AIRCRAFT SERIOUS INCIDENT

FINAL REPORT

SI 11/25

Air Accident Investigation Bureau (AAIB)

Ministry of Transport Malaysia

Fixed-Wing Aircraft Boeing 737-800,

Registration 9M-MXU, at Sultan Ahmad Shah Airport, Kuantan, Pahang

on 27 November 2025



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Issued on 27 October 2026
MOT.(S).600-5/4/123

FINAL REPORT SI 11/25

AIR ACCIDENT INVESTIGATION BUREAU (AAIB) MALAYSIA

REPORT NO: SI 11/25

OPERATOR	**: MALAYSIA AIRLINES BERHAD**
AIRCRAFT TYPE	**: BOEING 737-800**
NATIONALITY	**: MALAYSIA**
REGISTRATION	**: 9M-MXU**
PLACE OF OCCURRENCE	**: SULTAN AHMAD SHAH AIRPORT, KUANTAN, PAHANG**
DATE AND TIME	**: 27 NOVEMBER 2025 AT 1948 LT (1148 UTC)**

This investigation is carried out to determine the circumstances and causes of the accident with a view to the preservation of life and the avoidance of accident or incident in the future. It is not the purpose of this investigation to apportion blame or liability (Annex 13 to the Chicago Convention and Civil Aviation Regulations 2016).

All times in this report are Local Time (LT) unless stated otherwise. LT is UTC +8 hours.

INTRODUCTION

The Air Accident Investigation Bureau (AAIB) is the air accident investigation authority in Malaysia and is responsible to the Minister of Transport. Its mission is to promote aviation safety through the conduct of independent and objective investigations into air accidents and serious incidents.

The AAIB conducts these investigations in accordance with the Annex 13 to the Chicago Convention and Civil Aviation Regulations of Malaysia 2016.

It is inappropriate that AAIB reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

In accordance with ICAO Annex 13 paragraph 4.1, notification of this serious incident was sent out on 29 November 2025 to the Civil Aviation Authority of Malaysia (CAAM), ICAO and National Transport Safety Board (NTSB), United States of America as the State of Design and Manufacture. The Preliminary Report for this serious incident was subsequently submitted to CAAM, Royal Malaysian Airforce (RMAF), NTSB, the aerodrome operator and the aircraft operator on 25 December 2025.

In accordance with ICAO Annex 13 paragraph 6.3, a copy of the Draft Final Report was sent on 18 September 2026 to the CAAM, NTSB, RMAF, the aerodrome operator and the aircraft operator inviting their significant and substantiated comments on the report.

Unless otherwise indicated, recommendations in this report are addressed to the investigating or regulatory authorities of the State having responsibility for the matters with which the recommendations are concerned. It is for those authorities to decide what action is to be taken.

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APPENDIX

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GLOSSARY OF ABBREVIATIONS

A	
AAIB	Air Accident Investigation Bureau
AMM	Aircraft Maintenance Manual
ATC	Air Traffic Control
ATPL	Air Transport Pilot Licence
C	
CAAM	Civil Aviation Authority of Malaysia
Cb	Cumulonimbus
CoA	Certificate of Airworthiness
CoR	Certificate of Registration
CPL	Commercial Pilot Licence
CVR	Cockpit Voice Recorder
D	
DDM	Difference in Depth of Modulation
F	
FDR	Flight Data Recorder
ft	feet
G	
G/S	Glideslope
H	
HFACS	Human Factors Analysis and Classification System
hPa	Hectopascal
hrs	Hours
I	
ICAO	International Civil Aviation Organisation
IFR	Instruments Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
K	
kts	Knots

L

LDA	Landing Distance Available
LOC	Localiser
LT	Local Time

M

m	Metre
MAB	Malaysia Airlines Berhad
MAG	Malaysia Aviation Group
MAHB	Malaysia Airports Holdings Berhad
MASB	Malaysia Airport Sdn. Bhd.
METAR	Meteorological Aerodrome Report
Mhz	Megahertz
MOR	Mandatory Occurrence Report

N

NOTAM	Notice to Airmen
NRES	Ministry of Natural Resources and Environmental Sustainability
NTSB	National Transport Safety Board

P

PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot-in-Command
PM	Pilot Monitoring
POB	persons on board

R

RA	Radio Altimeter
RFFS	Rescue and Fire-Fighting Services
RMAF	Royal Malaysian Air Force

S

SIC	Second-in-Command
SMS	Safety Management System
SPECI	Special Weather Report
STOL	Short Take-off and Landing

U

UTC	Coordinated Universal Time

V

VFR	Visual Flight Rules

W

WMKD	Sultan Ahmad Shah Airport, Kuantan
WMKK	Kuala Lumpur International Airport
WOW	Weight-on-Wheels

SYNOPSIS

On 27 November 2025, Malaysia Airlines flight MH1276, a Boeing 737-800 (9M-MXU), experienced a runway excursion during landing at Sultan Ahmad Shah Airport (WMKD) following a scheduled flight from Kuala Lumpur International Airport (WMKK). Despite widespread rain and Instrument Meteorological Conditions (IMC), the flight proceeded normally until the final approach to Runway 36. During an ILS approach to Runway 36, the aircraft was stabilised by 1,000 ft, with the Pilot-in-Command (PIC) correcting minor deviations noted by the Second-in-Command (SIC). Due to an unserviceable Precision Approach Path Indicator (PAPI), the PIC used runway edge lights and visual cues to continue the approach. Below 50 ft Radio Altimeter (RA), the aircraft drifted right during the flare. Despite corrective inputs, the aircraft touched down right of the centreline and the right main landing gear veered off the paved runway surface onto the adjacent grass area before the aircraft was steered back onto the runway.

The flight crew reported that they were initially unaware of the excursion and taxied the aircraft safely to the apron where subsequent inspections revealed significant evidence of the event. Ground crews discovered deep cuts on the starboard tyres and traces of grass in the wheel well and also inboard flap area, while a runway inspection confirmed damage to four (4) runway edge lights and tyre marks on the grass strip. Following the serious incident, the operator notified the AAIB and submitted a Mandatory Occurrence Report to the CAAM. An official investigation was consequently initiated.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

On 27 November 2025, a Boeing 737-800 aircraft, registered 9M-MXU operated by Malaysia Airlines Berhad, was conducting a scheduled commercial passenger flight, MH1276 from WMKK to WMKD, Kuantan, Malaysia. The flight was normally scheduled to depart WMKK at 1815 LT with an estimated flight time of approximately 30 minutes over a distance of about 110 nautical miles.

On the day of the event, the flight departed WMKK at 1916 LT, slightly behind schedule, with no reported technical abnormalities. This sector was the third flight of the day for both the PIC and SIC, whose duty period commenced at 1205 LT. Weather forecasts indicated widespread rain across Peninsular Malaysia throughout the day. The flight proceeded normally in continuous rain conditions and was estimated to arrive at WMKD at 1948 LT. For this sector, the PIC was the Pilot Flying (PF), while the SIC acted as the Pilot Monitoring (PM).

The aircraft was configured for an ILS approach to Runway 36. The PF conducted an arrival briefing, including a discussion of anticipated threats and mitigation measures for potential deviations during the approach and landing, as well as a review of go-around procedures. The Air Traffic Control (ATC) provided the flight crew with the prevailing aerodrome weather information for WMKD issued at 1100 UTC (1900 LT). The reported conditions indicated Runway 36 in IMC, surface wind from 320° at 10 kts, gusting to 16 kts, prevailing visibility of 2,000 meter with rain, cloud reported as few at ground level and scattered at 2,400 ft, air temperature 24 °C, and QNH 1007 hPa.

During the initial approach, above 2,000 ft, the PF reported that both runway edge lights were clearly visible and the aircraft was tracking the correct approach path as depicted in the published approach chart for Runway 36. The aircraft was fully configured for landing and was stabilised by 1,000 ft. Minor deviations were called out by the PM and were promptly corrected by the PF while continuing the approach. At decision altitude, the PF called “continue,” stating that both sides of the runway edge

lights remained visible. Due to the PAPI being unserviceable, the PF relied on visual cues to maintain alignment with the runway centreline.

