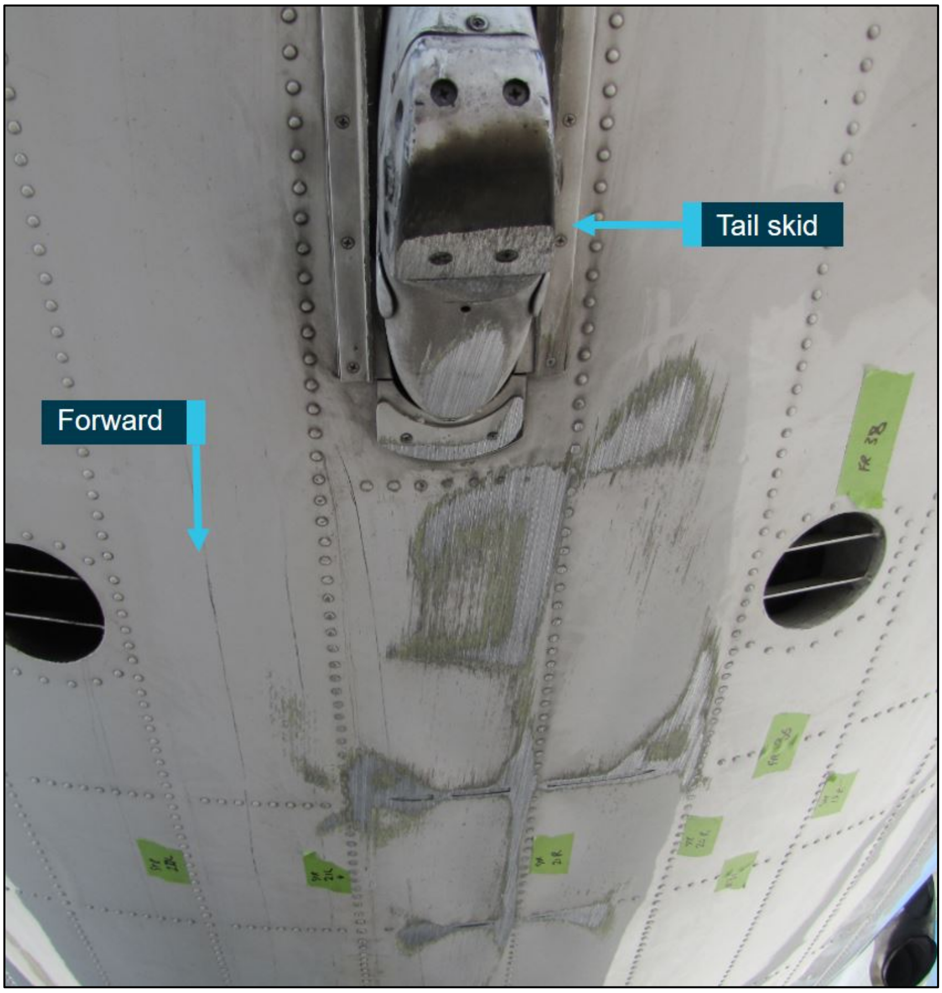
After the passengers disembarked, the captain inspected the aircraft and tail skid. He later recalled observing that the red limit stroke detector was visible and that there was no other visible damage to the aircraft. The captain therefore assessed that the rear fuselage had not contacted the runway and did not inspect the underside of the rear fuselage. He then made an entry in the aircraft technical log regarding the hard landing and contacted the operator's maintenance engineering department to advise them of the occurrence. This entry required maintenance actions prior to any subsequent flight, grounding the aircraft. The subsequent engineering inspection identified the damage to the aircraft.

The check captain and first officer did not inspect the aircraft for damage.

Damage

Technical examination identified that the aircraft sustained impact and abrasion damage to the tail skid and the underside of the rear fuselage forward of the tail skid (Figure 6). Reskinning of sections of the fuselage underside, replacement of the tail skid and a drain deflector mast was required before the aircraft was returned to service.

