AIRCRAFT ACCIDENT

FINAL REPORT

I 04/21

Air Accident Investigation Bureau (AAIB)

Ministry of Transport Malaysia

Incident Involving Fixed Wing Aircraft

Airbus 320-216, Registration 9M-AJN

at Kuching International Airport, Sarawak

on the 7 November 2021

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Issued on 23 March 2022
MOT.(S).600-5/4/82

AIR ACCIDENT INVESTIGATION BUREAU (AAIB)
MALAYSIA

REPORT NO. : I 04/21

OPERATOR	**:**	**AIRASIA**
AIRCRAFT TYPE	**:**	**AIRBUS 320-216**
NATIONALITY	**:**	**MALAYSIA**
REGISTRATION	**:**	**9M-AJN**
PLACE OF OCCURRENCE	**:**	**KUCHING INTERNATIONAL AIRPORT, SARAWAK**
DATE AND TIME	**:**	**7 NOVEMBER 2021 AT 1905LT**

The sole objective of the investigation is the prevention of accidents and incidents. In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of this investigation to apportion blame or liability.

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

INTRODUCTION

The Air Accident Investigation Bureau of Malaysia

The Air Accident Investigation Bureau (AAIB) is the air accidents and serious incidents 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.

AAIB also conducts investigation into air incidents when the occurrence shows evidence to have safety issues concerned.

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

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

In accordance with ICAO Annex 13 paragraph 4.1, notification of the incident was sent on 09 November 2021 to Bureau d'Enquêtes et d'Analyses (BEA) of France as State of Manufacturer. A copy of the Preliminary Report was subsequently submitted to the above organisation on 30 November 2021.

In accordance with ICAO Annex 13 paragraph 6.3, a copy of the Draft Final Report was sent on 17 January 2022 to Civil Aviation Authority of Malaysia (CAAM) as State of Registry, Bureau d'Enquêtes et d'Analyses (BEA) of France as State of Manufacturer, Airbus as State of Manufacturer's Technical Adviser, European Aviation Safety Agency (EASA), Aircraft Operator and Aerodrome Operator inviting their significant and substantiated comments on the report.

Unless otherwise indicated, recommendations in this report are addressed to the investigating or regulatory authorities of the State having responsibility for the matters

with which the recommendations are concerned. It is for those authorities to decide what action is taken.

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APPENDICES

GLOSSARY OF ABBREVIATIONS

A	
AAIB	Air Accident Investigation Bureau
ATPL	Airline Transport Pilot Licence
B	
BEA	Bureau d'Enquêtes et d'Analyses of France
C	
CAAM	Civil Aviation Authority of Malaysia
CM	Crew Member
COVID-19	Coronavirus Disease 2019
E	
EASA	European Aviation Safety Agency
H	
HFACS	Human Factors Analysis and Classification System
I	
ICAO	International Civil Aviation Organisation
ICC	In-Charge Cabin Crew
ie	id est or 'that is'
K	
KIA	Kuching International Airport
KLIA	Kuala Lumpur International Airport
L	
LCD	Liquid Crystal Display
LT	Local Time
LTD	Limited

M

MASB	Malaysia Airports Sdn Bhd
MOR	Mandatory Occurrence Report

O

OEM	Original Equipment Manufacturer

P

PBB	Passenger Boarding Bridge
PLC	Programmable Logic Control
PTY	Private

S

SOP	Standard Operating Procedures

U

UTC	Coordinated Universal Time

SYNOPSIS

An Airbus 320-216 on a schedule flight AK6461 from Sibu arrived at Kuching International Airport and docked at Bay 1. Upon docking, Passenger Boarding Bridge (PBB) was connected.

While passengers were disembarking, a sudden jolt was felt (vertical and lateral) and the PBB alarm sounded. Passenger disembarkation was temporary halted and PBB Operator was immediately contacted. It was found that the Forward Passenger Door lower edge skin had contacted with the PBB safety shoe metal structure which caused a tear on the lower edge skin.

The PBB Operator came later to retract and reconnect back the PBB. Remaining passengers disembarked from the aircraft successfully. Aircraft Engineer inspected the damage and declared the aircraft unfit to fly.

A Mandatory Occurrence Report (MOR) was submitted by the Aircraft Operator to Civil Aviation Authority of Malaysia (CAAM) and Air Accident Investigation Bureau, Malaysia (AAIB) as notification of the incident.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

Flight AK6461 was a scheduled flight from Sibu to Kuching. After landing at Kuching International Airport (KIA), aircraft was assigned to Bay 1. Aircraft taxied in and parked at Bay 1 uneventfully. After the aircraft had parked, engines were shut down and the parking checklist was completed. The chocks were placed and the park brakes were released. Seatbelt sign was turned off after confirming all 4 aircraft doors had been disarmed by the crew.

