



Australian Government

Australian Transport Safety Bureau

Runway excursions on take-off involving Airbus A330-323, 9M-MTL, and Boeing 787-9, VN-A819

Melbourne Airport, Victoria, on 7 and 18 September 2023

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Addendum

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Preliminary report

This preliminary report details factual information established in the investigation’s early evidence collection phase, and has been prepared to provide timely information to the industry and public. Preliminary reports contain no analysis or findings, which will be detailed in the investigation’s final report. The information contained in this preliminary report is released in accordance with section 25 of the *Transport Safety Investigation Act 2003*.

The occurrences

Overview

Within an 11-day period in September 2023, the ATSB received two notifications of runway excursions during take-off at night from runway 34 at Melbourne Airport, Victoria. Runway 34, which was normally 3,657 m long, had been temporarily shortened by 1,568 m from the northern end, due to runway resurfacing works in progress (WIP) (Figure 1).

Figure 1: Melbourne Airport arrangement relating to the occurrences



Source: Google Earth, annotated by ATSB

The flight crew of both aircraft did not identify that the shortened runway was in place and used the full length of runway 34 for their take-off performance calculations. As a result, the reduced-thrust¹ engine settings used by both flight crews extended the take-off runs beyond the temporary runway end lights into a 450-metre buffer² before the works limit line. The jet blast from each aircraft impacted runway unserviceability lights,³ works lights and marker cones. Personnel were active in the works area at the time of both occurrences, however none were physically injured as a result. There was no damage to either aircraft, or injuries to passengers, and both continued with their planned flights.

¹ See *Aircraft information*.

² Comprising a 210 m clearway (incorporating a 150 m declared stopway) after the runway end, plus a 240 m runway end safety area (RESA). See *Melbourne Airport runway works*.

³ Lights designating the runway unserviceability area.

9M-MTL, 7 September 2023

On the night of 7 September, a Malaysia Airlines Airbus A330-300, registered 9M-MTL was scheduled for a 2330 local time⁴ departure to fly as a scheduled passenger transport Melbourne to Kuala Lumpur, Malaysia as flight MH128. The first officer (FO) was the pilot flying (PF), and the captain was the pilot monitoring (PM).⁵

The same flight crew had flown into Melbourne via runway 34 the previous night at about 2030, on another A330-300 aircraft. When approaching Melbourne, the flight crew reported that they checked the NOTAMs,⁶ which identified that taxiway E would be closed as a result of WIP that evening. Even though the NOTAM came into effect after they were scheduled to land, the crew contacted air traffic control (ATC), who confirmed that taxiway E could be used to vacate the runway. The aircraft landed without issue.

At around 2100 on 7 September, prior to leaving their hotel, the flight crew each downloaded an electronic copy of the flight briefing package.⁷ Both crew indicated they went briefly through the flight plan, including weather and fuel, before travelling to the airport. After arriving at the airport check-in, the flight crew also picked up a hard copy of the briefing package and immediately proceeded through to the aircraft.

The flight crew arrived at the aircraft at about 2245 and reported commencing with the company standard operating procedures (SOP) and checklist to prepare for the flight. This included another review of the flight briefing package.

One of the NOTAMs in the briefing package (Figure 2) indicated that, at the time of the scheduled departure, runway 34 had the length reduced by 1,568 m from the northern end due to WIP. It also stated that the take-off run available (TORA) was 2,089 m. Both crew later stated that they were aware of the WIP as a result of checking the runway NOTAMs on approach to Melbourne the previous evening, but missed the NOTAM details while preparing for the occurrence flight. The FO reported going through the NOTAMs on their electronic flight bag (EFB)⁸ and indicated that the split screen display may have affected their ability to detect the shortened runway. The captain recalled going 'briefly' through the NOTAMs.

⁴ Local time was Australian Eastern Standard Time (AEST), which is Coordinated Universal Time (UTC) +10 hours. Times in this report are AEST unless otherwise noted.

⁵ 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.

⁶ Notice to Airmen (NOTAM): A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. See *Notice to airmen (NOTAM)*.

⁷ The briefing package, flight release or dispatch release contains pertinent information and expected conditions for the intended flight, including flight plan, weather reports, NOTAMs and other flight documents. In this case originated by Malaysia Airlines flight dispatch.

⁸ Electronic flight bag (EFB): an electronic device or set of devices containing applications used for flight planning, such as take-off performance calculations.

Figure 2: Runway WIP NOTAM as presented in the 9M-MTL briefing package

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1H5688/23 VALID: 06-SEP-23 1235 - 08-SEP-23 1835
DAILY 1235-1835
RWY 16/34 LENGTH REDUCED BY 1568M NORTHERN END DUE WIP
RWY 16 THR DISP
HN: MARKED BY 5 GREEN WINGBAR LIGHTS EITHER SIDE OF RUNWAY AND 6
GREEN LIGHTS ACROSS THE RUNWAY IN 2 GROUPS OF 3 WITH CENTRAL GAP
RWY 16 HIAL NOT AVBL
RWY 16 PAPI RH SIDE NOT AVBL
RWY 34 TEMP END OF RWY MARKED BY 6 RED LIGHTS ACROSS THE RWY IN 2
GROUPS OF 3 WITH CENTRAL GAP
RWY 34 LAHSO NOT AVBL
CAUTION WORKERS AND EQPT OPR BEHIND ACFT DEP RWY 16
DECLARED DISTANCES
RWY TORA TODA ASDA LDA
16 2232 2352(2.02) 2292 2089
34 2089 2149(2.25) 2239 2089
RWY 16 STODA 2242(1.6) 2327 (1.9)
RWY 34 STODA 10586(1.6) 1722(1.9) 2105(2.2)
REFER METHOD OF WORKING PLAN 2022/2 STAGE 8
    
