SERIOUS INCIDENT REPORT NUMBER SI 01/2017

(FINAL REPORT)

SERIOUS INCIDENT INVOLVING MALAYSIA AIRLINES MH2718
BOEING B737-800 REGISTRATION 9M-MXX
AT SIBU AIRPORT, SARAWAK
8 APRIL 2017

BIRO SIASATAN KEMALANGAN UDARA

MINISTRY OF TRANSPORT

MALAYSIA

BIRO SIASATAN KEMALANGAN UDARA

MALAYSIA

SERIOUS INCIDENT REPORT NO.: SI 01/2017

OPERATOR	**:**	**MALAYSIA AIRLINES BERHAD (MAB)**
AIRCRAFT TYPE	**:**	**BOEING B737-800**
NATIONALITY	**:**	**MALAYSIA**
REGISTRATION	**:**	**9M-MXX**
PLACE OF INCIDENT	**:**	**SIBU AIRPORT, SARAWAK**
DATE AND TIME	**:**	**08 APRIL 2017 AT 2217 HOURS (LT)**

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

This report contains a statement of facts which have been determined up to the time of issue. It must be regarded as the final report. However, it is subjected to alteration or correction if any additional evidence becomes available.

This investigation is carried out to determine the circumstances and causes of the serious incident with a view to the preservation of life and the avoidance of accidents and incidents in the future and not for the purpose of apportioning blame or liability (Civil Aviation Regulations 2016).

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ABBREVIATIONS

A/P : Autopilot
A/T : Auto Throttle
AAIB : Air Accident Investigation Bureau
ADARP : Airport Disabled Aircraft Removal Plan
AFRS : Airport Fire and Rescue Service
AGL : Above Ground Level
APU : Auxillary Power Unit
ASL : Above Sea Level
ATC : Air Traffic Control
ATIS : Automatic terminal information system
ATPL : Air Transport Pilot License
Bhd : Berhad
BSKU : Biro Siasatan Kemalangan Udara
CG : Centre of Gravity
CMV : Converted Meteorological Visibility
CPL : Commercial Pilot License
CRM : Crew Resource Management
CRS : Certificate of Release to Service
CSMM : Corporate Safety Management Manual
CSO : Corporate Safety Oversight
CVR : Cockpit Voice Recorder
DA : Decision Altitude
DCA : Department of Civil Aviation
DCAM : Department of Civil Aviation Malaysia
DME : Distance Measuring Equipment
DOL : Design Objective Level
E&M : Engeneering and maintenance
F/D : Flight/Director
FCOM : Flight Crew Operations Manual
FCTM : Flight Crew Training Manual
FCU : Flight Conrol Unit
FDP : Flight Duty Period
FDR : Flight Data Recorder

FLT : Flight Time Limitation

FIR : Flight Information Region

ft : feet

FOD : Foreign Object Debris

fpm : feet per minute

GA : Go-Around

HAT : Height Above Threshold

ICAO : International Civil Aviation Organization

ICC : In-charge crew

IIC : Investigator-in-Charge

ILS : instrument landing system

IOE : Initial Operating Experience

kg : kilograms

khz : kilohertz

km : kilometres

kts : knots

KUL : Kuala Lumpur

LC : Line Check

LFUS : Line Flying Under Supervision

ILS : Instrument Landing System

ITCZ : Inter Tropical Convergent Zone

LT : Local Time

m : metres

MAB : Malaysia Airlines Berhad

MAC : Mean Aerodynamic Chord

MAHB : Malaysia Airport Holding Berhad

MAS : Malaysia Airlines System

MASB : Malaysia Airport Sdn Bhd

MCP : Mode Control Panel

MDA : minimum descent altitude

MDA/H : Minimum descent altitude/height

MFL : Minimum Friction Level

MHz : Megahertz

MIH : Manual Inflation Handle

MPL : Maintenance Planning Level

MR : Maintenance Record

nm : nautical miles

NOTAMS : Notification to Airmen

OM : Operations Manual

PA : Passenger Address

PAPI : Precision Approach Path Indicator

PF : Pilot Flying

PFD : Primary Flight Display

PM : Pilot Monitoring

QNH : Query: Newlyn Harbour

QRH : Quick Reference Handbook

RVR : Runway Visual Range

RA : Radio Altitude

RVR : Runway Visual Range

SBW : Sibu

SEP : Safety Emergency Procedure

Sdn : Sendirian

SMS : Safety Management System

SPECI : Special Weather Report

STC : Specific Takeoff Charts

TEM : Threat and Error Management

TOGA : Take Off Go-Around

TRE : Type Rating Examiner

TRI : Type Rating Instructor

TTMC : Twin Tower Medical Center

WBGS : Sibu Airport

WMKK : Kuala Lumpur International Airport

WQAR : Wireless Quick Access Recorder

WRVR : wind/runway visual range

Glossary

CMV	:	Converted Meteorological Visibility is a values equivalent to Runway Visual Range (RVR) which is derived from meteorological visibility. It is converted using specific mathematical formula that is based on the available approach and runway lightings, as well as daylight or night hours.
Drift angle	:	Angle between aircraft heading and the track.
FTL	:	Flight Time Limitation (FTL) scheme is a flight and duty time limitation that is developed by the regulatory authority and FTL is intended to prevent the daily and cumulative effects of fatigue among the crew members.
Go-around	:	Aborted landing of an aircraft that is in final approach.
RVR	:	Runway Visual Range is the distance over which the pilot of an aircraft on the centreline of the runway can see the runway surface markings or the lights delineating the runway or identifying its centreline. RVR is normally expressed in feet or meters.
Fuel Tankering	:	Uplifting fuel from one station to a next station is justified when the fuel price differential between the two stations is sufficiently large to cover the cost of the transportation (economic tinkering), or when there is no fuel, uplift limitation exist, fuel contamination or other reason which does not permit uplift of fuel at the destination (mandatory tinkering).
Transmissometer	:	An instrument for measuring the extinction coefficient of the atmosphere, and for the determination of visual range. It operates by sending a narrow, collimated beam of energy (usually a laser) through the propagation medium. The measured visibility is given in the RVR values.
Wave off	:	Similar to a go-around, a wave off is normally performed below the minimum descent altitude/height (MDA/H) or at a height close to the ground.

INTRODUCTION

Air Accident Investigation Bureau of Malaysia

The Biro Siasatan Kemalangan Udara (BSKU) is the air accident and serious incident 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 BSKU conducts investigations in accordance with Annex 13 to the Convention of the International Civil Aviation and the Civil Aviation Regulations 2016 of Malaysia.

In carrying out these investigations, the BSKU will adhere to ICAO‟s stated objective, which is as follows:

“The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.”

Accordingly, it is appropriate that the BSKU‟s reports should not be used to assign fault, blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

Occurrence Brief

OPERATOR : MALAYSIA AIRLINES BERHAD (MAB)

AIRCRAFT TYPE : BOEING B737-800

REGISTRATION : 9M-MXX

PLACE OF INCIDENT : SIBU AIRPORT, SARAWAK

DATE : 08 APRIL 2017

TIME : 2217 LT

Notes:

1. All times that are mentioned in this report are in Local Time (LT).

2. All altitudes in the report are based on barometric (QNH) value, unless otherwise stated.

SYNOPSIS

On 08 April 2017, at 2217 LT, a Malayia Airlines Berhad (MAB) Boeing B737-800 bearing registration 9M-MXX was performing a scheduled flight MH2718 from Kuala Lumpur (KUL) to Sibu (SBW), Sarawak, with 63 passengers and 6 crew. MH2718 experienced a runway excursion upon landing on Runway 13 at Sibu Airport in heavy rain.

The aircraft veered to the right of Runway 13 and travelled approximately 480 m on the soft ground parallel to the runway before coming to a stop diagonally towards the runway edge. The nose gear collapsed just before the aircraft came to a complete stop.

All passengers and crew were safely evacuated from the aircraft using the two (2) forward slides. No injuries were reported during the whole serious incident. The aircraft sustained damages to the nose gear assembly and also the lower fuselage aft of the nose gear, while areas around the flaps, engine cowling and fan bypass areas sustained minor damages as a result of the runway excursion.

Investigators from BSKU were sent to Sibu on 9 April 2017 and investigation started on the same day. MAB also conducted an independent investigation alongside BSKU. The investigation was led by Investigation-in-Charge (IIC), Brigadier General Dato‟ Lau Ing Hiong RMAF. The investigation was assisted by two MAB investigators as experts on the aircraft type.

The investigation team arrived in Sibu on 09 April 2017 and proceeded with the investigation on site. Interviews were conducted with the related personnel. The Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR) were removed from the aircraft. On 18 April 2017, both FDR and CVR were brought to AAIB Singapore by two officers (one each from BSKU and MAB) for their analysis.

The investigation revealed a number of factors that have caused and contributed towards the incident that occurred during the night hours. Sudden increase in rain intensity at the Sibu Airport, i.e. from moderate to heavy at below 100 ft above ground level (AGL) had caused the flight crew to have reduced visibility of visual references and runway lightings. There was no centerline light available on Runway 13/31 Sibu. The Pilot Flying (PF) was informed of the crosswind component from the right during the final approach by the Pilot Monitoring (PM). The wind velocity had however reduced to less than 2 knots from the initial 6 knots as the aircraft was approaching the runway. The PF nevertheless applied crosswind technique for the landing by oscillating the control wheel to the right, consistent with the „perceived‟ right crosswind. This had introduced a heading drift of 4^{o} to the right that resulted in a heading of 133^{o}. In actual fact, the runway heading is 129^{o}. The aircraft touched down at approximately 10 m to the right of centerline with 6^{o} of bank angle. There was minimal rudder input to regain the runway centerline track. The aircraft left the runway surface at 720 m from Threshold Runway 13, approximately three seconds after the aircraft had initially contacted the runway.

Recommendations will be forwarded to MAB with reference to the corrective actions that are required. These shall include providing remedial training to the flight crew that were involved, enforcement of threat and error management (TEM) principals in relation to flight activities, improvement on the standard callouts that would be used during the landing phase, and other crew resource management (CRM) related training.

The crew have completed the required training and assessement. They have been released for line operation.

The aircraft that was involved in the incident has been repaired and was returned to service on 22 November 2017.

FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On 08 April 2017, a MAB Boeing B737-800 aircraft, registration 9M-MXX, was operating a scheduled passenger flight MH2718. It departed Kuala Lumpur International Airport (WMKK) at 2008 LT for Sibu Airport (WBGS), Sarawak.

1.1.2 There were a total of 63 passengers on board (61 adults and 2 infants), and 6 crew members (2 flight crew and 4 cabin crew). There were also 2 live dogs located in the aft cargo hold.

1.1.3 Prior to departure, the crew reviewed the documents that were related to the flight. The weather forecast for SBW was generally good with temporary reduction of visibility to 4,000 m in rain showers expected at the time of arrival.

1.1.4 The fuel that was planned for the flight also included the fuel that was required for the return sector to KUL the next morning as per MAB fuel tankering policy. In addition, the crew ordered an additional 800 kg fuel to cater for the forecasted weather in SBW.

1.1.5 The pilot-in-command, seated on the left-hand seat acted as the PF, while the co-pilot, seated on the right-hand seat was the PM.

1.1.6 The flight was running slightly behind schedule due to the late arrival of the aircraft from its previous sector. The flight departed from Runway 32R in KUL at 2008 LT.

1.1.7 The departure from KUL was uneventful and MH2718 was cruising at 33,000 ft above sea level (ASL). The enroute weather for the MH2718 was cloudy and the flight crew made necessary deviations to avoid build-up of clouds, with reference to the weather radar on board the aircraft.

1.1.8 Prior to descent, at approximately 2114 LT, the flight crew received a weather report for arrival into SBW from the automatic terminal information system (ATIS), information "Oscar" issued at 2000 LT, as follows: Runway 13 Instrument Landing System (ILS) approach, wind at 220^{O} at 3 kts, light rain over the airfield, with visibility of more than 10 km, temperature 27^{o}C, dew point 25^{o}C, QNH 1009, cloud Scattered at 1,800 ft AGL, and Broken at 15,000 ft AGL.

1.1.9 The PF subsequently conducted an abbreviated approach briefing for an ILS approach Runway 13 SBW, mentioning the go-around procedure and the diversion to Kuching if it is required, based on the prevailing weather and remaining fuel on board. There was no evidence of a "TEM" briefing that was conducted by the crew. However, both crew said that they had carried out a part of the briefing prior to departure from KUL. The crew also mentioned that the PM made reference to the landing performance that was required from the Quick Reference Handbook (QRH) and later showed and gestured to the PF that it was sufficient based on the expected landing weight and weather conditions.

1.1.10 During the descent, crew observed on their weather radar images of weather activity over SBW.

1.1.11 At 2139 LT, MH2718 was transferred to Sibu Tower on 123.2 MHz and was cleared initially to descend to 10,000 ft ASL. There were two other aircraft (MASWings 3705 and Air Asia 5875) departing from SBW at the time.

1.1.12 Based on the weather information that was shown on the weather radar, the crew requested a weather update from Sibu Tower. Subsequently, it was given at 2140:14 LT with following details: surface wind was light and variable, light to moderate rain over the airfield and Runway Visual Range (RVR) of 1,200 m. At this point, the flight was on descent passing 13,500 ft.

1.1.13 Crew discussed on the updated weather report and decided that the visibility was sufficient to commence the approach into SBW, based on the published minimum RVR of 550 m that was required to conduct the ILS approach into SBW.

1.1.14 Upon sighting the opposite traffic (Air Asia 5875), MH2718 requested for visual descent and was cleared by Sibu Tower to 7,000 ft. The crew initiated the flap extension early during the descent to avoid getting caught high on the approach.

1.1.15 At 2144:14 LT, while passing 7,600 ft, ATC issued further descent clearance from 7,000 ft to 2,500 ft, once the aircraft was within 25 DME from SBW. They were then cleared for the ILS approach.

1.1.16 At 2145:26 LT, Sibu Tower reported changes in the weather conditions, where the rain intensity has increased from moderate to heavy, RVR of 1,500 m and the wind at 280^{o} and 5 kts. They were passing 6,200 ft at this time and at a distance of 21 nautical miles (nm) from the touchdown.

1.1.17 Considering the visibility was sufficient to commence the approach, the PF armed the approach mode to intercept the ILS approach. The PF subsequently reviewed the go-around procedures and highlighted to the PM that a missed approach would be carried out any time they were not happy to continue the approach. The PF did not engage the second autopilot (A/P) to enable an automated go around.

1.1.18 At 2148:40 LT, the aircraft was established on the Localizer and the approach continued for Runway 13. Sibu Tower controller cleared MH2718 to land, reported the surface wind at 120^{o} at 4 kts and that the runway surface was wet.

1.1.19 The approach was commenced from the waypoint ASABA (Refer to Appendix A) on A/P with Sibu Tower reporting RVR of 1,500 m in moderate to heavy rain. The aircraft was fully configured and in stable approach condition. Landing checklist was completed at 2150:19 LT.

1.1.20 At 2150:59 LT, the wiper was selected to HIGH setting.

1.1.21 At 2152:18 LT and approximately at 600 ft, the PF decided to discontinue the approach as he could not see the Precision Approach Path Indicator (PAPI) or the runway edge lights. Only the approach light was visible to him. This was later concurred by the PM during the go-around procedure.

1.1.22 The go-around was initiated by pressing the Takeoff/Go-Around (TOGA) switch, which resulted in the A/P disconnection as only a single channel A/P was engaged at the time. The

PF immediately took over and flew the flight manually, while the auto-throttle continues to manage thrust. Subsequently PF reengages the A/P. The published missed approach procedure was followed to waypoint NIKEV for a holding at 2,500 ft.

1.1.23 The crew later requested to proceed to waypoint ASABA, which is the initial approach point for Runway 13. The PF noticed that the weather to the east and south of airfield was good. However, there was still weather being observed over the airport and on the approach segment.

1.1.24 While enroute to waypoint ASABA, crew requested for a weather update and was provided with the updates as follows at 2158:23 LT: Slight rain over the airfield, wind calm, tower observed visibility was 1,500 m, and RVR 800 m.

1.1.25 At 2200:36 LT, the crew reported established in the holding pattern at ASABA. Passenger Address (PA) was made to inform the passengers of the reason to discontinue the approach, and that the crew will attempt another approach in about 20 minutes if the visibility improves. If not, a diversion to Kuching Airport would be considered.

1.1.26 At 2202:37 LT, on request from the crew, ATC provided a weather update, which indicates calm wind conditions, light rain and RVR of 1,200 m. The crew acknowledged the message.

1.1.27 At 2206:12 LT, ATC provided another update following the changes in the prevailing weather condition, which was: Surface wind 020^{o} at 2 kts, visibility 3,000 m in heavy rain, cloud cover reported few at 500 ft AGL, scattered at 1,800 ft AGL, overcast at 15,000 ft AGL, temperature 25^{o}C, dew point 24^{o}C, QNH 1011 and RVR 1,200 m. The crew acknowledged the weather report.

1.1.28 At 2211:08 LT, the crew requested for a visibility update, to which ATC responded RVR 1,200 m. On query by the crew with ATC on whether there was any heavy rain over the airfield, ATC responded that it was "ON and OFF".

1.1.29 Based on this weather report and after approximately 11 minutes of holding, the crew decided to attempt another approach. ATC cleared MH2718 for approach at 2211:54 LT.

1.1.30 At 2214:07 LT, when passing 2,200 ft ASL, PF announced sighting the approach lights. The aircraft was fully configured for the landing with Flap 30, and the Landing checklist was completed by 1,800 ft ASL.

1.1.31 AT 2214:23 LT, ATC cleared MH2718 to land Runway 13 and provided information on the surface condition "wind light and variable and runway surface wet".

1.1.32 At 2215:11 LT, PM announced sighting the PAPI when passing 1,400 ft, which was confirmed by the PF. PF also mentioned sighting of the runway edge lights.

1.1.33 At 2215:44 LT, PM announced "1,000 ft Stable" based on the stable approach parameters observed. A/P was disconnected at approximately 800 ft ASL. Approaching 500 ft, PM announced the current wind information which was "Right crosswind 6 kts".

1.1.34 In response to mildly changing wind conditions, PF made frequent but small aileron adjustments to maintain the aircraft on the localizer of the ILS. This was evident from the frequent oscillation of the control wheel during the manual flying segment.

1.1.35 Below 300 ft radio altitude (RA), the FDR recorded a gradual reduction on vertical descent rate from 800 ft per minute (fpm) to 550 fpm over approximately 12 seconds. Wind speed was recorded at 3 kts at this altitude.

1.1.36 At the minimum descent altitude (MDA) of 290 ft, PM announced "Minimum - PAPI", followed by PF"s response to continue the approach with reference to the PAPI lights and runway edge lightings.

1.1.37 At 2216:44 LT, PM called "three whites" indicating aircraft was slightly high on profile. This occurred at approximately 180 ft RA.

1.1.38 PF immediately announced "correcting" to indicate his response to the call by PM, and increased the rate of descent up to 920 fpm to correct the profile.

1.1.39 At 200 ft RA, the FDR recorded glide slope deviation of - 1 unit (1 dot above profile), while PF continued with the profile correction.

1.1.40 At approximately 100 ft RA, there was a sudden and intense rainfall which caused visibility to decrease rapidly. According to the pilots, they were still able to see the runway edge lights and PAPI, hence the PF continued the approach to land. The wipers were operating at HIGH speed setting at that time.

1.1.41 This reduction in visibility was later confirmed based on the data retrieved from the RVR database, where the visibility dropped from 1,400 m to 900 m as the aircraft was about to touch down. The intensity of the runway edge light and PAPI was set at 100 percent by ATC controller. This was done following the go-around from the first approach as the crew declared that they were not able to see the PAPI or the runway edge lights.
(*Note: The visibility further reduced to down to 450 m over the next few minutes while evacuation was in progress.)*

1.1.42 According to the FDR, the aircraft crossed over the threshold at 42 ft RA and was flying over the runway centerline.

1.1.43 At 30 ft RA, the aircraft was still over the centerline. PF initiated flare at 25 ft RA. Wind speed at that time had decreased to 1 kt.

1.1.44 Below 20 ft RA, a slight bank between 2° and 6° was progressively introduced (The aircraft touched down with 6° bank angle). A very slight left rudder input was evident from the FDR data just prior to landing (Refer to Appendix B for graphical interpretation).

1.1.45 The aircraft heading was offset by 4^{o} to the right on touchdown.

1.1.46 From the interview, PF mentioned that he could not recall any bank angle being introduced.

1.1.47 PM observed that the aircraft was drifting to the right as he noticed the runway edge lights moving towards him just before touchdown. The CVR recorded PM saying "slightly left

of centerline sir", followed by "slightly right of centerline sir". These calls were initiated by PM from 8 ft RA until the aircraft had touched down.

1.1.48 Tyre marks on the runway indicated that the aircraft first touched down on the right wheel at a distance of approximately 540 m from Threshold Runway 13, and approximately 13 m to the right of the runway centerline marking. The FDR recorded the first touchdown on the right wheel at 2217:02 LT. The left wheels contacted the runway at 620 m (2217:03 LT). The nose wheel marking was only seen on the soft ground outside the runway surface. The FDR data showed the nose wheel contacted the ground 4 seconds after the main gear touchdown. Following the main gear touchdown, the pitch attitude was held approximately constant with a momentary increase in pitch attitude of up to 6^{o} observed before the nose wheel contacted the ground.

1.1.49 The aircraft heading was offset by 3^{o} – 4^{o} to the right of the runway alignment. The FDR recorded heading drift from 130^{o} to 133^{o}. The runway heading was 129^{o}.

1.1.50 Shortly after, at 2217:05 LT, PM called out "Go-around Captain, Go-around Captain". The FDR data shows that the aircraft has started departing the runway surface by this time.

1.1.51 PF mentioned during the interview that he made an attempt to commence a go-around by pressing the TOGA switch. However, there was no response from the aircraft autothrottle system. The FDR data reviewed later showed that the TOGA mode was activated after the aircraft came to a stop.

1.1.52 The FDR data showed the ground spoilers extension upon touchdown and the autobrakes were subsequently engaged. The thrust reversers were not deployed until the aircraft was out of the runway.

1.1.53 PF mentioned that he did not realize the aircraft was heading off the runway until he felt the aircraft moving violently over the surface. He stated that the visibility was significantly reduced at this point.

1.1.54 Aircraft departed the runway surface at 780 m from the threshold and travelled approximately 480 m on the soft ground parallel to the runway approximately 20 m to the right of runway edge, until the nose gear collapsed. The aircraft then swung left towards the runway edge as the nose gear collapsed and came to a stop diagonally over the runway edge.

1.1.55 The flight and cabin crew members felt strong vibrationswaying to the left and right, and a loud "thud" before the aircraft came to a stop at approximately 1,260 m from Threshold Runway 13.

1.1.56 The Captain then shut down both engines in anticipation of a possible evacuation. Upon assessing the situation and discussing with the co-pilot, the Captain requested for the evacuation checklist. He commanded passenger evacuation at approximately 4 minutes after the aircraft came to a stop. The evacuation was carried out using the two forward slides (Door 1 Left and Door 1 Right). All passengers and crew members were safely evacuated in less than 90 seconds. No injuries were reported.

1.1.57 Inspection of the flight deck panels performed during the investigation found certain switches and flight controls settings were not in the correct positions as required by the

evacuation checklist. These included Engine 1 and 2 Fire Switches, outflow valve position, flap handle and flap surfaces.

1.1.58 The cabin crew also reported that four Airport Fire and Rescue Services (AFRS) personnel climbed up the slide while the crew were still on board the aircraft. All passengers had evacuated by this time.

1.1.59 According to the cabin crew, the rain was getting heavier during the evacuation. Passengers were subsequently led by the cabin crew and AFRS personnel to the fire station. Head count was performed by the cabin crew at the fire station and all passengers were accounted for. No injuries were reported. Some of the passengers were transported to the terminal using vehicles provided by airport authorities, MAB engineering and other agencies within the airport. Most of the passengers walked to the airport terminal building.

1.1.60 The medical team who was waiting at the terminal performed medical check-up on all passengers. All passengers were found without any injuries from the incident or evacuation.

1.1.61 The aircraft was subsequently removed from the incident location on 09 April 2017, and parked at Bay 1A for further assessment and rectification.

1.1.62 The runway was closed for 34 hours following the incident to facilitate the removal of aircraft, repair and inspection of the runway.

1.1.63 Based on initial assessment, the aircraft sustained damages to the nose gear assembly and the lower fuselage aft of the nose gear, while areas around the flaps, engine cowling and fan bypass areas sustained minor damages.

1.2 Injuries to Personnel. No injuries were recorded on any of the passengers or crew.

1.3 Damage to Aircraft. Damage assessment on the airframe and engines was carried out by the Boeing and CFM respectively. The major component damage, specifically in the nose wheel area (section 41) is listed in Appendix C. The assessment of the damages was completed and the rectification is in progress.

1.4 Other Damages. One of the runway edge light cover on the right-hand side of the runway located approximately 720 m from Threshold Runway 13 was damaged by the aircraft. There were minor damages to the runway surface around the areas where the aircraft came to a stop.

1.5 Personnel Information

1.5.1 Captain

1.5.1.1 The Captain is male and he is 46 years old. He held an Air Transport Pilot License (ATPL) that was issued on 11 September 2006 by the Authority of Ministry of Transport, Malaysia. The validity of the ATPL license, ratings and flying hours are listed in the following table:

Subject	
Medical Validity	31 January 2018
B737-800 Operational date	27 May 2014
Total Hours	8,438:58
Hours on Type	1,551:18
Command Hours on Type	1,466:46
Last Base Check	14 November 2016
Last Line Check	11 December 2016
Instrument Rating	14 November 2016
Hours in last 28 days	62:52
Rest Hours Prior to Incident	15:28

1.5.1.2 The Captain opted for a no-pay leave package for a period of 3 years between 11 February 2016 and 10 February 2019, offered by MAB via letter reference HRS/EA – 1190/15 dated 11 November 2015. A request for early return to MAB was subsequently made by the Captain and the request was accept by MAB on 18 October 2016 via letter reference HRS/EA/SSZ – 400/16. The date of rejoining MAB was on 01 November 2016.

1.5.1.3 A reactivation training program was developed by the Training Department of MAB for the Captain. The training program comprises the following:

1.5.1.3.1 Recurrent Ground Training.
1.5.1.3.2 Safety Emergency Procedure (SEP).
1.5.1.3.3 Dangerous Goods Cat 10.
1.5.1.3.4 2 Training Sessions (OPC 2016 & LPC 2016 Day 1).
1.5.1.3.5 Current License Proficiency Check (LPC 2016 Day 2).
1.5.1.3.6 Line Flying Under Supervision (LFUS) - Minimum 4 sectors.
1.5.1.3.7 Line Check (LC) - Minimum 2 sectors.

1.5.1.4 The Captain completed all the above requirements and was cleared on-line on 11 December 2016.

1.5.2 Co-Pilot

1.5.2.1 The Co-pilot is a Second Officer. He is a male and he is 27 years old. He held a Commercial Pilot License (CPL) that was issued on 26 November 2009 by the Authority of Ministry of Transport, Malaysia. The validity of the CPL license, ratings and flying hours are listed in the following table:

Subject	
Medical Validity	31 July 2017
B737-800 Operational date	18 May 2015
Total Hours	1,911:20
Hours on Type	1,711:20
Command Hours on Type	0
Last Base Check	06 April 2017
Last Line Check	25 May 2016
Instrument Rating	08 October 2016
Hours in last 28 days	34:24
Rest Hours Prior to Incident	15:28

1.5.3 Cabin Crew

1.5.3.1 There were four cabin crew members on board of MH2718. All of them met the DCAM and Operator proficiency requirements. The validity of the qualification and ratings of the cabin crew are stipulated in the next few paragraphs.

1.5.3.2 Cabin Crew In-Charge

1.5.3.2.1 The Cabin Crew in-charge is a male and he is 52 years old. According to Malaysia Airlines‟ records, the certification details are listed in the following table:

Subject	Expiry
Safety Emergency Procedure (SEP)	27 July 2017
Crew Resource Management (CRM)	21 October 2017
Safety Management System (SMS)	15 October 2018

1.5.3.2.2 The most recent flight pattern duty and duty times are stated in the following table:

Duty Date	Flight Pattern	Duty Time (Hours)
06 April 2017	Off day	Nil
07 April 2017	KUL-BKI	4:17
08 April 2017	BKI-KUL-SBW	8:19

1.5.2.3 Cabin Crew number two

1.5.2.3.1 The Cabin Crew Number 2 is a Female and she is 47 years old. Her Work Assignment is the Flight Stewardess Business Class. According to Malaysia Airlines‟ records, the certification details are listed in the following table:

Subject	Expiry
Safety Emergency Procedure (SEP)	01 March 2018
Crew Resource Management (CRM)	14 March 2018
Safety Management System (SMS)	24 November 2018

1.5.3.3.2 The most recent flight duty pattern and duty times were as follows:

Duty Date	Flight Pattern	Duty Time (Hours)
06 April 2017	Off day	Nil
07 April 2017	KUL-BKI	4:17
08 April 2017	BKI-KUL-SBW	8:19

1.5.3.4 Cabin Crew number three

1.5.3.4.1 The Cabin Crew Number 3 is a Male and he is 47 years old. His Work Assignment on the incident flight is the Leading Steward Economy Class. According to Malaysia Airlines‟ records, the certification details are listed in the following table:

Subject	Expiry
Safety Emergency Procedure (SEP)	09 November 2017
Crew Resource Management (CRM)	06 February 2019
Safety Management System (SMS)	20 October 2018

1.5.3.4.2 The most recent flight duty pattern and duty times were as follows:

Duty Date	Flight Pattern	Duty Time (Hours)
06 April 2017	Off day	Nil
07 April 2017	KUL-BKI	4:17
08 April 2017	BKI-KUL-SBW	8:19

1.5.3.5 Cabin Crew number four

1.5.3.5.1 The Cabin Crew Number 4 is a Male and he is 43 years old. His Work Assignment on the incident flight is the Flight Steward Economy Class. According to Malaysia Airlines‟ records, the certification details are listed in the following table:

Subject	Expiry
Safety Emergency Procedure (SEP)	18 July 2017
Crew Resource Management (CRM)	15 February 2018
Safety Management System (SMS)	01 February 2019

1.5.3.5.2 The most recent flight duty pattern and duty times were as follows:

Duty Date	Flight Pattern	Duty Time (Hours)
05 and 06 April 2017	Off day	Nil
07 April 2017	KUL-BKI	4:17
08 April 2017	BKI-KUL-SBW	8:19

1.5.4 Air Traffic Controllers. Two Sibu ATC Tower‟s controllers were on duty. Both started their duties at 1400 LT and ends at 2200 LT on 08 April 2017. During the 8 hours shift, one controller would be on active duty, while the other on administrative duty. The controllers rotate their duties every 4 hours. Both the controllers held the required licenses and had the necessary experience to perform their functions at their respective work positions.

1.6 Aircraft Information

1.6.1 General

1.6.1.1 The Boeing B737-8H6 (B737-800 series) aircraft was built in 2014 with serial number 40161. The aircraft is owned by Avolon Aerospace AOE 111 Limited. It was leased to MAB since 2015 and was registered in Malaysia as 9M-MXX.

1.6.1.2 Department of Civil Aviation Malaysia (DCAM) issued the Certificate of Airworthiness No. M.1815 that was valid from 01 August 2016. According to the technical records, the aircraft had accumulated 9,164:20 flight hours and 4,669 cycles up to 08 April 2017.

1.6.1.3 The aircraft is fitted with two CFM 56-7B26E Engines, serial number 660266 in the number one position with 9,164:20 total hours since new and serial number 660267 in the number two position with 9,164:20 total hours since new.

1.6.1.4 The aircraft is configured with 16 Business Class seats and 144 Economy class seats.

1.6.1.5 The maximum takeoff weight for the aircraft is 79,015 kg and the aircraft weight at takeoff was 63,197 kg. The Centre of Gravity (CG) range for takeoff is between 6% and 36% Mean Aerodynamic Chord (MAC) and the CG at takeoff was 21.34%. The aircraft weight at the time of incident was approximately 58,000 kg. The maximum landing weight for the aircraft is 66,360 kg. The aircraft had about 7,000 kg of fuel at the time of incident.

1.6.1.6 The deferred items recorded in the Maintenance Record 2 (MR2) are as follows:

1.6.1.6.1 Specific Takeoff Charts (STC) and MEL stowage compartment restrain bar detached.

1.6.1.6.2 Oxygen mask panel, Captain‟s side reset test switch broken. Test/Reset function still possible.

1.6.1.6.3 Strong nauseating and pungent smell from all air louvers after takeoff power applied. It dissipates when climbing past 20,000 ft.