Figure 6: Damage to the tail skid and underside of the rear fuselage

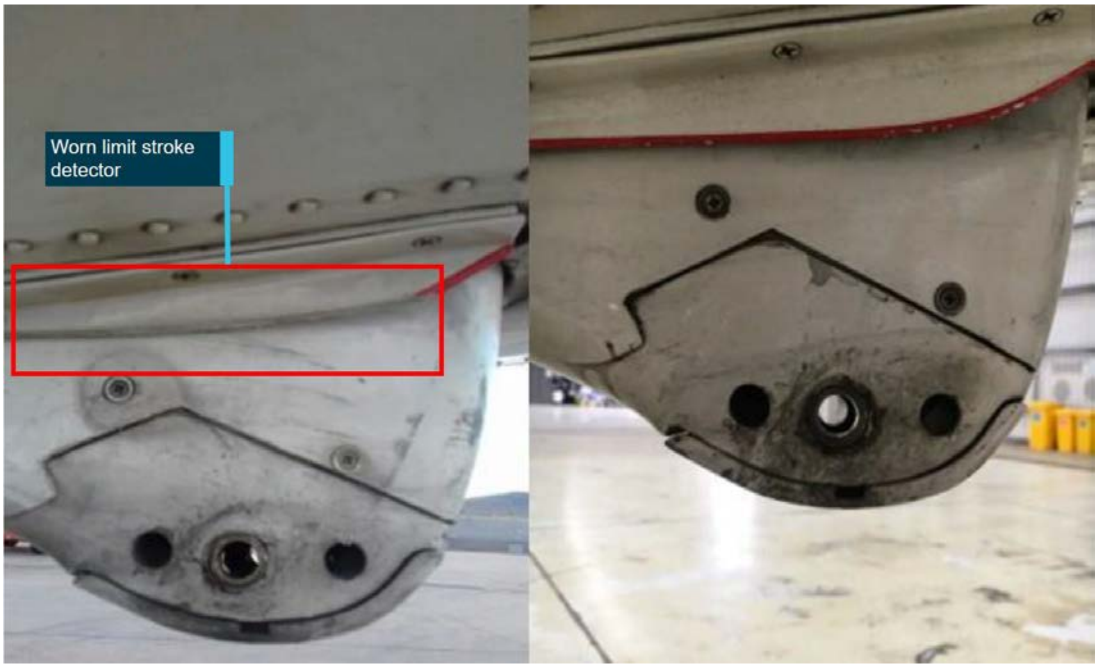


Source: ATSB

Damage and wear to the tail skid and associated stroke indicator indicated that the tail skid was fully compressed during the landing (Figure 7). After landing, the main landing gear oleos[6] remained fully compressed, indicating they had lost gas pressure.

6 Oleo strut - a pneumatic air–oil hydraulic shock absorber.

Figure 7: Figure showing the limit stroke detector from FVZ (left) and an undamaged stroke indicator (right).



Source: Operator

Analysis of the loads sustained by the nose and left main landing gear determined that these were below certification limits and the assemblies were returned to service. The loads sustained by the right main landing gear were above certification limits, this assembly was subject to a stress analysis and assessment prior to being returned to service.

Approach and landing

Stabilised approach criteria

The operator's procedures included a stabilised approach criteria, which included the following relevant items:

- Thrust setting is appropriate for the aircraft configuration and trajectory
- Speed within -5 [kt] to +10 [kt] of the speed target.
- The PM should continue to monitor basic flight parameters and ANNOUNCE deviations.
- TRANSIENT exceedances of the stabilised approach criteria associated with changing environmental conditions are permissible providing the stabilised criteria can be quickly recovered.
- The PF must initiate a go-around for sustained or repeated exceedances of the stabilised approach criteria.
- The PM must announce "NOT STABLE" if the PF does not initiate a go-around for a sustained unstable approach.
- If either pilot is unsure about the safe outcome of the landing then a go-around must be initiated or called for.

Technique

After the occurrence, the captain commented that for the aircraft weight at the time of the approach, a typical power setting would have been about 22 per cent torque. The flight crew operations manual instructed that during landing, flight crew should reduce power from the approach power setting to flight idle when passing a height of 20 ft. The check captain also advised the ATSB that reducing power to idle at about 100 ft was the incorrect technique and would lead to an excessive descent rate.