At approximately below 50 ft RA, during the initial flare, the aircraft drifted slightly to the right of the runway centreline. The PM called “localizer” to highlight the lateral deviation, and corrective control inputs were applied by the PF. However, the aircraft touched down approximately 950 m from threshold and about 16 m to the right of the centreline[1]. The right main landing gear exited the paved surface onto the adjacent grass area for about 316 m before it returned to the runway.

The PF reported was not aware that the right main landing gear had exited the paved surface during landing. Prior to touchdown, the PF experienced a slight rightward deviation from the centreline and applied corrective inputs until positive touchdown was achieved. Following touchdown, the aircraft experienced a light bounce, after which the PF steered the aircraft back towards the runway centreline. During this recovery, a momentary vibration was felt, which the PF attributed to the right landing gear contacting a foreign object. Despite being uncertain of the exact cause, the PF was able to taxi the aircraft safely to the designated civil apron. The PIC subsequently informed the aircraft maintenance engineer of the occurrence, suspecting a hard landing and requested ATC to conduct a runway inspection.

In response to the PIC’s report, ground maintenance personnel conducted a physical inspection for a hard landing and reviewed the aircraft on-line maintenance data from the operator’s headquarters; neither the physical inspection nor the on-line data indicated that a hard landing had occurred. The post-flight inspection identified several deep cuts on the starboard main landing gear wheels, with traces of grass observed within the starboard main landing gear wheel well and the inboard flap area. The condition was assessed as a normal defect rather than damage associated with a runway excursion, and the affected tyres were replaced prior to the occurrence being reported to the AAIB.

[1] The published runway width of Runway 36 at Sultan Ahmad Shah Airport (WMKD) is 45 m, corresponding to approximately 22.5 m from the runway centreline to each runway edge.

A runway inspection conducted by ATC revealed damage to four (4) runway edge lights on the eastern side of the runway. Tyre marks were also observed on the grass strip adjacent to the eastern side of the runway, indicating that a runway excursion had occurred during the landing.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	-	-	-	**-**
Serious	-	-	-	**-**
Minor	-	-	-	**-**
None	7	135	-	**142**
Total	**7**	**135**	**-**	**142**

Table 1: Injuries to Persons

1.3 Damage to Aircraft

A post-occurrence inspection of the aircraft was conducted to determine the presence and extent on any damage. No damage was observed to the aircraft structure. However, several deep cuts were identified on the starboard main landing gear wheels, and traces of grass were found within the starboard wheel well and inboard flap area as shown in Figure 1 and Figure 2.

Deep Cuts on the Starboard's Main Wheels



Traces of Grass in Starboard's Wheel Well



Figure 1: Condition at Starboard's Main Landing Gear Wheels and Wheel Well

Traces of Grass inboard Flap Area

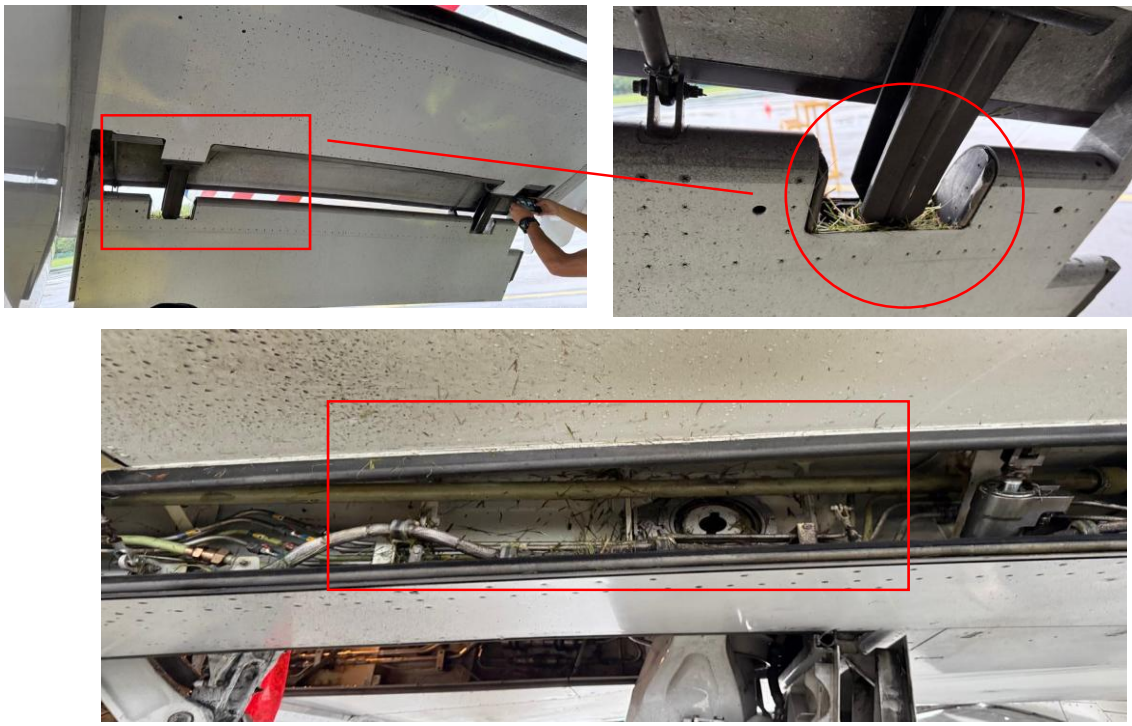


Figure 2: Condition at Inboard Starboard Flap Area

1.4 Other Damage

A general visual inspection of the runway was conducted following the occurrence to assess and identify any damage. Four (4) runway edge lights on the eastern side of the runway were hit and destroyed as the right landing gear impacted concrete pads located just off the runway edge (Figure 3 and 4). In addition, tyre marks were observed on the grass strip adjacent to the eastern side of the runway and ends 316 m from the first mark.

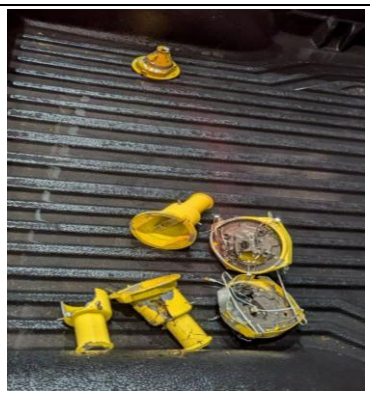
Location one of damaged Runway Edge Light	Location of damaged Runway Edge Light (Close-up)	Damaged Runway Edge Lights
		

Figure 3: Condition of the Runway Edge Lights

Tyre marks on the grass strip (following the incident)	Tyre marks on the grass strip (At daylight after the incident)	The tyre marks on the grass strip (Close-up)
		

Figure 4: Tyre Marks on Grass Strip of the runway

1.5 Personnel Information

1.5.1 Pilot Boeing 737-800

Status	Pilot-in-Command (PIC)
Nationality	Malaysian
Age	42 years old
Gender	Male
License Type	ATPL
License Validity	Valid until 31 July 2026
Aircraft Rating	Multi-Engine Land
Instructor Rating	Nil
Total Hours on Type	8129:32 hrs
Total Flying Hours	8293:43 hrs
Total Captain Hours	326:32 hrs
Rest Period Since Last Flight	More than 24 hrs
Date of Medical Examination	24 July 2025

1.5.2 Second Pilot Boeing 737-800

Status	Second-in-Command (SIC)
Nationality	Malaysian
Age	30 years old
Gender	Male
License Type	CPL
License Validity	Valid until 31 May 2026
Aircraft Rating	Multi-Engine Land
Instructor Rating	Nil
Total Hours on Type	1400:01 hrs
Total Flying Hours	1560:31 hrs
Rest Period Since Last Flight	29:03 hrs
Date of Medical Examination	13 May 2025

Both PIC and SIC were licensed, qualified, and approved to perform the flight in accordance with existing regulations**.** The Pilots were medically fit for the flight.

1.6 Aircraft Information

Aircraft Type	Boeing 737-800
Manufacturer	Boeing Company
Year of Manufacturer	May 2014
Owner	Anggerik Labuan Limited
Registration No.	9M-MXU
Aircraft Serial No.	40158
C of A Expiry Date	1 June 2026
C of R Expiry Date	22 May 2026

The aircraft was airworthy when dispatched for the flight and has a valid Certificate of Registration (CoR) and also Certificate of Airworthiness (CoA) during the serious incident happened.