1.6.1.6.4 Seat 14A armrest endcap cracked and seat 12A, 14F armrest endcap missing.

1.6.1.6.5 During weekly check, found No. 1 Engine Economic fault. Message number 77-10841. The top right EGT signal (T49551) is out of range.

1.6.1.7 Maintenance History

1.6.1.7.1 **Maintenance Program**

1.6.1.7.1.1 The aircraft was maintained in accordance with the B737-800 Maintenance Program, reference MAB/B737-800. A Certificate of Release to Service (CRS) is issued after each maintenance program and signed by authorized maintenance personnel.

1.6.1.7.1.2 The periods and frequencies of the maintenance inspections of this program are listed in the following table:

No	Check Type	Inspection Intervals	Location
1	Quarterly Checks	90 days/560 cycles	Line/Base Maintenance
2	Base Check	7,500 hours	Hangar

1.6.1.7.2 Scheduled Maintenance

1.6.1.7.2.1 Since the delivery of aircraft up to the date of incident, one scheduled maintenance check was performed in accordance with the approved maintenance program. The details, as per the information extracted from the Aircraft Technical Log, are reflected in the following table:

No	**Check type**	**Date**	**Total aircraft flight hours**	**Total aircraft cycles**	**Hours since last check**	**Place**
01	1K	04 October 2016	7,203:45	3,761	0:00	KUL

1.6.1.7.3 Unscheduled Maintenance

Date	**Discrepancy description**	**Correction Action**
02 April 2017	Antiskid INOP light Illuminated after touchdown	Antiskid Wheel Transducer Position 4 found loose. Transducer reconnected. Ground Ops check found satisfactory
03 April 2017	Antiskid INOP light Illuminated again	AACU BITE Faulted XDCR 4. C/out replacement of XDCR. Ops test carried out. Found Satisfactory.

There was no record of recurrence of the above defect from 03 April 2017 until the incident date.

1.6.1.7.4 Landing gear and tyres

1.6.1.7.4.1 The landing gear on the B737-800 is made up of 1 nose gear assembly with 2 wheels and 2 main landing gear assemblies with 2 wheels on each side. The main wheels are numbered 1 to 4 from left to right.

1.6.1.7.4.2 The tyres were examined after the incident. The condition of the tyres and threads were found to be in compliance with the manufacturer‟s instructions. Maintenance records of the tyres were reviewed and found to be in order.

1.6.1.7.4 Cabin Doors

1.6.1.7.4.1 The B737-800 has four identically operated cabin doors. They are used for normal entry and exits as well as for emergency evacuation. The cabin doors are of plugtype and open in an inward and outward motion. When opening the door, it first moves inward, then is pushed outward and forward. When the door is opened, it is held at its position by GUST LOCK.

1.6.1.7.4.2 Emergency Operation (inside)

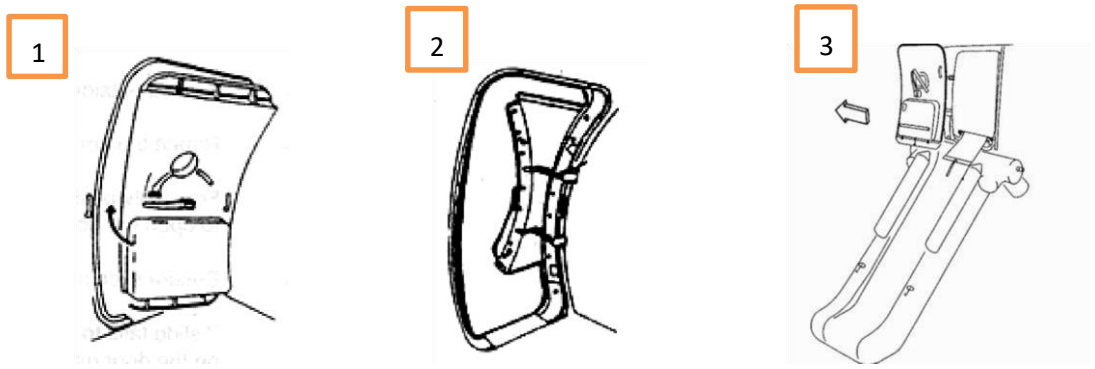
1.6.1.7.4.2.1 To open:

a. Assess condition outside the door through the view port.
b. Ensure the aircraft has stopped and the engines are shut down.
c. Ensure that the door is ARMED for crash land/DISARMED for ditching.
d. Rotate the door handle and push the door open.

1.6.1.7.4.2.2 Evacuation Slide Deployment.

1.6.1.7.4.2.2.1 When the door is opened in an ARMED mode during emergency crash land, the slide will automatically deploy & inflates. If the slide did not inflate, pull the Manual Inflation Handle (MIH) to manually inflate slide which is located on right side of door girt.

1.6.1.7.4.2.2.2 If the slide does not inflate even after the manual attempt, crew will block the exit and redirect passengers to other useable exits. As a last resort, if there is no other exits available, the deflated slide can be used as an apron slide.



Source: Safety Emergency Procedure Issue 2 Revision 0, TR1, dated 31 January 2017

Figure 1: B737-800 Main door emergency opening

1.6.1.8 **Weight and Balance**. MH2718 landed with almost 7,000 kg of fuel and a landing weight was of 58,000 kg. The weight and CG were within the prescribed limits. The aircraft had sufficient fuel to proceed to KUL, as additional fuel was catered for the return flight to KUL the following morning, as per the MAB fuel policy.

1.6.1.9 **Windshield wipers**. The rain removal system for the forward windows consists of windshield wipers and a permanent rain repellent coating on the windows. The wipers have 3 settings, i.e. Intermediate, Low and High.

1.6.1.10 Wind shear alert system.

1.6.1.10.1 Wind shear detection is always activated when the aircraft is below 2,300 ft in the takeoff and landing environment even when the radar is turned off. Warnings and Cautions are enabled from the time the aircraft passes 1,200 ft until 400 ft. From 400 ft until 50 ft, only Warnings are enabled. From 50 ft until touchdown (0 ft), all new alerts are disabled.

1.6.1.10.2 A wind shear WARNING is generated whenever a detected wind shear event occurs within ± 0.25 NM of the longitudinal axis of the aircraft and within ± 30 degrees of the aircraft heading. When the aircraft is on the ground (takeoff roll), the wind shear WARNING occurs for wind shear events within 3 nm.

1.6.1.10.3 A wind shear CAUTION is generated whenever a detected wind shear event occurs outside the wind shear warning region and within ± 30^{o} of the aircraft heading and less than 3 nm from the aircraft.

1.6.1.11 **Landing Performance Calculations**

1.6.1.11.1 MAB OM (A) provides reference to the requirement of PNF/PM to add to the briefings the relevant performance data applicable of the approach and also the remaining fuel/time before initiating diversion. In addition, the B737-800 Flight Crew Operations Manual (FCOM) provides specific procedure on calculation of the aircraft landing performance as part of the descent procedure (NP.21.49).

1.6.1.11.2 Landing distance`s are found in the Performance section of the B737-800 QRH and the FCOM.

1.6.1.12 **Go-around**

1.6.1.12.1 Go–Around (GA) mode is engaged by pushing either TOGA switch. An Autopilot (A/P) go–around requires dual A/P operation and is armed when FLARE armed is annunciated on the Primary Flight Display (PFD). If both A/Ps are not operating, a manual F/D go–around is available.

1.6.1.12.2 With the A/T Arm switch at ARM, the A/T go–around mode is armed when descending below 2,000 ft RA. Refer to Appendix H for further details.

1.6.1.13 **Go-around after touchdown**

1.6.1.13.1 If a go-around is initiated before touchdown and touchdown occurs, continue with normal go around procedures. The F/D go-around mode will continue to provide go-around guidance commands throughout the maneuver.

1.6.1.13.2 If a go-around is initiated after touchdown but before thrust reverser selection, continue with normal go-around procedures. As thrust leavers are advanced, auto speed brakes retract and autobrakes disarm. The F/D go-around mode will not be available until go-around is selected after becoming airborne.

1.6.1.13.3 Once reverse thrust is initiated following touchdown, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.

1.6.1.14 **Anti-skid Protection System**

1..6.1.14.1 Antiskid protection is provided in the normal and alternate brake systems. The normal brake hydraulic system provides each main gear wheel with individual antiskid protection. When the system detects a skid, the associated antiskid valve reduces brake pressure until skidding stops. The alternate brake hydraulic system works similar to the normal system, however, antiskid protection is applied to main gear wheel pairs instead of individual wheels.

1.6.1.14.2 Both normal and alternate brake systems provide skid, locked wheel, touch down and hydroplane protection. Antiskid protection is available even with loss of both hydraulic systems.

1.7 Meteorological Information

1.7.1 The weather forecasted at Sibu Airport on 08 April 2017 was as follows:

FT 080500z 0806/0906 25008KT 9999 FEW016 BKN300 TEMPO 0809/0813 4000 SHRA FEW015CB SCT016 BKN150 =

1.7.2 The hourly METAR and SPECI issued between 1000 and 1600 are listed as follows:

WBGS 081600Z 12001KT 9999 -RA FEW005 SCT018 OVC150 24/23 1010= WBGS 081500Z 10002KT 7000 RA FEW005 SCT018 OVC150 24/23 Q1011=

WBGS SPECI 081421Z 35003KT 3000 +RA FEW005 SCT018 OVC150 24/23 Q1011

Interpretation: Sibu special weather report at 2221 LT, surface wind 350^{o} at 3 kts, visibility 3,000 m in heavy rain, few cloud at 500 ft, scattered at 1,800 ft, overcast at 15,000 ft, temperature 24^{o}, dew point 23^{o}, QNH 1011

WBGS 081400Z 32002KT 6000 RA FEW005 SCT018 OVC150 25/24 Q1011=
WBGS SPECI 081310Z 20006KT 160V240 3000 RA SCT018 BKN150 26/25 Q1010=
WBGS 081300Z 22002KT 9999 -RA SCT018 BKN150 27/25 Q1009=
WBGS 081200Z 34003KT 9999 SCT018 BKN150 27/24 Q1008=
WBGS 081100Z 24002KT 9999 FEW015CB BKN150 27/25 Q1007=
WBGS 081000Z 16003KT 9999 FEW015CB SCT018 BKN300 28/24 Q1006=

1.7.3 According to the ATC controller on duty, the weather over Sibu Airport was sporadic from 2100 LT onwards, with rain intensity cycle from light to moderate and moderate to heavy frequently, i.e. in every 15 to 20 minutes.

1.7.4 During the investigation, the data from the RVR readout was obtained from the Meteorological Department. This data shows the sporadic visibility pattern (associated with changing rain intensity) ranging from 450 m to 10 km throughout the period in question.
The RVR data during this period is shown in Appendix P.

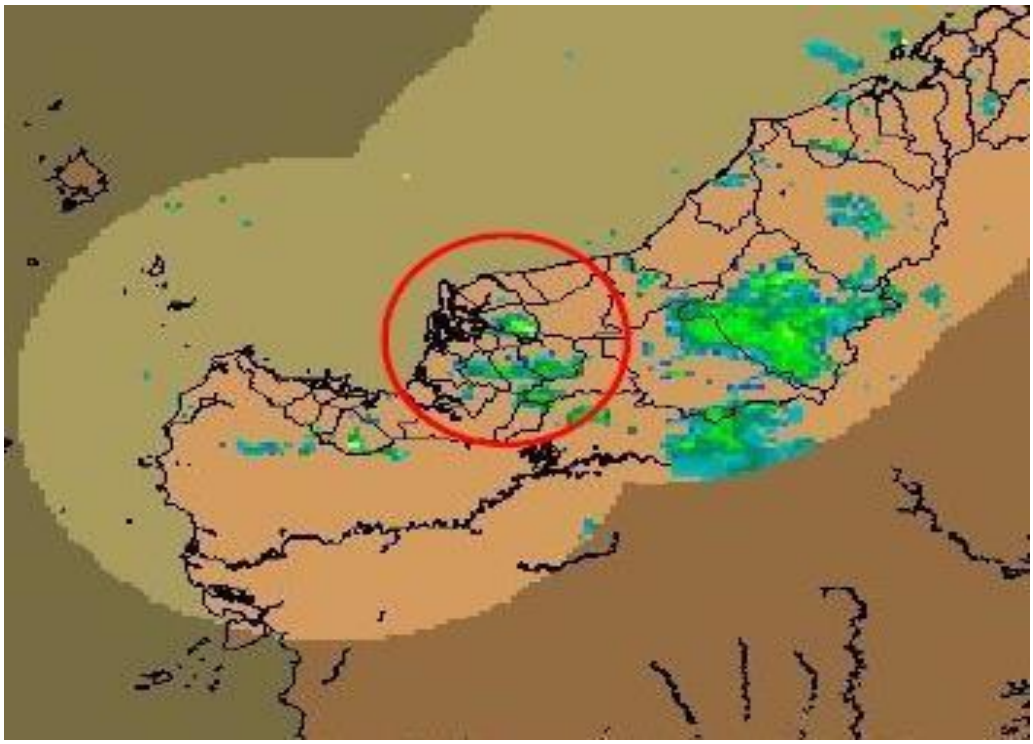


Figure 2: Weather radar image of cloud cover over Sibu at 2210 LT. (Source: Kuching Meteorological Department)

1.8 Navigation Aids. Sibu Airport is equipped with VOR DME (VSI 112.2 MHz) and ILS DME (ISU 110.5 MHz) and NDB (NIS 203 KHz).

1.9 Communication

1.9.1 Flight MH2718 was in communication with Kuching Radar on frequency 134.5 MHz prior to being transferred to Sibu Tower on frequency 123.2 MHz at 2139 LT.

1.9.2 Radar monitored Air Traffic Service is provided within Sibu Flight Information Region (FIR) daily between 0800 LT and 1700 LT, available on Approach frequency 122.6 MHz. Beyond this period, air traffic control is provided by Tower on frequency 123.2 MHz. (As per Nortification to Airmen (NOTAM) WMKKD0274/17, issued on 20 March 2017).

1.10 Airport Information

1.10.1 Operating hours are from 0600 LT - 2200 LT. SBW has a single runway (Runway 13/31). Runway 13 is a precision approach runway that is equipped with an ILS, while Runway 31 is a non-precision approach runway.

1.10.2 **Runway 13 lighting and marking**

1.10.2.1 The runway lighting system of Runway 13 includes high intensity approach lights, runway threshold lights, runway edge lights, and runway end lights. There was no runway centerline light available at Sibu Airport.

1.10.2.2 Runway 13 markings comprise of the threshold markings, runway designated markings (in the form of runway number), touchdown zone markings (in the form of an array of repeated vertical bar on either side of the centerline, every 500 ft over the first 3,000 ft of the runway, aiming point marking 1,500 ft from the runway threshold, and centerline markings (broken lines indicating the center of the runway).

1.10.3 Transmissiometer

1.10.3.1 Sibu airport has 2 units of transmissometer, each for Runwy 13 and Runway 31 respectively. This model, VPF-700 Visibility Sensor was fitted in 2010, together with other stations in East Malaysia such as Kuching, Bintulu and Miri.

1.10.3.2 This equipment is capable of providing runway visual range information which measures horizontal visibility at the specific location near the runway threshold, as well as the wind component, which is transmitted as RVR values and wind information directly to the display units located at Meteorological Department and ATC Control Tower concurrently.

1.10.4 **Runway 13 undulation**

1.10.4.1 There was of a slight undulation evident on Runway 13, with a downslope from beginning of Threshold Runway 13 up to approximately 400 m in the direction of the runway, followed by an upslope along the entire length of remaining runway. The gradient of downslope was measured at 0.43 %, while the upslope was 0.58 %.

1.10.5 **Runway Friction Test**

1.10.5.1 Runway friction test was performed on 28 August 2016 by AVIATRADE Sdn Bhd using GRIPTESTER Measuring Wheel. Prior to the test, the friction measuring equipment underwent calibration and conformity certification on 01 October 2015. In fact, the test confirmed that it was in compliance with the manufacturer‟s requirements.

1.10.5.2 The runway friction test results were examined by the investigation team. The following table shows the results.

Runway	Speed	Depth of Water	Average friction value	MFL	MPL	DOL
13	65	1.0 mm	0.67	0.43	0.53	0.74
31	65	1.0 mm	0.67	0.43	0.53	0.74

Table 1: Runway friction test parameters and limits.

Note:

- MFL refers to the Minimum Friction Level. When the reading is below the MFL, it indicates that runway may be slippery when wet. Immediate corrective actions are required to be taken.
- MPL refers to Maintenance Planning Level – below which corrective maintenance action should be initiated.
- DOL refers to Design Objective Level – which establishes the minimum friction level for a newly constructed or resurfaced runway surface.

1.10.5.4 The test results show that the average friction values for both runways were above the MPL.

1.10.6 **Rubber deposit removal**. Following the runway friction test that was conducted on 28 August 2016, Aviatrade Sdn Bhd provided recommendations to Malaysia Airport Holding Berhad (MAHB) Sibu with regards to the removal of rubber deposit on certain parts of the runway due to the exiting surface condition. The last record of rubber deposit removal was dated on 24 May 2015 (Refer Appendix N).

1.11 **Flight Recorders**

1.11.1 **CVR**. The aircraft was equipped with a L3 Aviation Recorders, P/no: 2100-1025-22 S/no: 000927865. The CVR contained 2 hours of recordings.

1.11.2 **FDR**. The FDR was a L3 Aviation Recorders, P/no: 2100-4045-22 S/no: 000810809. The FDR contained 25 hours of flight data. Plots of the FDR readout can be found in Appendix D.

1.12 **Impact Information**. Photographs were taken during the on-site inspection and assessments are provided in the following. The approximate locations of the sequence of events are shown on the Runway diagram, followed by the individual images describing the event.

Figure 3: Layout of Sibu Airport Runway 13/31 with reference to the images 2 to 7

Figure 4: Right Wheel tyre marking on runway
(Shown as "Image 2 in the airport layout in Figure 3)

Figure 5: Both main wheel marks show aircraft veering to the right. Left main wheel contacted runway at 620 m from Threshold Runway 13 (shown as "Image 3" in the airport layout in Figure 3)

Figure 6: Right main wheel leaving the paved runway surface at approximately 720 m from Threshold Runway 13 (Shown as "Image 4" in the airport layout in Figure 3)

Figure 7: Wheel track on the soft ground approximately 20 m parallel with the runway (Shown as “Image 5” in the airport layout in Figure 3)


Figure 8: Approximate location of nose gear collapse (Shown as “Image 6” in the airport layout in Figure 3)

Figure 9: Final aircraft location – 1,260 m from Threshold Runway 13 (Shown as "Image 7" in the airport layout in Figure 3)

1.13 A**ircraft System Components**. The aircraft"s cockpit instruments, external flight controls and landing gear components were identified, photographed and documented.

1.13.1 **Overhead Cockpit P5 Panel**. The positions of the following switches are noted (as shown in Figure 10):

1.13.1.1 Electric Hydraulic Pumps – OFF.
1.13.1.2 APU – ON.
a. 1.13.1.3 Fuel Pump – OFF.
b. 1.13.1.4 Pack – OFF.

Figure 10: Photograph of Overhead Cockpit P5 Panel

1.13.2 **Center Pedestal**. With the complete power down, the position (Left or Right) and the units of rudder trim could not be established, as shown in Figure 11.

Figure 11: Photograph of Center pedestal

1.13.3 **Engine and APU Fire Panel**. The APU Fire handle was pulled whereas the Engine 1 and 2 Fire handles were in normal position (not pulled) as shown in Figure 12.

Figure 12: Photograph of Engine and APU Fire Panel

1.13.4 **Landing Gear Component**

1.13.4.1 **Left Main Gear Wheels**. The left wheel tyres and other components appeared to be covered in mud following the excursion. There were minor damages evident on various components and flight control surfaces. However, the conditions of the tyres were inspected and they appeared to be in compliance with manufacturer's recommendation.

Figure 13: Photograph of Left Main Wheel

1.13.4.2 **Right Main Gear Wheels**. Similar to the left wheels, the right wheels and the other landing gear components were also covered in mud following the excursion. Tyres condition were examined and found to be in compliance with manufacturer‟s recommendation as shown in Figure 14.

Figure 14: Photograph of Right Main Wheel

1.13.4.3 **Nose wheel (collapsed)**. The nose wheel and the nose landing gear components sustained significant damages following the collapse while travelling over the soft ground as shown in Figure 15.

Figure 15: Photograph of Nose Wheel (Collapsed)

1.14 Medical Information

1.14.1 All passengers and cabin crew were examined by the medical officers at the Sibu Airport while the flight crew were taken to Sibu Hospital immediately following the incident. None of them suffered any form of bodily injuries or impairment during the incident or evacuation procedures.

1.14.2 As part of the standard protocol following an air accident or incident, the flight crew were requested by MAB to undergo alcohol and drug test. This was however not done at Sibu Hospital as the hospital procedures to conduct such tests require a police report of the incident. There was no police report being made at the time.

1.14.3 Queries were made during the post incident investigation confirmed that the hospital had informed that the test could only be carried out with an accompanying police report.

1.14.4 The Captain that was involved was subjected to a more thorough examination by the medical officer in attendance, as he was observed to have high blood pressure reading following the event.

1.14.5 Once his condition had stabilized after a few hours at the hospital, the flight crew were transported to the hotel.

1.15 Fire. There was no fire being reported, nor did the investigation reveal any evidence of fire during and after the incident.

1.16 Survival Aspects. All passengers and crew survived the incident without any bodily injuries or fatalities.

1.17 Emergency Response. The AFRS arrived at the scene of the incident at 2218 LT, approximately one minute after they had received the alert from Control Tower. The AFRS personnel attended to the evacuation procedures until all the passengers had safely vacated the aircraft at 2222 LT. The passengers and crew were subsequently taken to the Fire Station during

the heavy rain, where head count was carried out by MAB cabin crew. All passengers and crew were accounted for.

1.18 Tests and Research

1.18.1 **Highlights**. Data from the FDR were synchronized with the CVR and measurement markings on the runway to highlight the sequence of event leading to the incident. Please refer to Appendix E.

1.18.2 **Simulator session**

1.18.2.1 A simulator reenactment of the incident was performed on 17 May 2017 to support the investigation. The simulator that was used for the test was MAB/CAE Boeing B737-800 full-flight simulator that was certified by the DCAM.

1.18.2.2 The parameters that were used during the simulation were extracted from the FDR, CVR, Load-sheet documents, ATC visibility reports, RVR data, pilot reports and information collected on Runway 13 Sibu. The weather and runway conditions that were simulated were as close as possible to the time of incident, although the simulator"s level of fidelity did not allow exact reproduction of the effects of the rain and light conditions on visual perception at the time of incident.

1.18.2.3 MAB B737-800 Type Rating Examiner (TRE) occupied the left seat while a B737800 Type Rating Instructor (TRI) was seated on the right seat.

1.18.2.4 The simulator sessions were undertaken to determine the estimated position of the wheels touchdown, based on the bank angle that was introduced during the flare below 20 ft RA. The simulation also gave a general idea how the aircraft would behave following the parameters specified below:

a. Touchdown on the heading specified.

b. Minimal rudder input from the pilot for approximately 3 seconds after the main wheels contacted the runway.

c. A significant left rudder application thereafter.

1.18.2.5 For comparison, a simulation of immediate rudder application as required after the touchdown at the approximate location was done. A wave-off from below 10 ft RA was also simulated. The results were as follows:

a. There was a considerable reduction of visibility observed with the simulated increment in rain intensity that is based on the RVR values gathered.

b. A prepared recovery from the deviation showed that the aircraft could return to the centerline provided an immediate large left rudder input was applied.

c. A prepared wave off from 10 ft RA was successfully carried out with the aircraft contacting the runway during the maneuver (as it would due to the low altitude recovery) and climbed positively.

1.18.2.6 **Pilot's eye test and psycho-physiological assessment**

1.18.2.6.1 Both the flight crew were subjected to eye test on 09 May 2017 to determine if degraded vision had contributed towards the incident. The test, known as Titmus eye test, was conducted at MAB facility, Twin Tower Medical Center (TTMC), by the DCAM authorized medical examiner.

1.18.2.6.2 The Titmus eye test revealed a slight decrease in visual acuity for near vision of the PF"s right eye. However, his vision was normal with both eyes. Distant visual acuity showed no abnormalities.

1.18.2.6.3 The PM"s Titmus eye test for both near and distant vision were normal.

1.18.2.6.4 There was no other medical condition established during assessment.

1.19 Organization and Management Information

1.19.1 MAB, formally known as Malaysia Airlines System (MAS) is the national career of Malaysia, is based in Kuala Lumpur. MAB operates fifty four (54) Boeing B737-800 series aircraft for its regional operations. The long haul routes are served by Airbus A380 fleet, while the medium range operations are supported by the Airbus A330-300 fleet.

1.19.2 MAB has a Flight Operations Division, Flight Safety and Operational Compliance, Training (Flight Crew and Cabin Crew).

1.19.3 Flight Operations" reference manuals comprise of MAB Operations Manual OM (A) which provides information on company policy and procedures, OM (B) is the FCOM which provides information relating to the specific aircraft type, OM (C) illustrates information regarding the route and airport information, while OM (D) provides guidance material for development and conduct of crew training.

1.19.4 References to MAB"s policies, procedures and systems information related to the incident are provided in Appendix R.

1.20 Additional Information

1.20.1 **Threat and Error Management (TEM)**

1.20.1.1 The concept of TEM involves the preparation and adaptation of crew action plan that is developed based on the identification of current and potential threats in order to mitigate the associated risks. An effective TEM relies on the experience and exposure of the crew in similar situations previously, knowledge gained through training and the information available to the crew at the time.

1.20.1.2 TEM briefing encompasses 3 pertinent areas of operations, namely Man,
Machine and Environment, all of which need to be evaluated for potential risks and their respective mitigation action. The elements that are related to man include psychophysiological

status of the pilots in terms of the amount of rest/sleep attained prior to the flight, tiredness, fatigue, stress, any medication consumed, etc. The machine aspect covers the status of the aircraft in terms of defects and any additional procedures that are required. The environment factors include weather, applicable NOTAMS, terrain surrounding the airport, and any other hazards and risk elements that may affect the safe operation of flight.

1.20.1.3 Following identification of potential threats, mitigation actions that are required to address the potential risks are discussed and acknowledged by all flight crew. This will ensure that the PM is aware and able to anticipate PF‟s action through the shared mental model that was established from TEM briefings and effective communication.

1.20.2 Operational declaration of Sibu Airport

1.20.2.1 Sibu Airport was closed from 2217 LT on 8 April 2017 to 0800 LT on 10 April 2017 owing to the removal of the disabled aircraft together with the maintenance and inspection of the runway.

1.20.2.2 MAB inititated the aircraft recovery process following the incident. The plan entailed:

a. The recovery team departed KUL to Bintulu by air and subsequently were transported to Sibu Airport by road.

b. The recovery equipment departed KUL to Kuching by air and subsequently was transported to Sibu Airport by road.

c. Both the recovery team and equipment arrived at Sibu Airport by 1430 LT.

d. The recovery process started immediately upon arrival and was completed at 2000 LT on 9 April 2017. The disabled aircraft was positioned at Bay 1A.

e. The Sibu Airport restoration process commenced soon after the removal of the disabled aircraft from the runway. This restoration process went on until the following day morning at about 0700 LT.

f. Sibu Airport Authority carried out the inspection following the restoration process and finally declared Sibu Airport operational at 0800 LT on 10 April 2017. In effect, Sibu Airport was closed for 34 hours.

2 ANALYSIS

2.1 General

2.1.1 The Captain and Second Officer had valid license and qualified in accordance with applicable Regulations and Operator‟s requirements. The cabin crew that were involved were trained and qualified in accordance with the regulatory (DCAM) and MAB‟s proficiency requirement.

2.1.2 The Captain was on no pay leave for almost 9 months between 11 February 2016 and 01 November 2016. Upon his return to employment, he underwent reactivation training and assessment program in accordance with DCAM approved syllabus, prepared by MAB. The Captain was subsequently cleared on-line on 11 December 2016.

2.1.3 During the medical assessment that was conducted on 09 May 2017, the captain (PF) had shown a slight reduction in visual acuity for near vision in his right eye. However, with both eyes, the visual acuity was normal.

2.1.4 Additionally, there was no evidence to suggest that the drop in acuity in the PF‟s right eye had contributed to his visual acuity of approaching the runway as his distant vision was normal.

2.1.5 No other medical conditions were established on both the PF and PM.

2.1.6 All the flight and cabin crew‟s Flight Duty Period (FDP) and rest period that were provided prior to this duty pattern were in accordance with the Flight and Duty Time Limitation Scheme approved by DCAM.

2.1.7 The air traffic controller who handled MH2718 was qualified and had experiences to perform the required functions.

2.1.8 The aircraft was properly certificated, equipped and maintained in accordance with the regulations and approved procedures. The aircraft did not have significant technical defects that might have contributed towards this incident. The most recent defect that was related to the antiskid on wheel number 4 was rectified on 03 April 2017 with no further records of recurring defect.

2.1.9 Based on the post incident inspections performed by the engineer on the aircraft tyres, it was found that all the four tyres were within the manufacturer‟s limitations. There were no signs of tyre failure or other defects that might have contributed towards the incident. The maintenance records on the tyres were found to be in order. However, the nose wheel tyres were not accessible for inspection as the nose gear had collapsed during the incident.

2.1.10 Inspection of the tyre tracks on the runway did not reveal activation of the antiskid system during the initial rollout until the aircraft departed the runway surface. In addition, review of the FDR data did not indicate antiskid activation during the landing roll. Based on this information, there is insufficient evidence to indicate that the aircraft had experienced skidding.

2.1.11 The flight crew ordered an additional 800 kg of fuel to cater holding at SBW due to infavarouable weather forecast with visibility of 4,000 m in rain.

2.1.12 Weather conditions at Sibu Airport prior to and during the incident was reported to be sporadic, with changing rain intensity from light to moderate and moderate to heavy frequently (every 15 to 20 minutes).

2.1.13 There was no wind shear alert triggered by the aircraft system at any time during the flight, including while operating in heavy rain. In addition, there was no report of wind shear by the incident flight crew, or from tower reports and other pilots that were operating in SBW at around the same time.

2.1.14 Fuel was not a factor in this incident as fuel was tankered for the return flight to Kuala Lumpur the next day. There were additional 4,500 kg of fuel, which amounts to over 2 hours of holding fuel before a diversion to Kuching would be required.

2.2 Safety and Operational Considerations

2.2.1 The investigation team conducted analysis of the evidence that were presented to determine the causal and contributory factors related to the incident. The following safety and operational factors were considered:

2.2.1.1 Aircraft‟s touch down position on the runway.

2.2.1.2 Awareness of the prevailing weather conditions.

2.2.1.3 Risk assessment and evaluation with regards to making an approach in heavy rain or thunderstorm conditions.

2.2.1.4 Crosswind landing techniques and procedures.

2.2.1.5 Flight crew‟s reaction to sudden loss or reduction in visibility while approaching the runway (below MDA).

2.2.1.6 PM‟s assertiveness level and standard callouts.

2.2.1.7 Absence of centerline lights at Sibu Airport that has higher exposure to inclement weather conditions and compounded by “black hole” effect.

2.2.1.8 Possibility of aqua planing due to standing water around the undulated portion of Runway 13.

2.2.1.9 Training and effective application of RVR information by ATC.

2.2.1.10 Airworthiness state of aircraft.

2.2.2 Additionally, the investigation also identified other relevant factors that need to be addressed with the relevant authorities that were directly involved in the airport and rescue operations. These are:

2.2.2.1 Preservation of evidence following an incident or accident.

2.2.2.2 Recommendations from the previous Runway Friction Test that were not fully implemented.

2.2.2.3 Evacuation and rescue procedures by AFRS personnel.

2.2.3 **Aircraft's touch down position on the runway**.

2.2.3.1 Tyre track observed on the runway during the investigation revealed the following:

a. The right wheel contacted the runway first at a distance of 540 m from Threshold Runway 13. This was followed by left wheel touchdown at distance of 620 m from Threshold Runway 13. The FDR data confirmed 1 second lapse between the right and left wheel touchdown.

b. Lateral displacement of right wheel touchdown position from runway centerline was measured to be approximately 13 m to right of centerline. Given the wheel base of B737-800 of 5.7 m, the lateral displacement of the aircraft from normal touchdown position was approximately 10 m to the right (Refer to Figure 16 below).

Figure 16: Photograph showing aircraft touchdown position relative to runway centerline.

c. The nose wheel touched the ground at approximately 4 seconds after the main wheel touchdown. The prolonged holding of the aircraft pitch following main gear touchdown prevented positive directional control that would have normally been achieved from nose gear contact on the runway. Based on the tyre tracks, the point of nose wheel touchdown was on the soft ground.

d. The elevated pitch attitude observed after the touchdown might have caused the pilot to have the reduced visibility of the runway situation. In addition, this maneuver had reduced the weight on main landing gear and thus decreased the braking and cornering effectiveness.