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Note: times are in UTC. See Take-off distances for a description of TORA, TODA, ASDA, and LDA.
 Source: Malaysia Airlines

Both crew reported listening to the automatic terminal information service (ATIS)⁹ and writing down the key information. The FO filled out the operator’s predeparture take-off certificate,¹⁰ which had spaces for the time the ATIS was accessed, along with weather information from the ATIS and other flight data. The version of the ATIS that the flight crew accessed was information Oscar¹¹ which stated ‘reduced runway length in operation’ and gave both the landing distance available (LDA) and the take-off run available (TORA) as 2,089 m. The ATIS audio was broadcast as follows:

MELBOURNE TERMINAL INFORMATION OSCAR, EXPECT GLS OR RNP APPROACH, RUNWAY THREE FOUR DRY, REDUCED RUNWAY LENGTH IN OPERATION, LANDING DISTANCE AVAILABLE TWO ZERO EIGHT NINER METRES, TORA TWO ZERO EIGHT NINER METRES, WIND THREE THREE ZERO DEGREES ONE ZERO KNOTS, VISIBILITY GREATER THAN ONE ZERO KILOMETRES, CLOUD FEW THREE THOUSAND FIVE HUNDRED FEET, TEMPERATURE ONE ZERO, QNH¹² ONE ZERO ZERO FIVE, ON FIRST CONTACT WITH MELBOURNE GROUND, TOWER OR APPROACH, NOTIFY RECEIPT OF INFORMATION OSCAR.

The flight crew proceeded with independent performance calculations using the Airbus EFB software *FlySmart*. Neither of the crew recalled recognising, after listening to the ATIS, that the runway length was reduced and there were no notes relating to the runway length recorded on the predeparture take-off certificate. Both crew selected the full length of the runway for their independent calculations, which resulted in the selection of a reduced-thrust take-off. The FO reported then cross-checking the two sets of performance figures, which were the same.

ATC cleared the aircraft to push back from the gate at 2329 and the aircraft was subsequently cleared to taxi to holding point K (at taxiway K) at 2337. At 2343, ATC gave the aircraft clearance to line up on runway 34 and, about one minute later, cleared the aircraft for take-off. None of the

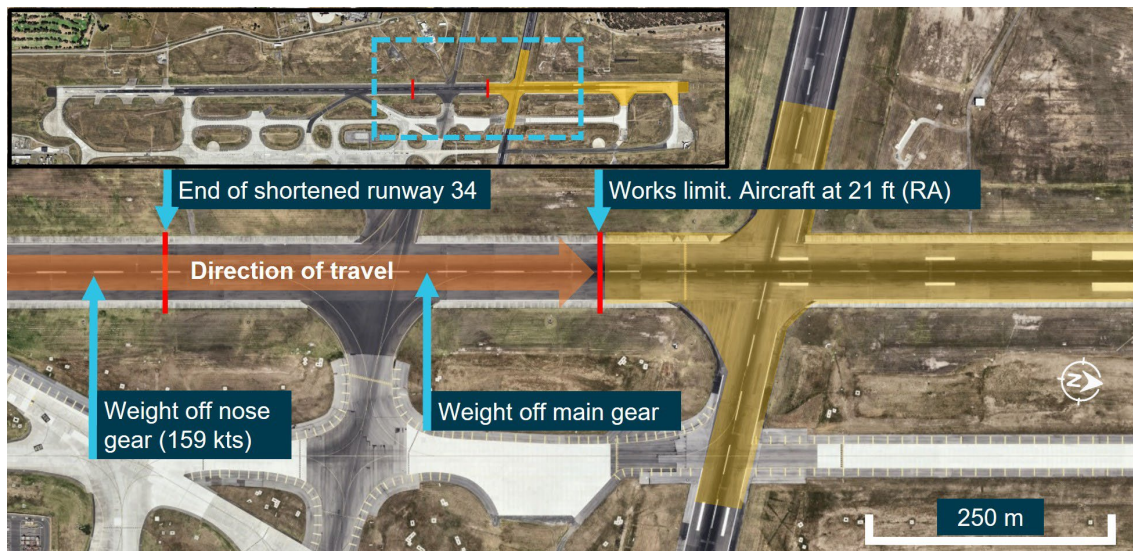
⁹ Automatic terminal information service: The provision of current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts. ATIS information is prefixed with a unique letter identifier and is updated either routinely or when there is a significant change to weather and/or operations. See Automatic terminal information service (ATIS).
¹⁰ Also referred to as a ‘take-off and landing data card’. It is a form for flight crews to enter flight information for quick reference.
¹¹ ATIS messages are identified by a designator in the form of a letter of the ICAO spelling alphabet, with consecutive ATIS messages in alphabetical order.
¹² QNH: the altimeter barometric pressure subscale setting used to indicate the height above mean seal level.

communications between the flight crew and ATC mentioned the shortened runway, the works in progress or the current ATIS version, which had not changed since the flight crew accessed it.