Missed approach guidance

The operator's standard operating procedures provided the following guidance for the conduct of a missed approach:

> A major cause of approach and landing accidents is the failure to recognise the necessity to execute a missed approach. The captain is ultimately responsible for the decision to continue or to discontinue an approach. However, the first officer is expected to take the decision and carry out the manoeuvre if acting as PF, or call a go-around if acting as PM and it becomes necessary.
>
> A missed approach shall be executed if any of the following occur:
>
> An approach is not stabilised.
>
> The approach becomes unstable in altitude, airspeed, glide path, course or configuration.
>
> Unexpected wind shear is encountered.

Flight crew training

The operator provided approach handling training to flight crew during type conversion training and their recurrent operational training in accordance with manufacturer recommendations and as approved by the Civil Aviation Safety Authority. Each flight crewmember had undergone this training on multiple occasions, exposing them to various approach scenarios. The operator also provided intervention training to flight crew during recurrent operational training and rank upgrade training.

Recorded flight data

The ATSB analysed relevant data from the aircraft's flight data recorder (FDR) and the cockpit voice recorder (CVR).

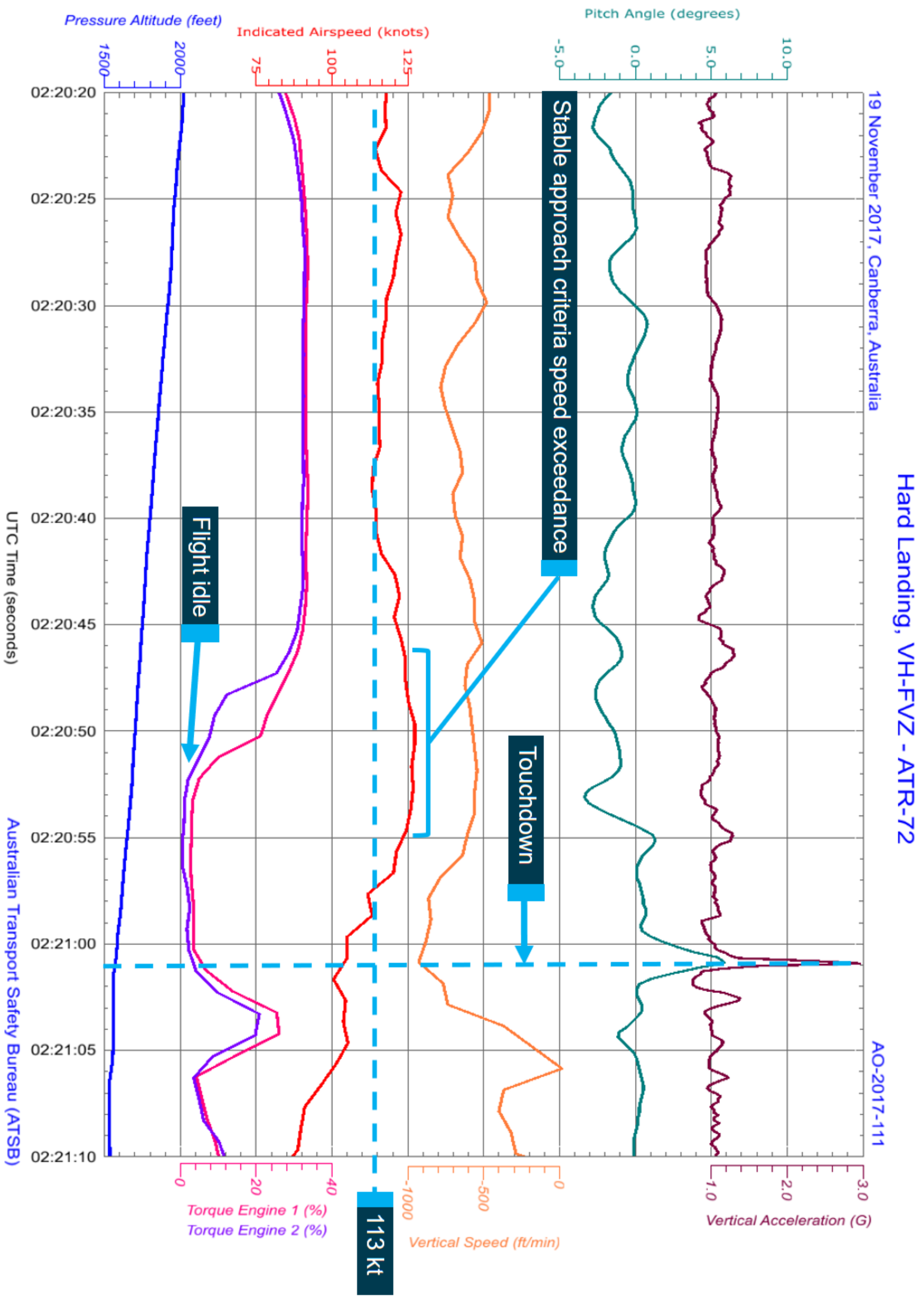
FDR data

The recorded flight data showed that the aircraft speed fluctuated in the turbulent conditions throughout the approach, and generally exceeded the speed target of 113 kt (Figure 8).

At 13:20:50, speed increased above 123 kt, to a maximum of 127 kt, exceeding the stabilised approach criteria speed limitation by up to 4 kt for a total period of 9 seconds. Engine power then reduced from about 26 per cent torque to flight idle as the aircraft descended through a height of 118 ft. The power remained at flight idle until increasing marginally to 3 per cent, one second before touch down. Over the last six seconds of the approach, the recorded speed reduced from 125 kt to 105 kt.

The data also showed that at touchdown, the aircraft pitch attitude was 6° nose-up.