2.2.4 **Awareness of the prevailing weather conditions**

2.2.4.1 As part of the descent preparation, the flight crew obtained the weather report broadcasted through the ATIS. The initial weather report that was obtained from ATIS at 2114 LT was issued at 2000 LT, which was: Wind 220^{o} at 3 kts, visibility more than 10 km, light rain, temperature 27^{o}C and QNH 1009. Consequently, the crew did not anticipate any difficulty in the landing based on the weather information that was issued 1 hour and 14 minutes earlier.

2.2.4.2 The crew were first alerted of the deteriorating weather condition while on descent passing 13,500 ft based on their assessment from the onboard weather radar. The crew requested for weather update. Tower reported that the visibility had dropped from 10 km to RVR of 1,200 m, in light to moderate rain over the airfield.

2.2.4.3 Nonetheless, the crew decided to continue their approach and later executed a goaround at about 600 ft when they could not see the PAPI and runway edge lights.

2.2.4.4 The RVR readout that was obtained from the Meteorological Department during the investigation showed continuous change in visibility associated with the intensity of rain, ranging between 450 m to 10 km. This weather pattern makes reporting the actual or predictive weather conditions within the next 15 minutes a difficult task to accomplish for the ATC controller.

2.2.4.5 Such was the scenario presented to the flight crew on 08 April 2017. At 2202:37 LT, tower provided an updated weather at SBW, which was: wind calm, light rain with RVR 1,200 m. At 2206:34 LT (4 minutes later), weather in SBW was reported to be with heavy rain, visibility 3,000 m and RVR of 1,200 m, while at 2211:18 LT (almost 5 minutes later), the RVR was still 1,200 m with moderate rain.

2.2.4.6 Note that the visibility was measured based on the tower observation and weather report received from Meteorological Department, while the RVR was obtained directly from the transmissometer that was located near the threshold of Runway 13 and Runway 31. These values may differ due to the varying intensity of rainfall between the control tower and the threshold of the individual runways, including the direction from which the visibility is measured.

2.2.4.7 Operating in the region that falls within the Inter Tropical Convergent Zone (ITCZ) can be challenging in terms of the weather system that often involves thunderstorm activities and heavy rain. Therefore, having the knowledge of the local weather phenomena is a crucial element of flight operations aimed at recognizing and managing the potential threats that are associated with it. It is equally important that the operating crew are provided with the latest weather updates and trend information to enable the crew to conduct a proper and timely evaluation of the current and potential threats.

2.2.5 Risk assessment, evaluation and decision making method

2.2.5.1 In deciding whether it is acceptable to commence an approach in marginal or reduced visibility, the flight crew would make reference and compare the actual weather presented to them against the minimum published visibility or RVR in the charts.

2.2.5.2 The minimum published RVR that is required to commence an ILS Runway 13 Approach at SBW is 550 m. Based on the latest RVR reported of 1,200 m, the crew briefly discussed and concluded that the RVR was indeed sufficient to commence the ILS approach into Runway 13.

2.2.5.3 However, the weather pattern at SBW was sporadic with frequently changing visibility and rain intensity over short periods of time (every 5 to 15 minutes) over the last one hour prior to the incident.

2.2.5.4 The PF mentioned during his approach briefing and later reminded the PM of his plan to discontinue the approach, if he or the PM was not happy with the approach conditions. While it may be presumed that the PF was aware of the potential negative consequence resulting from the adverse weather and was prepared to execute a go-around should it becomes necessary, this was not clearly communicated to the PM. Obviously the phrase "not happy" does not provide a clear reference or guidelines on what to expect and what actions are to be taken in case of an undesirable event.

2.2.5.5 There were several occasions where the crew had the opportunity to review their decision to commence and continue their approach to land in the midst of heavy showers prevailing at the airport. The crew were initially provided with weather information which led them to believe that there was no considerable threat to the landing. The weather update was given while on descent passing 13,500 ft certainly presented them with the opportunity to review their decision based on the newly identified threats, i.e. RVR 1,200 m and in moderate to heavy rain. Instead, the crew appeared to be relying on one aspect of the weather criteria (visibility) in their decision to continue the approach. Another opportunity was presented following the missed approach procedures and holding.

2.2.5.6 Therefore, it is evident that the flight crew did not use adequate risk management strategy in identifying all the potential threats that were related to the approach and landing in heavy rain and thunderstorm. In particular, the potential threat of wind shear, microburst, turbulence, or sudden drop in visibility during the approach, or landing on the runway potentially contaminated by standing water were not considered in its entirety.

2.2.5.7 While the crew did discuss on the plan to divert to Kuching if the weather conditions in SBW does not show any improvement, the crew did not evaluate and review the appropriate options or recovery methods from each of the identified risks. This is not consistent with company policy pertaining to the adaptation of "TEM" concept prior to commencing approach. As a result, the possibility of a go-around in the event of failure to maintain runway centerline was not anticipated, particularly in the absence of the runway centerline lights. Neither was the possibility of losing visual reference due to heavy rain.

2.2.5.8 From the CVR, the flight deck environment appeared to be conducive for effective communication between the crew members. The commander did not show any signs of hostility or power gradient that could hamper open communication. This is essential to ensure any abnormalities to the operation of flight are effectively communicated.

2.2.6 Crosswind landing techniques and procedures

2.2.6.1 During the final approach, the PM called out the wind information as displayed on the flight instrument to inform the PF of the wind component that was affecting the aircraft flight path. According to the CVR, the PM called "right 6 tail 2" at approximately 760 ft during the approach, and again at 600 ft, indicating that there was 6 kts of right crosswind and 2 kts of tailwind.

2.2.6.2 Consequently the PF applied the necessary drift angle and control wheel input to maintain the desired track towards the runway. This was evident from the constant oscillation of the control wheel throughout the approach. However, the wind was gradually dissipating below 500 ft, with less than 2 kts recorded below 130 ft AGL.

2.2.6.3 The PF continued to apply wing low crosswind technique during the flare maneuver before landing, on the basis of "perceived" right crosswind. Hence, below 25 ft RA, as the PF increased the aircraft pitch attitude to begin his flare maneuver, a right bank was progressively introduced. This was consistent with FDR data which showed that the aircraft was flying over the centerline until 30 ft in wings level attitude. Subsequently, the aircraft was slowly drifting to the right from a right bank that was introduced of up to 6^{o}, before the right wheel came into contact with the runway.

2.2.6.4 B737-800 FCTM prescribes three methods of performing crosswind landing, namely, de-crab technique, landing in a crab, and side-slip technique. Typically, crosswind landings would require cross control application between the aileron (roll control) and rudder (yaw control) at some stage of the maneuver (depending the crosswind landing method being used), to achieve correct alignment with the runway direction on landing. The two prescribed methods commonly used are shown below.

De-Crab During Flare

On final approach, a crab angle is established with wings level to maintain the desired track. Just prior to touchdown while flaring the airplane, downwind rudder is applied to eliminate the crab and align the airplane with the runway centerline.

As rudder is applied, the upwind wing sweeps forward developing roll. Hold wings level with simultaneous application of aileron control into the wind. The touchdown is made with cross controls and both gear touching down simultaneously. Throughout the touchdown phase upwind aileron application is utilized to keep the wings level.

Sideslip (Wing Low)

The initial phase of the approach to landing is flown using the crab method to correct for drift. Prior to the flare the airplane centerline is aligned on or parallel to the runway centerline. Downwind rudder is used to align the longitudinal axis to the desired track as aileron is used to lower the wing into the wind to prevent drift. A steady sideslip is established with opposite rudder and low wing into the wind to hold the desired course. Touchdown is accomplished with the upwind wheels touching just before the downwind wheels.

Note: The third method involves performing a landing in a crabbed angle established during the approach without any changes in heading. This method is employed when the crosswind component is minimal to cause any additional stress to the landing gear while landing in a crabbed angle.

2.2.6.5 The PF mentioned during the interview that he employed a mix of sideslip and decrab technique during the said landing, where he intended to touchdown on the upwind (right) wheel first, followed by the left wheel. Hence, to achieve this, the PF induced progressive right bank during the flare.

2.2.6.6 It was raining heavily at this point and according to the PF, the visibility had considerably reduced. There was no turbulence reported by the crew during the approach.

2.2.6.7 FDR readout showed minimal rudder input employed by the PF to correct for the drift in heading, which resulted from the pilot induced roll. The final heading recorded on touchdown was 133^{o}, while the runway alignment was 129^{o}.

2.2.6.8 The PF explained that visibility had reduced significantly prior to the touchdown, such that he had lost his positional awareness in relation to the runway centerline. Although he could reasonably see the runway edge lights, he could not be certain of the amount of rudder that was required to correct the drift, in the absence of runway centerline lights.

2.2.6.9 The PF further explained that he was not able to react in time to bring the aircraft back to the centerline before the aircraft left the runway surface. The flight crew only realized of the runway excursion after noticing the aircraft was moving violently over the surface. He then immediately applied full rudder force to the left to return to the runway but the aircraft was already on the soft ground. Based on the FDR data and CVR recording, the aircraft departed the runway surface approximately 3 seconds after the first touchdown.

2.2.6.10 In theory, travelling at a ground speed of 146 kts with a drift angle of about 4^{o} over 5 seconds of flare maneuver (as per FDR), would result in the aircraft touching down approximately 10 m to the right of centerline. This was evident from the tyre tracks on the runway which were measured and found the aircraft touched down at approximately 10 m from the centerline.

2.2.6.11 Without having considerable crosswind component from the right and/or significant left rudder input, the pilot induced bank angle would cause the aircraft heading to veer to the right and drift away from the centerline.

2.2.6.12 Simulation exercise carried out using the same parameters extracted from the incident produced similar outcome. With an induced roll of up to 6^{o} to the right, the aircraft would end up in drift angle of about 4^{o} from the runway alignment. The aircraft would touchdown at almost 1/3 to the right of the runway centerline in about 4-5 seconds. If this heading was maintained without immediate rudder input to correct the offset, the aircraft would go off the runway.

2.2.6.13 Refer to the sequence of event (from the point of crossing the runway threshold to the final stop of the incident aircraft), shown as graphical illustrations based on the data provided from FDR. (Appendix B and Appendix G)

2.2.7 Flight Crew's response to sudden reduction in visibility while approaching the runway below MDA

2.2.7.1 Reduction in visibility

a. A sudden reduction in visibility during the last 100 ft on the approach was not anticipated by the crew. Based on the visibility reported by ATC controller of 1,200 m and the information on intermittent rain („OFF and ON"), the decision to commence the approach was made after a brief discussion between the flight crew.

b. Both crew mentioned that they could see the entire runway edge lights before they encountered the heavy downpour below 100 ft RA. The visibility then dropped significantly and they were only able to see a stream of lights on both sides of the runway. The wipers were set at high speed and both inboard and outboard landing lights were switched ON.

c. The intensity of the runway edge lights and PAPI was set to 100 % by the ATC controller.

d. The reduction in visibility below 100 ft RA was contributed by the sudden increase in the intensity of the rain which would have made it difficult to identify visual references. This was further exacerbated by the reflection of the landing lights from the water droplets, especially in the darkness of the night. Despite the reduction in visibility, the PF mentioned that he could still see the runway edge lights sufficiently well and was confident that he could safely continue with the landing.

e. The PF, however, stated later that under the prevailing weather conditions that night, he did not detect the slight bank that was introduced below 20 ft RA, or the lateral deviation in time to correct the drift before the aircraft left the runway surface.

f. To evaluate the level of discernibility of the runway lightings at various stages below 100 ft RA, a series of photographs were taken from the flight deck at various heights.

g. The following images illustrate pilot‟s view during the approach. It is important to note that the photographs were taken at night, in the visibility of more than 10 km, and without rain.

h. Analysis of the photographs shows that the pilots would have noticed the PAPI and runway edge lights until 20 ft RA, below which only the runway edge lights would have been discernable.

Figure 17: Pilot‟s view-Runway 13 at 100 ft AGL.

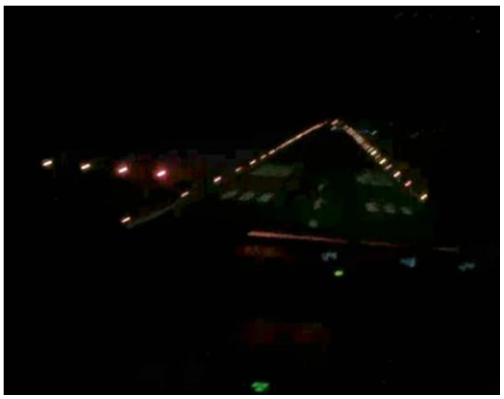


Figure 18: Pilot"s view-Runway 13 at 30 ft AGL

Figure 19: Pilot"s view-Runway 13 at 20 ft AGL.

i. Based on the above images, the investigators collectively agreed that the flight crew had limited visual reference available while descending below 20 ft RA in heavy rain. Below this height, the PF would be looking entirely outside of the aircraft to execute flare and landing maneuvers. With only the runway edge lights available as visual reference, it would be difficult for the PF to accurately judge or detect deviation from the runway centerline, including if there was any inadvertent or deliberate bank angle induced.

2.2.7.2 Preparedness for go-around

2.2.7.2.1 Approach and landing accidents are often avoidable with a proper and timely decision to go-around. Therefore, preparation for go-around is an important defence against preventing an undesired state of the aircraft upon landing.

2.2.7.2.2 Flight crew must always be go-around minded until it can be made certain that the aircraft is and will remain within the confines of the runway both laterally and longitudinally for the landing.

2.2.7.2.3 In this incident, the PF mentioned that he did not consider going around as he was confident of executing the landing safely. However, based on the outcome of the investigation, the investigation team is of the opinion that the PF might have lost his positional awareness following the sudden increase in intensity of rain, and failed to recognize the need to execute a timely go-around when it was warranted.

2.2.7.2.4 In order to be go-around prepared or go-around minded, it is essential that applicable briefings, standard calls, task sharing and cross checking activities are carried out diligently as per the established procedures, during all approaches. This is an important factor as no two approaches are the same in terms of executing the published approach and go-around procedures, as well as the potential threats surrounding the airport, the weather, aircraft and the operating crew.

2.2.7.2.5 Go-around maneuvers that were practised in the simulator are normally executed from MDA or Decision Altitude (DA), while on line flying, this could be done from a range of approach altitudes until touchdown. While some manufacturer‟s SOPs incorporate the distinction between a discontinued approach and a go-around based on the altitude of the aircraft (above or below the MCP/FCU altitude), there is not much emphasis given to performing a go-around from below MDA or DA.

2.2.7.2.6 Boeing B737-800 FCTM outlined the recommended "Landing" call when sufficient visual reference is established or maintained below MDA/H. Typically, this "landing" call is made at about 100 ft AGL by the flight crew.

2.2.7.2.7 Interviews conducted randomly with MAB B737 flight crew and simulator observations on the fleet indicate a possible misconception among some of the flight crew that the "Landing" call is related to commitment or assurance to land, thus potentially influencing their decision not to execute a go-around once the "landing" call is made.

2.2.7.2.8 FCTM recommended callouts are as follows (Refer to Appendix E1):

a. At DA(H) - Suitable visual reference established, i.e. PM calls the visual cues, and the PF calls "CONTINUE".

b. Below DA(H) - Suitable visual reference established, PF calls "LANDING".

2.2.7.2.9 Additionally, the stabilization criteria stipulated in FCTM prescribes the following:

a. At 100 ft HAT for all visual approaches, the airplane should be positioned so the flight deck is within, and tracking to remain within, the lateral confines of the runway edges extended.

b. As the airplane crosses the runway threshold, it should be:

   i. Stabilized on approach airspeed to within + 10 knots until arresting descent rate at flare.

   ii. On a stabilized flight path using normal maneuvering.

   iii. Positioned to make a normal landing in the touchdown zone (the first 3,000 ft or first third of the runway, whichever is less).

   iv. Initiate a go-around if above i, ii or iii criteria cannot be maintained.

2.2.7.2.10 The above FCTM references do not provide any indication that the "landing" call is associated with assurance or commitment to land.

2.2.7.2.11 Hence, the flight crew must be made aware that although the "landing" call is made, due consideration must be given to the unpredictable effect of heavy rain and thunderstorm on the trajectory of aircraft approaching the runway, or any other reason that could prevent a safe landing, and to take appropriate actions that would provide a safe outcome.

2.2.7.2.12 Procedures for go-around after landing gear touchdown is provided in B737-800 FCTM, which may be employed up to the point of reverser deployment. Sufficient care must be taken while performing the rejected landing (wave-off) maneuver in accordance with the stipulated procedures. This includes awareness on the state of automation, increase in pitch due to the application of go-around thrust, or raising the landing gears too early during the initial go-around phase which could result in a belly landing should the aircraft climb performance becomes degraded due to changes in the environmental factors (wind-shear or microburst).

2.2.8 Windshield wipers and hydrophobic coating. Although the wipers were operating at HIGH speed, the visibility as reported by the crew had rapidly reduced during the heavy downpour. This demonstrates that even though the wipers are at HIGH setting and with hydrophobic coating on the windscreen, flight crew must be aware of the possibility of rapid reduction in visibility due to a sudden increase in rain intensity.

2.2.9 Increased workload during the critical phase of flight prior to landing

2.2.9.1 On the approach below 300 ft RA, the vertical descent rate had gradually decereased from 800 fpm to 550 fpm for approximately 12 seconds. This has caused the flight path to be slightly higher than normal profile. The FDR recorded glide path deviation of -1 (1 dot high) at 200 ft RA and -1.5 units (1.5 dots high) at 100 ft RA. This is consistent with the callout made by the PM at 180 ft RA based on the PAPI indication which showed 3 white lights and 1 red, instead of 2 white and 2 red to indicate correct profile.

2.2.9.2 Following the callout by the PM, the PF took immediate action to correct the profile by increasing the descent rate up to 920 fpm. The company stabilized approach criteria allows for vertical descent rate of up to 1,000 fpm to satisfy the stabilization criteria. In order to remain within the criteria, the PF needed to ensure that no excessive correction was taken on the descent rate. These additional actions and monitoring would likely have increased the crew workload when approaching the runway in heavy rain, thus further increasing the demand on the performance of PF to ensure safe landing under challenging environmental conditions.

2.2.9.3 Despite the increased demand on PF"s performance, the aircraft crossed the runway threshold (at 42 ft RA) on centerline until approximately 20 ft RA. This would suggest that the higher workload did not cause the crew to loose focus on maintaining appropriate lateral control of the aircraft as they approached the runway.

2.2.10 PM assertiveness level and standard calls

2.2.10.1 The PM made several calls to alert the PF of the impending risks of runway excursion. The calls were "slightly to the left sir" followed by "slightly to the right sir" when the aircraft was below 8 ft RA. Two seconds later, the PM announced "go around sir, go around sir". However, the aircraft had already landed and departed the runway surface by this time.

2.2.10.2 These calls were perceived to be less assertive and inaudible given the noisy environment prevalent in the flight deck at the time. The PF, during the interview, had confirmed that he did not hear the PM announcing the deviation from centerline, but did hear him say “go around sir” twice.

2.2.10.3 Additionally, the use of non-standard calls and the length of the callout were found inappropriate. The PM, in his initial callout, mistakenly announced the direction to the deviation in relation to the runway centerline, i.e. he announced left when the aircraft was actually on the right of centerline. The deviation callout should have been short, precise and clearly audible to get the attention of the PF to the impending issue, considering the criticality of the situation and the limited time available to correct the situation.

2.2.11 Appropriate use of automation

2.2.11.1The PF mentioned during the interview that following the callout by the PM of the go-around call, the PF did attempt to press TOGA switch. However, according to him, there was no response from the automation.

2.2.11.2 The FDR data was reviewed and found that the PF did not press the TOGA switch until after the aircraft came to a stop on the soft ground. The auto throttle was disconnected during the approach at about 700 ft, followed by the autopilot disconnect for a manual approach and landing on Runway 13. In this configuration, even if the TOGA switch is pressed, the automation will only provide Flight Director guidance, without an automatic increase in thrust (as it would if the auto throttle was engaged or in armed mode). In this case, the PF would need to manually push the throttles to increase and perform the Flight Director guided go-around maneuver. Refer to Appendix H.

2.2.11.3 Additionally, it was observed that the go around from the first approach was initiated with the autopilot and auto throttle still engaged. Hence, automatic thrust increment was provided upon activation of TOGA.

2.2.11.4 On the second approach, the PF claims that he intended to go-around following the deviation alert but he did not push the throttle up manually. The investigation team believes that the PF might have been confused with the level of automation available at the time (given the circumstances), or was over reliant on automation to execute the required task.

2.2.12 Evacuation procedure issues

2.2.12.1 After the unexpected departure from the paved surface of the runway, the aircraft travelled approximately 480 m in the south easterly direction parallel to the runway before coming to a stop. The nose gear collapsed just before the final stop diagonally over the runway edge to the right hand side.

2.2.12.2 The captain shut both the engines down in anticipation of possible evacuation, which resulted in the total loss of electrical and hydraulic power to the aircraft. The co-pilot then carried out what appeared to be tasks related to after landing procedure, which included raising the flap lever to up, starting APU, switching off electrical hydraulic pumps, fuel pumps and packs, among others. During this time, the In-Charge Crew (ICC) walked into the cockpit as the cockpit door was no longer in locked position due to loss of electrical power.

2.2.12.3 Short discussion on the position of the aircraft transpired between the co-pilot and the ICC. Upon confirmation from the pilots that the aircraft was off the runway surface, the ICC queried if an evacuation was necessary. The captain responded that an evacuation will be carried out once the flight crew compledted the required checklist. The Captain then initiated the evacuation checklist, which was completed in part as the flaps and outflow valve could not be moved or verified to be in the intended position as the electrical power was no longer available. Subsequently, the Captain confirmed with the ICC that an evacuation using the slides was necessary.

2.2.12.4 Inspection of the flight deck panels during the investigation found that certain switches and flight controls were not in the correct positions as required by the evacuation checklist. This includes the Engine 1 and 2 Fire handles which were not pulled, outflow valve position which was still closed, and the flap handle and flap surfaces were not at full extended position.

2.2.12.5 Based on the CVR, startle factors and moments of confusion were evident immediately following the incident, which caused the crew to carry out the "after landing procedures" instinctively, and not completing the evacuation checklist accurately.

2.2.12.6 The evacuation process was initiated 4 minutes after the aircraft came to a stop. While the time that was taken to initiate an evacuation might be viewed as considerably long, the flight crew mentioned that they had assessed the situation adequately and determined that there was no urgency to evacuate immediately as there was no sign of fire or any imminent danger to the aircraft and its occupants. The flight crew took longer time to overcome the initial state of shock and to regain their composure.

2.2.12.7 Upon receiving the evacuation command from the captain over the PA, the forward Door 1 Left (L) and Door 1 Right (R) were opened by the ICC and the flight stewardess assigned to the respective doors. They then shouted the evacuation command for the passengers to release their seat belts, remove high heels shoes and to proceed towards the front doors for evacuation, without their cabin bags.

2.2.12.8 Prior to the evacuation command, the flight steward at Door 2 R moved towards to the mid cabin and positioned himself behind the divider between the business and economy class. According to the steward, he wanted to calm and reassure the passengers who were mostly seated towards the forward part of the aircraft in the economy section. There were no passengers in the aft section of the aircraft. Crew at Door 2 L remained at the assigned location.

2.2.12.9 Upon receiving the evacuation order, the cabin crew assisted all 63 passengers which included 2 infants and 4 adults with reduced mobility to safely evacuate from the aircraft using the 2 forward doors within 90 seconds.

2.2.12.10 During the interview, the cabin crew were asked as to why the aft evacuation slides were not deployed. The reasons provided were:

a. The crew at Door 2 R left his assigned position and proceeded to mid cabin.

b. Door 2 L crew mentioned that upon hearing the evacuation order from the forward crew, he proceeded to assess the condition outside of the Door 2 L areas through the door viewer. He stated that he could not view and assess the condition outside of the door as it was dark and raining heavily. Hence he decided not to open Door 2 L.

2.2.12.11 Additionally, the aft cabin crew also mentioned during the interview that:

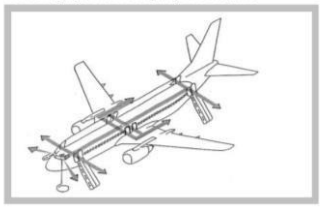
a. There were only less than half the number of passengers (63 passengers) from the full capacity of the aircraft (160 seats) and most of them were already seated in the forward part of the aircraft before the evacuation started.

b. There was no sign of fire or smoke evident from inside the cabin at that time. This had further supported their decision not to use the aft doors to evacuate as there was no urgency perceived to evacuate more expeditiously.

2.2.12.12 No instruction was given by the captain on the choice of door to be used for the evacuation.

2.2.12.13 Nevertheless, the procedures for evacuation following a crash land required evacuation from all primary 4 main doors (Door 1 L, Door 1 R, Door Door 2 L and Door 2 R). The over-wing window emergency exits were supposed to be opened by the passengers seated near the over-wing exits, as shown in the diagram below.

EVACUATION ROUTE (in any gear landing gear collapse scenario).



Source: B737-800 SEP Manual (Issue 1, Revision 1 dated 01 July 2016)

Figure 20: SEP on Evacuation Using All Available Exits

2.2.12.14 The evacuation process using only the 2 forward doors was completed in a timely manner due to the swift action by the cabin crew and relatively lesser number of passengers in the cabin.

2.2.12.15 However, the intention of the cabin crew to evacuate from forward doors could have been hampered if one or both of the forward doors were jammed or unable to be opened for reasons such as unsafe conditions in the area outside of the door, slide pack malfunctioned, and others. In this case, the crew would now have to redirect all the passengers to evacuate from the aft section or through the over-wing emergency exits. While there were 3 crew in the forward and mid-section of the aircraft, only 1 crew was at the aft section at the time to manage at least the initial part of the evacuation from the aft cabin doors. This could likely further delay the evacuation process.

2.2.12.16 The cabin crew also reported that four AFRS personnel climbed up the slide while the crew were still on board the aircraft. All passengers had evacuated by this time.
2.2.12.17 According to the crew, the rain was getting heavier during the evacuation. Passengers were subsequently led by the crew and AFRS personnel to the fire station. Head count was performed at the fire station and all passengers were accounted for. In addition, no injuries were reported.

2.2.12.18 Some of the passengers were transported to the terminal building using vehicles that were provided by airport authorities, MAB engineering and other agencies within the airport. Nevertheless, most of the passengers also walked to the terminal building.

2.2.12.19 There were issues relating to the adequacy of vehicles to transport passengers from the fire station to the terminal building. According to the Sibu Airport Emergency Manual, the responsibility to provide transportation to the passengers following the evacuation and other specific passenger concerns rests with the air operator.

2.2.12.20 However, during the discussion with the relevant agencies at Sibu Airport, it was concluded that, it is not possible to rely on the air operator that was involved to facilitate transportation only by themselves for all passengers and crew that were involved in the incident or accident. Instead, it should be a concerted effort by all agencies within the airport to ensure the expeditious handling of the situation in the interest of safety and wellbeing of the persons that are involved.

2.2.13 Absence of centerline lights at airports that have higher exposure to inclement weather conditions

2.2.13.1 Sibu Runway is not equipped with runway centerline lights. The lack of runway centerline lights is common among the domestic stations in Malaysia, including international airport such as Kuching International Airport.

2.2.13.2 Although runway centerline lights is not a requirement as per ICAO Annex 14 Aerodromes Standards for Category 1 Airport, the availability of the runway centerline lights is certainly beneficial when operating in marginal visibility in heavy rain, mist, fog or haze (all of which are common types of precipitation in this region), especially at night.

2.2.13.3 Airports that have higher exposure to inclement weather conditions, based on the meteorological and risk factor studies of the regional weather phenomenon, should be given highest consideration to the installation of centerline lighting.

2.2.13.4 Additionally, the "black hole effect" is also prominent when approaching Sibu Airport at night due to lack of other lightings surrounding the airport. Only lighting visible are the approach lights, runway edge lights and PAPI that are brightly lit.

The "black hole effect" is a visual illusion that poses an inherent risk during night visual approaches. Black hole conditions exist on dark moonless or overcast nights, over water or over dark featureless terrain where the only visual stimuli are the lights on and/or near the airport.

Source: Flight Safety Fondation: Flight Safety Digest, August – November 2000.

2.2.13.5 The consequence of flying a black hole approach includes landing short of the runway and inadvertent aircraft roll due to the absence of horizon or any other features available as visual reference.

2.2.14 Airworthiness state of aircraft. There was no evidence to suggest that a malfunction of the aircraft system had caused the aircraft to deviate from the intended track on the runway resulting in runway excursion. Aircraft maintenance record showed a defect in the antiskid system was recorded on 02 April 2017. The defect was subsequently rectified on 03 April 2017.

2.2.15 Possibility of aquaplaning due to standing water around the undulated portion of Runway 13

2.2.15.1 Sibu Runway profile measurement provided by MAHB was captured and analyzed. It shows that the runway has a downward slope of approximately 0.43 % from the beginning of Threshold Runway 13 until approximately 400 m, and followed by an upslope of approximately 0.58 % until the end of runway. This undulating segment, which is close to the touchdown zone of Runway 13 has the potential to have standing water during periods of continuous heavy rain (Refer Appendix I Part 1). Note: The slope ratio of Runway 13 is within the limits of ICAO Annex 14, paragraph 3.1.13 and 3.1.14 (Refer Appendix I Part 2).

2.2.15.2 Sibu Airport authority conducts runway inspections 3 times daily. It encompasses inspections on the overall runway and taxiway surface conditions, lightings, Foreign Object Debris (FOD), and other related areas, including examination of the presence of standing water on the runway. (Refer Appendix J and Appendix K)

2.2.15.3 There was no clear evidence to suggest possible occurrence of aquaplaning following landing of the incident aircraft. This is further supported by the absence of flat spot on any of the 4 main wheel tyres inspected post incident, or any skid marks on the runway. This eliminates aquaplaning as a contributory factor to this incident.

2.2.16 Training and effective application of RVR equipment

2.2.16.1 Training on the operational use of the wind/runway visual range (WRVR) equipment, which comprises of wind and RVR readouts, was provided to Meteorology Department and ATC personnel at Sibu Airport by the system provider when it was installed in 2010. The syllabus consists of basic system description, instructions on how to interpret the displayed data, and the information to be transmitted to the pilots pertaining to the current visibility, including any significant changes in the visibility or RVR.

2.2.16.2 ATC controller did not consistently provide information on the precipitation levels and tower observed visibility to the pilots prior to or during the approach, apart from the RVR readings.

2.2.16.3 Between the time the last RVR readout that was given to the pilot at 2211:18 LT (before commencing the approach) and the time aircraft touched down at 2217:02 LT, there was a significant reduction in the recorded RVR reading from 1,200 m to 600 m (Refer to Appendix P).

2.2.16.4 At 2214:23 LT, ATC issued landing clearance with information on wind and runway surface condition. There was no mention of the changes in the RVR or rain intensity by the ATC throughout the approach which was almost 6 minutes in duration.

2.2.16.5 The ATC controller was able to monitor the changes to the RVR from the display unit, while the intensity of the precipitation was assessed by visual observation.

2.2.16.6 The ICAO Document 4444 Air Traffic Management outlines the following with regards to reporting visibility and RVR values to the pilot on approach to land.

During final approach, the following information shall be transmitted without delay: *Changes in observed RVR value(s), in accordance with the reported scale in use, or change in the visibility representative of the direction of approach and landing* *Source: ICAO Doc 4444, Air Traffic Management Part 6.6.5 (e)*

2.2.16.7 The investigation team noted that providing a single RVR readout to the pilots, without information on the type of precipitation or tower observation of the current visibility may not be sufficient to create the full picture of the actual environmental condition prevailing and the severity of the weather during the approach and landing. This is particularly true as the transmissiometer provides a localized horizontal information limited to the specific range around the unit located near runway thresholds.

2.2.17 Preservation of evidence following an incident or accident

2..2.17.1 During the incident, the aircraft right wheel came into contact with the 12th Runway edge light (counting from beginning of Threshold Runway 13) on the right hand side. The top outer case (Transparent portion) of the runway edge light was broken as a result.

2.2.17.2 Upon arrival of the investigation team at the site, it was discovered that damaged runway edge light was repaired and replaced by MASB personnel.

ICAO Annex 13 Part 3.3 and 3.4 state the following:

Part 3.3 ***The State of Occurrence shall take all reasonable measures to protect the evidence and to maintain safe custody of the aircraft and its contents for such a period as may be necessary for the purpose of an investigation. Protection of evidence shall include preservation, by photography or other means, of any evidence which might be removed, effaced, lost or destroyed***
Part 3.4 ***If a request is received from the State of Registry, the State of the Operator, the State of Design or the State of Manufacture that the aircraft, its contents and any other evidence remain undisturbed pending inspection by an accredited representative of the requesting State, the State of Occurrence shall take all necessary steps to comply with such request, so far as this is reasonably practicable and compatible with the proper conduct of the investigation; provided that the aircraft may be moved to the extent necessary to extricate persons, animals, mail and valuables, to prevent destruction by fire or other causes, or to eliminate any danger or obstruction to air navigation, to other transport or to the public, and provided that it does not result in undue delay in returning the aircraft to service where this is practicable.***
Sources: ICAO Annex 13, Eleventh Edition, July 2016.