The crew reported that, in accordance with the airline’s standard operating procedure, the FO (as PF) set the thrust and the captain then put a hand on the throttle levers. The captain reported that at approximately 100 kt, they observed that the runway end lights appeared ‘close’. The captain considered advancing the throttles to take-off/go-around (TOGA)¹³ thrust, but elected not to, as they felt it may distract or startle the FO. The PF reported that they did not notice the lights.

Aircraft flight data showed that upon reaching the calculated rotation speed (V_R) of 159 kt, approximately 75 m before the runway end, the aircraft rotated (weight off the nose landing gear), (Figure 3). Both crew recalled that the initial rate of rotation was slow¹⁴ and was subsequently corrected. The data recorded weight off the main landing gear, after the end of the runway, approximately 170 m before the works limit line. The data recorded 21 ft (6.4 m) radio altitude (RA) as the aircraft crossed the works limit.

Figure 3: 9M-MTL take-off relative to runway works



Source: Google Earth, annotated by ATSB

Once the aircraft was stabilised at 10,000 ft, the crew briefly discussed the proximity of the runway end lights during the take-off. There was no indication of any issue with the aircraft and no contact from ATC to indicate any issue, so the crew continued the flight to Kuala Lumpur.

The airport operator, Australian Pacific Airport Melbourne (APAM) reported that it ceased the runway overlay works the day after the occurrence, pending the outcome of its initial investigation. After a review of the existing risk assessment for displaced threshold runway works, APAM carried out a number of safety actions (see *Safety action*) and recommenced the works on 11 September.

There were no further incidents relating to the runway works reported until 18 September.

VN-A819, 18 September 2023

On 18 September 2023 at 2230, a Bamboo Airways Boeing 787-9 aircraft, registered VN-A819, was being prepared to depart Melbourne Airport for scheduled passenger transport flight QH83 to Hanoi, Vietnam. There were 3 flight crew, who were assigned the roles (according to the

¹³ TOGA: Take-off / go-around, a thrust lever setting that applies maximum available thrust.

¹⁴ Recorded data showed a pitch rate of 2.1 degrees per second, compared to the Airbus standard operating procedure of 3 degrees per second.

operator’s terminology) of pilot in command (PIC), PM, and PF.¹⁵ For this flight, the PIC sat in the jump seat behind the pilots at the controls, the PM sat in the left pilot’s seat and the PF sat on the right.

The same flight crew had flown into Melbourne via runway 34 at around midday on 17 September, on another Boeing 787-9. At the time of this arrival there were no restrictions on the runway or taxiways.

At approximately 2000, prior to leaving their hotel, the flight crew reported downloading and reviewing the flight briefing package¹⁶. The aircraft had an inoperative auxiliary power unit (APU) and had one brake unit (of 8 total) deactivated. The crew then had an initial briefing on the planned flight while on the way to the airport.

The flight crew received a hard copy of the flight briefing package at the airport and later reported that additional review of the documents was conducted as a group. The flight dispatcher’s email to the crew, accompanying the briefing package, indicated that there was no special effect on the flight. The PIC reported that the NOTAMs were reviewed at this point and identified that the runway works NOTAM (essentially the same as the one for the first occurrence, shown in Figure 2) came into effect at 2235,¹⁷ 5 minutes after the scheduled departure time (2230). The PIC recalled an intent to read the NOTAMS again when conducting the EFB performance calculations.

The PF and PM reported that after arriving at the aircraft, they obtained ATIS information November. This indicated that runway 16/34 was currently closed due to the runway works, that all runways would be closed from 2225, and from 2235 runway 34 would be operational with a displaced threshold. The relevant part of the ATIS was broadcast as:

MELBOURNE TERMINAL INFORMATION NOVEMBER...RUNWAY ONE SIX THREE FOUR CLOSED DUE WORKS. FROM TIME ONE TWO TWO FIVE ALL RUNWAYS CLOSED. FROM TIME ONE TWO THREE FIVE RUNWAY THREE FOUR WITH DISPLACED THRESHOLD FOR ALL OPERATIONS...

As a result of the APU fault, external power was connected to the aircraft. The crew reported that the power disconnected halfway through flight planning, leaving the aircraft completely dark. Two further power outages resulted in an estimated 40-minute delay until power was stabilised, and a further 30 minutes to prepare the aircraft again. The PF and PM reported that they were experiencing a high workload at the time.

The PF recalled obtaining the up-to-date ATIS information, which had changed to information Oscar from 2220. It stated that runway 09/27 and runway 16/34 were closed due to WIP:

MELBOURNE TERMINAL INFORMATION OSCAR...RUNWAY ZERO NINER TWO SEVEN AND ONE SIX THREE FOUR CLOSED DUE WORKS. FROM TIME ONE TWO THREE FIVE RUNWAY THREE FOUR WITH DISPLACED THRESHOLD FOR ALL OPERATIONS ...

The flight crew did not recall recognising the runway closures from the ATIS and the PIC did not ultimately re-check the NOTAMs as originally intended.

At 2222 the crew requested flight clearance to Hanoi. In providing clearance, ATC advised the flight crew to expect to take off from runway 34 and that the ATIS information was now Oscar, which was acknowledged by the crew. At 2229, due to the APU fault, the crew requested to start one engine at the gate while connected to ground power, which was approved.

¹⁵ For this operator, these role titles are a general indication of each pilot’s technical role throughout the flight but do not restrict them to any one role. For example, the PIC or PM may control the aircraft at times.