Crew Member 1 (CM1)[1] and Crew Member 2 (CM2)[2] proceeded with their respective duties in preparation for the next sector in the cockpit. Few minutes later, In-charge Cabin Crew (ICC)[3] report that passenger disembarkation was temporary halted as ICC was not sure if it was safe to proceed with the disembarkation due to the activation of the PBB alarm. ICC also reported that the PBB had come in contact with Forward Pax Door lower edge skin. PBB Operator was contacted as the PBB Operator was not on standby at the PBB at the time when passengers were disembarking.

CM1 ascertained the ICC's statement by having a visual look at the door and having heard the sounding alarm of the PBB. CM1 went down to pass the message to the technician on duty to have a visual inspection and to ascertain the safety of the aircraft. On the way back to the cockpit, CM1 noticed the disembarkation had been continued with ICC and Cabin Crew P4 manning the passenger door from inside and outside. Moments later, the PBB Operator arrived and CM1 stopped the disembarkation to allow the PBB Operator to proceed with the recovery actions.

The PBB Operator proceeded to retract the PBB backward in effort to detach the stuck PBB safety shoe metal structure from the aircraft passenger door. However,

[1] CM1 is the Aircraft Captain flying on the left-hand seat.
[2] CM2 is the Aircraft Commander flying on the right-hand seat.
[3] ICC is the Senior Cabin Crew in-charge of the aircraft cabin.

since the PBB safety shoe metal structure was still in contact with the passenger door, a loud “clicking” sound was heard from the door during the PBB retraction process.

CM1 immediately stopped the PBB Operator’s action and suggested that PBB should be retracted downward and then backward instead. The PBB Operator realized the problem and proceeded to retract the PBB as suggested successfully. The PBB was reconnected and the disembarkation of remaining passengers were completed successfully.

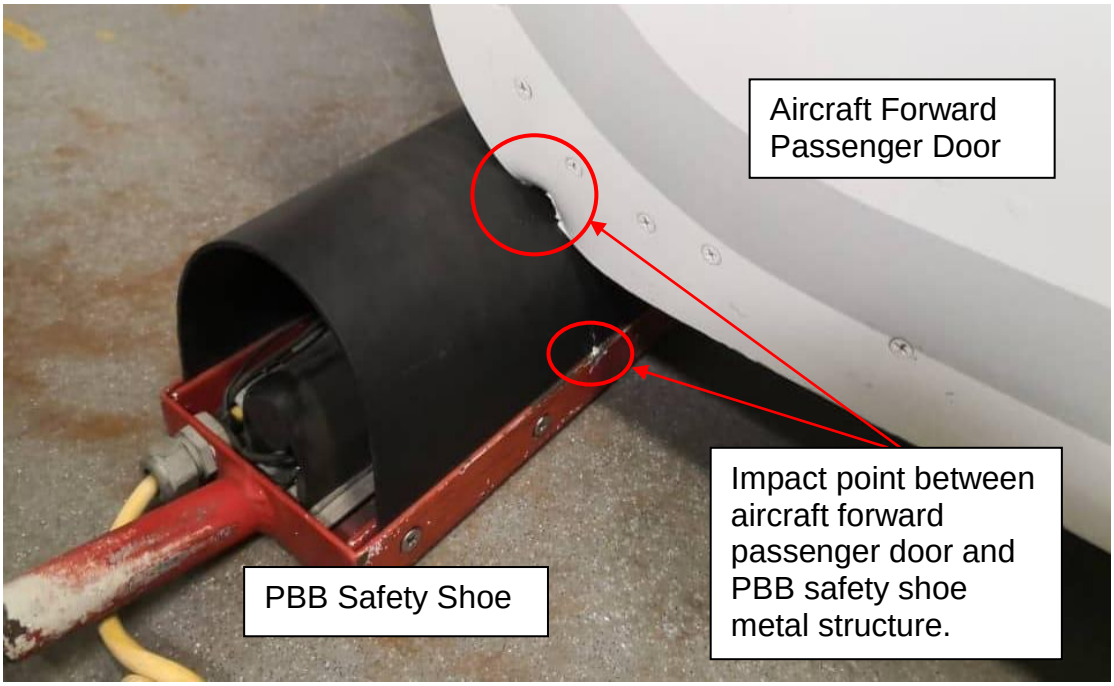

Figure 1: Impact point between aircraft forward passenger door and PBB safety shoe metal structure.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	NIL	NIL	NIL	NIL
Serious	NIL	NIL	NIL	NIL
None	7	128	1 (infant)	136

Figure 2: Injuries to persons

1.3 Damage to Aircraft

Post incident inspection revealed the Forward Passenger Door lower edge skin found torn.

