Australian Government
Australian Transport Safety Bureau

Hard landing involving Boeing 737, VH-YQR

Sydney Airport, New South Wales on 10 March 2023

ATSB Transport Safety Report
Aviation Occurrence Investigation (Defined)
AO-2023-010
Final – 8 December 2023

Cover photo: Simon Coates

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

Publishing information

Published by: Australian Transport Safety Bureau
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Addendum

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Executive summary

What happened

On the morning of 10 March 2023, a Boeing Company 737, registered VH-YQR, was being operated by Virgin Australia as flight number VA916, departing from Brisbane, Queensland to Sydney, New South Wales. During the landing, after a stabilised approach, the aircraft experienced a hard landing.

What the ATSB found

The ATSB found that during the final approach, the first officer (FO) flared the aircraft later than they normally did and the throttle was not reduced to idle prior to the initial touchdown resulting in the aircraft bouncing approximately 3 ft. During the bounce, the ground spoilers and speed brakes deployed, resulting in a hard landing of 2.96 G on the second touchdown.

The ATSB also found that the training provider, contracted by the operator to conduct Boeing 737 conversion training, was training pilots to initiate the flare at 30 ft, however the flight crew training manual required that the aircraft be flared at approximately 20 ft. This variation increased the risk of unstable and/or hard landings.

What has been done as a result

The operator has completed the following safety actions:

- reviewed hard landing events from 2017 to identify any commonalities or trends in the events
- increased oversight and focus with the external type rating providers and the Training and Standards team to ensure alignment of training with standard operating procedures
- added Zero Flight Time (ZFT) advanced simulator sessions into the operator's conversion course (OCC) program (the ZFT occurs approximately halfway through the line training to reconfirm the take-off and landing techniques while also being able to introduce more challenging conditions)
- an independent review of the checking and training department was undertaken consisting of:
  - a training and standards review, providing an overall health check focusing on the systems and the people
  - a post-COVID review – after a ramp up of activity, the review enabled the operator to understand how the checking and training department was performing

The operator also noted that, for factors not relating to this event, CAE is no longer being used as a type rating provider.

CAE completed several actions in relation to the occurrence. These included a risk assessment in pilot training assessment and the following:

- conducted a review of all Boeing 737 courseware to ensure that there were no areas of conflicting information
- conducted a review of the current training program design and development process across all platforms to ensure that an adequate quality control exists to verify that developed courseware did not contradict original equipment manufacturer's policies, standard operating procedures or techniques
- modified the courseware briefing slide relating to the autothrottle auto retard height and aligned the instructor guide to refer to the original equipment manufacturer's guidance text from the flight crew training manual for the normal flare technique
- released a training bulletin to all training centres conducting training on the 737 Max, to ensure that the original equipment manufacturer's technique was taught. The bulletin included a

review of the different elements of training conducted to ensure that the 20 ft flight crew training manual guidance and the 27 ft auto throttle auto-retard feature were covered, with the emphasis being on the flight crew training manual guidance.

Safety message

This incident highlights how important it is that operators ensure external training providers align their training with the operator's flight procedures. Ensuring pilots are trained as they are expected to fly will ensure they are well prepared especially during the critical flight phases.

It is also important for flight crew to be go-around minded at all times during the approach and landing. This will ensure they are prepared when things do not go as expected. Conducting a go around will allow the aircraft to be set up in a stabilised approach, increasing the likelihood of conducting a safe landing.

However, the Boeing flight crew training manual stated that where an 'airplane bounces during a landing attempt, hold or re-establish a normal landing attitude and add thrust as necessary to control the rate of descent. Thrust need not be added for a shallow bounce or skip. If a high, hard bounce occurs, initiate a go-around.'

Contents

The occurrence

At 0731 local time on the 10 March 2023, a Boeing Company 737-8FE (737), registered VH-YQR and operated by Virgin Australia as flight number VA916 on a scheduled air transport flight, departed from Brisbane, Queensland to Sydney, New South Wales. On board the aircraft were a training captain, first officer (FO) conducting line flying under supervision,[1] 4 cabin crew and 179 passengers.