¹⁶ Originated by Bamboo Airways flight dispatch.

¹⁷ The NOTAM and ATIS information presented uses UTC time and has been converted to local time for this report. UTC is the preferred convention as it decreases the likelihood of errors during the conversion process.

ATIS information Papa was broadcast from 2233, stating that the reduced runway length was in operation and provided the associated runway declared distances:

MELBOURNE TERMINAL INFORMATION PAPA...REDUCED RUNWAY LENGTH IN OPERATION
TORA TWO ZERO EIGHT NINER METRES, TODA TWO ONE FOUR NINER METRES, ASDA TWO
TWO THREE NINER METRES, LANDING DISTANCE AVAILABLE TWO ZERO EIGHT NINER
METRES. RUNWAY THREE FOUR DEPARTURES FROM TAXIWAY KILO. CENTRELINE LIGHTS
NOT AVAILABLE. RUNWAY ZERO NINER TWO SEVEN CLOSED DUE WORKS...

The flight crew did not access this ATIS version. At 2240, after starting one engine, the flight crew requested and received clearance to push back from the gate and, at 2246, received clearance to taxi to holding point K. About a minute later, ATC contacted the flight crew to advise that their transponder wasn't showing on the radar, which the crew acknowledged and corrected.

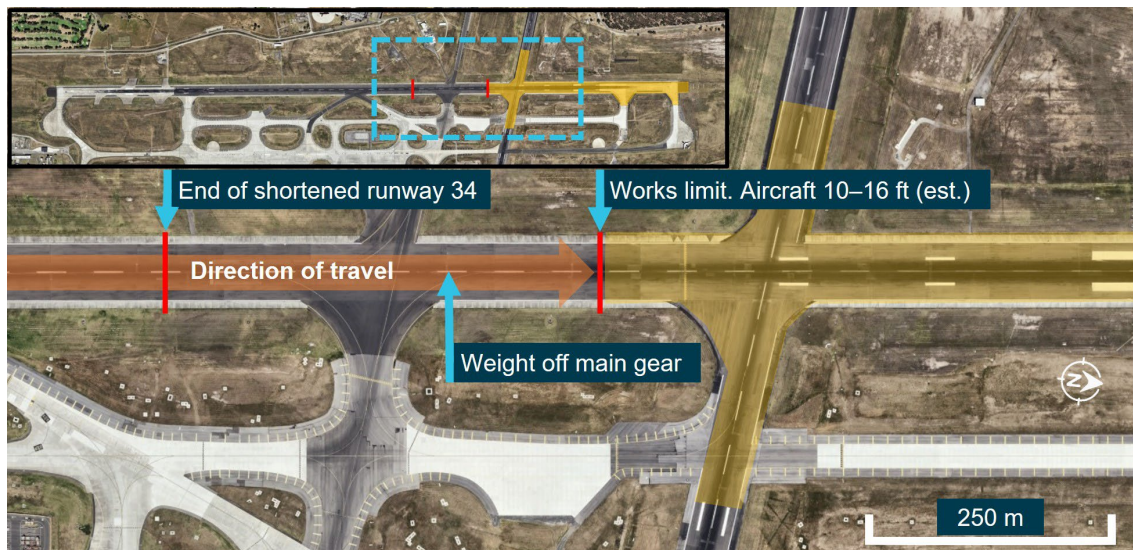
The aircraft held for about 3 minutes at holding point K for incoming traffic and, at 2254 was cleared to line up on runway 34. A minute later, ATC asked the flight crew, 'confirm you have information Papa'. The crew did not respond to the request.

About 25 seconds later, after engaging with another aircraft, ATC called VN-A819 again. Once acknowledged, ATC again asked the crew to 'confirm you have ATIS information Papa', to which the PM replied, 'information Papa copy'. At 2256, on receipt of their response, ATC gave the flight take off clearance.

During post-occurrence interviews, the PF and PIC recalled that they recognised the ATIS version change from Oscar to Papa at this time, but they had not accessed information Papa. The crew indicated that their expectations around the ATIS change were normally to do with the QNH or wind and that any important change in the information would have been directly communicated by ATC rather than the ATIS. At the time of the question from ATC, the PF indicated they felt pressure already being lined up on the runway, with their traffic display showing an aircraft on approach a few miles out behind them.

Flight path data provided by Bamboo Airways identified the point of weight off the main landing gear as just past taxiway E (Figure 4). Based on witness reports and review of CCTV footage, Melbourne airport estimated the height over the works limit to be 3–5 m (10–16 ft).

Figure 4: VN-A819 take-off relative to runway works



*Flight path provided by Bamboo Airways. The point of rotation was not available at the time of writing.
Source: Google Earth, annotated by ATSB*

During the take-off run, the flight crew observed that the runway end lights were much closer than normal. After take-off was completed, the crew discussed the proximity of the runway end lights.

There was no indication of any fault with the aircraft and no contact from ATC to indicate any other issue. The crew therefore continued the flight to Hanoi.

After this occurrence, APAM ceased works for the remainder of the evening and, on the following day, cancelled any further displaced threshold works for the remainder of the runway overlay project.

Context

Personnel information

Preliminary examination of flight crew details indicated that all flight crew members held appropriate licenses and qualifications to conduct the respective flights. All flight crew members reported being adequately rested, having had at least 24 hours rest before commencing duty ahead of the occurrence flights.