Figure 8: Graphical representation of flight recorder data



Source: ATSB

The ATSB also analysed the recorded flight data to determine the wind conditions experienced by the aircraft during the final six seconds of the approach. This analysis showed that during the final seconds of the approach, the aircraft encountered a significant shift in wind direction and strength, as shown in Table 1.

Table 1: Wind conditions for final 6 seconds of approach

Time	Strength (kt)	Direction (°M)	Head wind component (kt)
13:20:55	13	016	12
13:20:56	13	023	11
13:20:57	13	031	10
13:20:58	12	060	5
13:20:59	15	072	3
13:21:00	17	258	-2 (tail wind)

Prior to the reduction in power to flight idle, the approach descent rate was in the normal range of 500 to 600 feet per minute. After the power reduced to idle, the descent rate increased from 560 feet per minute at 13:20:53, reaching 784 feet per minute four seconds later as the aircraft encountered the wind shift, and 928 feet per minute at touchdown.

The recorded peak vertical acceleration at touchdown was 2.97 G.[7]

CVR data

The cockpit voice recorder captured the following relevant items:

Table 2: Cockpit voice recorder key items

Time	Pilot monitoring (captain)	Pilot flying (first officer)	Cockpit area microphone
13:19:27	1000 ft. Stable.		
13:20:23			Autopilot disengagement tone.
13:20:24	Check.	Autopilot is out.	
13:20:56	Ease back on a bit.	Yep.	
13:20:59	Put more power on.		
13:21:01	Go-around. Oh, too late. Leave and stay. Abort. Reject. I have control.	Check, you have control.	Sound of touchdown.

Similar occurrences

Portuguese Gabinete de Prevenção e Investigação de Acidentes com Aeronaves e de Acidentes Ferroviários investigation 15/ACCID/2016 (CS-DJF)

On 22 October 2016, White Airways ATR 72-212A, registered CS-DJF, performed a regular commercial passenger transport flight at night, between Porto Airport, Portugal and Lisbon Airport, Portugal.

Following a continued unstable approach, the aircraft touched down on the nose landing gear and bounced multiple times. This resulted in separation of the wheels and respective axles of the nose landing gear. After a fourth touchdown, the aircraft stabilized and completed the landing with the nose landing gear leg in contact with the runway surface.