At an altitude of about 900 ft on approach to runway 34R[2] at Sydney, the FO, the pilot flying,[3] disengaged the autopilot and began to manually fly the aircraft. At approximately 20 ft above the runway, the captain detected that the commencement of the landing flare[4] was late (see the section titled *Stable Approach and landing*) and advised the FO to flare the aircraft and to reduce the engine thrust level to idle. The FO subsequently commenced the flare however, due to the late flare initiation and the thrust not being reduced to idle prior to the initial touchdown, the aircraft bounced approximately 3 ft. The captain assessed the situation and determined that, as the bounce was not too high and there was enough runway length ahead for the FO to continue with the landing, there would be a higher chance of adverse effects if they took control of the aircraft.

During the bounce, both the speed brake and the ground spoilers deployed resulting in a loss of lift and the aircraft touched down the second time with a force of 2.96 G. Once the aircraft settled on the runway, the captain took control of the aircraft and completed the landing.

After the passengers had disembarked, the captain spoke with cabin crew prior to completing the subsequent flight.

At 1055, the aircraft departed Sydney Airport for Gold Coast Airport where on landing, an engineer advised the flight crew that the landing at Sydney Airport was recorded as a hard landing.[5] In response, and although not required, the captain contacted the engineering team and conducted a visual inspection of the aircraft with a licenced aircraft maintenance engineer. No issues were found with the aircraft.

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1 Pilot line flying under supervision: Pilot under supervision flying with line training captain to complete training in normal flight operations.

2 Runway number: the number represents the magnetic heading of the runway. The runway identification may include L, R or C as required for left, right or centre.

3 Pilot Flying (PF): procedurally assigned role 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.

4 Landing flare: the nose of the aircraft is raised prior to touchdown, to slow the descent rate.

5 Hard landing: The operational limits for the aircraft set out in the aircraft's flight manual are exceeded during the landing.

Context

Aircraft 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. They had over 10,778 hours of flying experience, of which over 8,660 hours were on the Boeing 737. They were an experienced check captain for the Boeing 737 aircraft type with the operator.

First officer

The first officer held a commercial pilot licence (aeroplane), an instrument rating for multi-engine aircraft and a Class 1 aviation medical certificate. They had over 2,481 hours of flying experience, of which 29.3 hours were on the Boeing 737 and had completed 29.3 hours flying within the 90 days prior to the occurrence.

The first officer began working with the operator in 2018, initially flying a different aircraft type before being made redundant in October 2020 due to the reduction in flying during the COVID pandemic. They returned to work for the operator in 2022 and began training as a first officer on the Boeing 737 in September that year. They completed their type rating at an international training provider, in November 2022 and returned to Australia to complete an operator conversion course (OCC) during December 2022. They completed a recency simulator session at the end of January before beginning line training for the Boeing 737 in early February 2023.

Weather

The weather at the airport during the occurrence was fine, visibility of 10km or more, scattered[6] cloud at 3,000 ft and a 9 kt west-north-westerly wind.

Boeing 737 landing characteristics

Stable approach and landing

A stable approach path is defined by a combination of crew preparedness, aircraft configuration, approach speed, and flight path that must be maintained during the approach. The operator required that if this criteria was not met then the crew were required to conduct a missed approach.

The operator's stabilised approach policy stated the following criteria must be met by 1,000 ft above ground level:

- briefings and normal checklists completed
- aircraft in the correct landing configuration
- aircraft on the correct lateral and vertical flight path
- wings level no later than 500 ft
- sink rate no greater than 1,000 ft per minute
- thrust setting appropriate for the aircraft configuration and trajectory
- speed within -5 kt to +10 kt of the target speed.