1.7 Meteorological Information

The serious incident occurred during night-time operations. Weather conditions at WMKD between 1900 and 2000 LT were characterised by active rainfall. Upon the arrival of MH 1276 into the WMKD, ATC provided the flight crew with the prevailing Kuantan aerodrome weather information issued at 1100 UTC. The reported conditions indicated runway 36 in IMC, surface wind from 320° at 10 kts, gusting to 16 kts, prevailing visibility of 2,000 m, rain, cloud reported as few at ground level and scattered at 2,400 ft, air temperature 24 °C and QNH 1007 hPa.

The comprehensive meteorological data and analysis details in this section were derived from the official Weather Report (*Laporan Keadaan Cuaca*) for Sultan Ahmad Shah Airport, Kuantan, for 27 November 2025. This report was specifically prepared by the National Aviation Meteorological Centre and the Pahang Meteorological Office under the Malaysian Meteorological Department (MET Malaysia), Ministry of Natural

Resources and Environmental Sustainability (NRES) at the formal request of the AAIB Malaysia.

1.7.1 General Weather Situation

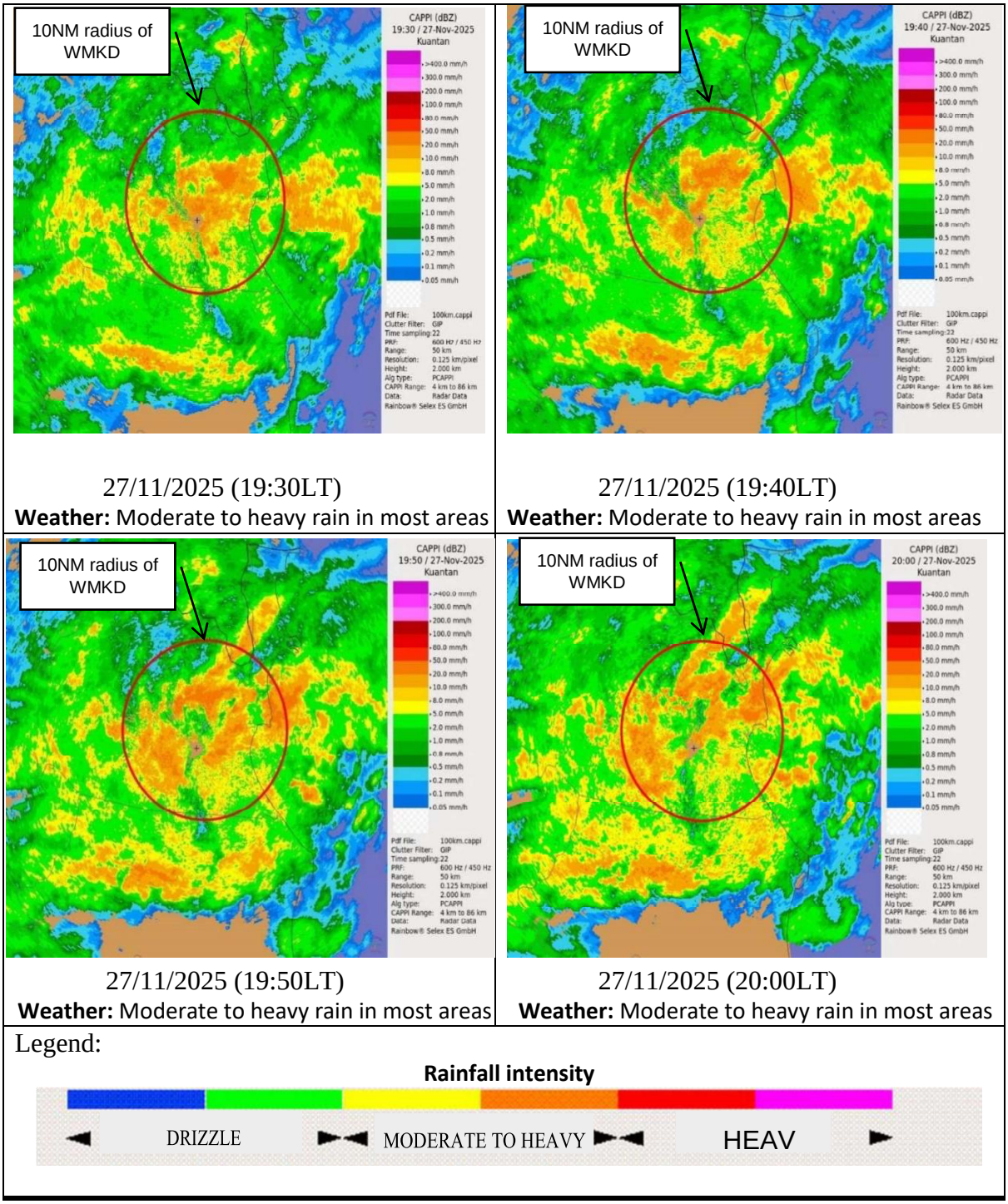
On the day of the serious incident, a “WASPADA” (Caution) level continuous rain warning level) was issued at 0830 LT, which included the Kuantan area and remained valid until 29 November 2025. Continuous weather monitoring and radar image analysis indicated that heavy rain had commenced in the Kuantan district at approximately 1700 LT.

1.7.2 Surface Observations

Between 1930 LT and 2000 LT, the Kuantan Meteorological Station—the closest station to the serious incident location—reported heavy rain phenomena, wind speeds reaching up to 7 kts, and horizontal visibility dropping as low as 2,000 meters. A Special Weather Report (SPECI) for WMKD had been issued earlier at 1840 LT to report the occurrence of heavy intensity rain. The Meteorological Aerodrome Report (METAR) at 1900 LT recorded winds from 280° at 7 kts (varying between 200 and 330°), visibility of 2,000 meters, and heavy rain (+RA). The subsequent METAR at 2000 LT demonstrated no significant change in the severe weather conditions, indicating winds from 310° at 7 knots (varying between 280 and 360°), visibility of 2,000 meters and continuing heavy rain.

1.7.3 Radar and Satellite Analysis

The airport was subjected to heavy rain. As shown in Figure 5, radar imagery within a 10NM radius (Red Circle) of the WMKD between 1930 LT and 2000 LT showed rainfall rates ranging from 10.0 mm/h to 50.0 mm/h, which corresponds to moderately heavy to heavy rain categories. By 2000LT, the rain cell had fully developed and covered the entire 10 NM radius from the centre of the airport, creating a high risk for water accumulation and reduced braking action on the runway.