ATSB investigation AO-2015-032 (9M-MTA)

On 14 March 2015 Malaysia Airlines Airbus A330, registered 9M-MTA, began its approach to Melbourne Airport, Victoria after a flight from Kuala Lumpur, Malaysia. In the final stages of the approach, the approach became unstable, however the approach was continued. At

[7] G load: the nominal value for acceleration. In flight, g load represent the combined effects of flight manoeuvring loads and turbulence and can have a positive or negative value.

approximately 50 feet, the captain reported feeling the aircraft sink and manually increased the thrust to the engines in an attempt to slow the rate of descent. Despite this action, the aircraft experienced a hard landing of a magnitude requiring replacement of the aircraft’s main landing gear.

ATSB investigation AO-2008-007 (VH-NXE)

On 7 February 2008, a Boeing Company 717-200 aircraft, registered VH-NXE, was being operated on a scheduled passenger service from Cairns, Queensland via Nhulunbuy (Gove) to Darwin, Northern Territory with six crew and 88 passengers.

The flight crew were conducting a visual approach to runway 29 at Darwin Airport and elected to follow the instrument landing system to the runway. The aircraft was above the glideslope for the majority of its approach and temporarily exceeded the operator's stabilised approach criteria shortly before landing however the approach was continued. The aircraft sustained a hard landing resulting in structural damage.

Safety analysis

During a check flight of both flight crew members, the aircraft's approach to runway 35 at Canberra Airport became unstable. The flight crew did not conduct a go-around and the approach continued with an increasing descent rate. The descent rate was not reduced before the aircraft touched down, resulting in a hard landing.

This analysis will examine the reasons for the unstable approach and subsequent hard landing.

Approach and handling

The approach was conducted in conditions of light turbulence leading to minor speed excursions. As the aircraft descended through 265 ft above runway level, the aircraft speed reduced. In response, the PF increased power. Four seconds later, the aircraft encountered a wind change that, in combination with the now higher power setting, increased the airspeed to 127 kt – 4 knots more than the 10 kt limitation stipulated by the operator's stabilised approach criteria. The airspeed exceedance was not detected by the PF and therefore no corrective action, or initiation of a go-around, occurred.

While the PF did not identify the stabilised approach criteria exceedance, he assessed the presence of overshoot windshear. In response, he reduced power to flight idle at a height above the runway of 118 ft. The selection of flight idle power was initiated at a point significantly higher than the 20 ft directed by the operator's procedures. That action was contrary to the operator's stabilised approach criteria which required a thrust setting appropriate for the aircraft configuration and trajectory. The PM identified the incorrect power setting, but did not detect the further stabilised approach criteria exceedance and did not call for a go-around at that stage.

The continuation of the approach when a go-around should have been conducted allowed the subsequent conditions to develop, leading to the hard landing.

Pilot monitoring response

After the power was reduced to flight idle, the PM identified that the power was incorrectly set. In an attempt to recover the approach, the PM twice called for an increase in power and then subsequently manually increased power. The first call was acknowledged by the PF, however no corrective action was taken, possibly due to his focus on controlling the aircraft. The second call occurred too late to enable a response from the PF and the physical intervention also occurred too late to alter the aircraft trajectory.

The captain held the first officer in high regard; this may have increased the captain's confidence the first officer would recover the undesirable aircraft state. The captain also reported that during check flights, he had a tendency to modify his behaviours and allow first officers more margin than normal when correcting deviations in the operation of the aircraft in order to prevent any adverse impact on the check flight assessment of the first officer. These factors may have delayed or reduced the intervention by the captain.

Orasanu (2010) outlines that analytical decision making is difficult if not impossible in high risk environments (such as aviation) where there is limited time and information and where conditions change unexpectedly.

In this occurrence, the PM needed to make a quick decision on how to recover the approach. Due to the limited time available in the final phase of approach and a perception that the condition of the aircraft would not lead to a significant event, the PM attempted a verbal correction of the aircraft state. The verbal intervention did not result in a correction and the unstable approach continued. Just prior to touchdown, the PM also attempted a physical intervention but it came too late to prevent the hard landing.