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[6] Cloud cover: in aviation, cloud cover is reported using words that denote the extent of the cover – 'scattered' indicates that cloud is covering between a quarter and a half of the sky.

The aircraft met the operator's stabilised approach criteria.

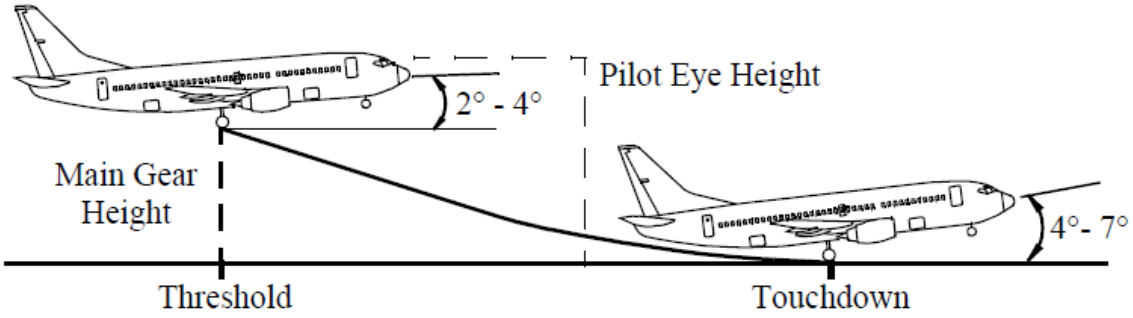
Aircraft flare

The flight crew training manual (FCTM) stated that it was expected that the pilot would:

> … initiate the flare when the main gear is approximately 20 feet above the runway by increasing pitch attitude approximately 2–3°. This slows the rate of descent.
>
> After the flare is initiated, the pilot is required to smoothly retard the thrust levers to idle and make small pitch attitude adjustments to maintain the desired descent rate to the runway. A smooth thrust reduction assists in controlling the natural nose-down pitch change associated with thrust reduction. Hold sufficient back pressure on the control column to keep the pitch attitude constant. A touchdown attitude as depicted in the figure below is normal with an airspeed of approximately VREF. Ideally, main gear touchdown should occur simultaneously with thrust levers reaching idle.

It also stated that the 'typical landing flare times ranged from 4 to 8 seconds…'

Figure 1: Flare profile



Source: Boeing 737 NG/MAX Flight Crew Training Manual

Bounced landings

The Flight Safety Foundation Approach and Landing Accident Reduction Tool Kit states that bounced landings are usually the result of one or more of the following factors:

- loss of visual references
- excessive sink rate
- late flare initiation
- incorrect flare technique
- excessive airspeed
- power on touchdown preventing the automatic extension of ground spoilers.[7]

The Boeing 737 NG/MAX FCTM[8] stated that if a higher than idle thrust level is maintained through initial touchdown, the automatic speedbrake[9] deployment may be disabled even when the speedbrakes are armed.

In addition, during a bounce, if the thrust levers are retarded to idle the speedbrake may deploy and a loss of lift could occur. This could result in a nose-up pitching moment and a hard landing or tail strike on the subsequent touchdown.

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[7] Ground spoilers: Used to maximise wheel brake efficiency by 'spoiling' or dumping the lift generated by the wing and thus forcing the full weight of the aircraft onto the landing gear.

[8] The Boeing 737 NG/MAX FCTM: The FCTM includes the Boeing 737-800 aircraft model.

[9] Speedbrakes consist of panels on the upper surface of the wing that when deployed increase drag and reduce lift from the wing, forcing the weight of the aircraft onto its landing gear. In a normal landing sequence, the speedbrakes are armed to extend automatically.

The manual stated that to recover from a bounced landing pilots are required to:

- hold or re-establish a normal landing attitude and add thrust as necessary to control the rate of descent
- initiate a go around if a high or hard bounce occurs
- initiate a go around if there is insufficient runway to continue the landing.