27/11/2025 (19:30LT)
Weather: Moderate to heavy rain in most areas

27/11/2025 (19:40LT)
Weather: Moderate to heavy rain in most areas

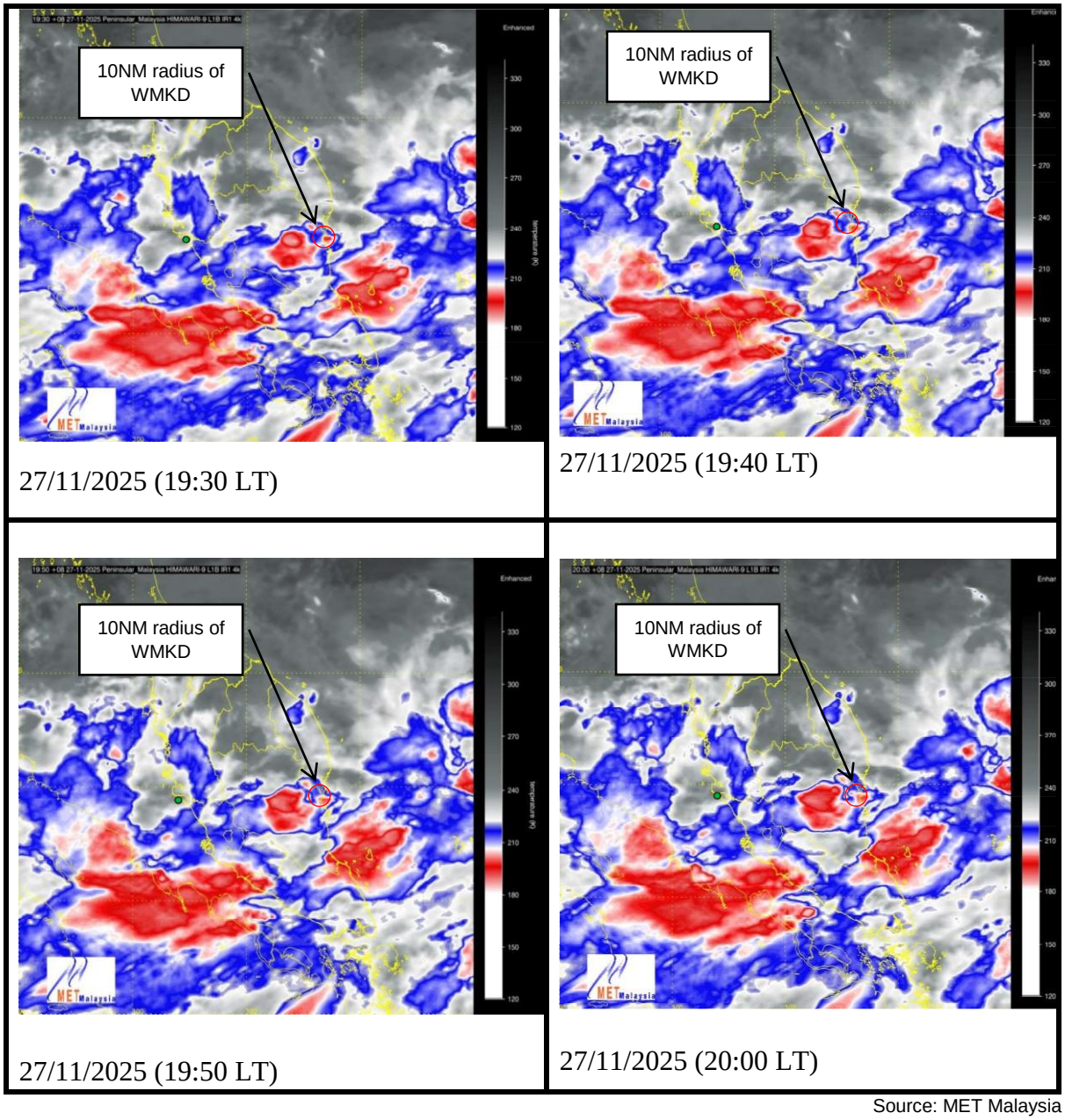
27/11/2025 (19:50LT)
Weather: Moderate to heavy rain in most areas

27/11/2025 (20:00LT)
Weather: Moderate to heavy rain in most areas

Source: MET Malaysia

Figure 5: Radar imagery within a 10NM radius of the WMKD

Furthermore, Himawari-9 Infrared Band 13 satellite imagery captured during this time frame as shown in Figure 6 confirmed the presence of thick cumulonimbus (Cb) convective clouds within the area, indicating the strong potential for heavy rain and thunderstorms.



Source: MET Malaysia

Figure 6: Himawari-9 Infrared Band 13 satellite imagery

1.7.4 Aerodrome Warnings and Advisories

In response to the deteriorating conditions, an Aerodrome Warning for WMKD was issued and remained valid from 1046 UTC to 1345 UTC on 27 November 2025, warning of moderate to heavy rain and visibility of less than 3,000 meters. Additionally, a SIGMET (SIGMET 7) for the Kuala Lumpur FIR, valid from 1100 UTC to 1400 UTC, reported embedded thunderstorms with tops reaching Flight Level 540, moving west-northwest with no expected change in intensity.

1.8 Aids to Navigation

All navigation aids fitted on the aircraft and installed at WMKD were operational at the time of the occurrence except PAPI Light runway 18/36 and DVOR/DME VKN 113.700 Mhz were unserviceable since 30 September 2025.

1.9 Communications

All ATC communication frequencies were operating normally.

1.10 Aerodrome Information

Kuantan Airport (ICAO: WMKD) also known as Sultan Ahmad Shah Airport is a joint-user military operated airfield. Malaysia Airports Sdn. Bhd. (MASB) are responsible towards the operation of civil aircraft on the civil taxiway and aprons. The aerodrome is located approximately 15 km southwest of Kuantan, Pahang and is equipped with a tarmac runway 18/36 measuring about 2,743 metres in length and 45 metres in width. The runway is supported by standard markings and lighting for day and night operations with Taxiway H serving as the taxiway linking the runway to the civil apron. Navigation and approach aid available at the aerodrome include an ILS for Runway 36 VOR/DME and PAPI supporting both IFR and VFR operations. ATC services—comprising Aerodrome Control, Approach Control and Ground Control—are provided by RMAF, with civil operators confined with ground handling of civil aircraft into Sultan Ahmad Shah Airport.



Figure 7: Sultan Ahmad Shah Airport (WMKD)

The aerodrome provides apron facilities capable of supporting commercial narrow-body aircraft, general aviation and government operations. Ground services include passenger handling and aircraft turnaround support are available without refuelling facilities for civil aircraft, while Rescue and Fire-Fighting Services (RFFS) are provided in accordance with ICAO requirements. As a joint-use facility, civil operations may be affected by military exercises, airfield restrictions or maintenance activities which are promulgated through NOTAM. The aerodrome terrain is generally flat with no significant obstacles published along approach or departure paths.

1.11 Flight Recorders

The aircraft B737-800, Registration 9M-MXU was equipped with a Flight Data Recorder (FDR) and a Cockpit Voice Recorder (CVR). The data from FDR and CVR was downloaded for analysis. Post-incident preservation protocols were not fully implemented, resulting in the FDR and CVR remaining active for approximately two hour and thirty minutes from the time of serious incident. Consequently, the aircraft continued to provide power to the recorders, which led to the recorders especially CVR inadvertently overwriting the audio data pertinent to the occurrence.

1.12 Wreckage and Impact Information

Figure 8 illustrates the wreckage and impact information of aircraft 9M-MXU at WMKD on the day of occurrence. The red circle denotes the approximate position of aircraft first touchdown at about 950 m (measured from threshold) from inbound track runway 36 observed by the ATC from the control tower and the red line represent the aircraft first touchdown approximately 15 m to the right of the centreline based on the tyre marks on the grass (as shown in Figure 3 and 4), then steered on ground onto the adjacent grass area before the aircraft returned to the runway.



Source: CAAM Runway Incursion/Excursion Initial Report

Figure 8: 9M-MXU wreckage and impact information (WMKD)

Following the runway excursion incident, an examination of the aircraft revealed several defects as outlined in Paragraph 1.3. The impact sequence and ground contact evidence were identified through damage to the runway edge lights and disturbance to the adjacent grassed area as detailed in Paragraph 1.4.

1.13 Medical and Pathological Information

The pilots underwent a urine drug panel screen and the results were negative for substance abuse.

1.14 Fire

There was no indication of fire inflight or after landing.

1.15 Survival Aspects

Not applicable.

1.16 Tests and Research

Not applicable.

1.17 Organisational and Management Information

1.17.1 Aircraft Operator

Malaysia Airlines Berhad (MAB), the national carrier of Malaysia, operates under the Malaysia Aviation Group (MAG) and is headquartered in Kuala Lumpur, with its primary hub at WMKK. The airline's fleet consists of widebody and narrow body aircraft, offering comprehensive flights to both domestic and international destinations across Asia, Europe, and Oceania. Malaysia Airlines is a part of the MAG, which includes subsidiaries such as Firefly, MAB Kargo, and AeroDarat Services, covering various aviation market segments.

1.17.2 Aerodrome Operator

Malaysia Airport Sdn. Bhd. (MASB) is a wholly owned subsidiary of Malaysia Airport Holding Berhad (MAHB) responsible for the management, operation, maintenance, and development of the nation's airport infrastructure, encompassing international, domestic, and short take-off and landing (STOL) airports. MASB provides both aeronautical and non-aeronautical services, ensures compliance with applicable national legislation and international aviation standards, and supports the safe, secure, and efficient conduct of air transport operations in furtherance of national connectivity, economic development, and the sustainability of the aviation sector.

On the other hand, the principal aerodrome operator in WMKD is Royal Malaysian Air Force (RMAF). RMAF are responsible for the management, operation, maintenance, and development of the WMKD's infrastructure and provide aeronautical (air traffic

services), non-aeronautical services (VIP/VVIP/State services), emergency services, ensures compliance with applicable national legislation, and supports the safe, secure, and efficient conduct of air operations in furtherance of national security, connectivity, economic development, and the sustainability of the aviation sector.