The check captain reported that he recognised the approach was unstable. While the operator's guidance permitted intervention in some circumstances, the check captain assessed that the approach and landing, while 'untidy', would be safe. Additionally, he reported that he did not call for a go-around as he was not part of the operating crew and had assessed that a call from the rear of the cockpit may have distracted the flight crew in the critical phase of flight.

Wind change

Four seconds prior to touchdown, the aircraft was descending at a rate of 784 ft/min, already greater than the design limit of the undercarriage. At that time, the aircraft was subjected to a change in wind from a 10 kt headwind component to a 2 kt tailwind component. This resulted in a further reduction in lift produced by the aircraft and at this time, the captain felt the aircraft 'drop out from under him'.

The already high descent rate of 784 ft/min, combined with the wind change, led to the aircraft reaching a recorded 928 feet per minute at touchdown, resulting in the 2.97 G hard landing and substantial damage to the aircraft.

Findings

From the evidence available, the following findings are made with respect to the hard landing involving ATR 72, VH-FVZ at Canberra Airport, Australian Capital Territory on 19 November 2017. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing factors

- During the approach, the pilot flying did not identify that the speed had exceeded the stabilised approach criteria, which required immediate correction or initiation of a go-around.
- In response to an assessment of overshoot shear, the pilot flying reduced power to idle at a height greater than that stipulated by operator procedures. This resulted in an abnormally high descent rate that was not reduced prior to touchdown.
- A significant change in the wind direction and strength immediately before the aircraft touched down further increased the aircraft's descent rate and contributed to the resultant damage.
- Verbal and physical intervention by the pilot monitoring did not prevent the hard landing.

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

Training and guidance

The operator, Virgin Australia Airlines, has amended ATR 72 operational documentation to strengthen guidance on the effects of sustained low power settings during approach and landing and the importance of avoiding that situation.

The operator has also reinforced existing training regarding speed management during approach and landing.

Operational monitoring

The operator has added additional criteria to its operational monitoring program to detect low power settings at low heights during normal operations.

General details

Occurrence details

Date and time:	19 November 2017 – 1321 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Hard landing	
Location:	Canberra Airport, Australian Capital Territory	
	Latitude: 35° 18.42’ S	Longitude: 149° 11.70’ E

Captain details

Licence details:	Air Transport Pilot Licence (Aeroplane)
Medical certificate:	Class 1
Aeronautical experience:	Approximately 8,170 hours

First officer details

Licence details:	Commercial Pilot Licence (Aeroplane)
Medical certificate:	Class 1
Aeronautical experience:	Approximately 1,320 hours

Aircraft details

Manufacturer and model:	GIE Avions De Transport Regional ATR 72-212A	
Year of manufacture:	2013	
Registration:	VH-FVZ	
Operator:	Virgin Australia Airlines	
Serial number:	1087	
Type of operation:	Air transport high capacity - passenger	
Persons on board:	Crew – 5	Passengers – 67
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Operator
- Aircraft crew
- Canberra Airport
- Bureau of Meteorology
- Airservices Australia.

References

Federal Aviation Administration of The United States 2016, Airplane Flying Handbook.

Orasanu, J. (2010). Flight Crew Decision-Making. In B. G. Kanki, R. L. Helmreich, & J. Anca (Eds.), Crew Resource Management, (pp. 147-179).

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the operator, flight crew, aircraft manufacturer and French Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA) and the Civil Aviation Safety Authority (CASA).

Submissions were received from the operator, flight crew, aircraft manufacturer, BEA and CASA. The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The 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; 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.

Purpose of safety investigations

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

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Terminology used in this report

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing factor: a factor that, had it not occurred or existed at the time of an occurrence, then either:

(a) the occurrence would probably not have occurred; or

(b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or

(c) another contributing factor would probably not have occurred or existed.

Other factors that increased risk: a safety factor identified during an occurrence investigation, which did not meet the definition of contributing factor but was still considered to be important to communicate in an investigation report in the interest of improved transport safety.

Other findings: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
Hard landing involving ATR 72, VH-FVZ
Canberra Airport, ACT on 19 November 2017

AO-2017-111

Final – 12 November 2019