2.2.17.3 Regulation on protecting occurrence sites and preserving evidence was developed to ensure that all evidences and clues are preserved, photographed and documented to assist in determining what happened.

2.2.17.4 In this respect, photograph of the broken runway edge light was taken prior to executing the repairs and replacement work of the runway edge light (Refer Appendix Q). However, it was noted that as there was no urgency in getting the light repaired, due to the closure of the airport following the incident, any actions to repair or replace damaged items resulting from the incident would need authorization from the investigating authority. Hence, the requirement of the Annex 13 with regards to preservation of evidence was only partially met.

2.2.18 Recommendations from the previous Runway Friction Test conducted was not fully implemented.

2.2.18.1 Runway Friction Test that was conducted on 28 August 2016 produced a recommendation to the airport authority with regards to removal of rubber deposit as per the maintenance scheduled that was established for Sibu Airport. It was mentioned during the interview with officials from MASB that the schedule for the rubber deposit from Sibu Runway was at least once a year or as required based on the test results. However, the records produced by MASB show that the last rubber deposit removal was made on 24 May 2015. The runway friction test conducted on 28 August 2016 showed a result above the maintenance planning level (0.67μ vs 0.53μ). Hence, there is no requirement to comply with the rubber removal recommendation (Refer Appendix M).

2.2.18.2 Nonetheless, in order to ensure that the runway centerline markings are not obscured by the rubber deposits, MASB runs a scheduled maintenance program to paint the runway centerline markings on a monthly basis in ensuring that they are sufficiently discernible to the pilots during all conditions. (Refer Appendix O)

2.2.19 Evacuation and rescue procedures by AFRS personnel

2.2.19.1 It was recorded in the safety reports that were raised by cabin crew that AFRS officers climbed into the aircraft using the slide while the crew were still onboard. This was verified through CVR recording where AFRS officers were heard communicating with the crew in the aircraft cabin, asking about the battery switches. All passengers were said to have disembarked by this time.

2.2.19.2 Procedures on Evacuation and Rescue that was established for AFRS states the following:

AFRS personnel shall not obstruct the evacuation flow of uninjured passengers and shall only provide assistance when required. *Source: AFRS Strategies & Tactics at Aircraft Emergencies manual dated 1st June 2012*

However, in this incident, there was no obstruction to the passenger evacuation flow, in accordance with AFRS strategies and tactics for handling of aircraft emergencies.

2.2.19.3 The report submitted by AFRS with regards to the incident stated that two of its officers climbed back into the aircraft together with the captain and copilot via the slide, after the evacuation procedure was completed, to ensure that the battery and navigation aid system were turned off. These were done after ensuring that there was no threat of fire or other dangers related to the aircraft following the incident.

2.2.20 Sibu Hospital procedures

2.2.20.1 Blood, alcohol and breathalyzer tests become less effective over time as the alcohol content in the blood stream reduces with the passing of time. Hence, it is important that the alcohol and drug test on the persons that are involved in an incident and accident are done as soon as possible to eliminate use of alcohol and/or drug as one of the potential factors that may have contributed to the occurrence.

2.2.20.2 In this incident, although the flight crew were required to perform the drug and alcohol test, the physician at Sibu Hospital did not allow the test to be conducted without a police report on the incident. The flight crew were denied the test even though they had voluntarily consented to the test. While this maybe the hospital‟s requirement, having to make and produce a police report at the hospital would likely delay the critical task of conducting required tests. This would be further hampered at locations where the police stations are not co-located within the hospital premises.

2.2.20.3 Additionally, it must be stressed that the procedures to perform the required medical checkup, specifically on drug and alcohol test, must be clearly documented in the appropriate airline manuals and are carried out accordingly.

2.2.21 **Disabled aircraft removal**

2.2.21.1 MASB has the Airport Disabled Aircraft Removal Plan (ADARP). According to Appendix S of the ADARP, the time that is required for the deployment of manpower and mobilization of equipment is 12.5 hours and 16.5 hours respectively.

2.2.21.2 By comparison, MAB took a total of 16 hours to position both manpower and equipment to Sibu Airport following the incident.

2.2.21.3 However, the recovery process took a total of 6 hours (completed at 21:00 LT) and Sibu Airport restoration inclusive of inspection took 12 hours (completed at 09:00 LT the following morning) following the aircraft recovery.

CONCLUSION

3.1 FINDINGS

3.1.1 The flight crew were licensed and qualified for the flight in accordance with applicable regulations.

3.1.2 The flight crew held valid medical certificates and were medically fit to operate the flight.

3.1.3 The flight crew were provided with adequate rest and their flight duty times were in compliance with the Flight Time Limitation Scheme that was established by MAB and approved by DCAM.

3.1.4 The aircraft was properly certificated, equipped and maintained in accordance with the applicable regulations and MAB‟s requirements.

3.1.5 The weather information extracted by the flight crew from ATIS was not current. ATIS was broadcasting weather reports that were outdated by more than 1 hour.

3.1.6 Although the ATC controller was providing RVR readouts and precipitation information to the pilots, the information that were provided were not consistent with the weather changes. Hence, the pilots were not fully aware of the rapidly changing weather condition in the area of the runway.

3.1.7 Despite the deteriorating weather conditions reported by ATC Sibu, flight crew decided to continue the descent and approach without performing a proper risk assessment to determine the potential threats associated with the moderate to heavy rain. The crew appeared to be concerned over the required visibility to conduct the approach rather than the multiple risks of making an approach and landing in the face of heavy rain or thunderstorm.

3.1.8 While descending below 100 ft AGL, the intensity of the precipitation had increased rapidly such that the PF had reduced visual reference to detect the lateral movement of the aircraft over the runway to prevent the runway excursion.

3.1.9 The absence of centerline lights on the runway made it difficult for the PF to verify his position in relation to the runway given the unfavorable weather conditions and reduced visibility.

3.1.10 Usage of non-standard phraseology to communicate current weather and weather trend information by ATC controller to the pilots, ie. the phrase "OFF and ON" were used by ATC to indicate the current rain conditions. These did not provide the clear description of the prevailing weather condition, or the trend information. The reduction in visibility information should be given alongside the type of precipitation, and its intensity, to assist the pilots in making appropriate decisions to commence or continue the approach.

3.1.11 The aircraft crossed the runway threshold at 42 ft and was on the centerline. Subsequently the PF induced a progressive right bank below 20 ft RA during the flare maneuver. This was done to achieve upwind wheel touch down, often associated with crosswind landing. However, in this incident, there was no appreciable crosswind component that was evident from FDR to warrant large input on the control wheel. The PF‟s induced oscillation led to the aircraft being in a right bank, and as the aircraft was in a flare, the time that was taken to touchdown resulted in a slow drift to the right.

3.1.12 Following the main gear touchdown, the aircraft pitch attitude was held consistently high, and increased slightly up to 6^{o} before the nose gear contacted the ground (4 seconds after the left main gear touched down).

3.1.13 The PM called out the deviation from the centerline after realizing the aircraft was drifting toward the runway edge. However, the call was in error in terms of the direction of deviation and was also too lengthy. This could have misled the PF in performing the corrective action required. Nevertheless, the PF could not hear the PM‟s erroneous call and therefore he did not respond to it.

3.1.14 The PF did not take immediate action to regain the runway as he was unaware of the significant deviation from centerline due to the reduced visibility. The aircraft departed the runway surface in a matter of seconds from touchdown, which did not give much time for the PF to recognize and react accordingly to maintain the aircraft on the runway.

3.1.15 The PF did not execute a go-around or wave off as he was likely startled by the sudden reduction in visibility close to the ground, hence, continued with the landing, despite the large deviation from centerline (which he may not have been completely aware of). In addition, the possibility of performing a go-around in the event of failure to maintain runway centerline was not anticipated or discussed.

3.1.16 The PF mentioned during the interview that he intended and did press the TOGA switch after being alerted by the PM to go-around. However, he indicated that there was no response from the auto throttle system. Nevertheless, the FDR data shows that the TOGA switch was only pressed after the aircraft came to a stop.

3.1.17 Flight crew underestimated the possibility of losing necessary visual reference while operating in heavy rain, particularly in the absence of runway centerline lights.

3.1.18 Although the undulation at the beginning of Runway 13 could cause standing water to accumulate during heavy downpour, there was no sign of aquaplaning in this incident. This is based on the following:

3.1.18.1 The tyre tracks found on the runway show no signs of skidding from the point of contact on the runway until vacating the paved surface.

3.1.18.2 There were no flat spots evident on any of the four main wheel tyres.

3.2 OTHER FINDINGS

3.2.1 The Sibu Airport Authority did not seek authorization from the investigating authority prior to repair and replacement of the damaged runway edge lighting.
3.2.2 ADARP was activated immediately by Sibu Airport Authority following the incident. The deployment of the manpower and equipment from KUL to SBW, the removal of disabled aircraft and the final restoration of Sibu Airport was completed within the planned time (Refer to Appendix S).

3.2.3 Sibu Hospital did not facilitate the drug and alcohol test for flight crew following the incident, without any accompanying police report. Therefore, these tests were not performed on the flight crew.

3.3 CAUSAL FACTORS

3.3.1 A sudden increase in the intensity of rain while approaching the runway at night resulted in the significant reduction of the PF‟s visual reference. Under these conditions and without the runway centerline lights, the PF did not detect the lateral movement of the aircraft in time to correct the displacement from the runway centerline.

3.3.2 Pilot induced oscillation resulting in the progressive input of roll angle to the right of up to 6 degrees during flare maneuver without any considerable left rudder input. This resulted in a drift in the aircraft heading towards the right side of the runway. The resultant drift angle recorded on touchdown was 4 degrees (Runway heading is 129^{o} while the touch down heading was 133^{o}).

3.3.3 The PF had likely lost his positional awareness with reference to the runway edge due to the degraded visibility, hence, did not exert sufficient and timely rudder application to regain the runway centerline before departing the surface of the runway.

3.4 CONTRIBUTORY FACTORS

3.4.1 Continuous rain with changing intensity over the airfield throughout the approach and landing.

3.4.2 Inadequate risk assessment on the prevailing weather conditions made by the flight crew through the established TEM briefing as stipulated in the MAB OM (A).

3.4.3 The elevated pitch attitude after touchdown may have caused the reduction of visual reference to the runway. This would reduce the effectiveness of braking and cornering ability of the aircraft due to reduced weight on the main landing gear.

3.4.4 Lack of assertiveness by the PM in getting the attention of the PF to the developing and impending deviation from centerline. Currently, there is no standard callout stipulated in the MAB OM (A) with reference to the calling out of centerline deviation.

3.4.5 Absence of centerline lights at night in the reduced visibility conditions due to the heavy rain made it difficult for the PF to acquire the required visual reference to conduct a safe landing and roll out.

3.4.6 The "Black hole effect" is prevalent during night approaches into Sibu due to the lack of lightings and visual reference surrounding the airport. This could result in an optical illusion leading towards a false pitch or bank perception, especially during approaches with reduced visibility such as in heavy rain or fog.

3.4.7 Rubber deposit on the runway could have caused the runway centerline markings to become less discernable, especially when the runway surface was wet and in reduced visibility condition.

3.4.8 Inadequate updates of weather reports that were provided by the ATC controller to the pilots as and when considerable changes to the weather conditions over the airfield were observed.

3.4.9 Use of single RVR readout as means of reporting the visibility in heavy rain or thunderstorm at night did not alert the pilots on the severity of precipitation at the airport. The transmissiometer only measures the horizontal visibility at a specific range around the unit located near runway thresholds.

4. SAFETY RECOMMENDATIONS

4.1 DCA is to ensure MAB

4.1.1 To ensure flight crew that were involved are coached:

4.1.1.1 In the use their best judgment, knowledge and experience in identifying and managing potential risks relating to takeoff, approach and landing in heavy rain and thunderstorm.

4.1.1.2 On the proper execution of crosswind landing technique, in accordance with the procedures outlined in the Boeing B737-800 FCTM including go-around and wave-off practices both in manual and autopilot mode as applicable.

4.1.1.3 To understand the difference between the execution of an automated and the manual go-around in terms of availability of the auto throttle function to assist the management of thrust. In this respect, flight crew"s overreliance of automation should be addressed accordingly.

4.1.1.4 To emphasize the FCTM recommendation relevant to flare maneuver and landing roll procedures as follows:

4.1.1.4.1 Fly the nose wheels smoothly onto the runway without delay.

4.1.1.4.2 Not to attempt to hold nose wheels off the runway. Holding the nose up after touchdown for aerodynamic braking is not an effective braking technique and results in high nose gear sink rates upon brake application..

4..1.1.4.3 To avoid the risk of a tail strike, do not allow the pitch attitude to increase after touchdown.

4.1.1.5 In CRM with specific emphasis on the effective employment of TEM principals during pre-departure and arrival briefings. Elements relating to situational awareness, critical thinking, decision making and communication should be included in the training program. The communication module should highlight the need to be assertive and to voice out clearly of any developing or impending safety deficiencies that require immediate action by the PF.

4.1.2 Use of the RVR as a measure of visibility during heavy rain or thunderstorm should be carefully evaluated. By comparison to static precipitation such as mist, fog or smog, lower RVR reading in moderate rain, heavy rain or thunderstorm more often indicates potential risks of encountering wind shear, microburst, turbulence, or slippery and contaminated runway. Therefore, flight crew should exercise extreme caution when operating in the reduced RVR even though the RVR reading is above the minimum published for the approach type.

4.1.3 MAB is to examine the need to provide guidance material to all flight crew with regards to the appropriate use of the RVR during takeoff and approaches in heavy rain and thunderstorm, particularly in airports that do not have runway centerline lights. Information that is provided should include guidance or direction to the pilots regarding the lowest usable RVR reading relative to the charted (LIDO) RVR/CMV.

4.1.4 The importance of the TEM briefing should be further emphasized to ensure that all flight crew conduct thorough evaluation of the potential risks and hazards that are associated with the current flight. Having identified the applicable risks, flight crew should discuss their expectations and develop a shared mental model of the situation at hand, including any required mitigation to properly and proactively address the threats that are identified. Reference should be made to MAB OM (A).

4.1.5 Similar CRM training as per reference in MAB OM (A) should be extended fleet-wide during flight crew competency checks, as well as during the Command Development Course, simulator training and Initial Operating Experience (IOE).

4.1.6 Having an enhanced knowledge of the local weather phenomenon would be beneficial in ensuring the safe aircraft operation in the dynamic and often challenging meteorological conditions. MAB is to identify and provide information to flight crew with regards to local weather phenomenon and other potential risks that are specific to selected airports through the MAB OM (C) or other suitable means.

4.1.7 Flight crew training program should be expanded to include decision and execution of go-around maneuvers below the MDA or close to the runway that are potentially caused by:

4.1.7.1 Loss of sufficient visual reference.
4.1.7.2 Aircraft is no longer assured of landing within the confines of the runway.

4.1.7.3 Runway becomes unusable due to presence of obstacles or other foreign objects.
4.1.7.4 Loss of required runway lightings.
4.1.7.5 Unstable approaches.
4.1.7.6 Any other reasons that are deemed necessary.

4.1.8 This recommendation is to be used in conjunction with MAB OM (A) which states that the landing may be completed provided that the required visual reference is established at the MDA/H and is maintained until landing.

4.1.9 To ensure clarity, MAB is to consider including in OM (A) on the requirement to perform a go-around in the event that visual reference becomes insufficient (or other reasons as stipulated above) following decision to continue approach below the MDA/H during precision and non-precision approaches.

4.1.10 Standard callouts are designed to alert the other pilot of any deviations from normal parameters should be short and precise. This is to address the issue immediately, without creating any doubts or uncertainty to the person executing the corrective action. It is especially true when the situation warrants immediate corrective action.

4.1.11 Similar to deviation from localizer track which is alerted by the call "localizer" without stating the direction of deviation, the drift from runway centerline should be highlighted with a single word "centerline" to save time and avoid ambiguity. MAB is to ensure the inclusion of standard callout intended to highlight identified deviations from the required lateral trajectory during flare and landing maneuvers.

4.1.12 MAB is to cascade to all flight crew highlighting the runway excursion incident and the lessons learned for the benefit of all pilots and the organization.

4.1.13 MAB is to ensure that all cabin crew are briefed on the requirement to deploy all escape slides for the evacuation on the ground, regardless of the number of passengers or their seating locations in the cabin. This is in accordance with the established SEP.

4.2 DCA to ensure MAHB

4.2.1 To comply with the ICAO Annex 13 Part 3.4 requirement on preservation of evidence with regards to repair and replacement of the damaged runway edge light.

4.2.2 To collaborate with all relevant agencies within the airport in order to facilitate the effective post evacuation procedures, which includes transportation for all passengers and crew that are involved in the incident or accident. There should be a concerted effort by all agencies to ensure the expeditious handling of the situation in the interest of safety and wellbeing of the persons that are involved.

4.3 DCA Sibu

4.3.1 The ATC controller should provide information on changes in weather conditions as they occur, either by updating ATIS information or through radio communication. This is to enable pilots to evaluate the situation and make necessary preparation for landing, hold or divert to a more suitable airport.

4.3.2 The weather information in ATIS should be updated on a more frequent basis, i.e every half hour instead of hourly. Any SPECI information that is issued by the meteorological department must be transmitted to the pilot via ATIS and/or by the ATC controller as a broadcast message.

4.3.3 ATC controllers are to refrain from using non-standard phraseology in providing weather information.

4.4 **DCAM**

4.4.1 To examine the need to establish an agreement or understanding between the Ministry of Transport and Ministry of Health to facilitate the drug, alcohol, blood and other necessary tests by either hospitals or medical facilities, if such request is made by air operator‟s officials following an air incident or accident.

4.4.2 To consider installation of the runway centerline lights at Sibu Airport and other airports that are frequently exposed to risk of adverse weather conditions.

APPENDIX LIST

A. Approach Chart for Sibu Runway 13 ILS.

B. Sequence of Events as per FDR Readout.

C. B737-800 9M-MXX Survey Report.

D. FDR Plot of 9M-MXX.

E. Highlights Based on FDR and CVR Data.

F. AFRS Incident Report.

G. Site Survey Illustration Runway 13 Sibu.

H. B737-800 Autopilot and Autothrottle Control.

I. Runway Profile.

J. Aerodrome Inspection Checklist.

K. Sibu Airport Weekly Maintenance Checklist.

L. Events Extracted from CVR in Relation to RVR Captured from Transmissiometer.

M. Runway Friction Test Report 28 August 2016.

N. Paint Removal at Runway Surface & Apron: Work Progress Report 24 May 2015.

O. Records of Painting Work Done for Runway Marking at Sibu 24 April 2015 – 23 May 2017.

P. RVR Readout.

Q. Runway 12th Edge Light that Was Damaged.

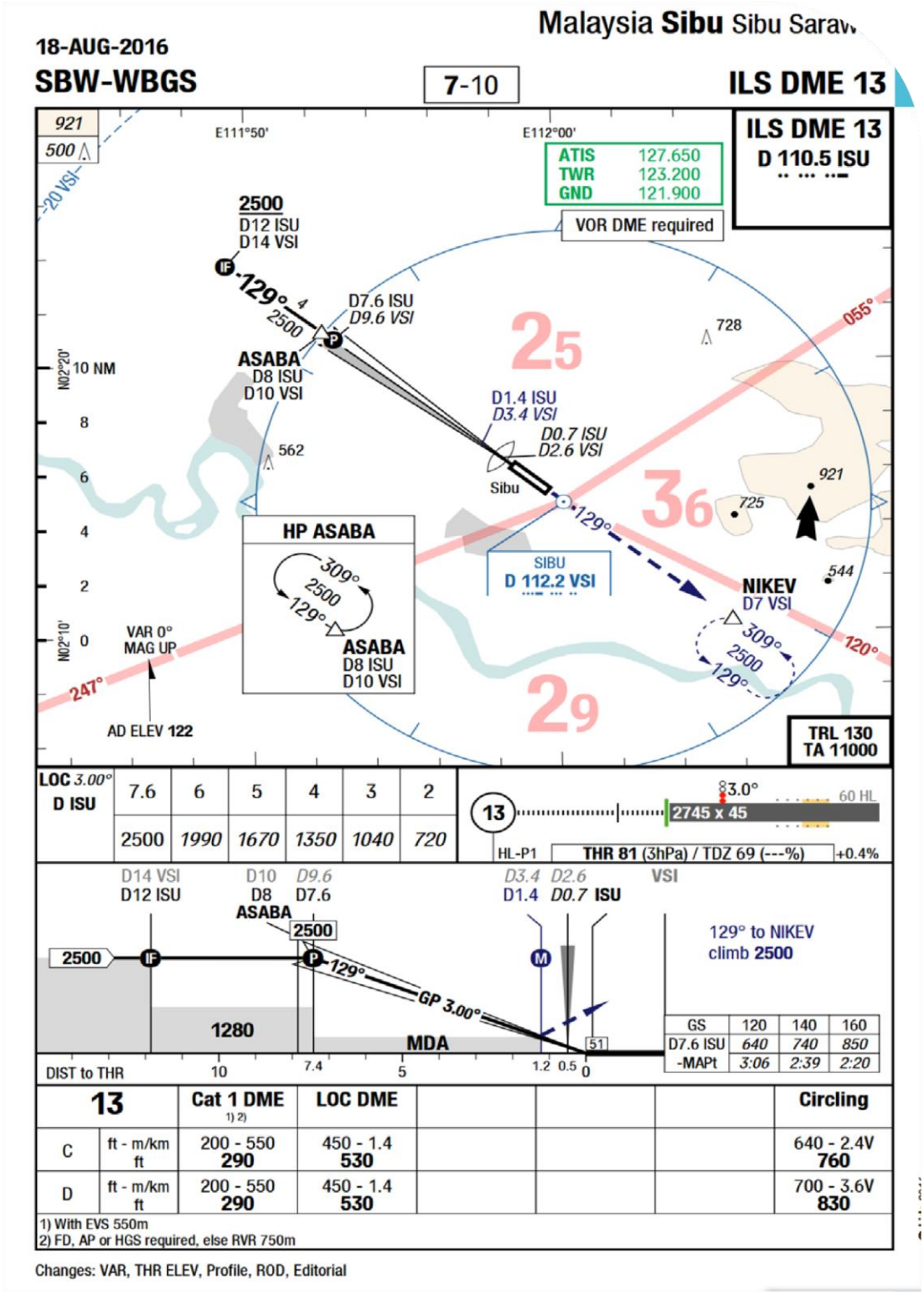
R. Extract of MAB Operations Manual (A).

S. Airport Disabled Aircraft Removal Plan (ADARP).

APPENDIX A

Approach Chart for Sibu Runway 13 ILS

Indicating holding position over waypoint ASABA and the approach profile.



APPPENDIX B

Sequence of Events as per FDR Readout.

Photograph 1: Aircraft appears to be on the centreline when flying over the Threshold Runway 13 at 42ft RA. No deviation was evident at this juncture.

Photograph 2: Aircraft was still seen flying over the centreline of Runway 13 at 30ft RA.

Photograph 3: Aircraft began to drift from centerline below 20ft RA. A slight bank is visible at this point. Heading was 130°.

Photograph 4: More bank was induced by the PF.
Heading was increasing to 131°.

Photograph 5: Bank angle was increasing with aircraft turning towards the right. Heading now is at 132^{o}.

Photograph 6: Aircraft was about to touch down on Runway 13. Bank angle was increasing to 4^{o}.

Photograph 7: First point of touchdown (on Right main wheel) at 540 m from Threshold Runway 13. Aircraft heading was 132°.
Bank angle was approximately 4° with heading 133°.

Photograph 8: Aircraft vacated the runway surface at approximately 780 m from Threshold Runway 13.

Photograph 9: Aircraft was on soft grounds, parallel to the runway.

Photograph 10: Position of aircraft at 10 seconds after touchdown.

Photograph 11: Nose gear collapsed at this point (14 seconds after touchdown).

Photograph 12: Aircraft's final stop, approximately 1,260 m from Threshold Runway 13.

APPENDIX C

B737-800 9M-MXX SURVEY REPORT

	ITEM	A/C SECTION	NOMENCLATURE	LOCATION
1	41 Section	SKIN Panel	BS178 - BS259.5, S24L-S24R	Skin Panel is Bent Upward
2	41 Section	SKIN Panel	BS259.5 - BS360, S24L - S24R	Skin Panel is torn & Bent Upward
3	41 Section	NWW Bear Strap	NWW Surround	Bear Strap is Torn & Bent Upward
4	41 Section	Frame – Outer Chord	BS251.6, LHS	LH Frame Chord is bent just Above Sidewall
5	41 Section	Lower Horizontal Sidewall Chord	NWW Surround Opening, BS224.8 - BS294.5 – LHS	Lower Chord is Torn & Bent Aft of BS251.6
6	41 Section	NLG Door Attach Fittings	Lower NWW Surround Opening - LHS & RHS	Nose Landing Gear Door Attach Fitting are Destroyed (6 locations)
7	41 Section	NLG Door Seal Horizontal Retainers	Lower NWW Surround Opening - LHS & RHS	Lower Sidewall Angles & Seal Retainers are Destroyed at Multiple Locations
8	41 Section	NLG Door Bulb Seals	Lower NWW Surround Opening - LHS & RHS	Nose Landing Gear Door Bulb Seals are Destroyed
9	41 Section	NLG Doors	NWW Area	LH & RH Doors are Destroyed
10	41 Section	NLG Doors – Sequence Rods & Bell Cranks	NWW Area - LHS & RHS	LHS & RHS Door Sequencing Rods & Bell Cranks are Destroyed or Suspect
11	41 Section	NWW Sidewall Bulkhead	NLG Wheel Well - BS224.8 - BS294.5 – LHS	1. Side Wall Panel is Bent in Between BS258 – BS277.
12	41 Section	NLG Trunnion Fitting	NWW Sidewall, BS290 – LHS	1. Side Wall Panel is Bent in Between BS258 – BS277. 2. Nose Landing Gear Door Tub Fitting are Damaged at all. 3. Locations (Ref: 151A7504) 3/Aft Blow Out Doors are Wrinkled on both LH & RH Sides (Ref: 141A7900-4), Ensure Decals are Destroyed.
13	41 Section	NLG Trunnion & Upper Draf Brace Bushings	NWW Sidewall, BS290 – LHS	Busing is Suspect.
14	41 Section	NLG Trunnion Fitting	NWW Sidewall, BS290 – RHS	Forward Edge of Fitting has Scratch.
15	41 Section	NLG Trunnion & Upper Drag Brace Bushings	NWW Sidewall, BS290 – RHS	Bushing is Suspect

16	41 Section	NLG Retract Actuation Support Fitting	NLG Wheel Well Overhead	Support Fitting is Bent
17	41 Section	NWW AFT BULKHEAD	BS294.5	Lower Bulkhead Chords & Web are Bent aft into E/E Bay
18	41 Section	NLG Jury Fittings	Aft Bulkhead, BS294.5	Jury Fittings are Destroyed
19	41 Section	NWW Aft Bulkhead Vertical Stiffeners & Brackets	Aft Bulkhead, BS294.5 – Aft Side	Provide all Stiffeners & Brackets below WL 192
20	41 Section	NWW Aft Bulkhead Horizontal Stiffeners & Brackets	AFT BULKHEAD, BS294.5 - AFT SIDE	Provide all Stiffeners & Brackets below WL 192
21	41 Section	Upper & Lower Drag Brace	Nose Landing Gear	
22	41 Section	Actuators & Hoses	NWW Area	
23	41 Section	Downlock Actuator C/T Jury Fittings	NWW Area	
24	41 Section	Uplock Switches	NWW Area	
25	41 Section	Wire Bundles, Conduits & Attach Brackets	NWW Area –Fwd Side	All wire Bundle Conduits & Attach Brackets are Bent & Suspect
26	41 Section	Positioning Switches	NWW Area	
27	41 Section	Steering Cables, Pulley Brackets * Quadrants	NWW Area	
28	41 Section	Hydraulic Tubes	NWW Area	All Hydraulic Tubes are Suspect
29	41 Section	E1 Rack Support Structure	E/E Bay Area	Entire Support Structure including LHS & RHS Stanchions, Attach Brackets, Rails are Destroyed Provide. Provide for all Attach Brackets that tie into RS294-5 Bulkhead
30	41 Section	E1-1 Shelf	E1 Rack	Shelf is Bent & Damaged
31	41 Section	E1-2 Shelf	E1 Rack	Shelf is Bent & Damaged
32	41 Section	E1-3 Shelf	E1 Rack	Shelf is Bent & Damaged
33	41 Section	E-1-4 Shelf	E1 Rack	Shelf is Bent & Damaged
34	41 Section	E1-5 Shelf	E1 Rack	Shelf is Bent & Damaged
35	41 Section	E8-1 Shelf	Upper E1 Rack	Shelf is Bent & Damaged
36	41 Section	E1 Rack Drip Shield & Moisture Drip Shield	E/E Bay Area	Drip Shield (Ref: 284A2809-27) is Cracked
37	41 Section	E1 Rack Cooling	E/E Bay Area	Provide all Plenums & Foam Seals

38	41 Section	E1 Rack Cooling Plenums	E/E Bay Area	All Ducts below S25R Were Damaged
39	41 Section	TCAS Antenna Support Structure	E/E Bay Area, BS305, BLO	
40	41 Section	TCAS Antenna	E/E Bay Area, BS305, BLO	
41	41 Section	TCAS Antenna COAX	E/E Bay Area, BS305, BLO	
42	41 Section	E5 Rack Support Structure	E/E Bay Area – S25R – S27R	D above Frame Include AE0502A Disconnect Panel
43	41 Section	Air Stair Provisions, Intercostal, Brackets & Angles	BS294.5 - BS351.2, S25L - LBL6.74	All Air Stair Provisions are Damaged within area Noted
44	41 Section	Floor Support Structure	E/E Bay Area - BS294.5- BS351	Include Web Locate at BS351
45	41 Section	Floor Panel	E/E Bay Area - BS344 - BS360	Floor Panel 284A6813-12 is Gouged at Forward
46	41 Section	Frame	BS312	Frame is severed between S26L – S26R
47	41 Section	Frame	BS325.3, LHS	Frame is bent up at S26L. Provide all air stair provisions below S25L
48	41 Section	Frame	BS328, RHS	Frame is bent at S25R
49	41 Section	Frame	BS330.62, LHS	Frame is bent at S26L. Provide all air stair provisions below S25L.
50	41 Section	Frame	BS344, LHS	Frame is destroyed below S26L
51	41 Section	Frame	BS344, RHS	Frame is destroyed below S26R
52	41 Section	E/E Bay Opening Frame – Fwd	BS323.7, LBL6.74 - RBL15.47	Entire “picture frame” structure is destroyed
53	41 Section	E/E Bay Opening Side – Frame	BS294.5 - BS360, LBL6.74	Entire “picture frame” structure is destroyed
54	41 Section	E/E Bay Opening Side Frames	BS294.5 - BS360, RBL 15.47	Entire “picture frame” structure is destroyed
55	41 Section	E/E Bay Opening Frame – Aft	BS351.2, LBL6.74 - RBL15.47	Entire “picture frame” structure is destroyed
56	41 Section	E/E Bay Access Door support structure & Tracks	BS323.7 - BS351.20, S25R - S27R	
57	41 Section	J23 Box Housing	BS344-BS351, LHS	Housing is dented
58	41 Section	Stringers	BS259.5 - BS360, S25L - S25R	Provide all stringer between BS294.5 – BS351 & S25L to S25R
59	41 Section	Stringer Clips	BS294.5 - BS360, S25L - S25R	Provide all stringer clips between BS294.5 – BS351 & S25L to S25R
60	41 Section	Shear Ties	BS294.5 - BS360, S25L - S25R	Provide all shear ties between BS294.5BS351 & S25L to S25R
61	41 Section	Floor Stub Beam Intercostal	BS312 - BS328, RBL15.47	Floor stub beam located above E1 rack RHS Stanchion is bent