During individual post-occurrence interviews with the ATSB, the flight crew from both aircraft recognised that they had not identified the runway shortening through the available NOTAMs or ATIS. The ATSB asked the flight crews if they had identified any additional opportunities that may have assisted in recognising that the shortened runway was in effect. The crews indicated that there would likely have been some benefit in additional cues to highlight the shortened runway length, including:

- Auditory cues, such as having their attention drawn specifically to the shortened runway when given various clearances.
- Visual cues, such as signage at the holding point, to highlight the WIP and shortened runway.

Aircraft information

Both the Airbus A330-300 (9M-MTL) and Boeing 787-9 (VN-A819) are wide-body (dual aisle) twin turbofan engine, long range, air transport operation aircraft. At the time of the occurrence:

- 9M-MTL had a take-off weight of 216.1 tonnes and no listed performance-related defects.
- VN-A819 had a take-off weight of 219.8 tonnes and the auxiliary power unit and one brake unit (of 8 total) was listed as inoperative.

Reduced-thrust or derated take-offs are a standard practice to reduce engine wear and overhaul costs when there is more take-off distance available than the aircraft safely needs. Flexible temperature (or FLEX in Airbus terminology) or assumed temperature (in Boeing terminology) settings achieve a reduced-thrust take-off to take advantage of the runway length available by using an artificially high ambient temperature value to limit engine thrust, resulting in longer take-off distances.

Both aircraft used electronic flight bag (EFB) systems for pre-flight performance calculations resulting in reduced-thrust take-offs. 9M-MTL used the Airbus *Flysmart* (example shown in Figure 5) and VN-A819 used the Boeing *Onboard Performance Tool*.

Figure 5: 9M-MTL Airbus *Flysmart* performance comparison between Melbourne runway 34 full-length (centre of image) and reduced-length (right) under otherwise identical conditions.



Green text from the top down includes: CONF (flaps setting), thrust, V speeds, and a reduced performance MTOW (maximum take-off weight at which the performance is achievable). The green bar on the runway diagram is the accelerate-stop distance required for the given scenario.

Source: Malaysia Airlines, modified by the ATSB

A comparison of the calculations made by the systems for a full-length and reduced-length runway applicable to each occurrence is shown in Table 1 (9M-MTL) and Table 2 (VN-A819). Using the full-length runway in the calculations resulted in a reduced thrust setting, reduced flaps setting and higher V speeds.¹⁸

¹⁸ V speeds denote different phases of the take-off based on airspeed.

Table 1: 9M-MTL Airbus *Flysmart* performance data comparison between Melbourne runway 34 full-length and reduced-length

Runway 34 full length	Runway 34 reduced length
Thrust: reduced-thrust 46 °C	Thrust: TOGA
Flaps: 2	Flaps: 3
V ₁ : ¹⁹ 159 kt	V ₁ : 136 kt
V _R : 159 kt	V _R : 136 kt
ASDR: ²⁰ 3,463 m	ASDR: 2,047 m

Table 2: VN-A819 Boeing *Onboard Performance Tool* data comparison between Melbourne runway 34 full-length and reduced-length

Runway 34 full length	Runway 34 reduced length
Thrust: reduced-thrust 42 °C	Thrust: TOGA
Flaps: 5	Flaps: 20
V ₁ : 165 kt	V ₁ : 144 kt
V _R : 166 kt	V _R : 146 kt
ASDR: 3,500 m	ASDR: 2,205 m

Recorded information

Recorded data from the following sources was obtained by the ATSB:

- quick access recorder (QAR) from each aircraft
- ATC audio and surface movement radar
- closed-circuit television (CCTV) data from several cameras at Melbourne Airport.

Aerodrome information

Runway information

Melbourne Airport is operated by Australian Pacific Airport Melbourne (APAM). It operates without a curfew, 24 hours per day, 7 days per week and has 2 runways:

- 16/34, which is 3,657 m long
- 09/27, which is 2,286 m long.

Runway 16/34 crosses approximately through the middle of 09/27, at a point about 2,680 m from the runway 34 threshold.

Runway works

APAM commenced a runway overlay / resurfacing works project on 3 November 2022, scheduled to be completed in February 2024. APAM published details of the works through a method of working plan (MOWP; see *Method of working plan*), local works plan (LWP), NOTAMs, a 19-page airline operator brief, aeronautical information circulars (AIC),²¹ and also held stakeholder consultation forums prior to and during the works.

¹⁹ V₁: the maximum airspeed at which a rejected take-off can safely be initiated in the event of an emergency.

²⁰ ASDR: accelerate-stop distance required. See *Runway distances*.

²¹ Aeronautical Information Circular (AIC): A notice containing information that does not qualify for the origination of a NOTAM or for inclusion in the AIP, but which relates to flight safety, air navigation, technical, administrative or legislative matters.

Method of working plan

The Civil Aviation Safety Regulation (CASR) Part 139 *Manual of Standards (MOS)* Chapter 15, *Aerodrome works*, states that ‘the operator of a certified aerodrome must make all necessary arrangements to ensure that aerodrome works do not create a hazard to aircraft or cause confusion to pilots.’ The same section notes that ‘aerodrome works may be carried out without the closure of the aerodrome, provided safety precautions are adhered to.’ As part of works arrangements, the MOS required aerodrome operators develop a method of working plan (MOWP).