Hard landings

Hard landings subject the aircraft's structure to high loads, potentially leading to structural damage such as cracks, deformation and structural failure, stress on landing gear components, and system malfunctions.

The Boeing 737 aircraft maintenance manual (AMM) stated that an indication of a hard landing on the main landing gear is a peak recorded vertical acceleration that exceeds 2.2 G. The G-level threshold is valid for a conventional landing with impact of no more than 2° roll, main landing gear touchdown first and normal rotation onto the nose gear. If there is a hard nose landing or the hard landing is accompanied by a roll of more than 2° at the time of main landing gear touch down, the recorded peak acceleration could be less than 2.2 G and a hard landing inspection would also be required. The inspection required a visual inspection of the main and nose landing gear, fuselage and supporting structures within 48 hours of the landing.

After each landing, the aircraft's flight data was automatically downloaded and processed. The landing parameters were based on the Boeing AMM and should a parameter over the hard landing criteria be detected, an automated email alert was sent to the operator's safety team.

In addition, the operator stated that if a pilot suspected a hard landing (whether above or below the maximum certified landing weight) had occurred, it was to be recorded in the maintenance log, with all relevant information such as weight, sink rate and any side loading, to assist ground engineers in performing the correct category of inspection.

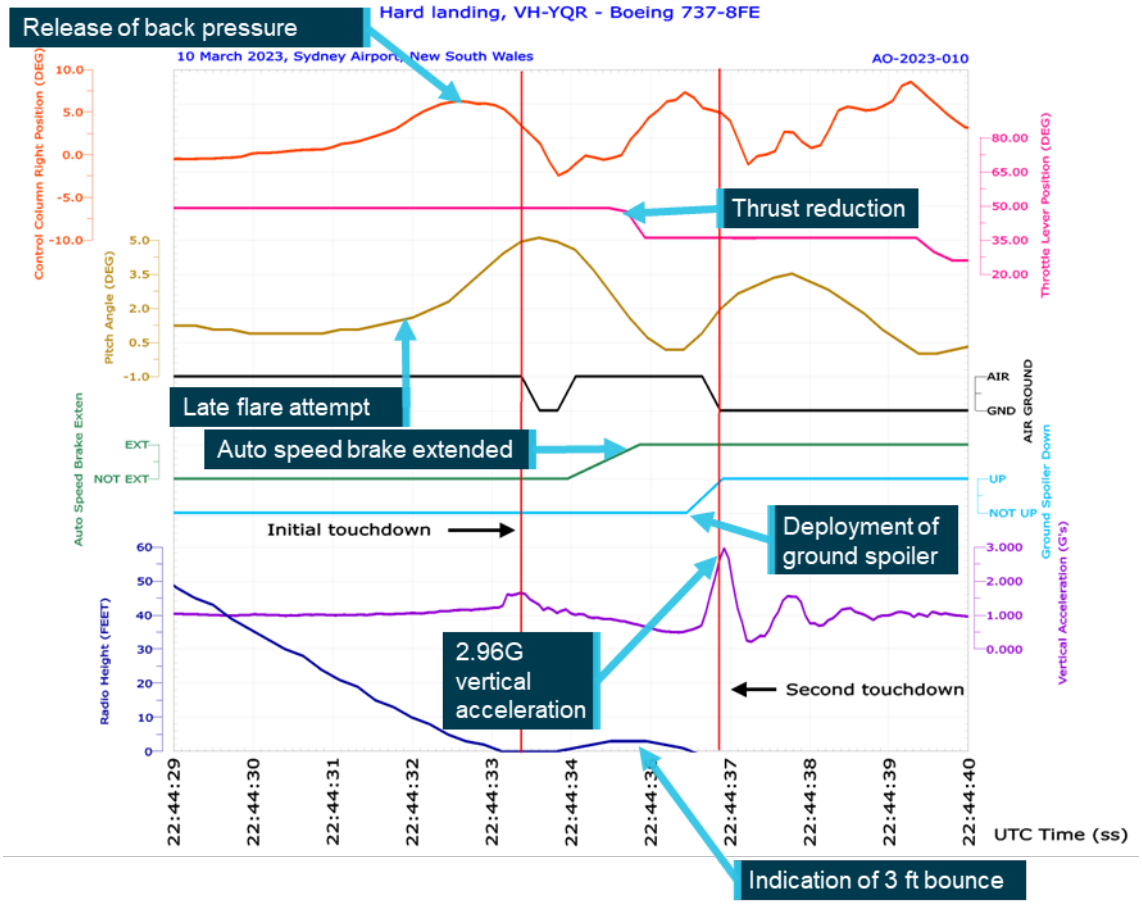
Neither the captain nor the FO thought the landing met the hard landing criteria and, as such, continued flying the next sector after the occurrence. The hard landing inspection was completed within 48 hours of the hard landing. No issues were found, and the aircraft was returned to service.