62	41 Section	Hydraulic Tubes	BS294.5 - BS351, S26L - S26R	All hydraulic tubing and attach hardware provisions have been either destroyed or exposed to FOD
63	41 Section	COAX Wire Bundles	BS294.5 - BS312	COAX Bundles that run with (W5039) have 4 areas with outer jacket damage.
64	41 Section	ATC Antenna	BS355, BL0	Antenna is broken
65	41 Section	Electronic Bay Access Door	BS323.7 - BS351.20, S25R - S27R	
66	43 Section	SKIN Panel	BS360-BS540, S24L-S24R	
67	43 Section	RA ANntenna	BS390S610, BS410, BS430 & BS450	
68	43 Section	VHF Antenna	BS470, LOWER	
69	43 Section	RAM Inlet Doors	BS5001 – LHS	Inlet door surface is pitted.
70	43 Section	RAM Inlet Doors	BS5001 – RHS	Inlet door surface is pitted
71	43 Section	Landing Lights	BS530 – LHS & RHS	Landing lights were turn off
72	43 Section	Drain Mast	BS524 – RHS	
73	Fuselage	Wing to body fairings	Wing Body Join Area	A total of 14 panels' fairings have multiple cracks & deep scratches. These panels have been identified during assessment as AOG bubble items - #42, #28, #29, #30, #19, #21, #19, #14, #12, #6, #7, #5, #1, #2
74	Fuselage	Wing to body fairing	Wing to body join area	Note: In addition, there were 5 panels that had minor damage and should be inspected upon removal. Reference AOG bubble items: #31, #32, #37, #38, #40, #41, #43
75	44 Section	DME Antenna	BS580	Antenna was destroyed
76	44 Section	Marker beacon antenna	BS610	Antenna was destroyed
77	44 Section	DME Antenna	BS640	Antenna was destroyed
78	44 Section	Anti-collision light	BS658	Light assy & structure housing was destroyed
79	46 Section	SKIN PANEL	BS727-BS887, S14L-S24R	Skin panel is pitted & scathed in several locations
80	46 Section	Skin panel	BS727-BS887, S14L-S24R	Skin panel is pitted & scathed in several locations
81	46 Section	Skin panel	BS727-BS887, S14L-S24R	Skin panel is pitted & scathed in several locations
82	46 Section	Aft cargo door	BS807-BS840	Door surface has multiple scratches
83	46 Section	Drain mast	BS727B	Surface is cracked
84	46 Section	VHF Antenna	BS727D, LOWER	Surface is cracked
85	47 Section	Skin panel	BS887-BS1016, S14L-S23L	Skin panel has multiple areas with pitting

86	47 Section	Skin panel	BS887-BS1016, S14R-S23R	Skin panel has multiple areas with pitting
87	47 Section	Drain mast	BS1001	
88	48 Section	APU Inlet air defector	BS1035	Air deflector is gouged on lower forward face
89	Fuselage	Body drains & retainers	BS178 TO BS887	
90	Fuselage	Insulation blankets	BS294.5 – BS360, S21L – S21R	Provide new blankets located within electronic bay area
91	Wing LH	Inboard Krueger Flap – Center tailgate	KRAS90 – KRAS218	Center tailgate is dented
92	Wing LH	Fixed L.E. lower panel	WBL63 -	Panel is dented in multiple locations
93	Wing LH	Landing door assy – Flap track cutout	BS727, BL73	Door assy is suspect (REF. 149A7322) & all attaching hardware
94	Wing LH	Inboard T.E. Flap Seal Cover – WTB	MFSTA63	WTB Seal Blade Fin (REF. 113A2019) is gouged
95	Wing LH	Inboard T.E. Flaps	MFSTA72 – MFSTA166	Upper & lower surfaces of aft & fwd panels are pitted & gouged in multiple areas
96	Wing LH	Outboard T.E. Flaps	WBL202-WBL414	Upper & lower surface of aft & fwd panels are pitted & dented in multiple areas
97	Wing LH	T.E. Flap track fairings #3	WBL160	Aft & Mid canoe fairings are dented & gouged
98	Wing LH	T.E. Flap Track Fairing #2	WBL254	Aft canoe is dented
99	Wing LH	T.E. Flap Track #1	WBL357	Mid canoe is dented & gouged
100	Wing LH	Spoiler #1	LH WING	Upper surface is dented
101	Wing RH	Inboard Krueger Flap Assy	KRAS90 – KRAS218	Inboard K-Flap dented in multiple locations
102	Wing RH	Inboard Tailgate Assy	KRAS90 – KRAS218	Inboard tailgate is dented in multiple locations
103	Wing RH	L.E. Skin panel	KRAS90 – KRAS218	Skin panel is dented in multiple locations
104	Wing RH	Fixed L.E. lower panel	WBL78 – WBL136	Inboard End of Panel (REF. 116A2132) bas pitting in multiple locations
105	Wing RH	L.E. Bleed air duct	WBL166	Bleed air duct (REF. 212A1213) located just inboard of strut is cracked
106	Wing RH	Lower Fixed T.E. Panel Assy	Lower Fillet Area	Panel Assy (REF. 115A2711-7), Turn Buckle Rods, Retaining Seal & ANGLE C/T Inboard panel are bent upward. NOTE: Foam dam seal is missing
107	Wing RH	Wiggle Plate	Lower Fillet Area	Inboard most wiggle plate(s) C/T Panel Assy 115A2711-7 are bent up

108	Wing RH	Lower Fixed T.E. Panel Assy	Lower Fillet Area	Panel assy, Turn Buckle Rods, Seal & Retainer has been pushed upward (REF. 11512715-11)
109	Wing RH	Landing door assy – Flap Track Cutout	BS727, BL73	Door assy is suspect (REF. 149A7322) & all attaching hardware
110	Wing RH	Inboard T.E. Flap	MFSTA72 – MFSTA166	Fwd & Aft Flaps are pitted & dented
111	Wing RH	Outboard T.E. Flap	WBL202-WBL414	Fwd & Aft Flaps are pitted & dented
112	Wing RH	Upper fixed T.E. Wedge Assy	WBL153-WBL200	Lower surface dented in multiple locations. Note: This panel assy (REF. 115A2512) is located between spoiler #7 & #8
113	Wing RH	T.E. Flap Track Fairing #6	WBL160	Aft & Mid canoe fairings are gouged
114	Wing RH	Spoiler #7	RH Wing	Lower surface dented in multiple locations
115	Wing RH	Spoiler #8	RH Wing	Lower surface dented in multiple locations
116	Wing RH	Spoiler #9	RH Wing	Lower surface dented in multiple locations
117	Empennage-Horizontal Stabilizer	Inboard L.E. Fixed Panel	LH Horizontal	Leading edge of panel has multiple dents
118	Empennage-Horizontal Stabilizer	L.E. Removable panels	LH Horizontal – LE69 – LE198	Leading edge of panel has multiple dents
119	Empennage-Horizontal Stabilizer	Inboard L.E. Fixed Panel	RH Horizontal	Leading edge of panel has multiple dents
120	Empennage-Horizontal Stabilizer	L.E. Removable Panels	RH Horizontal – LE69 – LE263	Leading Edge of Panel has multiple dents
121	Landing Gear – Nose	Nose Landing Gear	Nose Landing Gear	Entire Nose Gear is destroyed, Customer to provide complete Nose Landing Gear Build-Up that includes steering transfer cylinders, metering valves, cover assy, steering cable quadrant, wheels, tires, taxi light & all wiring harnesses, all new attach hardware will be required upon installation
122	Landing Gear – Main	Left Main Landing Gear	LH MLG	Strut assy (REF. D01A6101) & side strut (REF. 161A2100) has pitting, along with system tray assy (REF. 161A1315) is dented. Note: Entire Main Landing Gear build-up including all brake system & sensing rods, wheels & tires are suspect

123	Landing Gear – Main	Wire bundle cable guide bracket assy	LH MLG – FWD, LWR	Bracket assy is bent (REF. 287A6105)
124	Landing Gear – Main	Lower brake hose bracket assy	LH MLG – FWD, LWR	Bracket assy is dented (REF. 274A1913) C/T J28 & J29 Boxes
125	Landing Gear – Main	J28 Box Conduit	LH MLG – FWD	Conduit is dented (REF. 287A6116-5)
126	Landing Gear – Main	Hydraulic Tube	LH MLG – FWD	Brake Pressure outbd. Wheel (REF. 272A6101), be sure to include nylon hose guide on both LHS & RHS SIDES
127	Landing Gear – Main	Left Main Landing Gear – Inbd Assy	LH MLG – Outbd	Forward leading edge of door is pitted (AA3A8335)
128	Landing Gear - Main	Right Main Landing Gear	RH MLG	Strut assy (REF. 001A610) & side strut (REF. 161A2100) has pitting. Note: Entire Main Landing Gear build-up including all brake systems & sensing rods, wheels & tire suspect & tire bub cap is missing
129	Landing Gear – Main	J32 Box Conduit	RH MLG – FWD	Conduit is dented
130	Landing Gear – Main	J33 Box Conduit	FH MLG – FWD	Conduit is dented
131	Landing Gear – Main	Wire Bundle Cable Guide Bracket Assy	RH MLG – FWD, LWR	Bracket Assy is dented (REF. 287A6105)
132	Landing Gear – Main	Brake Wire Bundle Assy Unit	RH MLG – FWD, LWR	Entire Wire Bundle & Connectors is damaged (REF. 287A6108)
133	Landing Gear - Main	Guide Bracket Assy	RH MLG – AFT, LWR SIDE	Bracket assy is bent (REF. 287A6115)
134	Landing Gear - Main	Right Main Landing Gear–Mid Door Assy	RH MLG – OUTBD	Fwd edge of door is gouged
135	Engine	#1 Engine	Left	Fan blades are dent & cascades are packed with FOD
136	Engine	#1 Engine Inlet	LEFT	Lower surface damaged
137	Engine	#1 Engine Fan Cowl	Left, inbd & outbd	Lower surface damaged
138	Engine	#1 Engine thrust reverser	Left, inbd & outbd	Surface has multiple dents & packed with mud
139	Engine	#2 Engine	Right	Fan blades are bent & cascades are packed with FOD
140	Engine	#2 Engine inlet	Right	Lower surface damaged
141	Engine	#2 Engine Fan Cowl	Right, inbd & outbd	Lower surface damaged
142	Engine	#2 Engine thrust reverser	Right, inbd & outbd	Surface has multiple dents & packed with mud
143	Inspections	Ram air inlet	BS5001 – LHS & RHS	Ram air inlets are suspect

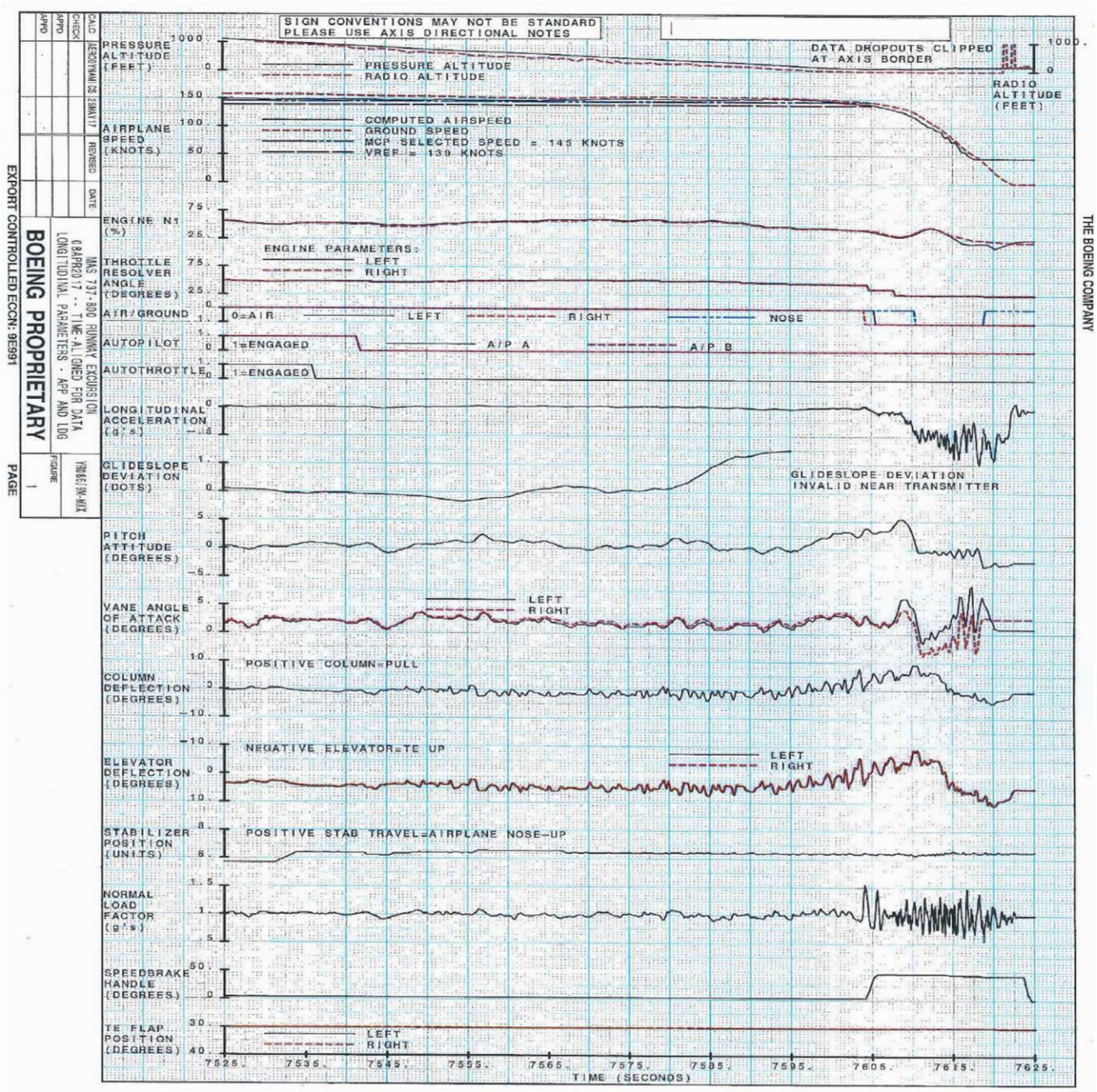
144	Inspections	Air conditioning pack area	BS560 – B575, Fwd LHS & RHS	Heat exchange condenser, fwd, cabin trim modulating valve, trim pressure regulating shut off, ducting & wiring & nitrogen unit system showed sign of heat exposure
145	Inspections	Anti-Collision Light – Power Unit	BS658	Anti-collision light power supply unit is suspect
146	Inspections	Keel Beam Webs & Lower Chords	BS560 – BS575	LHS & RHS Keel Beam Web & Chords show signs of heat exposure in area C/T air conditioning moisture separator unit
147	Inspections	APU inlet	BS 1035	APU Inlet is suspect
148	Inspections	Engine #1	Left Engine	
149	Inspections	Engine #2	Left Engine	
150	Inspections	Main Landing Gear	Left MLG	
151	Inspections	Main Landing Gear	Right MLG	
152	Inspections	Nitrogen System	Air conditioning Pack Area – LHS	Indication of overhead exposure were visible
153	Inspections	WING Control Surfaces	Left Wing	Front & Rear control surfaces are packed with mud & FOD
154	Inspections	Wing Control Surfaces	Right Wing	Front & Rear control surfaces are packed with mud & FOD
155	Inspections	Strut/Pylons	LHS & RHS	
FR1	41 Section	NWW Blow out panels	NWW Area	
FR2	41 Section	J22 Box	NWW Area	
FR3	41 Section	J24 Box	NWW Area	
FR4	41 Section	J46 Box	NWW Area	
FR5	41 Section	Equipment cooling ducts	BS259.5 – BS360	
FR6	Electrical Compartment	E5-2 IRU Shelf	E5 Rack	
FR7	Electrical Compartment	E1 Rack Disconnect panels	E/E Bay area – LHS & RHS	All disconnect panels show no sign of damage (REF. AE0105A, AED102A, AED104B)
FR8	Electrical Compartment	Pitot static lines & drains	E/E Bay area	
FR9	Electrical Compartment	Wire bundles	E/E Bay area	
FR10	43 Section	Ram Air Inlets	B540, LHS & RHS	
FR11	Fuselage	Wing to body structure	WTB Area– LHS & RHS	
FR12	Fuselage	Wing to body panels	WTB Area – LHS & RHS	
FR13	Fuselage	Blankets	BS727 – BS887	
FR14	Fuselage	Fwd & Aft Cargo Door Scuff Plate, Corner Plates & Sili	Cargo Area	

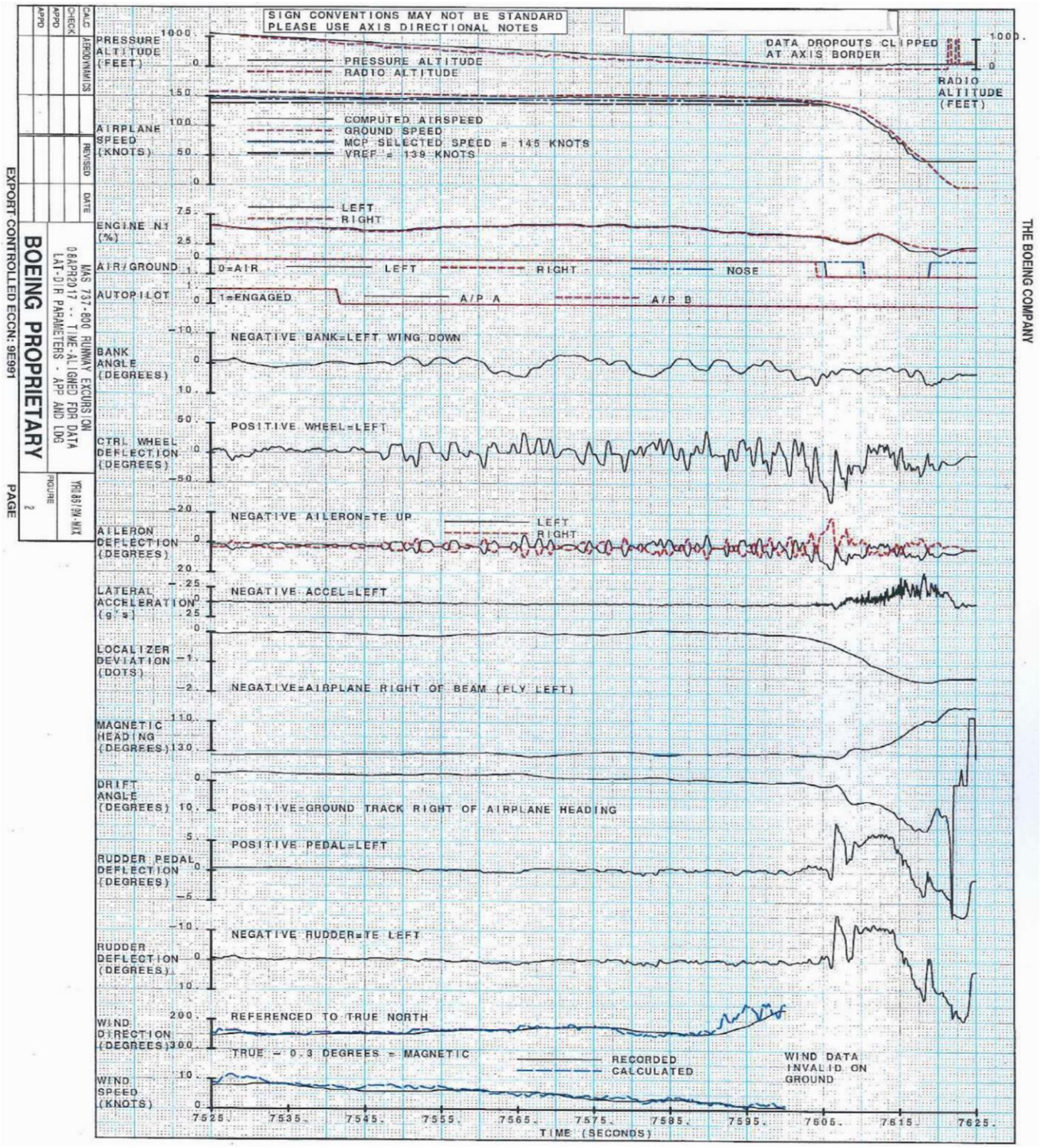
FR15	46 Section	E6 Rack	Aft Cargo Area	
FR16	46 Section	Waste Tank	Aft Cargo Area	
FR17	Systems – Environmental Control Systems	Mix Bay Area	Aft End of Cargo Area	
FR18	Interiors	Cargo Floor Panels	Fwd & Aft Cargo Area	
FR19	Interiors	Cargo Sidewalls	Fwd & Aft Cargo area	
FR20	Interiors	Passenger Seats	BS727 – BS887, Outbd Cabin Area – LHS & RHS	
FR21	Interiors	Passenger Floor Panels	BS727 – BS887, Outbd cabin area - – LHS & RHS	
FR22	Wing LH	Krueger Flap Actuators	KRAS90 – KRAS218	
FR23	Wing LH	Krueger Flap Actuators	KRAS90 – KRAS218	
FR24	Wing LH	Outbd Krueger Flap	KRAS90 – KRAS218	Provide for new jumper bond cables.

APPENDIX D

FDR Plot of 9M-MXX

Runway Excursion 08 April 2017





CALC AERODYNAMICS
CHECK
APPD
APPD
APPD
REVISED
DATE

BOEING PROPRIETARY

MAS 737-800 RUNWAY EXCURSION
08APR2017 -- TIME-ALIGNED FDR DATA
LAT-DIR PARAMETERS - APP AND LDG

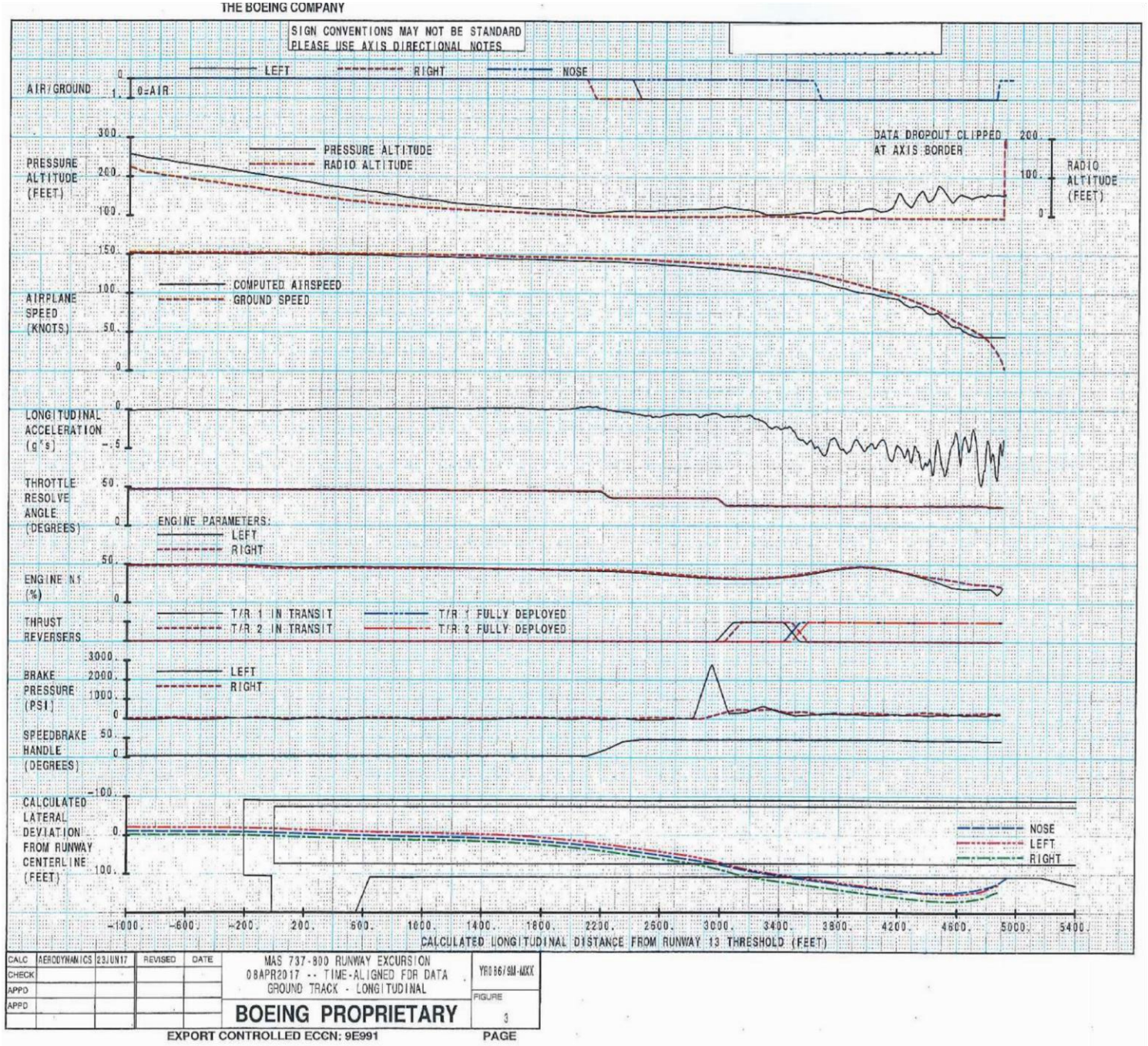
FIGURE 2

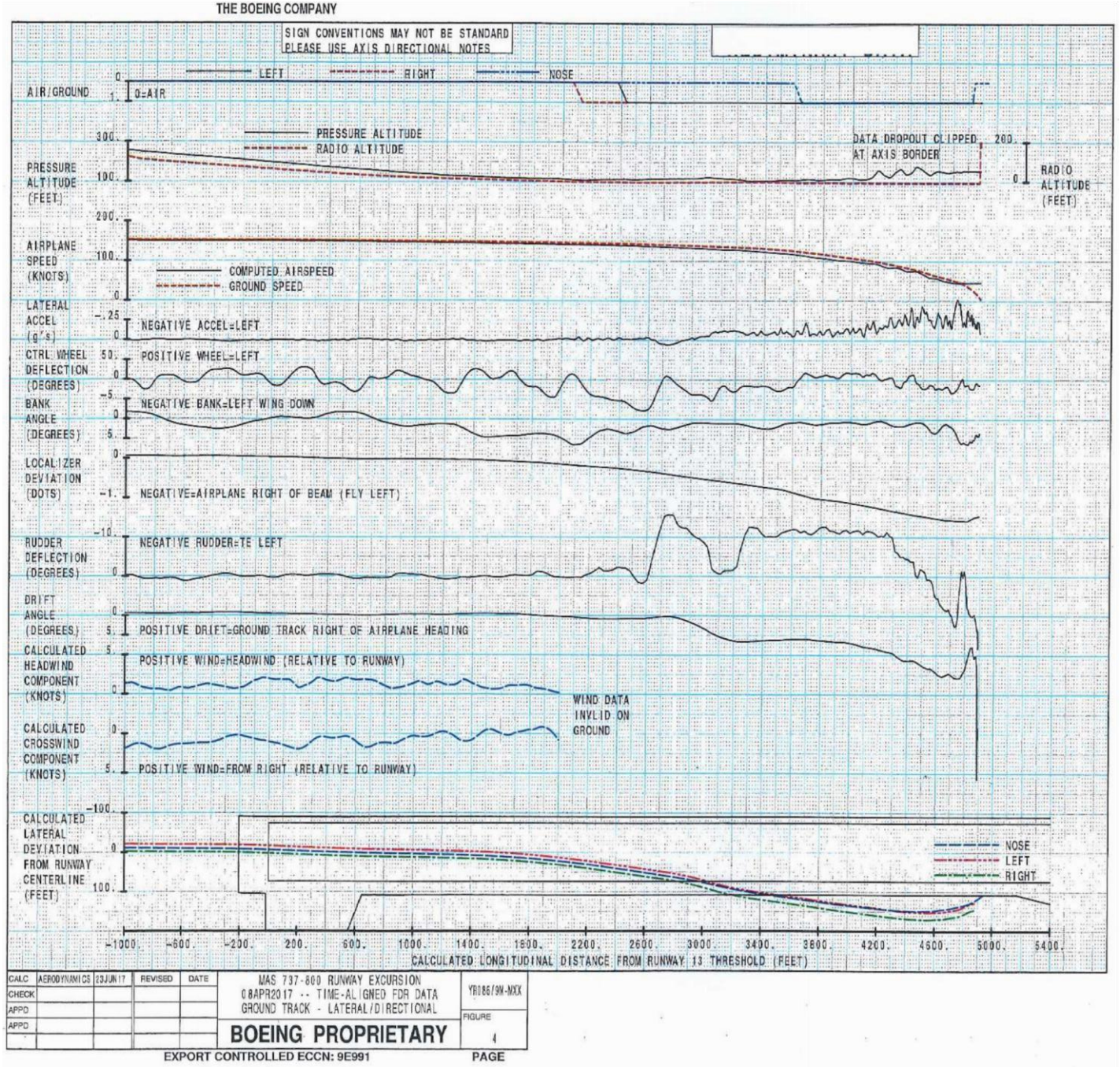
YR6869M-WIX

EXPORT CONTROLLED ECCN: 9E991

PAGE

THE BOEING COMPANY


THE BOEING COMPANY
SIGN CONVENTIONS MAY NOT BE STANDARD
PLEASE USE AXIS DIRECTIONAL NOTES
LEFT
RIGHT
NOSE
AIR/GROUND
0=AIR
PRESSURE ALTITUDE (FEET)
PRESSURE ALTITUDE
RADIO ALTITUDE
DATA DROPOUT CLIPPED AT AXIS BORDER
RADIO ALTITUDE (FEET)
AIRPLANE SPEED (KNOTS)
COMPUTED AIRSPEED
GROUND SPEED
LONGITUDINAL ACCELERATION (g's)
THROTTLE RESOLVE ANGLE (DEGREES)
ENGINE PARAMETERS:
LEFT
RIGHT
ENGINE N1 (%)
THRUST REVERSERS
T/R 1 IN TRANSIT
T/R 2 IN TRANSIT
T/R 1 FULLY DEPLOYED
T/R 2 FULLY DEPLOYED
BRAKE PRESSURE (PSI)
SPEEDBRAKE HANDLE (DEGREES)
CALCULATED LATERAL DEVIATION FROM RUNWAY CENTERLINE (FEET)
NOSE
LEFT
RIGHT
CALCULATED LONGITUDINAL DISTANCE FROM RUNWAY 13 THRESHOLD (FEET)
CALC AERODYNAMICS 23JUN17
CHECK
APPD
APPD
REVISED
DATE
MAS 737-800 RUNWAY EXCURSION
08APR2017 -- TIME-ALIGNED FOR DATA
GROUND TRACK - LONGITUDINAL
YR086/SM-4XXX
FIGURE
3
BOEING PROPRIETARY
EXPORT CONTROLLED ECCN: 9E991
PAGE


THE BOEING COMPANY
SIGN CONVENTIONS MAY NOT BE STANDARD
PLEASE USE AXIS DIRECTIONAL NOTES
LEFT
RIGHT
NOSE
AIR/GROUND
0=AIR
PRESSURE ALTITUDE
RADIO ALTITUDE
DATA DROPOUT CLIPPED AT AXIS BORDER
PRESSURE ALTITUDE (FEET)
RADIO ALTITUDE (FEET)
AIRPLANE SPEED (KNOTS)
COMPUTED AIRSPEED
GROUND SPEED
LATERAL ACCEL (g's)
NEGATIVE ACCEL=LEFT
CTRL WHEEL DEFLECTION (DEGREES)
POSITIVE WHEEL=LEFT
BANK ANGLE (DEGREES)
NEGATIVE BANK=LEFT WING DOWN
LOCALIZER DEVIATION (DOTS)
NEGATIVE=AIRPLANE RIGHT OF BEAM (FLY LEFT)
RUDDER DEFLECTION (DEGREES)
NEGATIVE RUDDER=TE LEFT
DRIFT ANGLE (DEGREES)
POSITIVE DRIFT=GROUND TRACK RIGHT OF AIRPLANE HEADING
CALCULATED HEADWIND COMPONENT (KNOTS)
POSITIVE WIND=HEADWIND (RELATIVE TO RUNWAY)
WIND DATA INVLID ON GROUND
CALCULATED CROSSWIND COMPONENT (KNOTS)
POSITIVE WIND=FROM RIGHT (RELATIVE TO RUNWAY)
CALCULATED LATERAL DEVIATION FROM RUNWAY CENTERLINE (FEET)
NOSE
LEFT
RIGHT
-1000. -600. -200. 200. 600. 1000. 1400. 1800. 2200. 2600. 3000. 3400. 3800. 4200. 4600. 5000. 5400.
CALCULATED LONGITUDINAL DISTANCE FROM RUNWAY 13 THRESHOLD (FEET)
CALC AERODYNAMICS 23JUN17
CHECK
APPD
APPD
REVISED DATE
MAS 737-800 RUNWAY EXCURSION
08APR2017 -- TIME-ALIGNED FDR DATA
GROUND TRACK - LATERAL/DIRECTIONAL
YR086/9N-MXX
FIGURE 4
BOEING PROPRIETARY
EXPORT CONTROLLED ECCN: 9E991
PAGE