Accordingly, APAM developed the *Runway Overlay Project* MOWP, which was published on the Melbourne Airport website and distributed to a stakeholder list of airlines and other organisations, including Malaysia Airlines and Bamboo Airways.

The MOWP divided the works into 16 stages, with stage 8 of the works concerning the intersection of runways 16/34 and 09/27. The works plan involved closure of runway 09/27 and, to maintain an operational runway during the works, the runway 16 threshold was displaced, shortening the length of both runways (Figure 1).

Stage 8 of the works was the only one that had displaced threshold runway operations; it spanned three periods, with NOTAMs published to cover each:

- The first period ran from 23 January 2023 until 3 March 2023 for asphalt works. During that time, APAM recorded 3 minor or potential jet blast incidents from aircraft not correctly following the runway lead-on lights at taxiway E. There was also one occurrence where an aircraft backtracked into the runway end safety area (RESA) before departing, which resulted in jet blast on a work safety officer vehicle. APAM reported that they followed up with all of the operators involved.
- The second period was from 15 to 26 May 2023 for runway grooving works. There were no recorded occurrences relating to the displaced threshold during that period.
- The third period, containing the subject occurrences, commenced on 7 September 2023 for airfield ground lighting installation works. During this period, the displaced threshold operations commenced at 2235 each night and finished 6 hours later at 0435 the following morning.

Runway distances

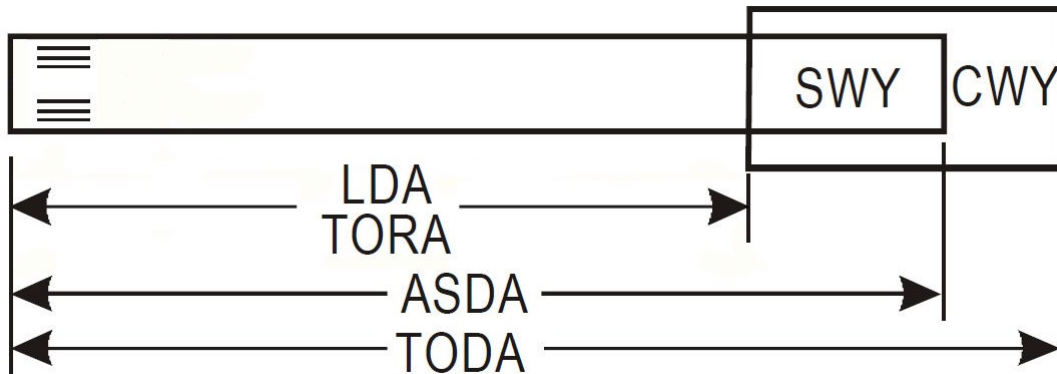
The International Civil Aviation Organization (ICAO) promulgates standards and recommended practices which countries signatory to the Convention on International Civil Aviation (including Australia) are expected to follow. Annex 14 to the Convention contained standards and recommended practices for aerodrome design and operations. To standardise the reporting and calculation of runway distances, Annex 14 defined the following ‘declared distances’ (Figure 6):

- Take-off run available (TORA). The length of runway declared available and suitable for the ground run of an aeroplane taking off.
- Take-off distance available (TODA). The length of the take-off run available plus the length of the clearway (CWY),²² if provided.
- Accelerate-stop distance available (ASDA). The length of the take-off run available plus the length of the stopway (SWY),²³ if provided.
- Landing distance available (LDA). The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

²² A defined rectangular area on the ground or water under the control of the appropriate authority, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height.

²³ A defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take-off.

Figure 6: Runway declared distances



Source: ICAO Annex 14, modified by ATSB

Take-off run required (TORR), and landing distance required (LDR) are associated distances required by a particular aircraft at a certain weight, thrust setting, and configuration. Take-off distance required (TODR) is the distance required from commencement of the take-off run for the aircraft to reach 50 ft altitude. Accelerate-stop distance available (ASDR) is the distance required to accelerate to the decision speed (V_1) and assuming the pilot takes action to reject the take-off at V_1 , bring the aircraft to a stop. Declared distances relevant to the subject occurrences are listed in Table 3.

Table 3: Melbourne runway 34 declared distances

Declared distance type	Normal distance (m)	Distance (m) during stage 8 runway works
Take-off run available (TORA)	3,657	2,089
Take-off distance available (TODA)	3,837	2,145
Accelerate-stop distance available (ASDA)	3,717	2,239
Landing distance available (LDA)	3,657	2,089

Visual aids

Aerodromes are required to have surface movement area guidance signs (MAGS) under certain conditions to provide guidance to aircraft and ground personnel. With regards to TORA MAGS the Part 139 MOS stated:

A take-off run available sign is to indicate to pilots the length of take-off run available from a particular taxiway from which the AIP²⁴ indicates that an intersection departure²⁵ is available.

A take-off run available sign must be provided as a final reassurance to the pilot of an aircraft that the pilot is at the correct take-off location.

In this occurrence the departures were from the runway 34 threshold, and therefore did not represent an intersection departure or require a TORA MAGS. Despite this, a MAGS was ordinarily present at taxiway K indicating the TORA for the full length runway. During the runway works periods, airside safety officers covered up the existing MAGS daily, prior to commencement of the displaced threshold runway operations. There was no requirement to have a runway works or reduced runway length MAGS at the runway 34 threshold.

²⁴ AIP: aeronautical information publication, published by Airservices.

²⁵ Intersection departure: a take-off from a point on a runway other than the designated threshold, usually at an intersection with a taxiway or runway.