Flight Data

The quick access recorder (QAR) data indicated that the aircraft was within the stable approach criteria during the approach and prior to the initial touchdown. However, the flare was initiated late at between 10-15 ft, and very quickly the attitude reached a maximum of 5º before the back pressure on the control column was released. Thrust was not reduced prior to the touchdown and as the aircraft touched down, it had a roll of 0.70°, a pitch of 5.09, and a vertical acceleration of 1.25 G. The ground spoilers did not activate, and the aircraft bounced 3 ft.

During the bounce, the thrust was reduced, however, not to idle, and the speedbrakes deployed automatically. Just prior to the second touchdown, the ground spoilers deployed, significantly reducing lift. As the aircraft touched down, it had a roll of 1.54°, a pitch of 2.11° and a G force of 2.96 G. Thrust was reduced to idle, 3 seconds after the second touchdown.

Figure 2: VH-YQR aircraft flight data



Source: ATSB

Training

Type rating

The operator sent new FOs to independent training providers for the Boeing 737 aircraft type rating. The FO involved in this occurrence attended an international training provider. When questioned, the training provider stated that pilots were trained to initiate the flare at 30 ft so the aircraft was in the flare at 20 ft. However, the landing briefing, developed by the training provider, stated that the flare would be initiated at around 25 ft. Despite this, they stated that all pilots are trained in accordance with the Boeing 737 NG/MAX FCTM height which required the flare to be initiated at approximately 20 ft (see the section titled *Stable approach and landing*).

During the FO's training, they completed 25 simulator landings and achieved all necessary competencies. Once training was completed, they returned to the operator to conduct operator specific training in the simulator.

Operator training

As part of their OCC, the operator conducted 8 simulator training sessions with FOs. During the last training session, the operator trained the pilots to begin flaring the aircraft at 20 ft and went through the steps for the recovery of bounced landings. It was expected that during the OCC, the operator would capture any training deficiencies and rectify them prior to line training.

The FO passed the operator proficiency check (OPC) in December 2022.

While under line training in the aircraft, the FO had completed a total of 7 landings.

After the occurrence, the FO reported that although the operator's training manuals and the OCC training required pilots to flare the aircraft at 20 ft, they were more comfortable flaring at 30 ft as originally trained. They advised that during all landings conducted prior to the occurrence flight, flare was initiated at 30 ft. The FO recalled that on the day of the occurrence, due to flying with a check captain, they made a last-minute decision to follow the operator's procedures to initiate flaring the aircraft at a height of 20 ft.