MASB act as an apron operator for civil flight, thus responsible for the overall administration, operation, and maintenance of the apron and associated taxiway. These responsibilities include the management and maintenance of airside infrastructure such as the Taxiway H, Apron and associated facilities, as well as the operation of landside and passenger terminal facilities, provision of commercial passenger services, implementation of security arrangements, and coordination of ground handling activities at commercial passenger terminal. The runway, taxiways (other than Taxiway H), RMAF apron, airfield ground lighting for Runway & Taxiway, and associated facilities, is under the responsibility of RMAF.

1.18 Additional Information

Nil

1.19 Useful or Effective Investigation Techniques

The investigation utilised a range of physical evidence recovered from the occurrence site—including tyre marks, ground track evidence, and photographic documentation of aircraft structural damage—as part of a systematic verification process executed to maintain objectivity and ensure a comprehensive analysis. Evidentiary analysis further encompassed comprehensive personnel interviews, structural decoding of flight recorder data, and the application of the Human Factors Analysis and Classification System (HFACS) framework to isolate human factor variables. This multi-layered analytical protocol was instrumental in mapping systemic latent conditions, identifying contributing factors, and determining the probable cause of the occurrence.

2.0 ANALYSIS

2.1 CVR Analysis

The CVR data recovered two hours and thirty minutes following the serious incident confirms that the flight crew recognised the runway excursion as it occurred. During a recorded post-event telephone conversation between the pilot and the Fleet Captain Narrow Body, the pilot demonstrated accurate situational awareness of the ground conflict by explicitly articulating that a runway excursion had taken place. However, the recording also establishes that neither the pilot nor the remaining crew members realised that the event mandated a formal safety report, resulting in no immediate action being taken to preserve the flight data for the subsequent investigation.

This reporting failure is viewed through an organisational lens rather than attributed strictly to individual pilot error. The crew's omission highlights latent organisational conditions within the operator's Safety Management System (SMS), specifically pointing to a potential lack of clarity regarding serious incident severity thresholds and mandatory reporting requirements. Furthermore, the lack of immediate data preservation suggests that recurrent training curricula may insufficiently emphasise the critical necessity of securing flight data following an occurrence. This systemic vulnerability was further compounded by a gap in supervisory oversight, as the Fleet Captain Narrow Body missed a key operational opportunity during the telephone exchange to instruct the pilot not to continue their return flight, to file a formal report and secure the relevant recordings.

2.2 FDR Analysis

A comprehensive analysis of the FDR was conducted for aircraft 9M-MXU to evaluate the dynamic interaction between flight crew control inputs, aircraft attitude, environmental conditions, and landing gear ground physics during the approach, flare, and rollout phases. The data was correlated against standard operating procedures, performance criteria, and physical evidence to determine the sequence of events contributing to the lateral deviation from the runway centreline.

2.2.1 Approach Phase (1,000 ft to 50 ft RA)

A review of the FDR data confirms the PF statement that the aircraft was stabilised during the final approach (Figure 9).

- **1,000 ft Radio Altimeter (RA) Gate:** At 1,000 ft RA, the aircraft was fully configured for landing (Gear Down and Flaps 30). The Computed Airspeed (CAS) indicated 148 kts was stable at calculated Vref + 5 knots (150 kts) with the descent rate constant at approximately 750 feet per minute.

- **Flight Path Tracking:** Both values for ILS Glideslope Deviation were converted from DDM to dots as per Boeing aircraft documentation. For ILS Glideslope Deviation, a negative sense indicates the aircraft is below glideslope which is translated as a “Fly Up” command. For ILS Localizer, a negative sense indicates the aircraft is right of glideslope which is translated as a “Fly Left” command. Based on the data retrieved from the FDR, the readout of the Localizer (LOC) and Glideslope (G/S) deviations were within the operator’s stabilised approach criteria. The FDR recorded maximum LOC deviations of -0.30 dots and G/S deviations of -0.50 dots between 1,000 ft and 200 ft RA, indicating active but minor corrections by the PF as the aircraft indicates shallow approach and to the right of the runway.

- **Wind Conditions:** The FDR-derived wind data (calculated from ground speed, true airspeed, and heading) indicated a consistent crosswind from the north-west, varying between 17 to 11 kts, which is consistent with the reported METAR (320° at 10 kts, gusting to 16 kts).

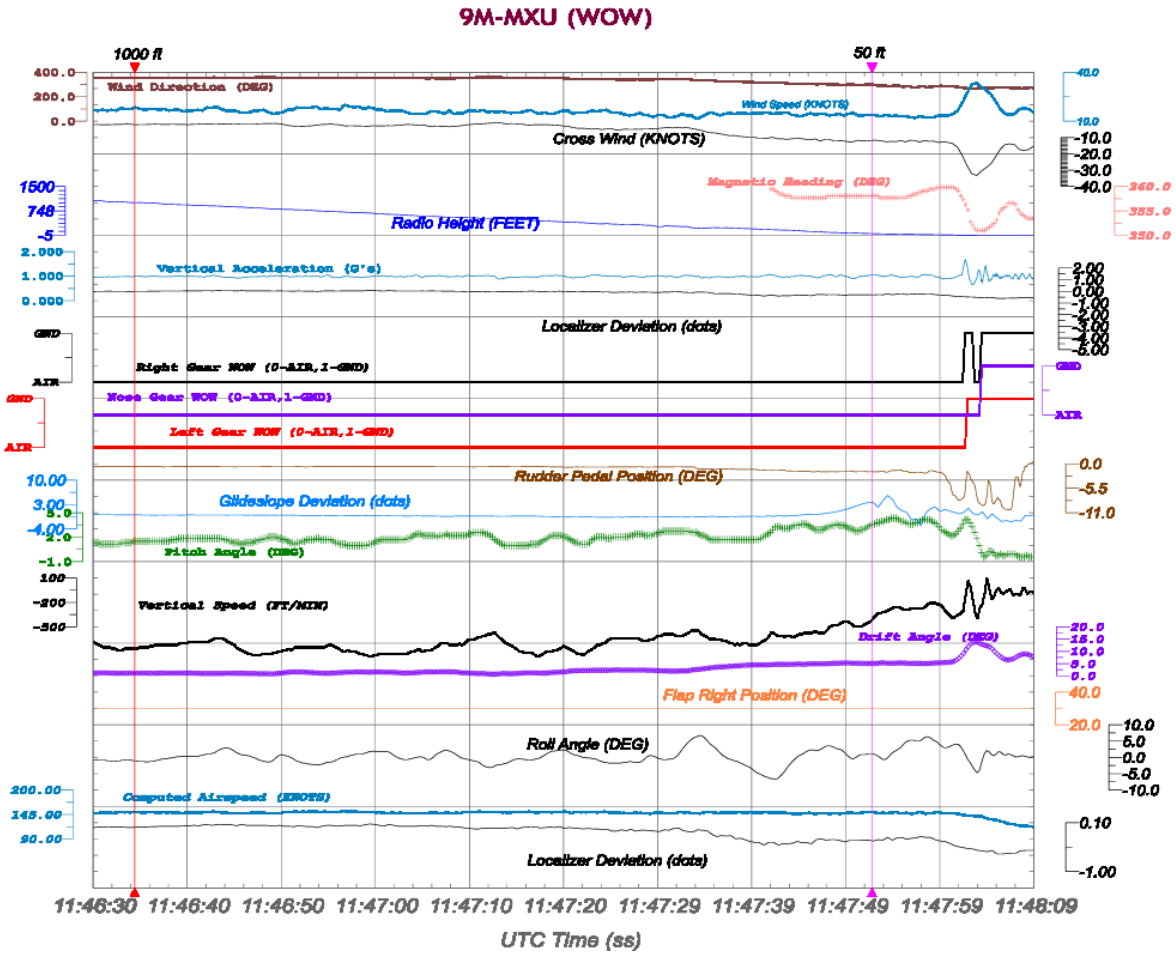


Figure 9: FDR Data Approach Phase (1,000 ft to 50 ft RA)

2.2.2 Flare and Touchdown Phase (50 ft RA to Touchdown)

The critical sequence of the event occurred below 50 ft RA. The FDR data provides a clear timeline of the lateral deviation and control inputs (Figure 10):

- **Initial Flare (Approx. 50 ft to 30 ft RA):** Pitch attitude began to increase for the flare at 60 ft RA. Simultaneously, the aircraft began to drift right of the centreline. Localizer deviation varied from -0.31 dots at 50 ft RA to -0.24 dots at 30 ft RA. The magnetic heading was maintained at 350 degrees, establishing a 10-degree left offset relative to the nominal runway heading of 360 degrees.