APPENDIX E

Highlights Based on FDR and CVR Data

Time	Event	Radio Altitude (feet)	Aileron input	Rudder Input	Bank Angle	Heading
1414:22	ATC issued clearance to land					
1415:59	Autopilot disconnected	800	2.1 (R)	Neutral	-0.5° (L)	132
1416:16	Crossing 500 feet RA	500	-1.6 (L)	Neutral	3° (R)	131
1416:43	Minimum Descent Altitude (MDA)	200	4.0 (R)	Neutral	-2° (L)	130
1416:51	Crosses 100 Ft RA	100	0.3 (R)	Neutral	2.0° (R)	130
1416:55	Crosses threshold 13	42	8.3 (R)	Neutral	-1.8° (L)	130
1416:56	Crosses 30ft RA	30	-2.6 (L)	Neutral	1.8° (R)	130
1416:57	Flare initiated	21	7.1 (R)	Neutral	1.2° (R)	130
	Flare maneuver	19	8.8 (R)	Neutral	1.2° (R)	130
	Start of deviation from centerline.	18	6.7 (R)	Neutral	1.4° (R)	130
1416:58	Flare maneuver	17	2.2 (R)	Neutral	2.5° (R)	130
	Flare maneuver	16	-3.4 (L)	Neutral	3.7° (R)	130
	Flare maneuver	15	-2.4 (L)	Neutral	3.7° (R)	130
	Flare maneuver	14	2.0 (R)	Neutral	4.6° (R)	130
	Flare maneuver	13	2.0 (R)	Neutral	4.6° (R)	130
1416:59	Flare maneuver	12	1.6 (R)	Neutral	4.4° (R)	131
	Flare maneuver	11	-2.1 (L)	Neutral	4.2° (R)	131
	Flare maneuver	10	0.6 (R)	Neutral	4.2° (R)	131
	Flare maneuver	9	4.6 (R)	Neutral	3.9° (R)	131
	PM announced deviation to the left of centerline	8	6.0 (R)	Neutral	3.7° (R)	132
1417:00	Flare maneuver	7	6.0 (R)	Neutral	3.7° (R)	132
	PM announced deviation to the right of centerline	6	9.2 (R)	Neutral	3.7° (R)	132

1417:00	Flare maneuver	5	10.8 (R)	Neutral	4º (R)	132
	Flare maneuver	4	4.3 (R)	1º (L)	5.1º (R)	132
1417:01	Flare maneuver	3	-0.5 (L)	1º (L)	6.5º (R)	132
	Flare maneuver	2	6.5 (R)	1º (L)	6º (R)	132
	Flare maneuver	1	10.4 (R)	1º (L)	4º (R)	132
1417:02	**Right wheel touch down on runway (540m from THR13)**	**0**	**11.0 (R)**	**1.3º (L)**	**2.5º (R)**	**133**
1417:03	**Left wheel touchdown on runway (620m from THR13)**	**-1**	**15.9 (R)**	**1.7º (R)**	**0.7º (R)**	**132**
1417:04	On runway	-2		1.3º (L)		133
1417:05	Leaving runway surface (PM announced “goaround” – 780m from THR13)	-1		1.8º (L)		130
1417:06	On soft grounds	0		10.7º (L)		126
1417:07	On soft grounds	-1		10.2º (L)		126
1417:08	On soft grounds	-3		10.9º (L)		126
1417:09	On soft grounds	-5		11.1º (L)		125
1417:10	On soft grounds	-6		10.7º (L)		124
1417:11	On soft grounds	-6		11.3º (L)		122

1417:12	On soft grounds	-6		4.4^{o} (L)		119

Source: Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR)

Legend:

1. Aileron input : (+) Right wing down (R)

: (-) Left wing down (L)

2. Bank Angle : (+) Right (R)

: (-) Left (L)

3. Rudder position : (-) Left Rudder (L)

: (+) Right Rudder (R)

1. THR13 : threshold runway 13

APPENDIX F

AFDR Incident Report

MALAYSIA AIRPORTS	Malaysia Airports Sdn. Bhd. Sibu Airport Standard Operating Procedure AFRS Incident Report	SOP no. : SOP/AF/04 SOP form no. : SOP/AF/04/01 : Ed.2 Rev.0 Page no. : 1 of 2

Incident Report No.: 0 1 (sequence) 1 7 Type of Incident *(darken column not relevant)* : A B C D E F G

Date : 0 8 (d/d) 0 4 (m/m) 2 0 1 7 (y/y/y/y) Day : Saturday

1. Details of Incident B738 landing from RW 13 at 2217 hours but subsequently skidded to right side (grass area) and finally Landed at Grid Map Golf 10. Nose wheel is found to be broken

   Cause of Incident Unknown

2. Time

2.1. Message received	: 2217	2.4. All casualties rescued /evacuated	: 2222
2.2. AFRS arrived at site	: 2218	2.5. AFRS operation completed (9/4/17)	: 0300
2.3. 1st casualty rescued	: 2219	2.6. All vehicles reached AFRS station	: 0302

3. Site of Incident

3.1. Location (Grid map)	: Golf 10	3.4. Others :	Aircraft final landing location at grass Area (Golf 10)
3.2. Distance from AFRS Station	: 500m		
3.3. Contour of terrain : Rata			

4. Information on Facilities Involved

4.1. Aircraft

4.1.1. Type of aircraft	: B738	4.1.3. Registration number	: 9m-mxx
4.1.2. Name of airline/owner	: Malaysia Airlines Bhd	4.1.4. Flight number	: MH 2718

4.2. Building

4.2.1. Type of building :

4.2.2. Size of building (floors) :

4.2.3. Building's owner :

5. Number of People Involved

5.1. People in aircraft / building

All people involved : 69 Uninjured : 69 Injured : nil Dead : nil

5.2. People on Ground

All people involved : nil Uninjured : nil Injured : nil Dead : nil

6. Cargo

6.1. Type of Cargo : Ordinary cargo (juga terdapat dua ekor anjing)

6.2. Dangerous goods carried : nil

8. Aircraft damaged on the Airport ... Aircraft Accident at the Airport ...

7. Notification

6.1. Notified by: ATC 6.2 How notified: Fire Alarm

8. Department / Agency / Unit Involved

		Vehicles	Men	Time
i.	Airport Fire and Rescue Service (AFRS)	2 ULFT.	07	2218
ii.	AVSEC	Hilux	02	2228
iii.	Operations	Hilux	02	2230
iv.	PDRM	Patrol Car	18	2340
v.	Hospital	Ambulance	04	2304
vi.	Malaysia Airlines Berhad	Van & tow tug	25	2315
vii.	MASB Engineering	Hilux	04	2310
viii.		-		
ix.				
x.				

9. Extinguishing Agents Used

Type	Amount Used		Fire fighting technique and sequence used by AFRS
i. Water :	nil	Litres	Both vehicles positioned in front of aircraft at 30 meters
ii. AFFF :	nil	Litres	
iii. Dry Powder:	nil	Kg	

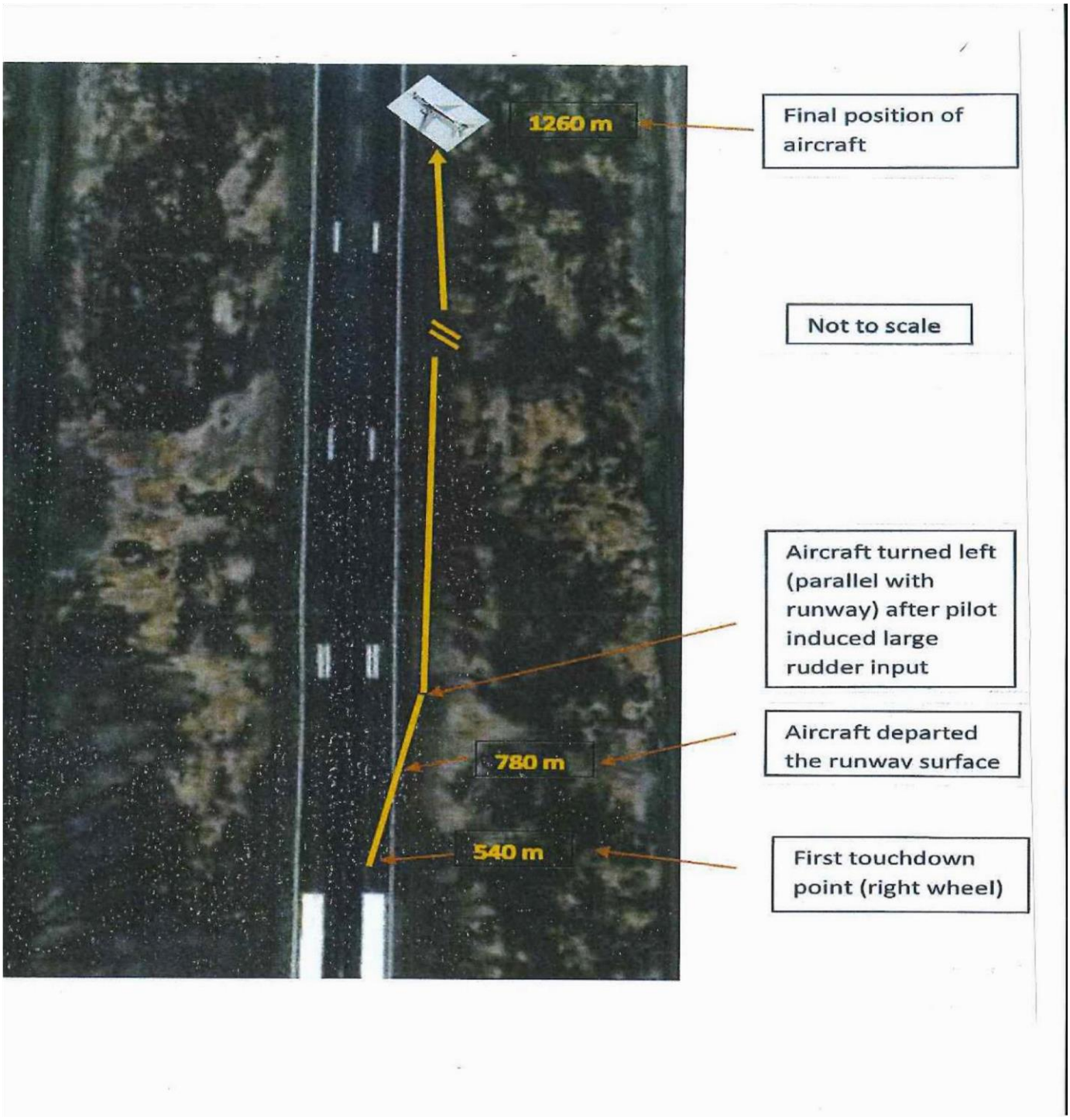
10. Chronology of Events

Time	Chronology
2217	Aircraft B738 skidded
2218	AFRS arrived at site with two vehicles
2219	Passenger evacuate via escape cute (both side)
2222	All passengers have been evacuated
2230	All passengers arrived at Fire Station and briefed by MAB staff
2240	All passengers arrived at Terminal building
2250	PB Morshidi Ali taking over command from A813 Kiai Hasan as Commanding Officer
2310	Two Firemen crew airline Pilot enter aircraft to switch off battery and navigation aid system
2318	Airlines representatives (Captain, Co-Pilot, & Technical Officer) to reconfirm all battery and Navigation fully terminated
0300	Fire vehicles return to balai bomba (Fire vehicle on rotation basis to provide lighting at scene until 0300 in the morning of 9 March 2017)

Signature	:	Signature	:
Name	: A813 Kiai Hasan / PB Morshidi Ali	Name	: Unggau Sin
Designation	: Commanding Officer	Designation	: Head of AFRS
Date	: 9/4/2017	Date	: 9/4/2017

APPENDIX G

Site Survey Illustration Runway 13 Sibu

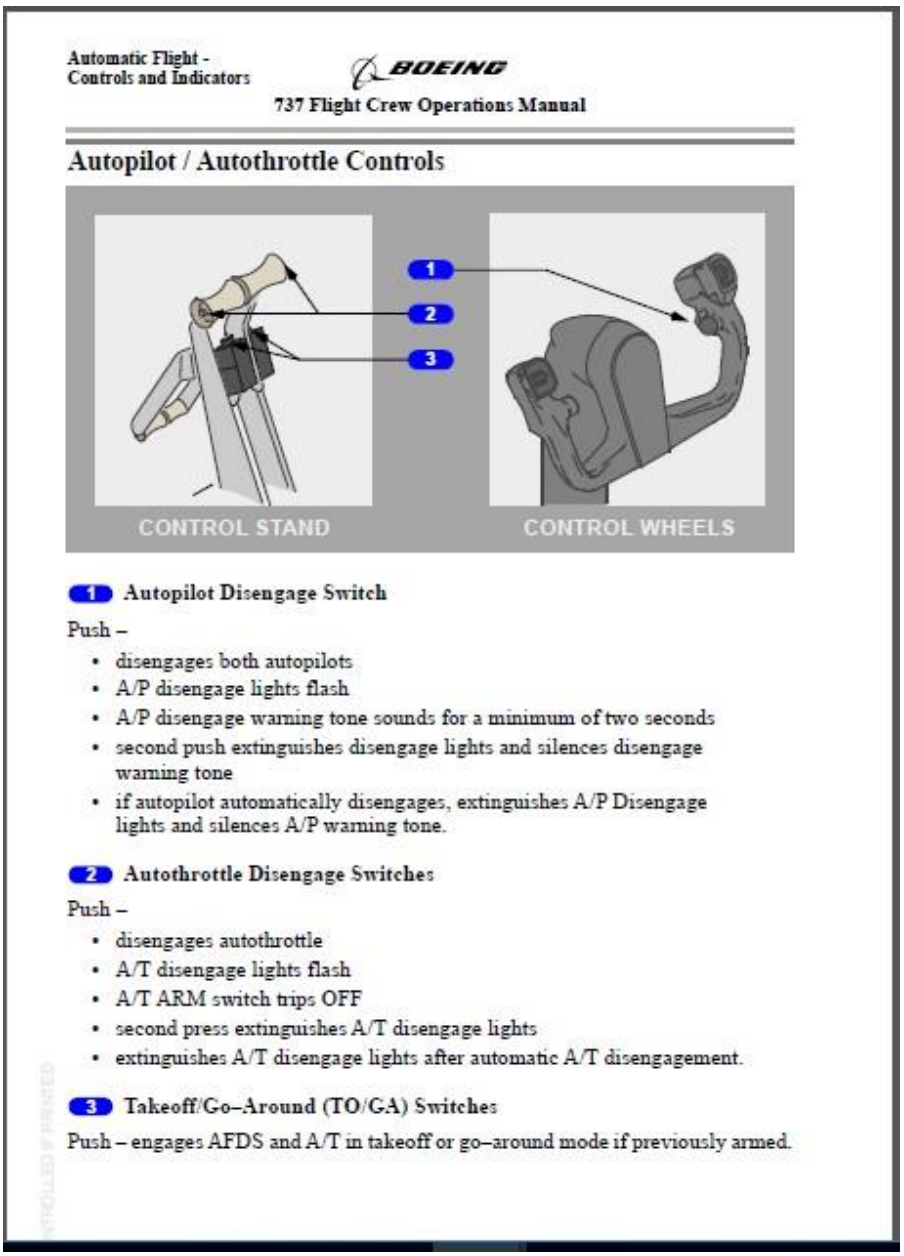


APPENDIX H

B737-800 Autopilot and Autothrottle Control

(Source: Boeing B737-800 Flight Crew Operating Manual, Revision 11, dated 16 March 2017)

1. TOGA switch location and functions



Automatic Flight -
Controls and Indicators

BOEING

737 Flight Crew Operations Manual

Autopilot / Autothrottle Controls

1 Autopilot Disengage Switch

Push –

- disengages both autopilots
- A/P disengage lights flash
- A/P disengage warning tone sounds for a minimum of two seconds
- second push extinguishes disengage lights and silences disengage warning tone
- if autopilot automatically disengages, extinguishes A/P Disengage lights and silences A/P warning tone.

2 Autothrottle Disengage Switches

Push –

- disengages autothrottle
- A/T disengage lights flash
- A/T ARM switch trips OFF
- second press extinguishes A/T disengage lights
- extinguishes A/T disengage lights after automatic A/T disengagement.

3 Takeoff/Go–Around (TO/GA) Switches

Push – engages AFDS and A/T in takeoff or go–around mode if previously armed.

2. Go-Around in Autopilot and Flight Director (F/D) mode (without autopilot)

Go–Around

Go–Around (GA) mode is engaged by pushing either TO/GA switch. An A/P go–around requires dual A/P operation and is armed when FLARE armed is annunciated. If both A/Ps are not operating, a manual F/D go–around is available.

With the A/T Arm switch at ARM, the A/T go–around mode is armed:

- when descending below 2000 feet RA

9M-FFF - OK-TSO
(SB Changes 9M-FFD, 9M-FFE)

- when above 2000 feet RA with flaps not up or G/S captured
- with or without the AFDS engaged.

A/P Go–Around

The A/P GA mode requires dual A/P operation and is available after FLARE armed is annunciated and prior to the A/P sensing touchdown.

With the first push of either TO/GA switch:

- A/T (if armed) engages in GA and the A/T Engaged Mode annunciation on the FMA indicates GA
- thrust advances toward the reduced go–around N1 to produce 1000 to 2000 fpm rate of climb
- pitch mode engages in TO/GA and the Pitch Engaged Mode annunciation on the FMA indicates TO/GA
- F/D pitch commands 15 degrees nose up until reaching programmed rate of climb. F/D pitch then commands target airspeed for each flap setting based on maximum takeoff weight calculations

9M-FFD, 9M-FFE, 9M-MLE, OK-TSO

- F/D roll commands hold current ground track. The Roll Engaged Mode annunciation on the FMA is blank

9M-FFF, 9M-MLF - 9M-MXY

- F/D roll commands hold current ground track at or below 400 feet RA. Above 400 feet RA LNAV will engage. The Roll Mode annunciation will display LNAV armed at or below 400 feet RA and LNAV engaged above 400 feet RA.
- the IAS/Mach display blanks
- the command airspeed cursor automatically moves to a target airspeed for the existing flap position based on maximum takeoff weight calculations.

If the TO/GA switch is pressed after touchdown and prior to A/T disengagement, A/P disengages and the A/T may command GA thrust.

With the second push of either TO/GA switch after A/T reaches reduced go–around thrust, the A/T advances to the full go–around N1 limit.

TO/GA mode termination from A/P go–around:

- below 400 feet RA, the AFDS remains in the go–around mode unless both A/Ps and F/Ds are disengaged
- above 400 feet RA, select a different pitch or roll mode.
  - if the roll mode is changed first:
    - the selected mode engages in single A/P roll operation and is controlled by the A/P which was first in CMD
    - pitch remains in dual A/P control in TO/GA mode.
  - if the pitch mode is changed first:
    - the selected mode engages in single A/P pitch operation and is controlled by the A/P which was first in CMD
    - the second A/P disengages
    - the roll mode engages in CWS R.
  - the A/T GA mode is terminated when:
    - another pitch mode is selected
    - ALT ACQ annunciates engaged.

Note: The pitch mode cannot be changed from TO/GA until sufficient nose–down trim has been input to allow single channel A/P operation. This nose–down trim is automatically added by the A/P to reset the trim input made by the A/P at 400 feet RA and at 50 feet RA during the approach.

With pitch mode engaged in TO/GA, ALT ACQ engages when approaching the selected altitude and ALT HOLD engages at the selected altitude if the stabilizer position is satisfactory for single A/P operation.

- if stabilizer trim position is not satisfactory for single A/P operation:
  - ALT ACQ is inhibited
  - A/P disengage lights illuminate steady red
  - pitch remains in TO/GA.

Note: To extinguish A/P disengage lights, disengage A/Ps or select higher altitude on MCP.

F/D Go–Around

If both A/Ps are not engaged, a manual F/D only go–around is available under the following conditions:

- inflight below 2000 feet RA

9M-FFF - OK-TSO
(SB Changes 9M-FFD, 9M-FFE)

- inflight above 2000 feet RA with flaps not up or G/S captured
- not in takeoff mode.
- if the TOGA switches are activated after touchdown (wheel spin-up)

With the first push of either TO/GA switch:

- A/T (if armed) engages in GA and advances thrust toward the reduced go–around N1 to produce 1000 to 2000 fpm rate of climb. The A/T Engaged Mode annunciation on the FMA indicates GA
- autopilot (if engaged) disengages
- pitch mode engages in TO/GA and the Pitch Engaged Mode annunciation on the FMA indicates TO/GA
- F/D pitch commands 15 degrees nose up until reaching programmed rate of climb. F/D pitch then commands target airspeed for each flap setting based on maximum takeoff weight calculations

9M-FFD, 9M-FFE, 9M-MLE, OK-TSO

- F/D roll commands approach ground track at time of engagement. The Roll Engaged Mode annunciation on the FMA is blank

9M-FFF, 9M-MLF - 9M-MXY

- F/D roll commands hold current ground track at or below 50 feet AGL. Above 50 feet AGL, LNAV will engage. The Roll Mode annunciation will display LNAV engaged above 50 feet AGL.
- the IAS/Mach display blanks
- the command airspeed cursor automatically moves to a target airspeed for the existing flap position based on maximum takeoff weight calculations.

With the second push of either TO/GA switch (if A/T engaged and after A/T reaches reduced go–around thrust):

- the A/T advances to the full go–around N1 limit

TO/GA mode termination from F/D go–around:

- below 400 feet RA, both F/D switches must be turned off.
- above 400 feet RA, select a different pitch or roll mode.
  - if the roll mode is changed first:
    - F/D roll engages in the selected mode
    - F/D pitch mode remains in TO/GA.
  - if the pitch mode is changed first:
    - F/D pitch engages in the selected mode.
    - F/D roll mode automatically changes to HDG SEL
  - the A/T GA mode (if engaged) is terminated when:
    - another pitch mode is selected
    - ALT ACQ annunciates engaged

Note: Engaging an A/P in CMD automatically engages the A/P and F/Ds in LVL CHG for pitch.

Single Engine F/D Go–Around

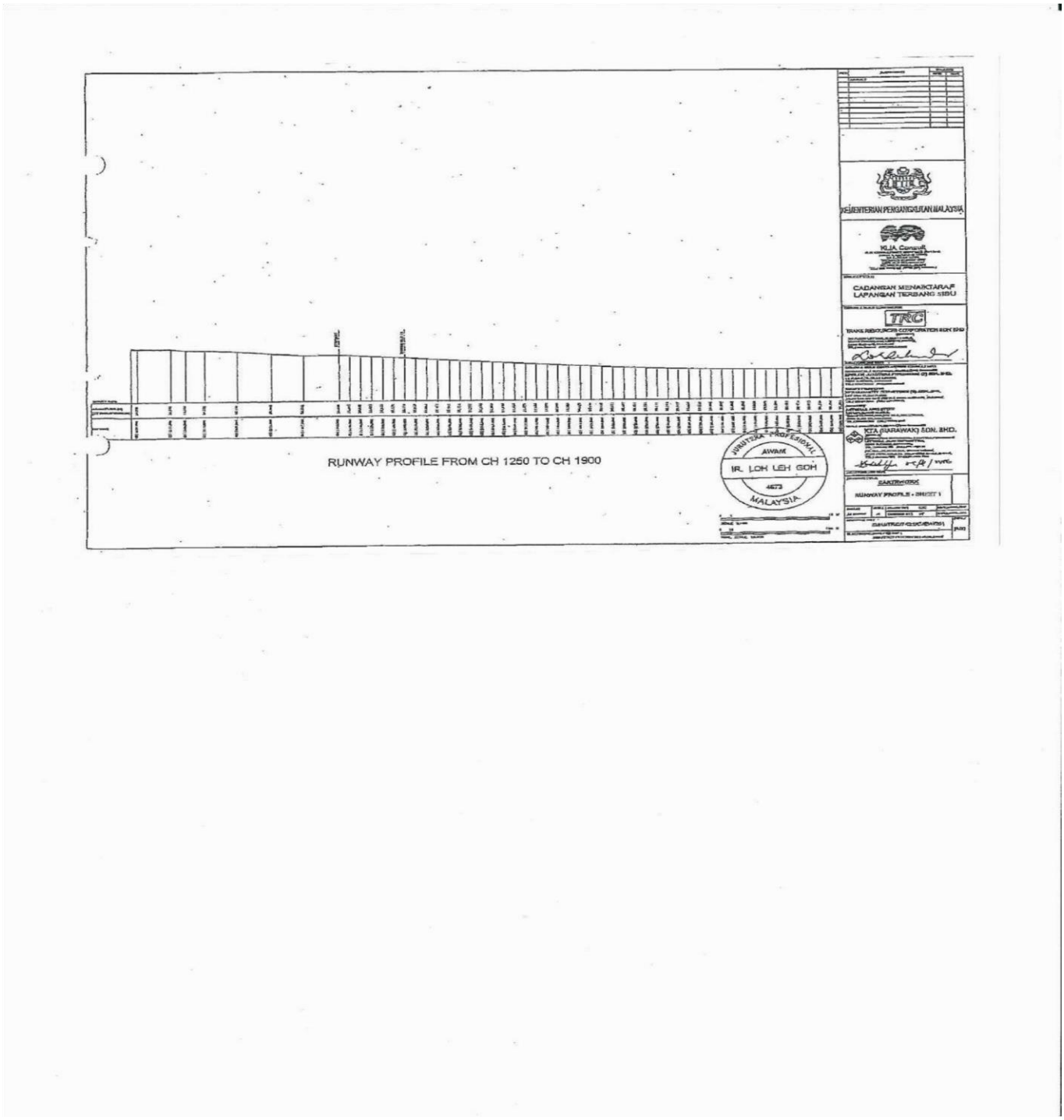
With a push of either TO/GA switch:

APPENDIX I

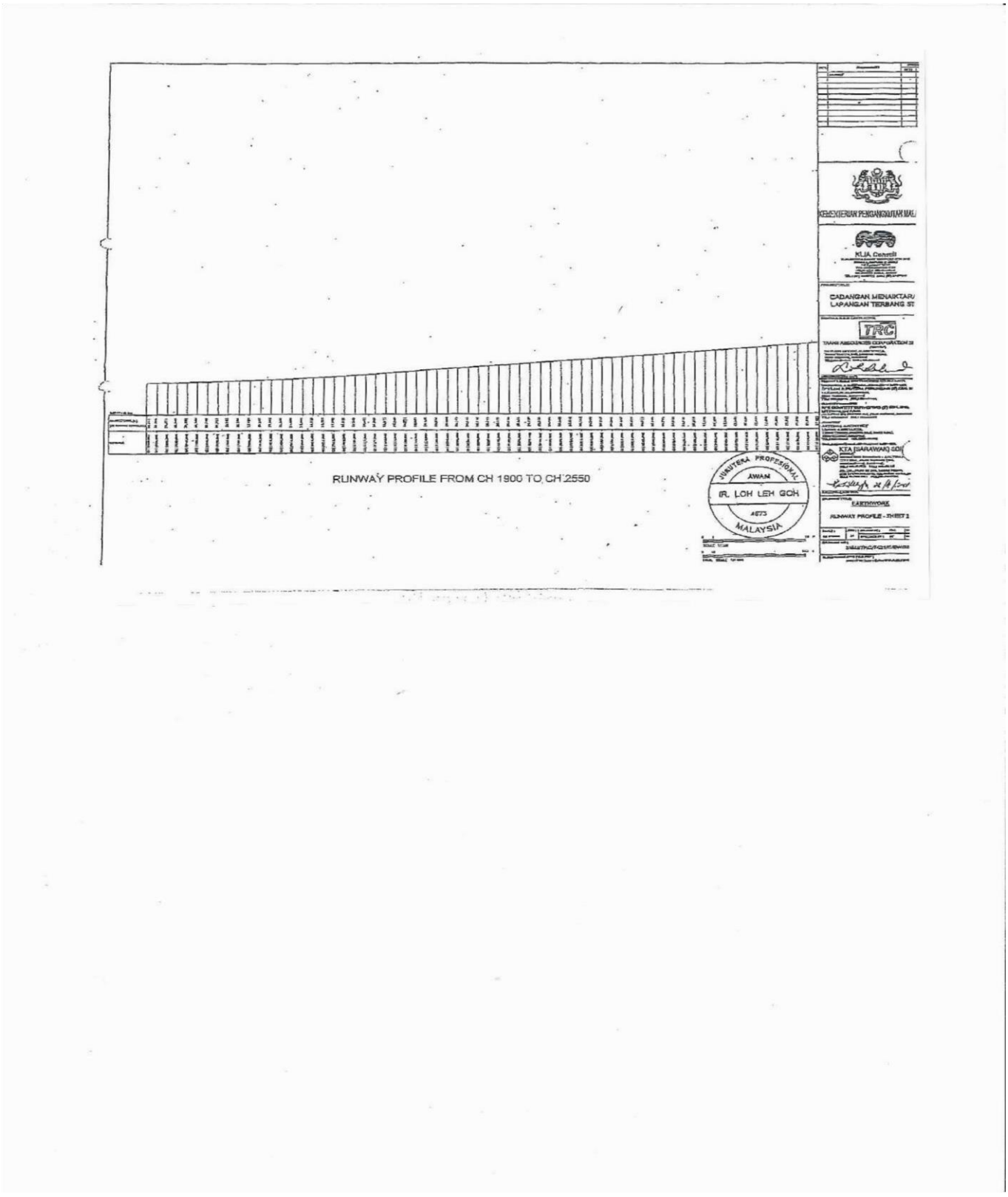
Part I

Runway Profile

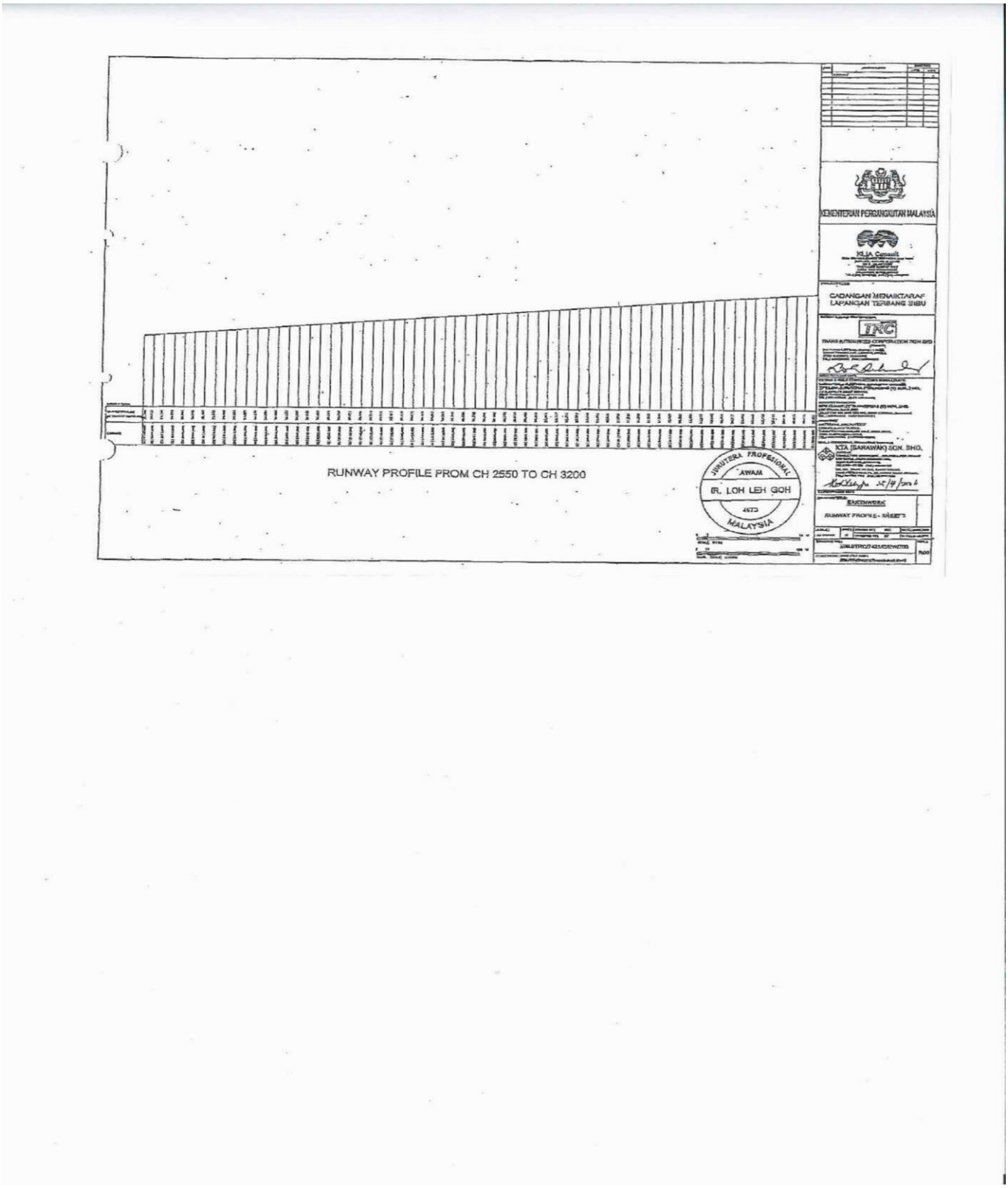
a. Threshold 13 to 400 m (CH1500 to CH1900).