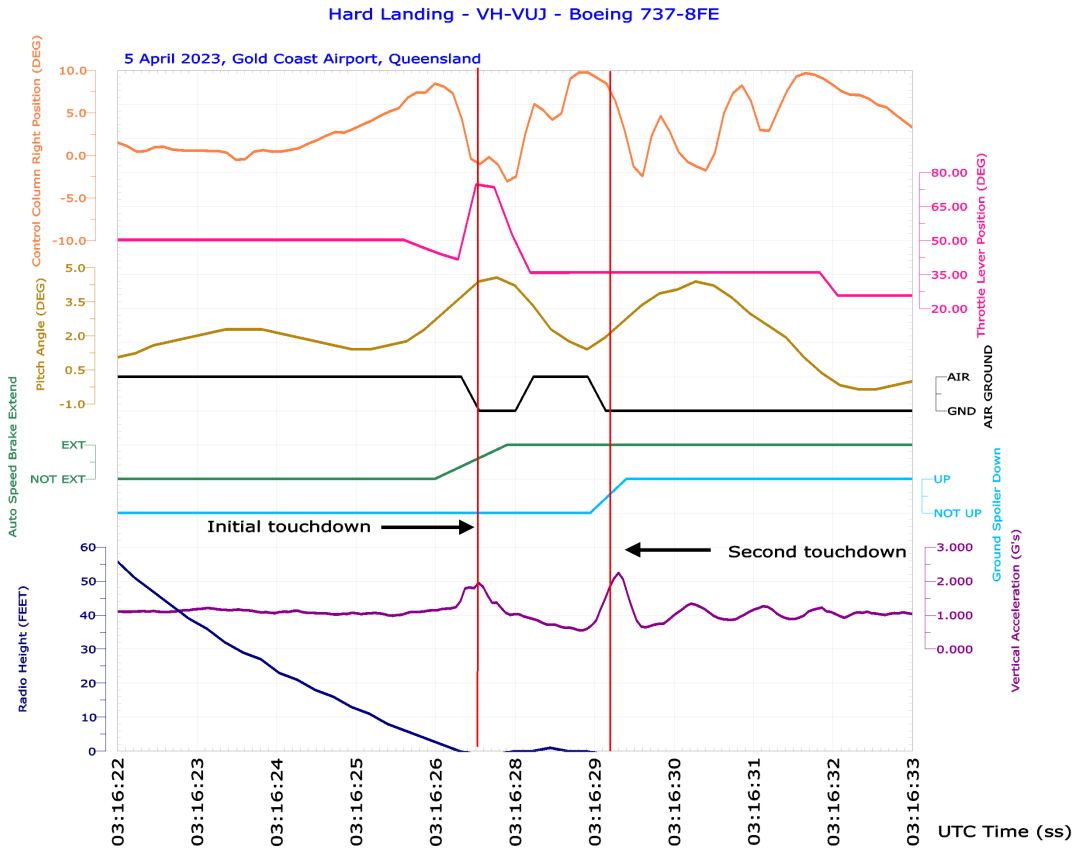
Other hard landings reported by the operator

Between March and June 2023, the operator reported 5 hard landings across the Boeing 737 fleet, including this occurrence. Of these flights, all but one had a FO undergoing line training as the pilot flying during the landing, however the FOs involved had done their Boeing 737 type rating at a different international type rating provider. It was reported that 2 of the hard landings were related to the flare technique, while the remaining 3 reports did not state why the hard landing occurred.

The ATSB received the flight data for the second flare-related hard landing. This landing, which occurred on 5 April 2023, was conducted by a different FO under line training. It had similar characteristics as the occurrence flight. On this flight, the flare was also initiated at approximately 10 ft and quickly increased to approximately 5º, before back pressure was released, thrust was reduced slightly but not to idle. The aircraft touched down with a roll of 1.42º, a pitch of 4.4º and a G force of 1.94 G (Figure 3). The speedbrakes deployed during the touchdown, however, the aircraft bounced approximately 2 ft.

During the bounce, the thrust was reduced, again not to idle, and the ground spoilers activated while the aircraft was still airborne resulting in a G force during the second landing of 2.2 G. The throttle was reduced to idle approximately 3 seconds after the second touchdown.