- **Flight Control Inputs:** At approximately 40 ft RA, corresponding to the PM's reported "localizer" callout, the FDR recorded a left Control Wheel input of 38

degrees and a right Rudder Pedal input of 2 degree and increasing to approximately 8 degree at 11:48:01 UTC, a few feet before touchdown.

- **Effectiveness of Correction:** Despite these leftward control inputs, the crosswind component and aircraft inertia continued to carry the aircraft's lateral trajectory to the right. The lateral acceleration parameter indicates the aircraft was in a rightward drift prior to main gear compression.

- **Touchdown Parameters:** Within the one-second window immediately prior to touchdown, the rudder pedal position underwent a rapid control reversal, transitioning sharply from 8 degrees right, through neutral, to a brief positive left input, before returning to a residual 2 degrees right input at the exact moment of main gear touchdown. This rapid control activity introduced transient yawing moments and sideslip angle variations during a critical phase where aerodynamic control effectiveness was decaying. The overall AIR/GROUND parameter transitioned from AIR to GROUND at 11:48:02 UTC, with both the left and right main landing gear Weight-on-Wheels (WOW) sensors transitioning to GROUND simultaneously. The recorded Vertical Acceleration (G-force) was 1.44 G (Figure 11), consistent with a firm but normal landing, ruling out a structural hard landing as initially suspected by the crew.. The magnetic heading at touchdown was 356 degrees against a runway track of 003 degrees, confirming a touchdown with a crab and drift angle. At 11:48:03 UTC, the right main landing gear WOW sharply transitioned back to AIR while the left gear remained firmly on the ground, indicating an asymmetric bounce that lasted approximately one to two seconds. The right main landing gear re-established contact with the runway at 11:48:04 UTC, ending the bounce, followed by the nose gear touchdown at 11:48:05 UTC.

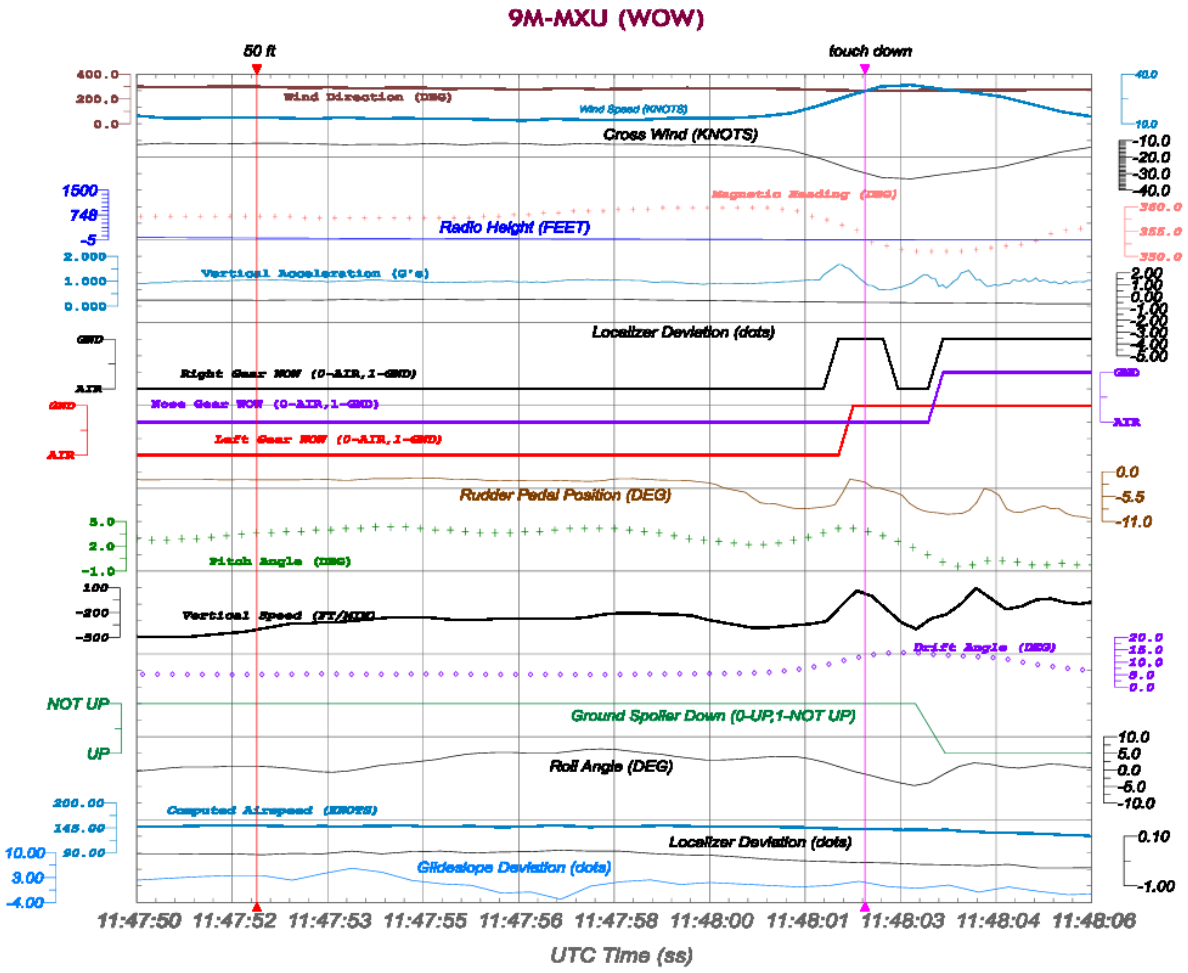


Figure 10: FDR Data Flare and Touchdown Phase (50 ft RA to Touchdown)

VA REPORT 9M-MXU

LANDING REPORT

AID:9M MXU DA:27/11	GMT:11:48	FNO:3048	ISFC:1345
TAT: 26.0 SAT: 23.3	ALT: 132	MACH:0.214	FCNT: 264
GW: 62196 FLT:0180-5	MODE:LAND	SID:A02 -4F	
S/N L:657916	DEPART:WMKK	DESTIN:VOMM	
S/N R:658986			

ACTUAL GROSS WEIGHT AT LANDING 62196

IVV	-231	VAC [0]	1.38		
MAX VAC	1.44	MAX VAC LAND	1.44	MAX VAC -1	1.22
MIN VAC	0.72	MIN VAC LAND	0.72	MIN VAC -1	0.66
WINDSHEAR	NOT				
STAB	4.7				
AOA	5.3				
PITCH	4.9				
ROLL	-0.7				
RUDD POS	-18.1				

Figure 11: Vertical Acceleration Report

2.2.3 Rollout and Excursion Sequence

- **Excursion:** Immediately following main gear compression, the right main landing gear exited the paved surface. This is corroborated by the right LOC deviation maximum of -0.50 dots and the subsequent physical evidence (tyre marks on the grass strip).

- **Recovery:** Ground Spoiler deployment and Autobrake application occurred at 11:48:04 UTC which is 2 seconds after touchdown. Within 2 seconds of touchdown also, the PF applied significant right Rudder Pedal of 9 degrees and Nose Wheel Steering inputs.

- **Return to Centreline:** The aircraft's lateral trajectory reversed, and it re-entered the paved runway surface approximately 316 meters after the initial excursion. The vibration reported by the PF aligns with the right main gear transitioning from the grass/mud shoulder back over the runway edge and damaged the runway edge lights.

2.2.4 Summary of FDR Analysis

The FDR data corroborates that the approach was stable at the 1,000 ft gate, but the lateral trajectory became un-stabilised below 50 ft RA. The corrective inputs initiated early in the flare were insufficient in magnitude and duration to arrest the wind-induced lateral drift before the right main landing gear touched down off the prepared surface. The combination of environmental conditions, angular misalignment at touchdown, and rapid control reversals created instability during the Weight-on-Wheels transition. This instability directly contributed to a non-standard landing sequence characterised by an asymmetric bounce of the right main landing gear and a subsequent lateral deviation from the runway centreline.