Aeronautical information

Aerodrome conditions

The Part 139 MOS required that, for works where an MOWP is issued, a NOTAM giving the time and date of the planned commencement of the works, or a planned change in works stage, must be requested. Similarly, *Procedures For Air Navigation Services (PANS)-Aerodromes* (ICAO Document 9981), which outlined several procedures for operating with runway lengths below the declared distances, one of which is for the aerodrome operator to:

Promulgate the details of the reduced runway distances established, using all appropriate methods. As a minimum, it is advisable to issue a NOTAM and, when possible, broadcast the information on automatic terminal information service (ATIS).

In addition, *PANS-Air Traffic Management* (ICAO Document 4444), 7.5.3 *Procedures for aerodrome control service* stated:

Essential information on aerodrome conditions shall be given to every aircraft, except when it is known that the aircraft already has received all or part of the information from other sources. The information shall be given in sufficient time for the aircraft to make proper use of it, and the hazards shall be identified as distinctly as possible.

Note.— “Other sources” include NOTAM, ATIS broadcasts, and the display of suitable signals.

Notice to airmen (NOTAM)

ICAO defines a notice to airmen (NOTAM) as a ‘notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations’.

The Airservices Australia *Aeronautical Information Publication (AIP) En Route* (section 1.10 (1)) stipulated that ‘before beginning a flight, a pilot in command must study all available information appropriate to the intended operation and make a careful study of... location specific NOTAM for aerodromes.’

Automatic terminal information service (ATIS)

The AIP defined the automatic terminal information service (ATIS) as the provision of current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts during the hours when the unit responsible for the service is in operation.

ATIS is a service broadcast over a dedicated radio frequency that provides operational information to aircraft operating in the vicinity of an airport, eliminating the need for a controller to broadcast the information repeatedly. It is normally accomplished through a voice recording, updated when conditions change.

Chapter 4 of ICAO Annex 11 *Air Traffic Services* outlined the standards related to ATIS, including, whenever Voice-ATIS and/or D-ATIS²⁶ is provided:

- the preparation and dissemination of the ATIS message is the responsibility of the air traffic services.
- aircraft must acknowledge receipt of the information upon establishing communication with the controller.

²⁶ The provision of ATIS via continuous and repetitive voice broadcasts (Voice-ATIS), or via data-link (D-ATIS).

Additionally:

- Information contained in a current ATIS, the receipt of which has been acknowledged by the aircraft concerned, need not be included in a directed transmission to the aircraft...

AIP En Route 2.3.2 reflected these requirements in Australian airspace, stating:

When operating from a controlled aerodrome where ATIS is in operation, a pilot in command must obtain the ATIS prior to taxi, and advise ATC of the ATIS code when requesting taxi clearance.

Related occurrences

- On 30 November 2022, a Boeing 737 overran runway 19L at Brisbane Airport, Queensland on take-off. Runway 19L was operating with a reduced length due to works in progress. The aircraft briefly entered, and became airborne in, the section of the runway that was closed due to those runway works. The aircraft completed the departure and continued to its destination. The investigation is continuing (ATSB investigation ([AO-2022-064](#))).
- On 3 and 19 September 2021, the flight crews of Boeing 737 aircraft each conducted displaced threshold approaches into runway 11 at Darwin Airport, Northern Territory. The runway was shortened at the opposite end due to works in progress, meaning the runway 11 threshold was unaffected. The aircraft touched down 1,153 m and 932 m into the runway, respectively, but neither aircraft overran the runway. The flight crews were each found to have misinterpreted the NOTAM information during pre-flight briefing, and had also misinterpreted or did not comprehend the ATIS information prior to arrival (ATSB investigation [AO-2021-037](#)).
- On the afternoon of 22 March 2007, the flight crew of a Boeing 777 commenced take-off at Auckland Airport, New Zealand, where the runway length had been reduced during a period of runway works. The crew had accessed the relevant NOTAM and ATIS containing this information, however there were several factors identified that contributed to the flight crew's belief that the full runway length was available. As such, they started the take-off with less engine thrust and flap than required. During the take-off the crew saw work vehicles in the distance on the runway and immediately applied full engine thrust. The aircraft became airborne approximately 190 m before the reduced runway end and cleared the height of the work vehicles by about 28 m. (Transport Accident Investigation Commission [report 07-001](#))
- On the afternoon of 16 July 2003 the crew of a Boeing 737 were preparing to depart Manchester Airport, United Kingdom. The runway in use was operating at reduced length due to works in progress at the far end. It was found that although having accessed a NOTAM and ATIS concerning the works the flight crew were unaware of the reduced runway length. The works were also not visible due to the runway being over a slight rise. The crew commenced the take-off using a reduced thrust setting and as they crested the rise, they saw the works vehicles. At that stage, the aircraft was close to the rotation speed, so the crew continued the take-off. The aircraft cleared a 4-m high vehicle by a height of approximately 17 m. (Air Accidents Investigation Branch [Report 3/2006](#))

Previous initiatives

- In 2010, the US Federal Aviation Administration (FAA) initiated the Airport Construction Advisory Council (ACAC),²⁷ which is a collaborative working group of industry stakeholders. The ACAC's aim is to help identify hazardous situations during runway and taxiway construction projects and identify ways to mitigate the associated risk. The webpage contains information, guidance material and checklists.