Figure 3: VH-VUJ aircraft flight data



Source: ATSB

Safety analysis

Both the occurrence landing and the 5 April 2023 landing showed very similar characteristics. In both cases, the initial bounced landing was the result of a combination of a late flare and a higher than idle thrust being maintained through initial touchdown. In addition, during the bounce, both the speedbrakes and ground spoilers deployed while the aircraft was still in the air, significantly reducing the amount of lift, which led to the hard landings during the second touchdown.

The training provider who trained the pilot of the occurrence landing stated that they used the Boeing 737 NG/MAX flight crew training manual (FCTM) when training pilots to land. However, they taught pilots to mentally prepare for the flare at 30 ft and to flare at 25 ft rather than 20 ft. The difference in heights during the training had the potential to create confusion. Additionally, during the later stages of an approach, the difference would have presented a different sight picture and reduced the pilot's reaction time when they then changed to using the FCTM and the operator's requirement to flare at approximately 20 ft.

The ATSB did not assess the procedures provided by the other training providers used by the operator.

The operator was unaware of the difference in flare height being taught at the third-party training provider. Although the international training provider did not comply with the flare height in the FCTM, the difference in flare height should have been captured in the operator conversion course (OCC). The OCC training required that the flare was commenced at 20 ft and during these 8 simulator sessions should have identified and worked with the FO to ensure they were comfortable with the flare height. There were no indications in the training reports that the FO had an issue with flare height.

When in the landing phase, there are many time-critical decisions which can increase the workload for a pilot (Lee, 2010). Changing an established habit at the last minute requires a higher level of cognitive effort. This increased cognitive load can lead to a slower response time, decreased efficiency, and a higher likelihood of errors or oversights. The intention of the first officer to flare at 20 ft rather than their normal 30 ft, while in line with the manufacturer's flight crew training manual (FCTM), introduced an unfamiliarity and uncertainty, which most likely led to misjudgement resulting in the aircraft being flared late and the thrust not being reduced prior to the initial touchdown.

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.

Safety issues are highlighted in bold to emphasise their importance. A safety issue is a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

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 hard landing involving Boeing 737-8FE, VH-YQR, at Sydney Airport, New South Wales.

Contributing factors

- During the landing, the aircraft was flared at a lower altitude than they had been trained and was required by the flight crew training manual. In addition, the power was not reduced to idle. In combination, these resulted in the aircraft bouncing.
- During the subsequent touchdown, the speedbrakes and ground spoilers deployed, significantly reducing lift and resulting in a hard landing of 2.96 G.
- **The training provider, contracted by the operator to conduct Boeing 737 conversion training, was training pilots to flare the aircraft at a higher altitude rather than the manufacturer's requirement of approximately 20 ft. This increased the risk of unstable and/or hard landings.** (Safety issue)

Safety issues and actions

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues. The ATSB expects relevant organisations will address all safety issues an investigation identifies.

Depending on the level of risk of a safety issue, the extent of corrective action taken by the relevant organisation(s), or the desirability of directing a broad safety message to the aviation industry, the ATSB may issue a formal safety recommendation or safety advisory notice as part of the final report.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions are provided separately on the ATSB website, to facilitate monitoring by interested parties. Where relevant, the safety issues and actions will be updated on the ATSB website as further information about safety action comes to hand.

Training provided on flare height

Safety issue description

The training provider, contracted by the operator to conduct Boeing 737 conversion training, was training pilots to flare at 30 ft rather than the manufacturer's requirement of 20 ft. This increased the risk of unstable and/or hard landings.

Issue number:	AO-2023-010-SI-01
Issue owner:	CAE
Transport function:	Aviation: Air transport
Current issue status:	Closed – Adequately addressed
Issue status justification:	The safety action taken by CAE adequately addresses the safety issue.