2.3 Human Factor Analysis

The occurrence was analysed utilising the Human Factors Analysis and Classification System (HFACS) to identify active failures and latent conditions, with consideration of

the “Dirty Dozen” human factor elements that contributed to the event and the post-incident response.

2.3.1 HFACS Tier 1: Unsafe Acts

i) **AE- Errors (AE1- Skill-Based Errors):** According to the Boeing 737 FCTM, transitioning to the left seat requires the pilot to adapt their visual references for the flare and touchdown phase. The aircraft drifted right below 50 ft RA, indicating a partial breakdown in the crosswind de-crab/sideslip execution. While the PM appropriately called “localizer”, the PF’s command execution lagged behind the aircraft’s dynamic lateral state, resulting in insufficient correction before the right main gear exited the paved surface.

2.3.2 HFACS Tier 2: Preconditions for Unsafe Acts

i) **PE- Environmental Factors (PE 1.2 Vision Restricted by Meteorological Conditions):** The flight crew was operating in degraded visual conditions due to widespread rain and Instrument Meteorological Conditions (IMC). Surface winds were reported from 320° at 10 kts, gusting to 16 kts, which likely contributed to the lateral drift experienced during the flare. Furthermore, the Precision Approach Path Indicator (PAPI) for Runway 36 had been unserviceable since 30 September 2025. The absence of this critical visual aid forced the PF to rely solely on runway edge lights for spatial orientation and glide path maintenance in poor weather.

ii) **PC- Condition of Individual (PC 1.3 Cognitive Task Oversaturation):** Despite a high total time on type (8,129 hours) , the PIC was relatively junior in the command role with only 326 hours as captain and a reported 43 night landings in the left seat. This limited left-seat exposure reduced his consolidated cognitive capacity to manage compounding threats simultaneously. His visual perspective and depth perception from the left seat were likely not fully adapted for a high-workload night flare without vertical guidance. The B737 NG/MAX Flight Crew Training Manual

emphasises the importance of maintaining the appropriate visual approach path and utilising available visual glide-path and runway references. Chapter 5, 'Approach and Missed Approach', states that the recommended visual approach path is approximately 2½° to 3° and that the flight crew should maintain the desired glide path during final approach. Chapter 6, 'Landing', further describes the use of PAPI as visual glide-path guidance and the visual aim-point technique for achieving the desired touchdown point. During this serious incident, the PAPI for Runway 36 was unserviceable. This removed a primary barrier against visual illusions, forcing the PF to divide limited left-seat night cognitive capacity between manually managing the glide path using the runway edge lights and countering gusting crosswind to achieve the desired touchdown point.

iii) PC- Condition of Individual (PC 3.7 Fatigue – Physiological/Mental):
This serious incident occurred during the third flight sector of the day for both the PIC and SIC, with their duty period having commenced at 1205 LT. Evidence obtained during the interviews indicated that the flight crew had operated in adverse weather conditions for most of the flight sectors that day. The cumulative effects of fatigue associated with the workload experienced during the preceding flight sector may have had a subtle effect on reaction time and spatial awareness during the high-workload phase of the crosswind landing in IMC.

The PIC subsequently reported that he was completely unaware that the right main landing gear had exited the paved runway surface during the landing roll. The crew attributed the momentary vibration experienced during the landing roll to contact with a foreign object. This indicated a critical Lack of Awareness, identified as one of the *Dirty Dozen* human factors elements, whereby the crew did not recognise that the aircraft had departed the paved runway surface.

2.3.3 HFACS Tier 3: Supervision

i) **SI- Inadequate Supervision (SI 1- Leadership/Supervision/ Oversight):** The CVR data recovered two hours and thirty minutes following the serious incident confirmed that the flight crew recognised the runway excursion as it occurred. During a recorded post-event telephone conversation between the pilot and the Fleet Captain Narrow Body, the pilot demonstrated awareness of the event and explicitly identified that a runway excursion had taken place. The subsequent actions, however, indicate a shortfall in supervisory intervention following notification of the occurrence.

In particular, the Fleet Captain Narrow Body was provided with an opportunity during the telephone conversation to provide immediate supervisory direction regarding the management of the occurrence. However, no instruction was given to the pilot to discontinue the intended return flight, submit a formal safety report, or secure and preserve the relevant flight recordings and data. This represents a potential Inadequate supervision factor, as the timeliness and effectiveness of supervisory guidance following a safety-significant occurrence did not adequately address the immediate operational and investigative requirements. Under the HFACS framework, inadequate supervision includes situations where supervisory availability, competency, quality, or timeliness does not meet task demands and contributes to an unsafe situation.

The supervisory omission is therefore considered significant because the Fleet Captain Narrow Body had direct awareness of the runway excursion through the post-event communication but did not provide appropriate immediate direction concerning the management of the occurrence. The absence of such supervisory guidance may allow the operation to continue without the immediate preservation of potentially relevant flight data and recordings.

2.3.4 HFACS Tier 4: Organisational Influences

i) **OC- Organisational Climate (OC1-Unit/Organisational Values/Culture):** The occurrence was not recorded in the aircraft technical log as a runway excursion. The flight crew reported a suspected hard landing to the maintenance engineer, and the technical log entry was not updated after the crew became aware that a runway excursion had taken place. Upon discovering deep cuts on the starboard main landing gear wheels and traces of grass within the wheel well and inboard flap area, ground crews assessed the condition as a “normal defect” as neither the physical inspection nor the on-line data indicated that a hard landing had occurred. In the absence of a runway excursion entry in the technical log, led maintenance personnel to treat physical evidence of a runway excursion as routine wear and tear, and the Boeing AMM structural inspections were not initiated. Thus, rather than quarantining the aircraft upon finding traces of grass and deep cuts on tyres, maintenance personnel replaced the affected tyres. This action deviates from the Boeing 737-800 AMM 05-51-96-210-801 (Runway/taxiway Excursion- Maintenance Practices (Conditional Inspection)), which mentioned when physical evidence indicates an aircraft has skids off onto unprepared surface, the AMM requires a comprehensive “Off-Runway Excursion” or “Phase I/Phase II Hard Landing” structural inspection. Replacing the tyres and dismissing the grass debris without executing the fully runway excursion maintenance practices compromised the structural verification of the landing gear (See Appendix A).

3.0 CONCLUSION

3.1 Findings

From the evidence available, the following findings are made with respect to the runway excursion involving Boeing 737-800, registered 9M-MXU, which occurred at WMKD on 27 November 2025. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

3.1.1 Pilot

i) Both pilots were properly licenced and qualified for the flight.

ii) Both pilots were medically fit before flight.

iii) The PIC had 326 hours of experience as an aircraft Captain, with 43 reported night landings from the left seat.

3.1.2 Aircraft

i) The aircraft had valid CoA and CoR.

ii) The aircraft is equipped and maintained in accordance with the existing regulations and approved procedures.

iii) The right main landing gear travelled 316 meters on adjacent grass before runway recovery.

iv) The aircraft's starboard main landing gear wheels exhibited several deep cuts.

v) Inspection revealed traces of grass within the aircraft's starboard wheel well and inboard flap area.

vi) The FDR and CVR were not isolated following the serious incident, which resulted in the CVR audio data from the occurrence being overwritten.

3.1.3 Runway

i) Four Runway Edge Light on the eastern side of the runway were found damage.

ii) Tyre marks were observed on the grass strip adjacent to the eastern side of the runway.

iii) The PAPI lights for runway 36 had been unserviceable since 30 September 2025.

3.2 Causes/Contributing Factors

3.2.1 Primary Cause

The aircraft drifted laterally during the flare under the influence of a gusting crosswind and heavy rain, that cause the aircraft touched down to the right of the centreline, resulting in a runway excursion where the right main landing gear exited the paved surface. The serious incident is categorised as **Runway Excursion (RE)**.

3.2.2 Contributing Factors

The following factors contributed to the Runway Excursion event:

i) **Environmental Conditions:** Heavy, continuous rain and a gusting crosswind (320° at 10 to 16 kts) severely restricted visual references and destabilised the aircraft's lateral trajectory during the flare.

ii) **Infrastructure Deficiencies:** The unserviceable PAPI for Runway 36 removed a primary visual barrier against spatial illusions, forcing the pilot to divide his cognitive capacity to manually maintain the glide path using only edge lights.

iii) **Human Factors (Crew):** The PIC experienced cognitive task oversaturation due to limited left-seat night operational experience, compounded by the physiological effects of cumulative fatigue during the third flight sector of the day.