²⁷ Federal Aviation Administration: https://www.faa.gov/airports/runway_safety/runway_construction

- The Global Action Plan for the Prevention of Runway Excursions (GAPPRE)²⁸ is an industry working group coordinated by the Flight Safety Foundation and EUROCONTROL, aimed at identifying the most important actions required to address the risk of runway excursions. The GAPPRE cited an International Air Transport Association (IATA) report that between 2005 and the first half of 2019, 23 percent of accidents in IATA's database involved a runway excursion, which was also the most frequent accident end-state.

The GAPPRE publication is available for download and contains recommendations, and associated guidance material and best practice information for aerodrome operators, air navigation service providers, aircraft operators, aircraft manufacturers, regulators and ICAO.

Safety action

Australian Pacific Airport Melbourne (APAM)

The day after the 7 September occurrence involving 9M-MTL, Australian Pacific Airport Melbourne (APAM) advised it ceased the runway overlay works, pending the outcome of its initial investigation. After a review of the existing risk assessment for displaced threshold runway works, APAM carried out the following safety actions:

- A Safety Alert was sent out to all airlines operating into Melbourne Airport. This included receiving read receipts and signed acknowledgement that they have received the alert. Airlines operating into the displaced threshold window were prioritised.
- Updates to the AIC and NOTAM stating all runway departures must be from Taxiway Kilo due to a shortened runway. AIC also included the key contents of the Safety Alert.
- APAM had requested for ASA [Airservices Australia] (Melbourne Tower) to amend take off phraseology to include that the runway was shortened, however this was declined as it was non-standard and too prescriptive.

APAM recommenced the works on 11 September.

Immediately following the 18 September occurrence involving VN-A819, APAM ceased the works for the remainder of that evening and, on the following day, APAM cancelled any further displaced threshold works for the remainder of the runway overlay project.

In addition, through its initial investigation, APAM made a number of internal recommendations. This included a review of alternate programs to achieve runway intersection works for future runway projects, and initiation of discussions with industry groups on improving visual aids and communication of information for shortened runway operations.

Malaysia Airlines

In response to the 7 September occurrence involving 9M-MTL, Malaysia Airlines reported that it:

- Issued a flight safety alert on 9 September 2023 to all flight crew, to notify of the occurrence, the shortened runway works and the significant difference in performance calculations for the full-length versus shortened runway lengths. Additionally, a notification was issued to flight crews, requiring acknowledgement that it had been read.
- Included a reminder in the company NOTAM about the Melbourne Airport runway 16/34 shortening.
- Included a special note in the operational flight plan for Melbourne to increase awareness of the shortened runway operations.

²⁸ Flight Safety Foundation: <https://flightsafety.org/toolkits-resources/gappre/>

Bamboo Airways

In response to the 18 September occurrence involving VN-A819, Bamboo Airways advised that it:

- Raised awareness of this occurrence with all flight crews and dispatchers.
- Engaged with dispatchers to enhance NOTAM checking and required actions, and also to improve communication of flight information to crews.

Further investigation

To date, the ATSB has:

- interviewed the flight crews
- reviewed flight planning information for each flight
- reviewed initial investigation reports from the aircraft operators and airport operator
- reviewed the works planning documents
- reviewed NOTAM and ATIS information
- analysed recorded flight data from 9M-MTL
- reviewed CCTV footage
- analysed recorded ATC audio and surface movement radar data
- conducted an initial review of regulations, requirements and recommended practices for displaced threshold runway works
- conducted an initial review of related occurrences.

The investigation is continuing and will include further review and analysis of the above as well as:

- recorded flight data from VN-A819
- runway works planning and risk assessments
- mechanisms for the communication of safety-critical aeronautical information to air crews.

Should a critical safety issue be identified during the course of the investigation, the ATSB will immediately notify relevant parties so appropriate and timely safety action can be taken.

A final report will be released at the conclusion of the investigation.

General details

Occurrence 1 details

Date and time:	7 September 2023 – 2345 EST	
Occurrence class:	Serious incident	
Occurrence categories:	Runway excursion, Jet blast / Prop / Rotor wash	
Location:	Melbourne Airport	
	Latitude: 37.6733° S	Longitude: 144.8433° E

Aircraft 1 details

Manufacturer and model:	Airbus A330-323	
Registration:	9M-MTL	
Operator:	Malaysia Airlines	
Serial number:	1395	
Type of operation:	Part 129 Foreign air transport operators-Standard Part 121	
Activity:	Commercial air transport-Scheduled-International	
Departure:	Melbourne Airport	
Destination:	Kuala Lumpur International Airport	
Persons on board:	Crew – 12	Passengers – 235
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	None	

Occurrence 2 details

Date and time:	18 September 2023 – 2357 EST	
Occurrence class:	Serious incident	
Occurrence categories:	Runway excursion, Jet blast / Prop / Rotor wash	
Location:	Melbourne Airport	
	Latitude: 37.6733° S	Longitude: 144.8433° E

Aircraft 2 details

Manufacturer and model:	Boeing 787-900	
Registration:	VN-A819	
Operator:	Bamboo Airways	
Serial number:	62736	
Type of operation:	Part 129 Foreign air transport operators-Standard Part 121	
Activity:	Commercial air transport-Scheduled-International	
Departure:	Melbourne Airport	
Destination:	Hanoi Noi Bai International Airport, Viet Nam	
Persons on board:	Crew – 13	Passengers – 199
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	None	

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.