Proactive safety action taken by CAE

Action number:	AO-2023-010-PSA-01
Action organisation:	CAE
Action status:	Closed

CAE completed several actions in relation to the occurrence. These include a risk assessment in pilot training assessment and the following:

- Conducted a review of all Boeing 737 courseware to ensure that there were no areas of conflicting information.
- Conducted a review of the current training program design and development process across all platforms to ensure that an adequate quality control exists to verify that developed courseware did not contradict original equipment manufacturer's policies, standard operating procedures or techniques.
- Modified the courseware briefing slide relating to the autothrottle auto retard height and aligned the instructor guide to refer to the original equipment manufacturer's guidance text from the flight crew training manual for the normal flare technique.

- A training bulletin was released to all training centres conducting training on the 737 Max, to ensure that the original equipment manufacturer's technique was taught. The bulletin included a review of the different elements of training conducted to ensure that the 20 ft flight crew training manual guidance and the 27 ft auto throttle auto-retard feature were covered, with the emphasis being on the flight crew training manual guidance.

Safety action not associated with an identified safety issue

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. All of the directly involved parties are invited to provide submissions to this draft report. As part of that process, each organisation is asked to communicate what safety actions, if any, they have carried out to reduce the risk associated with this type of occurrences in the future. The ATSB has so far been advised of the following proactive safety action in response to this occurrence.

Safety action by Virgin Australia

Virgin Australia has completed the following safety actions:

- reviewed hard landing events from 2017 to identify any commonalities or trends in the events
- increased oversight and focus with the external type rating providers and the Training and Standards team to identify areas of alignment with SOPs and training
- added Zero Flight Time (ZFT) advanced simulator sessions into the OCC program (the ZFT occurs approximately halfway through the line training to reconfirm the take-off and landing techniques while also able to introduce more challenging conditions)
- an independent review of the checking and training department was undertaken consisting of:
  - a training and standards review, providing an overall health check focusing on the systems and the people
  - a post-COVID review – ramp up activity had seen increased activity, so the review enabled the operator to understand how checking and training is performing.

The operator also noted that, for factors not relating to this event, CAE is no longer being used as a type rating provider.

General details

Occurrence details

Date and time:	10 March 2023 0944 Eastern Daylight-saving Time	
Occurrence class:	Incident	
Occurrence categories:	Hard landing	
Location:	Sydney Airport, New South Wales	
	Latitude: 33° 57.923' S	Longitude: 151° 11.547' E

Aircraft details

Manufacturer and model:	THE BOEING COMPANY 737-8FE	
Registration:	VH-YQR	
Operator:	VIRGIN AUSTRALIA AIRLINES PTY LTD	
Serial number:	41011	
Type of operation:	Part 121 Australian air transport operations - Larger aeroplanes-Standard Part 121	
Activity:	Commercial air transport-Scheduled-Domestic	
Departure:	Brisbane Airport, Queensland	
Destination:	Sydney Airport, New South Wales	
Persons on board:	Crew – 6	Passengers – 179
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Glossary

AMM	Aircraft maintenance manual
FCTM	Flight crew training manual
FO	First officer
OCC	Operator conversion course
OPC	Operator proficiency check
QAR	Quick access recorder.
RAPT	Risk Assessment in Pilot Training
ZFT	Zero Flight Time

Sources and submissions

Sources of information

The sources of information during the investigation included:

- the involved flight crew
- Virgin Australia
- quick access recorder data
- CAE

References

Lee, Kyongsun (2010). 'Effects Of Flight Factors On Pilot Performance, Workload, And Stress At Final Approach To Landing Phase Of Flight'. *Electronic Theses and Dissertations*, 2004-2019. 1628.

The Boeing Company (2020). Boeing 737 NG/MAX Flight Crew Training Manual.

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.

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

- Civil Aviation Safety Authority
- the involved flight crew and the cabin manager of VH-YQR
- Virgin Australia
- United Kingdom Air Accidents Investigation Branch (AAIB)
- CAE

Submissions were received from:

- the involved flight crew
- Virgin Australia
- United Kingdom Air Accidents Investigation Branch (AAIB)
- CAE

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

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.