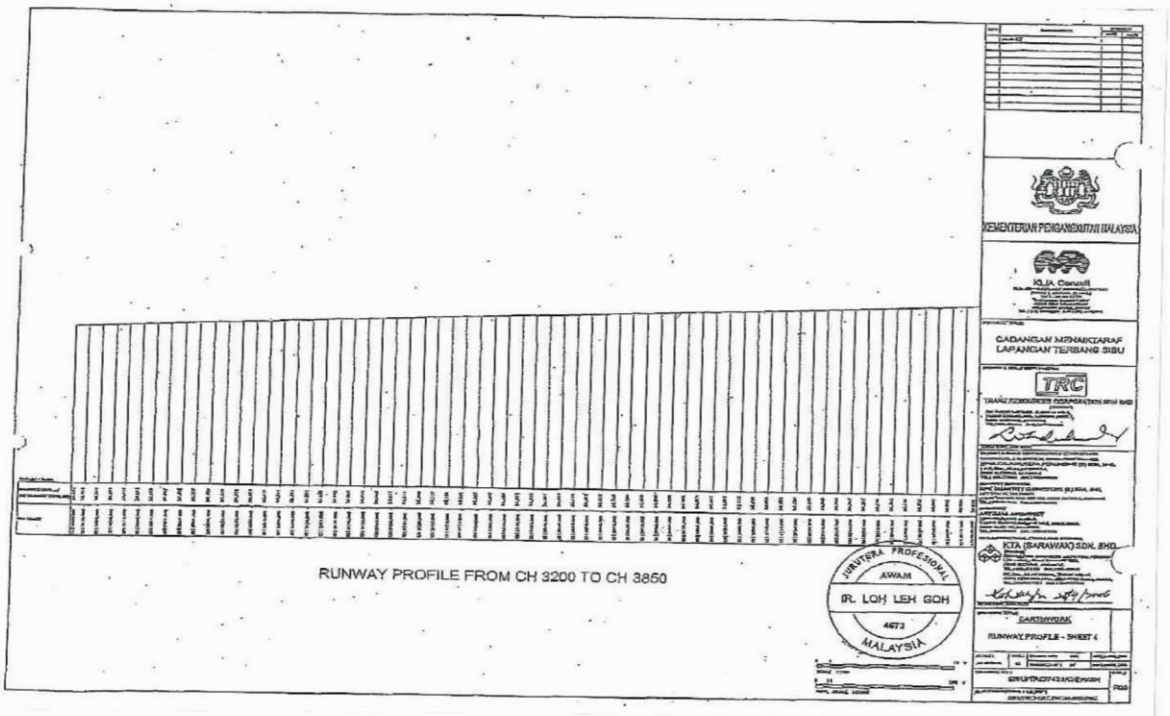
b. From 400 m to 1050 m (CH1900 to CH2550).



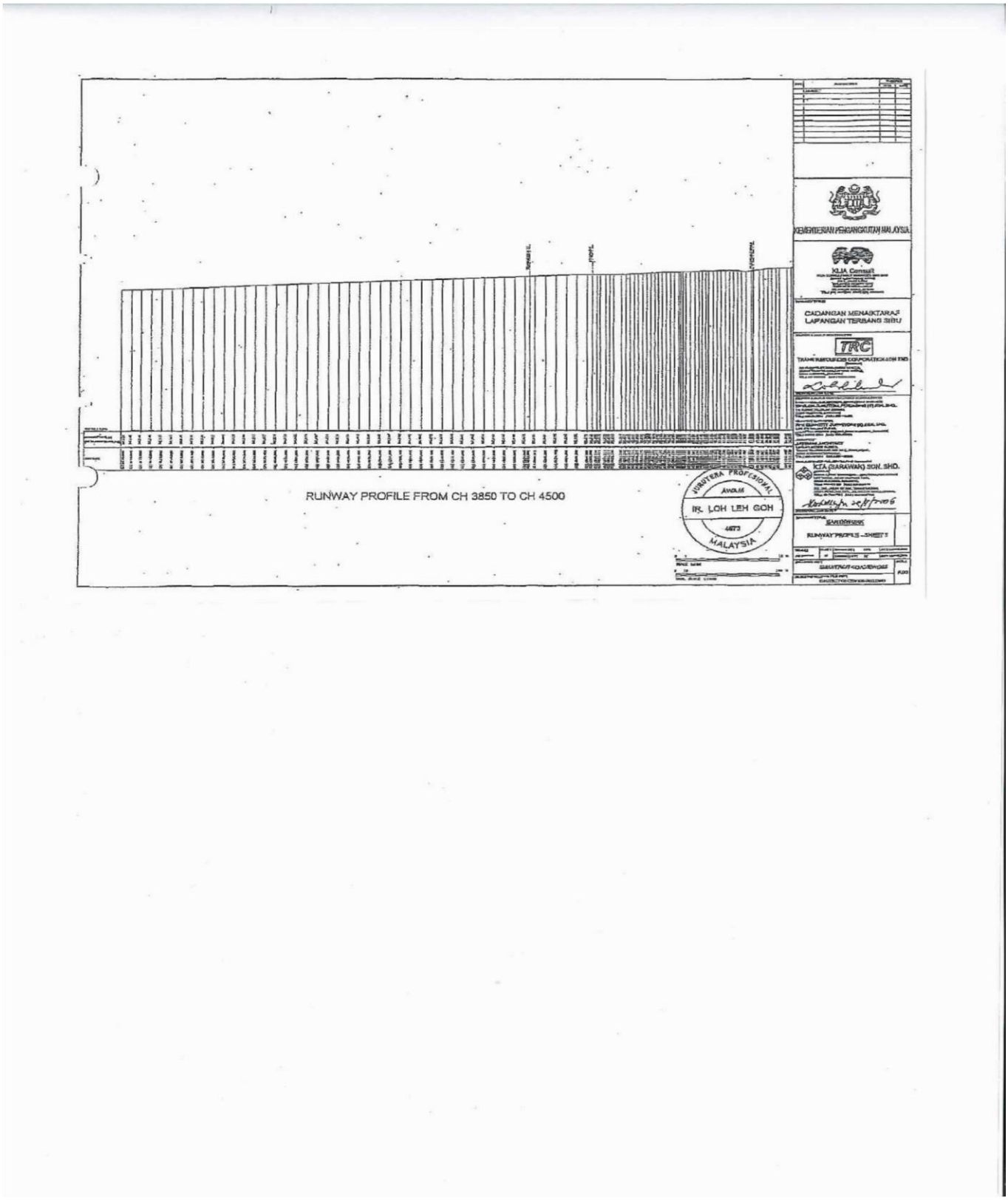
c. From 1050 m to 1700 m (CH2550 to CH3200).



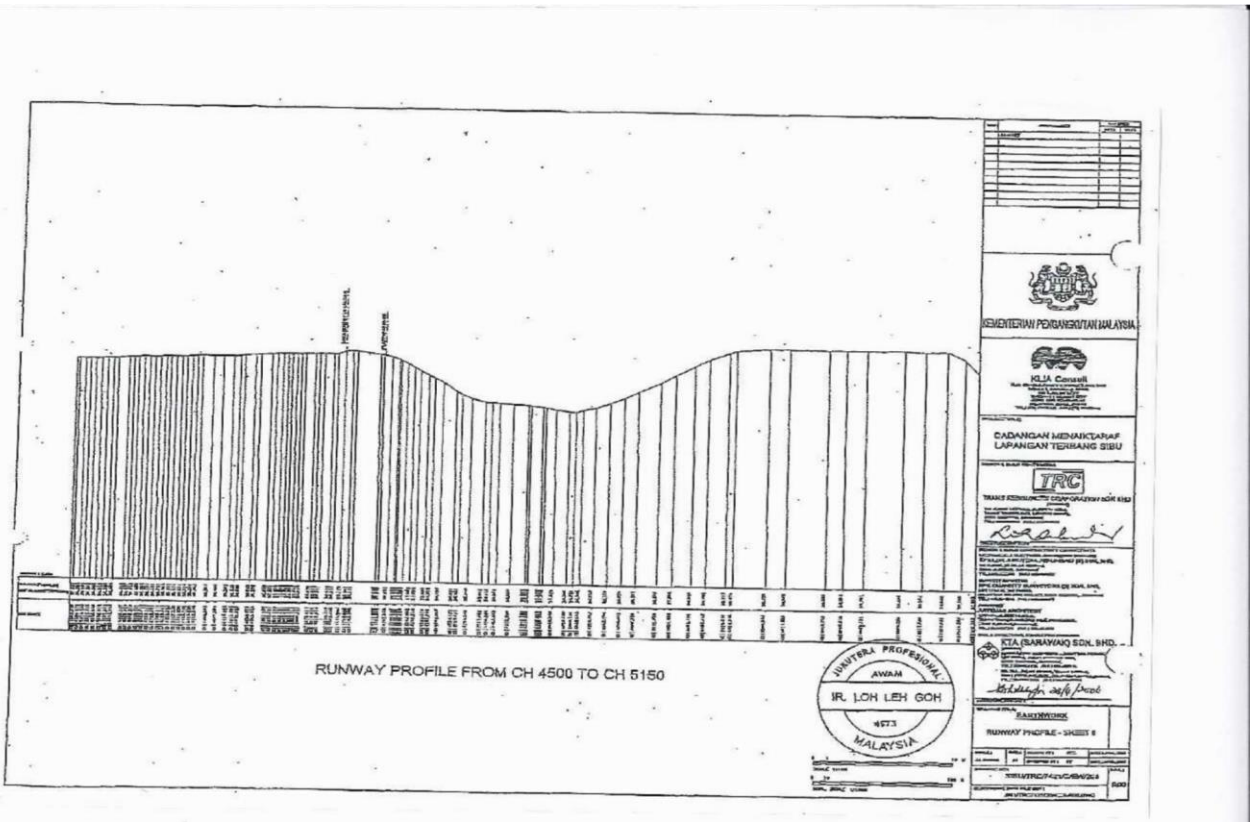
d. From 1700 m to 2350 m (CH3200 to CH3850).



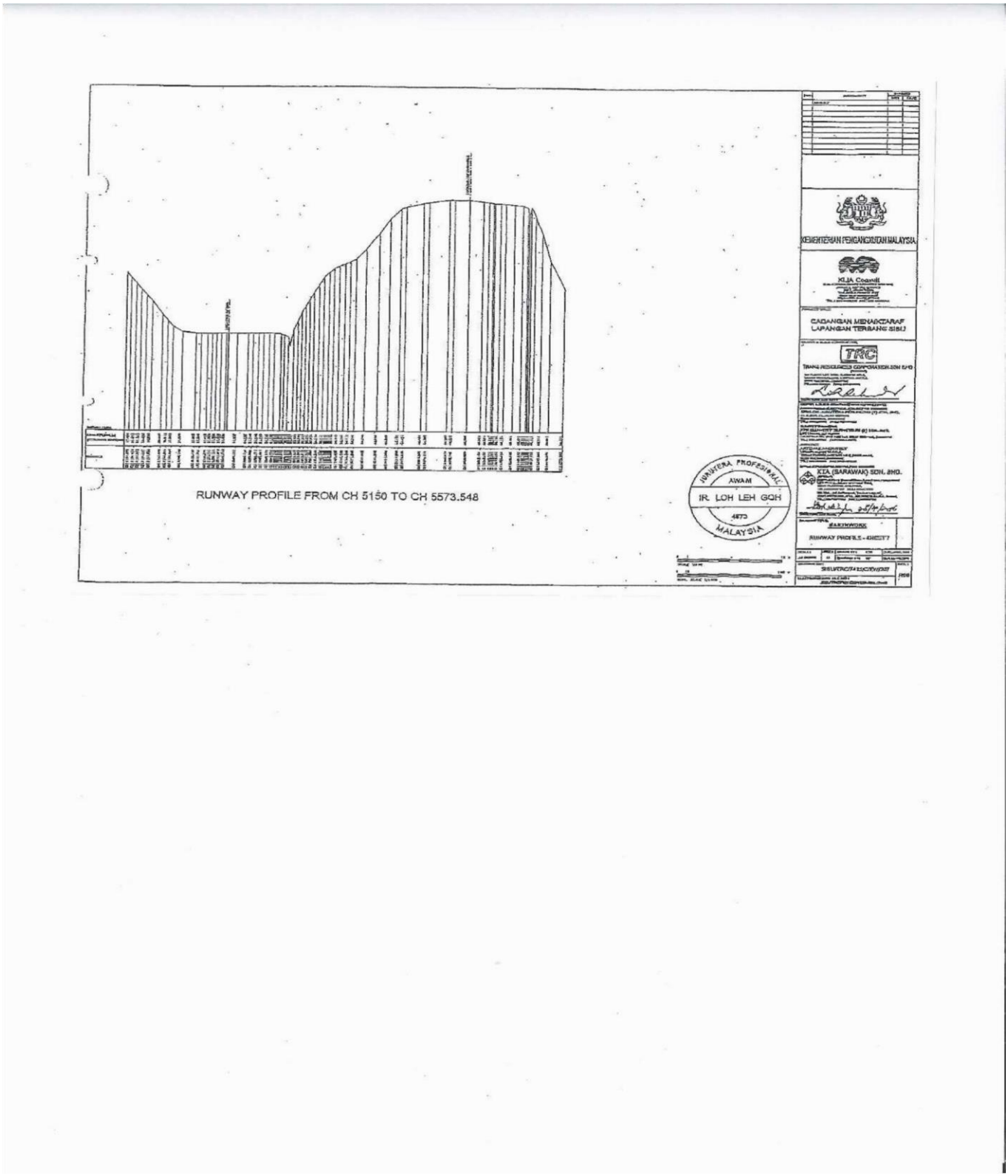
e. From 2350 m to 2900 m (CH3850 to CH4500).



f. From 2900 m to 3550 m (CH4500 to CH5150).



g. From 3550 m to end of runway (CH5150 to CH5578.548).



ICAO

International Standards
and Recommended Practices

Annex 14 to the Convention on International Civil Aviation

Aerodromes

Volume I
Aerodrome Design and Operations

Seventh Edition, July 2016

This edition supersedes, on 10 November 2016, all previous editions of Annex 14, Volume I.

For information regarding the applicability of the Standards and Recommended Practices, see Chapter 1, 1.2 and the Foreword.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.1 Runways

Number and orientation of runways

Introductory Note.— Many factors affect the determination of the orientation, siting and number of runways.

One important factor is the usability factor, as determined by the wind distribution, which is specified hereunder. Another important factor is the alignment of the runway to facilitate the provision of approaches conforming to the approach surface specifications of Chapter 4. In Attachment A, Section 1, information is given concerning these and other factors.

When a new instrument runway is being located, particular attention needs to be given to areas over which aeroplanes will be required to fly when following instrument approach and missed approach procedures, so as to ensure that obstacles in these areas or other factors will not restrict the operation of the aeroplanes for which the runway is intended.

3.1.1 **Recommendation.**— *The number and orientation of runways at an aerodrome should be such that the usability factor of the aerodrome is not less than 95 per cent for the aeroplanes that the aerodrome is intended to serve.*

3.1.2 **Recommendation.**— *The siting and orientation of runways at an aerodrome should, where possible, be such that the arrival and departure tracks minimize interference with areas approved for residential use and other noise-sensitive areas close to the aerodrome in order to avoid future noise problems.*

Note.— Guidance on how to address noise problems is provided in the Airport Planning Manual *(Doc 9184), Part 2, and in* Guidance on the Balanced Approach to Aircraft Noise Management *(Doc 9829).*

3.1.3 Choice of maximum permissible crosswind components

Recommendation.— *In the application of 3.1.1 it should be assumed that landing or take-off of aeroplanes is, in normal circumstances, precluded when the crosswind component exceeds:*

- *37 km/h (20 kt) in the case of aeroplanes whose reference field length is 1 500 m or over, except that when poor runway braking action owing to an insufficient longitudinal coefficient of friction is experienced with some frequency, a crosswind component not exceeding 24 km/h (13 kt) should be assumed;*

- *24 km/h (13 kt) in the case of aeroplanes whose reference field length is 1 200 m or up to but not including 1 500 m; and*

- *19 km/h (10 kt) in the case of aeroplanes whose reference field length is less than 1 200 m.*

Note.— In Attachment A, Section 1, guidance is given on factors affecting the calculation of the estimate of the usability factor and allowances which may have to be made to take account of the effect of unusual circumstances.

3.1.4 Data to be used

Recommendation.— *The selection of data to be used for the calculation of the usability factor should be based on reliable wind distribution statistics that extend over as long a period as possible, preferably of not less than five years. The observations used should be made at least eight times daily and spaced at equal intervals of time.*

Note.— These winds are mean winds. Reference to the need for some allowance for gusty conditions is made in Attachment A, Section 1.

Location of threshold

3.1.5 **Recommendation.**— *A threshold should normally be located at the extremity of a runway unless operational considerations justify the choice of another location.*

Note.— Guidance on the siting of the threshold is given in Attachment A, Section 11.

3.1.6 **Recommendation.**— *When it is necessary to displace a threshold, either permanently or temporarily, from its normal location, account should be taken of the various factors which may have a bearing on the location of the threshold. Where this displacement is due to an unserviceable runway condition, a cleared and graded area of at least 60 m in length should be available between the unserviceable area and the displaced threshold. Additional distance should also be provided to meet the requirements of the runway end safety area as appropriate.*

Note.— Guidance on factors which may be considered in the determination of the location of a displaced threshold is given in Attachment A, Section 11.

Actual length of runways

3.1.7 Primary runway

Recommendation.— *Except as provided in 3.1.9, the actual runway length to be provided for a primary runway should be adequate to meet the operational requirements of the aeroplanes for which the runway is intended and should be not less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aeroplanes.*

Note 1.— This specification does not necessarily mean providing for operations by the critical aeroplane at its maximum mass.

Note 2.— Both take-off and landing requirements need to be considered when determining the length of runway to be provided and the need for operations to be conducted in both directions of the runway.

Note 3.— Local conditions that may need to be considered include elevation, temperature, runway slope, humidity and the runway surface characteristics.

Note 4.— When performance data on aeroplanes for which the runway is intended are not known, guidance on the determination of the actual length of a primary runway by application of general correction factors is given in the Aerodrome Design Manual *(Doc 9157), Part 1.*

3.1.8 Secondary runway

Recommendation.— *The length of a secondary runway should be determined similarly to primary runways except that it needs only to be adequate for those aeroplanes which require to use that secondary runway in addition to the other runway or runways in order to obtain a usability factor of at least 95 per cent.*

3.1.9 Runways with stopways or clearways

Recommendation.— *Where a runway is associated with a stopway or clearway, an actual runway length less than that resulting from application of 3.1.7 or 3.1.8, as appropriate, may be considered satisfactory, but in such a case any combination of runway, stopway and clearway provided should permit compliance with the operational requirements for take-off and landing of the aeroplanes the runway is intended to serve.*

Note.— Guidance on use of stopways and clearways is given in Attachment A, Section 2.

Width of runways

3.1.10 **Recommendation.**— *The width of a runway should be not less than the appropriate dimension specified in the following tabulation:*

Code number	Code letter A	B	C	D	E	F
1[a]	*18 m*	*18 m*	*23 m*	–	–	–
2[a]	*23 m*	*23 m*	*30 m*	–	–	–
3	*30 m*	*30 m*	*30 m*	*45 m*	–	–
4	–	–	*45 m*	*45 m*	*45 m*	*60 m*

a. The width of a precision approach runway should be not less than 30 m where the code number is 1 or 2.

Note 1.— The combinations of code numbers and letters for which widths are specified have been developed for typical aeroplane characteristics.

Note 2.— Factors affecting runway width are given in the Aerodrome Design Manual *(Doc 9157), Part 1.*

Minimum distance between parallel runways

3.1.11 **Recommendation.**— *Where parallel non-instrument runways are intended for simultaneous use, the minimum distance between their centre lines should be:*

— *210 m where the higher code number is 3 or 4;*

— *150 m where the higher code number is 2; and*

— *120 m where the higher code number is 1.*

Note.— Procedures for wake turbulence categorization of aircraft and wake turbulence separation minima are contained in the PANS-ATM (Doc 4444), Chapter 4, 4.9 and Chapter 5, 5.8, respectively.

3.1.12 **Recommendation.**— *Where parallel instrument runways are intended for simultaneous use subject to conditions specified in the PANS-ATM (Doc 4444) and the PANS-OPS (Doc 8168), Volume I, the minimum distance between their centre lines should be:*

— *1 035 m for independent parallel approaches;*

— *915 m for dependent parallel approaches;*

— *760 m for independent parallel departures;*

— *760 m for segregated parallel operations;*

except that:

a) for segregated parallel operations the specified minimum distance:

1) may be decreased by 30 m for each 150 m that the arrival runway is staggered toward the arriving aircraft, to a minimum of 300 m; and

2) should be increased by 30 m for each 150 m that the arrival runway is staggered away from the arriving aircraft;

b) for independent parallel approaches, combinations of minimum distances and associated conditions other than those specified in the PANS-ATM (Doc 4444) may be applied when it is determined that such combinations would not adversely affect the safety of aircraft operations.

Note.— Procedures and facilities requirements for simultaneous operations on parallel or near-parallel instrument runways are contained in the PANS-ATM (Doc 4444), Chapter 6 and the PANS-OPS (Doc 8168), Volume I, Part III, Section 2, and Volume II, Part I, Section 3; Part II, Section 1; and Part III, Section 3, and relevant guidance is contained in the Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) *(Doc 9643).*

Slopes on runways

3.1.13 Longitudinal slopes

Recommendation.— *The slope computed by dividing the difference between the maximum and minimum elevation along the runway centre line by the runway length should not exceed:*

— *1 per cent where the code number is 3 or 4; and*

— *2 per cent where the code number is 1 or 2.*

3.1.14 **Recommendation.**— *Along no portion of a runway should the longitudinal slope exceed:*

— *1.25 per cent where the code number is 4, except that for the first and last quarter of the length of the runway the longitudinal slope should not exceed 0.8 per cent;*

— *1.5 per cent where the code number is 3, except that for the first and last quarter of the length of a precision approach runway category II or III the longitudinal slope should not exceed 0.8 per cent; and*

— *2 per cent where the code number is 1 or 2.*

3.1.15 Longitudinal slope changes

Recommendation.— *Where slope changes cannot be avoided, a slope change between two consecutive slopes should not exceed:*

— *1.5 per cent where the code number is 3 or 4; and*

— *2 per cent where the code number is 1 or 2.*

Note.— Guidance on slope changes before a runway is given in Attachment A, Section 4.

3.1.16 **Recommendation.**— *The transition from one slope to another should be accomplished by a curved surface with a rate of change not exceeding:*

— *0.1 per cent per 30 m (minimum radius of curvature of 30 000 m) where the code number is 4;*

— *0.2 per cent per 30 m (minimum radius of curvature of 15 000 m) where the code number is 3; and*

— *0.4 per cent per 30 m (minimum radius of curvature of 7 500 m) where the code number is 1 or 2.*

3.1.17 Sight distance

Recommendation.— *Where slope changes cannot be avoided, they should be such that there will be an unobstructed line of sight from:*

— *any point 3 m above a runway to all other points 3 m above the runway within a distance of at least half the length of the runway where the code letter is C, D, E or F;*

— *any point 2 m above a runway to all other points 2 m above the runway within a distance of at least half the length of the runway where the code letter is B; and*

— *any point 1.5 m above a runway to all other points 1.5 m above the runway within a distance of at least half the length of the runway where the code letter is A.*

Note.— Consideration will have to be given to providing an unobstructed line of sight over the entire length of a single runway where a full-length parallel taxiway is not available. Where an aerodrome has intersecting runways, additional criteria on the line of sight of the intersection area would need to be considered for operational safety. See the Aerodrome Design Manual *(Doc 9157), Part 1.*

3.1.18 Distance between slope changes

Recommendation.— *Undulations or appreciable changes in slopes located close together along a runway should be avoided. The distance between the points of intersection of two successive curves should not be less than:*

a) the sum of the absolute numerical values of the corresponding slope changes multiplied by the appropriate value as follows:

— *30 000 m where the code number is 4;*

— *15 000 m where the code number is 3; and*

— *5 000 m where the code number is 1 or 2; or*

b) 45 m;

whichever is greater.

Note.— Guidance on implementing this specification is given in Attachment A, Section 4.

3.1.19 Transverse slopes

Recommendation.— *To promote the most rapid drainage of water, the runway surface should, if practicable, be cambered except where a single crossfall from high to low in the direction of the wind most frequently associated with rain would ensure rapid drainage. The transverse slope should ideally be:*

— *1.5 per cent where the code letter is C, D, E or F; and*

— *2 per cent where the code letter is A or B;*

but in any event should not exceed 1.5 per cent or 2 per cent, as applicable, nor be less than 1 per cent except at runway or taxiway intersections where flatter slopes may be necessary.

For a cambered surface the transverse slope on each side of the centre line should be symmetrical.

Note.— On wet runways with crosswind conditions the problem of aquaplaning from poor drainage is apt to be accentuated. In Attachment A, Section 7, information is given concerning this problem and other relevant factors.

3.1.20 **Recommendation.**— *The transverse slope should be substantially the same throughout the length of a runway except at an intersection with another runway or a taxiway where an even transition should be provided taking account of the need for adequate drainage.*

Note.— Guidance on transverse slope is given in the Aerodrome Design Manual *(Doc 9157), Part 3.*

Strength of runways

3.1.21 **Recommendation.**— *A runway should be capable of withstanding the traffic of aeroplanes the runway is intended to serve.*

Surface of runways

3.1.22 The surface of a runway shall be constructed without irregularities that would impair the runway surface friction characteristics or otherwise adversely affect the take-off or landing of an aeroplane.

APPENDIX J

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 01/4/2017

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	N/A		N/A		X	N/A		
Stopway Lights	N/A		N/A		X	N/A		
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage	/		/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/		/			

Name :(1st. Insp) Erkin / Bucot — Time: 0550 hrs (LT)

Name :(2nd Insp) Erkin / Bucot — Time: 1105 hrs (LT)

Name :(3rd Insp) Simon / Romey — Time: 1545 hrs (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 02/04/2017

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Rwy Strip	✓		✓		✓			
TAXIWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
TWY Strip	✓		✓		✓			
AGL								
Runway Edge Lights	✓		✓		✓			
Runway End Light	✓		✓		✓			
Turn Pad Light	✓		✓		✓			
Threshold Wing Bar / Threshold Lights	✓		✓		✓			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	✓		✓		✓			
Taxiway Edge Lights	✓		✓		✓			
Approach Lights	✓		✓		✓			
Apron Edge Light	✓		✓		✓			
PAPI	✓		✓		✓			
Wind Direction Indicator	✓		✓		✓			
Beacon (Aerodrome/Identification)	✓		✓		✓			
APRON								
FOD	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Flood Lights/ High Mast	✓		✓		✓			
Cleanliness	✓		✓		✓			
Vehicle / Equipment Parking	✓		✓		✓			
Passenger Boarding Bridge (PBB)	✓		✓		✓			
Obstructions	✓		✓		✓			
Oil Spillage	✓		✓		✓			
Safety Gear (PPE)	✓		✓		✓			
Emergency shower	✓		✓		✓			
VDGS	✓		✓		✓			
PERIMETER								
Road	✓		✓		✓			
Drainage	✓		✓		✓			
Signages	✓		✓		✓			
Grass Area	✓		✓		✓			
OTHERS								
Guidance Sign (Mandatory & Information)	✓		✓		✓			
Weather Condition	✓		✓		✓			
Grass not obscuring AGL fitting	✓		✓		✓			
Grass not obscuring Signages	✓		✓		✓			
Service Road	✓		✓		✓			

Name :(1st. Insp) ERSINI / KUSAN — Time: 0550 HRS (LT)

Name :(2nd Insp) ERSINI / MOHD ADMAEN — Time: 1100 HRS (LT)

Name :(3rd Insp) BUAAT / HJ ALI (ENG) — Time: 1540 HRS (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 03/10/2019

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Rwy Strip	✓		✓		✓			
TAXIWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
TWY Strip	✓		✓		✓			
AGL								
Runway Edge Lights	✓		✓		✓			
Runway End Light	✓		✓		✓			
Turn Pad Light	✓		✓		✓			
Threshold Wing Bar / Threshold Lights	✓		✓		✓			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	✓		✓		✓			
Taxiway Edge Lights	✓		✓		✓			
Approach Lights	✓		✓		✓			
Apron Edge Light	✓		✓		✓			
PAPI	✓		✓		✓			
Wind Direction Indicator	✓		✓		✓			
Beacon (Aerodrome/Identification)	✓		✓		✓			
APRON								
FOD	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Flood Lights/ High Mast	✓		✓		✓			
Cleanliness	✓		✓		✓			
Vehicle / Equipment Parking	✓		✓		✓			
Passenger Boarding Bridge (PBB)	✓		✓		✓			
Obstructions	✓		✓		✓			
Oil Spillage	✓		✓		✓			
Safety Gear (PPE)	✓		✓		✓			
Emergency shower	✓		✓		✓			
VDGS	✓		✓		✓			
PERIMETER								
Road	✓		✓		✓			
Drainage	✓		✓		✓			
Signages	✓		✓		✓			
Grass Area	✓		✓		✓			
OTHERS								
Guidance Sign (Mandatory & Information)	✓		✓		✓			
Weather Condition	✓		✓		✓			
Grass not obscuring AGL filling	✓		✓		✓			
Grass not obscuring Signages	✓		✓		✓			
Service Road	✓		✓		✓			

Name :(1st. Insp) SIMON / FRANKIE — Time: 0520hrs (LT)

Name :(2nd Insp) SIMON / SUSIE — Time: 1220hrs (LT)

Name :(3rd Insp) IZWAN / Kirsan — Time: 1527 hrs (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MAS8/MSB/OPS/SOP/07/01

DATE : 04/04/17

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	NA		NA		H/A			
Stopway Lights	NA		NA		H/A			
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage	/		/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/		/			

Name :(1st. Insp) KO AKUJI / FRANCIS MAWI — Time: 0529 hrs (LT)

Name :(2nd Insp) KO AKUJI — Time: 1005 hrs (LT)

Name :(3rd Insp) ERTINI / OTHMAN — Time: 1625 HRS (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 05/4/2015

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Rwy Strip	✓		✓		✓			
TAXIWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
TWY Strip	✓		✓		✓			
AGL								
Runway Edge Lights	✓		✓		✓			
Runway End Light	✓		✓		✓			
Turn Pad Light	✓		✓		✓			
Threshold Wing Bar / Threshold Lights	✓		✓		✓			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	✓		✓		✓			
Taxiway Edge Lights	✓		✓		✓			
Approach Lights	✓		✓		✓			
Apron Edge Light	✓		✓		✓			
PAPI	✓		✓		✓			
Wind Direction Indicator	✓		✓		✓			
Beacon (Aerodrome/Identification)	✓		✓		✓			
APRON								
FOD	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Flood Lights/ High Mast	✓		✓		✓			
Cleanliness	✓		✓		✓			
Vehicle / Equipment Parking	✓		✓		✓			
Passenger Boarding Bridge (PBB)	✓		✓		✓			
Obstructions	✓		✓		✓			
Oil Spillage	✓		✓		✓			
Safety Gear (PPE)	✓		✓		✓			
Emergency shower	✓		✓		✓			
VDGS	✓		✓		✓			
PERIMETER								
Road	✓		✓		✓			
Drainage	✓		✓		✓			
Signages	✓		✓		✓			
Grass Area	✓		✓		✓			
OTHERS								
Guidance Sign (Mandatory & Information)	✓		✓		✓			
Weather Condition	✓		✓		✓			
Grass not obscuring AGL fitting	✓		✓		✓			
Grass not obscuring Signages	✓		✓		✓			
Service Road	✓		✓		✓			

Name :(1st Insp) Ramli / Kirsian — Time: 0545 hrs (LT)

Name :(2nd Insp) K. Muji / Rosan — Time: 1105 hrs (LT)

Name :(3rd Insp) Erfina / Frances — Time: 1530 hrs (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 2/4/2017

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage	/		/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/		/			

Name :(1st. Insp) Bugat, Kirian, Othman — Time: 0856HRS (LT)

Name :(2nd Insp) Bunon, Muhdnat Amirul — Time: 1218 HRS (LT)

Name :(3rd Insp) BUMON — Time: 1600 hrs (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 07/04/17

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage			/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/		/			