4.0 SAFETY RECOMMENDATIONS (SR)

4.1 Immediate Safety Action of the Preliminary Report

4.1.1 The Preliminary Report for this serious incident that issued on 25 December 2025 had mentioned the following recommended immediate safety action to the aircraft operator:

"The aircraft operator is recommended to encourage prompt and accurate reporting of incident to ensure timely action and enhance overall safety"

In response to the issued safety recommendation, the operator implemented continuous awareness communications and reminders for its personnel to ensure strict compliance with the updated Operations Manual. These specific provisions reinforce the procedural requirements and individual responsibilities for reporting unusual occurrences and operational events, serving as a preventative safety action already implemented by the organisation.

4.1.2 The Preliminary Report for this serious incident that issued on 25 December 2025 had mentioned the following recommended immediate safety action to the aerodrome operator:

i. The damaged Runway Edge Lights should be promptly repaired or replaced. Until repairs are completed, the affected lights should be clearly marked as unserviceable and flight operations should be conducted with caution with NOTAMs issued to alert pilots.

ii. Maintenance for PAPI lights Runway 18/36 should be scheduled as soon as possible to restore full functionality.

The investigation confirmed that the aerodrome operator had implemented the immediate safety actions recommended in the Preliminary Report dated 25 December 2025. The damaged runway edge lights were replaced on 7 April 2026, while the PAPI for Runway 18/36 was restored to full operational status on 30 November 2025

following the completion of the required maintenance. These actions addressed the safety concerns identified in the Preliminary Report.

4.2 Safety Recommendations of this Report

The Aircraft Operator is recommended to:

4.2.1 Review recurrent flight crew simulator training curricula to include representative scenarios requiring the application of crosswind landing techniques and effective visual aim-point and glide-path management during operations conducted under degraded visual conditions (night/IMC) and with degraded runway facilities. **(AAIB Recommendation SR SI 11/25 – 1)**

4.2.2 Review and update its Safety Management System (SMS) protocols to establish clear, mandatory reporting thresholds for abnormal operational events, and establish clear procedures for the immediate preservation of flight recorder's data following a serious incident, including appropriate measures to prevent the loss or overwriting of relevant recorded data.
(AAIB Recommendation SR SI 11/25 – 2)

4.2.3 Incorporate targeted human factors training for line maintenance personnel regarding the normalisation of deviance, reinforcing strict adherence to Aircraft Maintenance Manual (AMM) conditional inspection requirements whenever physical evidence or reports indicate a potential serious incident.
(AAIB Recommendation SR SI 11/25 – 3)

4.2.4 Enhance supervisory oversight training for fleet management to ensure timely operational intervention, accurate occurrence classification, and immediate data preservation whenever crews report abnormal flight or ground dynamics.
(AAIB Recommendation SR SI 11/25 – 4)

The Aerodrome Operator is recommended to:

4.2.5 Review and enhance maintenance prioritisation protocols to ensure the prompt repair and restoration of critical runway visual aids and lighting facilities to maintain safe aircraft operations.

(AAIB Recommendation SR SI 11/25 – 5)

5.0 COMMENTS TO THE REPORT AS REQUIRED BY ICAO ANNEX 13 PARAGRAPH 6.3

As required by ICAO Annex 13, paragraph 6.3, the Draft Final Report was sent to the CAAM, Aircraft Operator, Aerodrome Operator, RMAF and NTSB, inviting their significant and substantiated comments on the report. The following is the status of the comments received: -

States/Organisations	Status of Significant and Substantiated Comments
Civil Aviation Authority of Malaysia (CAAM)	No comment
Aircraft Operator	Comments that are accepted have been amended accordingly in this report
Aerodrome Operator	No comment
National Transport Safety Board (NTSB)	No comment
Royal Malaysian Airforce (RMAF)	No comment

CONCLUDING STATEMENT

This report presents the findings of the investigation into the serious incident involving 9M-MXU, with a primary focus on identifying safety factors and areas for improvement. It is emphasized that these findings and recommendations are not intended to assign blame or liability to any individual or organization but to enhance safety and prevent recurrence. By addressing the identified issues and implementing the proposed recommendations, stakeholders can strengthen operational safety, improve system reliability, and uphold the highest standards of aviation safety.

INVESTIGATOR IN-CHARGE
Air Accident Investigation Bureau
Ministry of Transport Malaysia

APPENDIX A

BOEING

737-600/700/800/900
AIRCRAFT MAINTENANCE MANUAL

RUNWAY/TAXIWAY EXCURSIONS - MAINTENANCE PRACTICES (CONDITIONAL INSPECTION)

1. **General**
   - A. Runway/Taxiway Excursions
     - (1) A runway/taxiway excursion occurs if the airplane takes off or makes a landing with one or more of the conditions that follow:
       - (a) The airplane skids off or overruns the specified runway/taxiway onto an unprepared surface.
       - (b) The airplane lands short of the specified runway.
       - (c) The airplane rejects take off and departs from the specified runway.
       - (d) The airplane uses a runway/taxiway not specified for taking off or landing.
       - (e) The airplane loses directional control and skids on the runway such that damage is suspected.

         NOTE: If the only inspection trigger was for two or more flat tires, then this does not count as "damage" and a Phase II inspection is not necessary. Also, if the Phase I inspection does not show more than flat tires and damaged wheels or brakes, then the aircraft can be returned to service after maintenance. In this condition it is not necessary to complete a Phase II inspection.
   - B. The Inspections
     - (1) This inspection is in two phases (Phase I and Phase II)
       - (a) The Phase I inspection is applicable when a runway/taxiway excursion occurs.
       - (b) The Phase II inspection must be done if Phase I shows that damage has occurred.
   - C. Inspections, Repairs and Replacements
     - (1) When the inspection procedure tells you to "examine" a component, look for the conditions that follow:
       - (a) Cracks
       - (b) Structures that are pulled out of their position
       - (c) Loose paint (paint flakes)
       - (d) Twisted parts (distortion)
       - (e) Bent parts
       - (f) Wrinkles or buckles in the airplane structure
       - (g) Fasteners that are loose or pulled out
       - (h) Fastener holes that became larger or longer.
       - (i) Delamination
       - (j) Discoloration (heat damage)
       - (k) Parts that do not align correctly
       - (l) Signs of impact damage
     - (2) Replace or repair the components that have one or more of the conditions given above.

ECCN 9E991 BOEING PROPRIETARY - See title page for details

TASK 05-51-96-210-801

2. Phase I Inspection

A. General

(1) This task includes the procedure necessary to complete the Phase I inspection after a runway/taxiway excursion.

B. References

Reference	Title
05-51-01 P/B 201	HARD LANDING OR OVERWEIGHT/HARD LANDING OR HIGH DRAG/SIDE LOAD CONDITION - MAINTENANCE PRACTICES (CONDITIONAL INSPECTION)

C. Location Zones

Zone	Area
100	Lower Half of Fuselage
500	Left Wing
600	Right Wing
700	Landing Gear and Landing Gear Doors

D. Runway/Taxiway Excursions Phase I Inspection

SUBTASK 05-51-96-210-001

(1) Do this task: HARD LANDING OR OVERWEIGHT/HARD LANDING OR HIGH DRAG/SIDE LOAD CONDITION - MAINTENANCE PRACTICES (CONDITIONAL INSPECTION), PAGEBLOCK 05-51-01/201.

END OF TASK

TASK 05-51-96-210-802

3. Phase II Inspection

A. General

(1) This task includes the procedure necessary to complete the Phase II inspection after a runway/taxiway excursion.

B. References

Reference	Title
05-51-01-210-802	Phase II Inspection (P/B 201)

C. Location Zones

Zone	Area
100	Lower Half of Fuselage
200	Upper Half of Fuselage
500	Left Wing
600	Right Wing
700	Landing Gear and Landing Gear Doors

D. Runway/Taxiway Excursions Phase II Inspection

SUBTASK 05-51-96-210-002

(1) Do this task: Phase II Inspection, TASK 05-51-01-210-802.

END OF TASK

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