Name :(1st Insp) ERTINO1 / FRANCIS — Time: 0538 HRS

Name :(2nd Insp) ERTINO1 / PRACTICAL STUDENT — Time: 1145 HRS

Name :(3rd Insp) Dunn / Othman — Time: 1735 HRS

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 08/04/17

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Rwy Strip	✓		✓		✓			
TAXIWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
TWY Strip	✓		✓		✓			
AGL								
Runway Edge Lights	✓		✓		✓			
Runway End Light	✓		✓		✓			
Tum Pad Light	✓		✓		✓			
Threshold/Wing Bar / Threshold Lights	✓		✓		✓			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	✓		✓		✓			
Taxiway Edge Lights	✓		✓		✓			
Approach Lights	✓		✓		✓			
Apron Edge Light	✓		✓		✓			
PAPI	✓		✓		✓			
Wind Direction Indicator	✓		✓		✓			
Beacon (Aerodrome/Identification)	✓		✓		✓			
APRON								
FOD	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Flood Lights/ High Mast	✓		✓		✓			
Cleanliness	✓		✓		✓			
Vehicle / Equipment Parking	✓		✓		✓			
Passenger Boarding Bridge (PBB)	✓		✓		✓			
Obstructions	✓		✓		✓			
Oil Spillage	✓		✓		✓			
Safety Gear (PPE)	✓		✓		✓			
Emergency shower	✓		✓		✓			
VDGS	✓		✓		✓			
PERIMETER								
Road	✓		✓		✓			
Drainage	✓		✓		✓			
Signages	✓		✓		✓			
Grass Area	✓		✓		✓			
OTHERS								
Guidance Sign (Mandatory & Information)	✓		✓		✓			
Weather Condition	✓		✓		✓			
Grass not obscuring AGL fitting	✓		✓		✓			
Grass not obscuring Signages	✓		✓		✓			
Service Road	✓		✓		✓			

Name :(1st. Insp) SIMON L PRANUS — Time: 0540HRS (LT)

Name :(2nd Insp) SIMON / KUS — Time: 1200HRS (LT)

Name :(3rd Insp) PETER T / OTHMAN — Time: 1540 HRS (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 04/04/2017

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	X		X		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	X		X		✓			
Marking	✓		✓		✓			
Rwy Strip	✓		✓		✓			
TAXIWAY								
FOD	✓		✓		✓			
Wildlife Hazard	✓		✓		✓			
Standing Water	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
TWY Strip	✓		✓		✓			
AGL								
Runway Edge Lights	X	1 nos broken	X	1 broken (nos	✓			
Runway End Light	✓		✓		✓			
Turn Pad Light	✓		✓		✓			
Threshold Wing Bar / Threshold Lights	✓		✓		✓			
Taxiway Stopbar Lights	X	N/A	X	N/A	N/A			
Stopway Lights	X	N/A	X	N/A	N/A			
Taxiway Centreline Lights	✓		✓		✓			
Taxiway Edge Lights	✓		✓		✓			
Approach Lights	✓		✓		✓			
Apron Edge Light	✓		✓		✓			
PAPI	✓		✓		✓			
Wind Direction Indicator	✓		✓		✓			
Beacon (Aerodrome/Identification)	✓		✓		✓			
APRON								
FOD	✓		✓		✓			
Surface	✓		✓		✓			
Marking	✓		✓		✓			
Flood Lights/ High Mast	✓		✓		✓			
Cleanliness	✓		✓		✓			
Vehicle / Equipment Parking	✓		✓		✓			
Passenger Boarding Bridge (PBB)	✓		✓		✓			
Obstructions	✓		✓		✓			
Oil Spillage	✓		✓		✓			
Safety Gear (PPE)	✓		✓		✓			
Emergency shower	✓		✓		✓			
VDGS	✓		✓		✓			
PERIMETER								
Road	✓		✓		✓			
Drainage	✓		✓		✓			
Signages	✓		✓		✓			
Grass Area	✓		✓		✓			
OTHERS								
Guidance Sign (Mandatory & Information)	✓		✓		✓			
Weather Condition	✓		✓		✓			
Grass not obscuring AGL fitting	✓		✓		✓			
Grass not obscuring Signages	✓		✓		✓			
Service Road	✓		✓		✓			

Name :(1st. Insp) Simon Akisim — Time: 0600hs

Name :(2nd Insp) Simon Akisim, Yakub, Dingan — Time: 1100hs

Name :(3rd Insp) Simon, Benet, Dominic — Time: 2025hs

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (X) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 10/4/2017

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	X	N/A	X	N/A	N/A			
Stopway Lights	X	N/A	X	N/A	N/A			
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage	/		/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/					

Name :(1st. insp) ICC Muj, Pauzi, Othman . Time: 0610 hrs (LT)

Name :(2nd insp) Pauzi, Kiwai, Dutra) (Student) Time: 1126 hrs (LT)

Name :(3rd insp) Simon, Dominic, Dato' Lau, Wakil MAB, Wakil DCA Time: 1620 hrs (LT)

Name :(4th insp) Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 11/04/17

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	/	N/A	x		NA			
Stopway Lights	/	N/A	x		NA			
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage	/		/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/		/			

Name :(1st Insp) Pawat / Francis — Time: 0543 Hrs (LT)

Name :(2nd Insp) Pawat / Sjm. Nordin — Time: 1145 Hrs (LT)

Name :(3rd Insp) KO MUSI / OTHMAN / GIBSON — Time: 1523 Hrs (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
AERODROME INSPECTION CHECKLIST

MASB/MSB/OPS/SOP/07/01

DATE : 12/04/2017

	STATUS							
	1st Insp	REMARKS	2nd Insp	REMARKS	3rd Insp	REMARKS	4th Insp	REMARKS
RUNWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Rwy Strip	/		/		/			
TAXIWAY								
FOD	/		/		/			
Wildlife Hazard	/		/		/			
Standing Water	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
TWY Strip	/		/		/			
AGL								
Runway Edge Lights	/		/		/			
Runway End Light	/		/		/			
Turn Pad Light	/		/		/			
Threshold Wing Bar / Threshold Lights	/		/		/			
Taxiway Stopbar Lights	N/A		N/A		N/A			
Stopway Lights	N/A		N/A		N/A			
Taxiway Centreline Lights	/		/		/			
Taxiway Edge Lights	/		/		/			
Approach Lights	/		/		/			
Apron Edge Light	/		/		/			
PAPI	/		/		/			
Wind Direction Indicator	/		/		/			
Beacon (Aerodrome/Identification)	/		/		/			
APRON								
FOD	/		/		/			
Surface	/		/		/			
Marking	/		/		/			
Flood Lights/ High Mast	/		/		/			
Cleanliness	/		/		/			
Vehicle / Equipment Parking	/		/		/			
Passenger Boarding Bridge (PBB)	/		/		/			
Obstructions	/		/		/			
Oil Spillage	/		/		/			
Safety Gear (PPE)	/		/		/			
Emergency shower	/		/		/			
VDGS	/		/		/			
PERIMETER								
Road	/		/		/			
Drainage	/		/		/			
Signages	/		/		/			
Grass Area	/		/		/			
OTHERS								
Guidance Sign (Mandatory & Information)	/		/		/			
Weather Condition	/		/		/			
Grass not obscuring AGL fitting	/		/		/			
Grass not obscuring Signages	/		/		/			
Service Road	/		/		/			

Name :(1st Insp) ERFIAI / DOMINIC / FRANCIS — Time: 0550 HRS (LT)

Name :(2nd Insp) ERFIAI / HJ RUDLI / FRANCIS / AMIRUL — Time: 1206 HRS (LT)

Name :(3rd Insp) DOMINIC / EN OTHMAN — Time: 1535 HRS (LT)

Name :(4th Insp) — Time:

NOTE : Condition (/) Satisfactory, (x) Unsatisfactory, NA - Not Applicable
- Pass / fax a copy of this checklist to DCA Control Tower after each aerodrome inspection is done.

APPENDIX K

Sibu Airport Weekly Maintenance Checklist

WEEKLY MAINTENANCE CHECKLIST
(RUNWAY DISTRESS)

Month of.: APRIL

Doc No : SOP/EN/01/01
Page No : 1 of 1

FUNCTIONAL LOCATION: MAB-3072-ASIDE-RNWAY — RUNWAY

FLEXIBLE PAVEMENT / RIGID PAVEMENT: Check for any, Medium (M)and High (H) severity distresses on Pavement. If present, please identify types and severity of the distresses and its location. Arrange for repair work as per recommendation in Pavement Distress Manual.

Functional Location	Start Date (Date & Time Confirmation)	Start Time (Date & Time Confirmation)	Aligator Crack	Bleeding	Block Cracking	Corrugation	Depression	Longituidinal & Transverse Crack	Patching & Utility Cut	Polish Aggregate	Ravelling and Weathering	Rutting	Shoving	Slippage Crack	Swell	Blow Up	Corner Break	Longituidinal & Transverse Crack	Durability Crack	Joint Seal Damage	Pop Outs	Pumping	Scalling / Map Cracking	Settlement/ Faulting	Spalling	End Date (Date & Time Confirmation)	End Time (Date & Time Confirmation)	REMARKS (i.e. Specific location, malfunction detail, action to be taken, etc) *Please use attachment if require more spaces
WEEK 1	3/4/17	1130	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											3/4/17	1200	During inspection, runway ok.
WEEK 2	10/4	1200	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				nil							10/4	1220	During inspection found ok.
WEEK 3	17/4	1200	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											17/4	1220	During inspection found ok.
WEEK 4	24/4/17	1200	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											24/4/17	1215	During inspection found ok

*Notes : Please insert (M) for distresses present with Medium Severity,(H) for distress present with High Severity, (✓) for satisfactory, (OG) for On-Going

Done by;

Name: [signature] MUHAMAD, TECHNICAL OFFICER CIVIL ENGINEERING DIVISION

Verified by;

Name: ALI BIN OMAR, TECHNICAL OFFICER, CIVIL ENGINEERING, MALAYSIA AIRPORTS SDN BHD, SIBU AIRPORT

APPENDIX L

Events Extracted from CVR in Relation to RVR Captured from Transmissiometer

Time	Pilot (P) & ATC (C) communication	RVR13 (meter)	RVR31 (meter)	Altitude passing
	First approach into Runway 13 Sibu.			
1348:39	C: Malaysian 2718, surface wind 210, 04 kts, Runway surface wet, Runway 13, Cleared to Land. Pilot acknowledged the landing clearance.	2000m	1100m	
1352:30	P: Malaysian 2718 going around. Note: Pilot reported that they were not able to sight the PAPI and runway edge lights. Proceeded for holding over waypoint ASABA.	550m	2000m	600ft
1358:23	Controller updated weather report on request from pilot: slight rain over the airfield, surface wind calm, visbility 1500m, RVR 800m.	800m	2000m	2500ft (holding)
1402:37	P: Malaysian 2718, could you update us on the visibility? C: Surface wind calm, light rain, RVR 1200m.	1200m	2000m	2500ft (holding)
1406:12	C: Malaysian 2718, Latest weather, surface wind 020, 02 knots, visibility 3000 meters, heavy rain, cloud few 500, scattered 1800, overcast 15,000, temperature 25,dew point 24, 1011 and RVR 1200.	1100m	No data recorded	2500ft (holding)
1411:08	P: Malaysian 2718 visibility please?			
1411:12	C: Visibility RVR 1200	1200m	1300m	2500ft (holding)

Time	Pilot (P) & ATC (C) communication	RVR13 (meter)	RVR31 (meter)	Altitude passing
1411:15	P: Masih Hujan Lebat? (Is it raining heavily still?)	1200m	1300m	
1411:18	C: On and Off	1200m	1300m	
1411:49	Pilot decided to attempt another approach and was cleared by for approach by ATC at 1411:58	900m	1300m	2500ft
1414:23	C: Malaysian 2718, Wind light and variable, runway surface wet, runway 13, cleared to land.	800m	1500m	2200ft
1414:30	P: Runway 13, Cleared to land, Malaysian 2718.	800m	1500m	2100ft
1414:34	C: Wind light and variable	800m	1500m	2000ft
1415		800m	1600m	1600ft
1416		650m	1400m	800ft RA
1416:52	Pilot reported increased intensity in rain	600m	900m	100ft RA
1417		600m	900m	13ft RA
1417:02	Aircraft touched down on runway 13.	600m	900m (or below)	
1418		500m	550m	
1419		400m	450m	
1420		450m	450m	
1421	Evacuation initiated			

APPENDIX N

Paint Removal at Runway Surface & Apron: Work Progress Report 24 May 2015

(260500-H)
22A, Jalan Kristal K7/K, Seksyen 7, 40000 Shah Alam, Selangor
Tel: +603 5519 2463/2464 Fax: +603 5518 2462
Email: info@aviatrade.com.my

WORK PROGRESS REPORT

Scope of Work : Paint Removal at Runway Surface & Apron

Location : Runway 13 & Apron (BAY 3B)

PO Number / Date

ITEM	Date	AREA	DESCRIPTION	LOCATION	LENGTH (m)	WIDTH (m)	QTY	TOTAL AREA (m2)
1	24 Mei 2015	Apron	Lead In Line	Bay 2A	4.5	0.15	1	0.675
2	24 Mei 2015	Apron	Lead Line	Bay 3B	41.1	0.15	1	6.165
3	24 Mei 2015	Apron	Arrow	Bay 3B	4.4	1.5	1	6.6
4	24 Mei 2015	Apron	Aircraft Type	Bay 3B	0.8	0.6	1	0.48
5	24 Mei 2015	Runway	Centre line	RWY 13	30	0.9	7	189
6					0	0	0	0
7					0	0		0
			Sub-Total		80.8	3.3		202.92

The signature below verifies that the above mentioned work has been done and is in compliance with the requirement.

Comments (if any)

Performed by:

Aviatrade Sdn Bhd
(Chop & Sign)

Verified by :

Malaysia Airport Sdn Bhd
(Chop & Sign)

APPENDIX O

Records of Painting Work Done for Runway Marking at Sibu
(24 April 2015 – 23 May 2017)

KERJA -KERJA MENGECAT RUNWAY

KONTRAK : 01 APRIL 2015 HINGGA 31 MAC 2016 (MASB/3072/SH/2014(11)

AIRSIDE

TARIKH	PERKARA
22.04.2015	RUNWAY DESIGNATION MARKING 3M(W)X9M(L)
25.04.2015	THRESHOLD RUNWAY 13
27.04.2015	THRESHOLD RUNWAY 31
30.04.2015	AIMING POINT 13
02.05.2015	RUNWAY SIDE STRIPE
07.05.2015	TOUCHDOWN ZONE 13
09.05.2015	TOUCHDOWN ZONE 31
09.05.2015	CHEVRON MARKING RUNWAY 31
10.05.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
13.05.2015	CENTERLINE TAXIWAY /TAXIWAY SIDE STRIP/TAXIWAY SHOULDER
13.05.2015	APRON SAFETY LINE/LEAD IN LINE/DOUBLE FULL LINE
14.05.2015	RUNWAY CENTERLINE MARKING - RWY 31
15.06.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
28.07.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
30.08.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
15.09.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
02.09.2015	RUNWAY DESIGNATION MARKING 3M(W)X9M(L)
02.09.2015	THRESHOLD RUNWAY 13
05.09.2015	THRESHOLD RUNWAY 31
20.09.2015	AIMING POINT 13
25.09.2015	RUNWAY SIDE STRIPE
29.09.2015	TOUCHDOWN ZONE 13
30.09.2015	TOUCHDOWN ZONE 31
02.10.2015	CHEVRON MARKING RUNWAY 31
03.10.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
04.10.2015	RUNWAY CENTERLINE MARKING - RWY 31
02.11.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
15.12.2015	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
16.01.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
18.02.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
19.03.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
20.03.2016	RUNWAY CENTERLINE MARKING - RWY 31
22.03.2016	RUNWAY DESIGNATION MARKING 3M(W)X9M(L)
24.03.2016	THRESHOLD RUNWAY 13
25.03.2016	THRESHOLD RUNWAY 31
27.03.2016	AIMING POINT 13
28.03.2016	RUNWAY SIDE STRIPE
30.03.2016	TOUCHDOWN ZONE 13
30.03.2016	TOUCHDOWN ZONE 31
30.03.2016	CHEVRON MARKING RUNWAY 31
31.03.2016	CENTERLINE TAXIWAY /TAXIWAY SIDE STRIP/TAXIWAY SHOULDER
02.04.2016	APRON SAFETY LINE/LEAD IN LINE/DOUBLE FULL LINE
16.04.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
17.04.2016	RUNWAY CENTERLINE MARKING - RWY 31
18.05.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13

KERJA -KERJA MENGECAT RUNWAY

KONTRAK : 01 APRIL 2015 HINGGA 31 MAC 2016 (MASB/3072/SH/2014(11)
~KONTRAK TAMAT

AIRSIDE

TARIKH	PERKARA
18.05.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
18.08.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 14
19.08.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 15
07.10.2016	RUNWAY DESIGNATION MARKING 3M(W)X9M(L)
07.10.2016	THRESHOLD RUNWAY 13
08.10.2016	THRESHOLD RUNWAY 31
10.10.2016	AIMING POINT 13
12.10.2016	RUNWAY SIDE STRIPE
15.10.2016	TOUCHDOWN ZONE 13
16.10.2016	TOUCHDOWN ZONE 31
16.10.2016	CHEVRON MARKING RUNWAY 31
07.10.2016	CENTERLINE TAXIWAY /TAXIWAY SIDE STRIP/TAXIWAY SHOULDER
07.10.2016	APRON SAFETY LINE/LEAD IN LINE/DOUBLE FULL LINE
01.11.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
10.12.2016	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
23.01.2017	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13

KERJA -KERJA MENGECAT RUNWAY

KONTRAK : 21 NOV 2016 - 20 NOV 2019 (MASB/PCD/C/2016)
AIRSIDE

TARIKH	PERKARA
23.01.2017	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
16.02.2017	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
17.02.2017	RUNWAY CENTERLINE MARKING 15 NOS - RWY 31
22.03.2017	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
10.04.2017	RUNWAY CENTERLINE MARKING 15 NOS - RWY 13
12.04.2017	THRESHOLD RUNWAY 13
14.04.2017	THRESHOLD RUNWAY 31
15.04.2017	TOUCHDOWN ZONE 13
09.05.2017	RUNWAY SIDE STRIPE
17.05.2017	RUNWAY SIDE STRIPE
23.05.2017	RUNWAY CENTERLINE MARKING 40 NOS - RWY 13

Last Painting for runway centerline marking - 23.05.2017
Next schedule for painting runway centerline marking - 21 June 2017

APPENDIX P

RVR Readout

Runway 31 Sibu

Date	mean wind speed	mean wind direction	mean MOR	cross wind	RVR
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
/4/2017 22:38	0.4	260	6000	-0.6	2000
/4/2017 22:37	0.6	230	5000	-1.1	2000
/4/2017 22:36	0.8	210	3400	-1.5	2000
/4/2017 22:35	1	200	1800	-1.8	1800
/4/2017 22:34	0.8	180	1800	-1.2	1800
/4/2017 22:33	0.5	220	1800	-1	1800
/4/2017 22:32	0.7	270	1500	-0.9	1500
/4/2017 22:31	0.9	270	1400	-1.1	1400
/4/2017 22:30	0.7	280	1200	-0.7	1200
/4/2017 22:29	0.9	270	1100	-1.1	1100
/4/2017 22:28		260	800	-1.5	800
/4/2017 22:27	1.1	270	700	-1.4	700
/4/2017 22:26	1.3	270	500	-1.6	550
/4/2017 22:25	1.2	300	300	-0.4	300
/4/2017 22:24	1.4	310	350	0	350
/4/2017 22:23	1.8	310	500	0	550
/4/2017 22:22	1.7	310	1100	0	1100
/4/2017 22:21	1.8	320	700	0.6	700
/4/2017 22:20	2	320	450	0.7	450
/4/2017 22:19	2.3	330	450	1.5	450
/4/2017 22:18	2.5		500	1.7	550
/4/2017 22:17	2.9	330	900	1.9	900
/4/2017 22:16	2.6	320	1400	0.9	1400
/4/2017 22:15	2.5	320	1600	0.8	1600
/4/2017 22:14	2.4	310	1500	0	
/4/2017 22:13	2.8	310	1300	0	1300
/4/2017 22:12	3.4	310	1300	0	1300
/4/2017 22:11	3.8	320	1300	1.3	1300
/4/2017 22:10	3.8	320	1100	1.3	1100
/4/2017 22:09	3.6	320	700	1.2	750
/4/2017 22:08	3.6	320	600	1.2	650
/4/2017 22:04	2.9	310	1700	0	1700
/4/2017 22:03	2.8	310	4400	0	2000
/4/2017 22:02	2.7	300	5000	-0.9	2000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Notes:

1. All time above in Local Sibu time
2. Landing was at 2217:02 LT (highlighted in yellow)
3. MOR – Meteorological Optical Range
4. Observe frequently changing RVR reading over the period

Runway 13 Sibu

Date	mean wind speed	mean wind direction	mean MOR	cross wind	RVR
/4/2017 22:32	0.7	120	600	0.2	650
/4/2017 22:31	0.6	110	600	0.4	600
/4/2017 22:30	0.4	80	1400	0.6	1400
/4/2017 22:29	0.6	90	1800	0.7	1800
/4/2017 22:28	0.4	100	1500	0.4	1500
/4/2017 22:27	0.2	160	600	-0.2	600
/4/2017 22:26	0.1	200	1100	-0.2	1100
/4/2017 22:25	0.8	210	1400	-1.5	1400
/4/2017 22:24	1.3	220	1300	-2.5	1300
/4/2017 22:23	0.8	260	1000	-1.2	1000
/4/2017 22:22	0.6	300	700	-0.2	750
/4/2017 22:21	0.6	290	700	-0.4	700
/4/2017 22:20	0.4	250	450	-0.7	450
/4/2017 22:19	0.9	170	400	-1.1	400
/4/2017 22:18	1.3	160	500	-1.3	500
/4/2017 22:17	1.2	150	600	-0.8	600
/4/2017 22:16	0.8	130	600	0	650
/4/2017 22:15	0.9	130	800	0	800
/4/2017 22:14	0.9	130	800	0	800
/4/2017 22:13	1	130	800	0	800
/4/2017 22:12	1	120	900	0.3	900
/4/2017 22:11	0.8	140	1200	-0.3	1200
/4/2017 22:10	0.4	120	1200	0.1	1200
/4/2017 22:09	0.1	330	2000	0.1	2000
/4/2017 22:08	0.4	50	700	0.8	750
/4/2017 22:07	1	30	600	1.9	600
/4/2017 22:06	1.4	360	1000	2.1	1000
/4/2017 22:05	1.6	360	1100	2.4	1100
/4/2017 22:04	1.6	340	1700	1.6	1700
/4/2017 22:03	1.8	340	2200	1.7	2000
/4/2017 22:02	1.8	330	1200	1.2	1200
/4/2017 22:01	1.8	320	1600	0.6	1600
/4/2017 22:00	1.9	320	1300	0.6	1300
/4/2017 21:59	1.2	320	1000	0.4	1000
/4/2017 21:58	1.2	270	900	-1.5	900

Notes:

1. All time above in Local Sibu time
2. Landing was at 2217:02 LT (highlighted in yellow)
3. MOR – Meteorological Optical Range
4. Observe frequently changing RVR reading over the period

APPENDIX Q

Runway 12th Edge Light that was damaged

(12th edge light is approximately 720 m from Threshold Runway 13)

APPENDIX R

Extract of MAB Operations Manual (A)

1. OM (A) 8.3.1.8.2: Commencement and Continuation of an Approach

Before commencing an approach to land, the Commander must satisfy himself that, according to the information available to him, the weather at the aerodrome and the condition of the runway intended to be used should not prevent a safe approach, landing or missed approach, having regard to the performance information contained in OM B (FCOM).

The in-flight determination of the landing distance should be based on the latest available report, preferably not more than 30 minutes before expected landing time.

An aircraft shall not descend in IMC below the minimum (sector) safe altitude (MSA) as shown on the instrument approach chart until it is established in the approved approach /holding procedure or if the aircraft is positively identified and being radar vectored.

The Commander or the pilot to whom conduct of the flight has been delegated may commence an instrument approach regardless of the reported RVR/visibility but the approach shall not be continued beyond the outer marker or equivalent position if the reported RVR/visibility is less than the applicable minima.

Where RVR is not available, RVR values may be derived by converting the reported visibility in accordance with table in chapter 8.1.3.11. If after passing the outer marker or equivalent position in accordance with above, the reported RVR/visibility falls below the applicable minimum, the approach may be continued to DA/H or MDA/H.

Where no outer marker or equivalent position exists, the Commander or the pilot to whom the conduct of the flight has been delegated, shall make the decision to continue or abandon the approach before descending below 1000 ft. above the aerodrome on the final approach segment. If the MDA/H is at or above 1000 ft. above the aerodrome, a height shall be established for each approach procedure, below which the approach shall not be continued if the RVR/visibility is less than the applicable minima.

Except in an emergency, an approach may not be continued beyond established operating minima. The approach may be continued below DA/H or MDA/H and the landing may be completed provided that the required visual reference is established at the DA/H or MDA/H and is maintained.

2. OM (A) 8.3.1.1.15: Briefings

Cockpit Briefings

The purpose of the Cockpit briefing is for the PF to inform the PNF/PM of the planned cause of action for both normal and abnormal situations for the flight. In addition, potential threats shall be identified within the broad categorization of Man, Machine and Environment in all cockpit briefings:

(Note: For COMPLIANCE TO ISARP FLT 3-11-23)

i. **MAN:** Where crew pairing, experience levels, fatigue and attitude (CAPT or FO) may require increased vigilance or any other change to intended contingency planning.

ii. **MACHINE:** Where deficiencies in the aircraft systems, Engineering or Airport and ATC facilities may impact the crews' workload and related processes.

iii. **ENVIRONMENT:** Where anticipation of inclement weather at various phases of the flight may require crew to modify their intended strategies. Airport congestion and conditions of various related services should also be considered when known. NOTAMS that may affect the flight.

Approach Briefing

The PF shall nominate the procedures to be used for the approach. Normally prior to descent and not later than the commencement of an approach, the PF shall brief on: i. aircraft and aerodrome and fuel status ii. Expected or cleared routing and STAR (if applicable and including diagram/charts) iii. MORA, MEA & MSA, any significant terrain problems.

iv. transition level

v. type of approach and appropriate minima and use of automation vi. missed approach routing and actions

vii. runway information and autobrake selection (including length, width, flaps selection and stopping distances)

viii. taxi routing (airport/taxi diagrams, NOTAMS) ix. docking guidance system

x. Other special procedures if applicable (e.g. – Low Visibility Procedures) xi. Meteorological conditions xii. Special conditions and operations (e.g. crew familiarization with the route or airport flown, hazardous materials, environmental, non-standard noise abatement, etc.)

3. OM (A) 8.3.9.2.4 Avoiding Thunderstorms

General rule.

Never regard a thunderstorm lightly. Avoiding thunderstorms is the best policy

i. Don't land or takeoff in the face of an approaching thunderstorm. Turbulence wind reversal or wind shear could cause loss of control.

ii. Don't attempt to fly under a thunderstorm even if you can see through to the other side. Turbulence and wind shear under the storm could be disastrous.

iii. Don't fly without airborne radar into a cloud mass containing scattered embedded thunderstorms. Scattered thunderstorms not embedded usually can be visually circumnavigated. iv. Don't thrust the visual appearance to be a reliable indicator of the turbulence inside a thunderstorm.

v. Do avoid by at least 20 nm any thunderstorm identified as severe or giving an intense radar echo. This is especially true under the anvil of large cumulonimbus.

vi. Do circumnavigate the entire area if the area has 6/10 thunderstorm coverage.

vii. Do remember that vivid and frequent lightning indicates the probability of a severe thunderstorm.

viii. Do regard as extremely hazardous any thunderstorm with tops 35,000 feet or higher whether the top is visually sighted or determined by radar.

1. Departure and Arrival

i. When significant thunderstorm activity is approaching within 15 nm of the airport, the Commander should consider conducting the departure or arrival from different direction or delaying the take-off or landing. Use all available information for this judgement, including PIREPs, ground radar, aircraft radar, tower reported winds and visual observations. In the terminal area, thunderstorms should be avoided by no less than 3 nm. Many ATC radars are specifically designated to reduce or exclude returns from "weather" and in these cases little or no assistance can be given by ATC.

ii. It is recommended that any guidance given by ATC should be used in conjunction with the aircraft own weather radar, in order to guard against possible inaccuracies in the ground radars interpretation of the relative severity of different parts of a storm area. Any discrepancies should be reported to ATC.

AIRPORT DISABLED AIRCRAFT REMOVAL PLAN (ADARP)

MALAYSIA AIRPORTS SDN BHD
SIBU AIRPORT
96000 SIBU
SARAWAK

APPENDIX S

EQUIPMENT AT SIBU AIRPORT, EQUIPMENT FROM OTHER AIRPORTS AND FROM THIRD PARTY FOR REMOVAL OF DISABLED AIRCRAFT (APPENDIX 8)

Airlines / Aircraft Operators & Largest Aircraft	Equipment at Sibu Airport									Equipment From Other Airports & Third Parties					
	Description of Equipment	Qty Required (column 1)	Qty available (Column 2)	Variance (Column 1-2)	Location of Equipment	Contact Person	Mobile No.	Office No.	Fax No.	Qty	Location	Contact Person	Mobile No.	Office No.	Fax No.
MAB	1. Tow Tug	2	1	-1	MAB Workshop	Mr. Tommy Bunsu (Engineer)	013-2168 030	084-307 800							
(B738w)	2. Tow Bar	1	1	Sufficient	MAB Workshop	Mr. Tommy Bunsu (Engineer)	013-2168 030	084-307 800							
	3. Jack	2	1	-1	MAB Workshop	Mr. Tommy Bunsu (Engineer)	013-2168 030	084-307 800							
	4. Pneumatic bag (air bag)	1	0	-1						1	Automated Warehouse, MA (Sepang), KLIA	AODM	012-304 3752	03-8776 9999	03-8926 5012
	5. Lifting equipment (spreader bar c/w lifting slings)	1	0	-1						1	MASB KCH	Airport Manager, KCH	019-479 0668	6082 – 454242	604-955 1314
	6. Heavy duty crane (50 tons)	2	0	-2						2	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316 167	084-343 266
	7. Transporter (Heavy duty lorry)	1	0	-1						1	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316 167	084-343 266
	8. Road builder machine	1	0	-1						1	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316 167	084-343 266
MASWings	1. Tow Tug	2	1	-1	MAB Workshop	Mr. Tommy Bunsu (Engineer)	013-2168 030	084-307 800							
(ATR72-600)	2. Tow Bar	1	1	Sufficient	MAB Workshop	Mr. Tommy Bunsu (Engineer)	013-2168 030	084-307 800							
	3. Jack	2	1	Sufficient	MAB Workshop	Mr. Tommy Bunsu (Engineer)	013-2168 030	084-307 800							
	4. Pneumatic bag (air bag)	1	0	-1						1	Automated Warehouse, MA (Sepang), KLIA	AODM	012-304 3752	03-8776 9999	03-8926 5012
	5. Lifting equipment (spreader bar c/w lifting slings)	1	0	-1						1	MASB KCH	Airport Manager, KCH	019-8166682	6082 – 454242	6082-458587
	6. Heavy duty crane (40 tons)	2	0	-2						2	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316 167	084-343 266
	7. Transporter (Heavy duty lorry)	1	0	-1						1	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316 167	084-343 266
	8. Road builder machine	1	0	-1						1	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316 167	084-343 266
AirAsia	1. Tow Tug	2	1	-1	Staging Area	Mr. Jackson LAU Lee Yung (Station Manager)	019-8272 817	084-307 808	084-307 801						
(A320)	2. Tow Bar	1	1	Sufficient	Staging Area	Mr. Jackson LAU Lee Yung (Station Manager)	019-8272 817	084-307 808	084-307 801						
	3. Jack	2	1	Sufficient	Staging Area	Mr. Jackson LAU Lee Yung (Station Manager)	019-8272 817	084-307 808	084-307 801						
	4. Pneumatic bag (air bag)	1	0	-1						1	Automated Warehouse, MA (Sepang), KLAI	AODM	012-304 3752	03-8776 9999	03-8926 5012
	5. Lifting equipment (spreader bar c/w lifting slings)	1	0	-1						1	MASB KCH	Airport Manager, KCH	019-816 6682	6082 – 454242	6082-458 587
	6. Heavy duty crane (50 tons)	2	0	-2						2	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316167	084-343 266
	7. Transporter (Heavy duty lorry)	1	0	-1						1	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316167	084-343 266
	8. Road builder machine	1	0	-1						1	Kong Saw Ming and Son Contract Services, Sibu	Teo / Kong	016-888 5358	084-316167	084-343 266