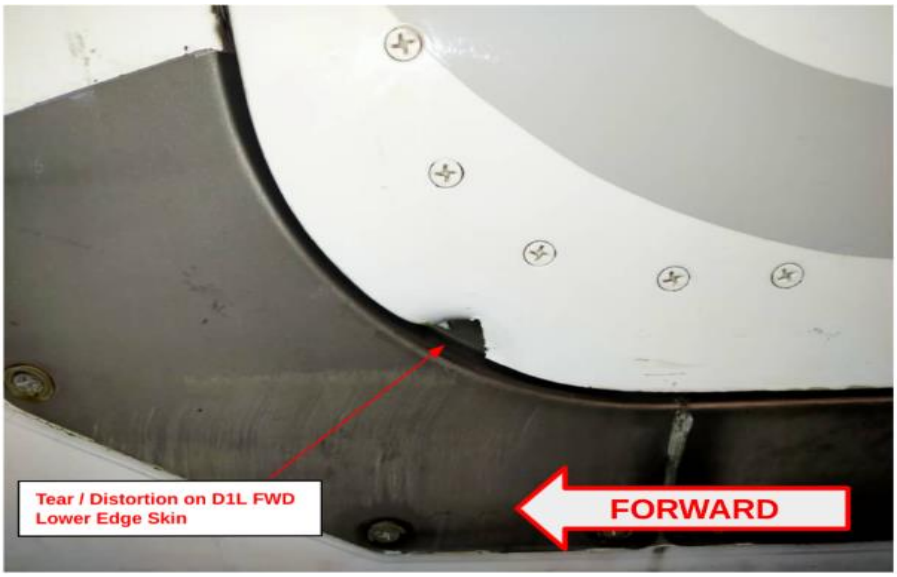

Figure 3: Damage forward passenger door lower edge skin.

1.4 Other Damage

Nil

1.5 Personnel Information

1.5.1 Aircraft Commander (CM2)

Nationality		Malaysian
Age		45
Gender		Male
License Type		ATPL
License Expiry		30 June 2022
Medical Expiry		31 May 2022
Aircraft Rating		A320
Instructor Rating		A320
Flying Hours	Total Hours	10,668.44
	Total on Type	9,850.30

Figure 4: Personnel Information – Aircraft Commander

1.5.2 Aircraft Captain (CM1)

Nationality		Malaysian
Age		30
Gender		Male
License Type		ATPL
License Expiry		31 July 2022
Medical Expiry		31 July 2022
Aircraft Rating		A320
Instructor Rating		Nil
Flying Hours	Total Hours	5,602
	Total on Type	5,437

Figure 5: Personnel Information – Aircraft Captain

1.5.3 Passenger Boarding Bridge (PBB) Operator

Age	57
Gender	Male
Organisation	Malaysia Airports Sdn Bhd (MASB)
Courses/Validities	1. PBB Operator Recertification Training Done – 21 October 2021. 2. PBB Permit Expiry – 19 October 2023.

Figure 6: Personnel Information – PBB Operator

1.6 Aircraft Information

The aircraft flown that day was in airworthy condition.

Aircraft Type	A320-216 (CEO)
Manufacturer	Airbus
Year of Manufacture	2014
Owner	SAFE N023 PTY LTD
Registration No.	9M-AJN
Aircraft Serial No.	6145
Certificate of Airworthiness Issue / Expiry date	22 May 21 / 21 May 22
Certificate of Registration Issue / Expiry date	15 Aug 19 / 14 Aug 22
Total Flight Hours	20,475

Figure 7: Aircraft Data

1.7 Meteorological Information

The incident happened during twilight[4] to dusk hours. Weather was fine and is not a contributing factor to the incident.

1.8 Aids to Navigation

Not applicable

1.9 Communications

PBB Operator was not contactable on walkie-talkie immediately after the incident. The PBB telephone/intercom was inoperative.

1.10 Aerodrome Information

Airfield	Kuching International Airport (KIA)
Runway	07/25
Length	3780m
Width	46m
ICAO Designator	WBGG
IATA Designator	KCH
Elevation	88ft

Figure 8: Kuching Aerodrome Information

The manufacturer of PBB Bay 1 is CIMC Tianda Airport Support Ltd, Shenzhen, China. It is a noseloader type bridge and had been in operation at KIA since year 2005.

KIA is equipped with 9 PBB for aircraft docking ie Bay 1 to Bay 9. There are 2 types of PBB in use at KIA ie noseloader type bridge (fix bridge) for Bay 1 to Bay 4 and apron drive type bridge (moveable) for Bay 5 to Bay 9. The aircraft parking bays location in KIA are as shown in Figure 9.

[4] Twilight is the period between sunset and dusk. During twilight there is still light in the sky.

A noseloader bridge is an enclosed passenger walkway between aircraft and terminal building (or fixed link). The bridge's function includes extending/retracting and elevating/lowering. The bridge is also equipped with a video camera display to monitor the surrounding area of the hydraulic station for the safe manoeuvre of the bridge by the PBB Operator. The noseloader PBB schematic diagram is shown in Figure 10. Figure 11 shows the noseloader bridge Bay 1 at KIA.

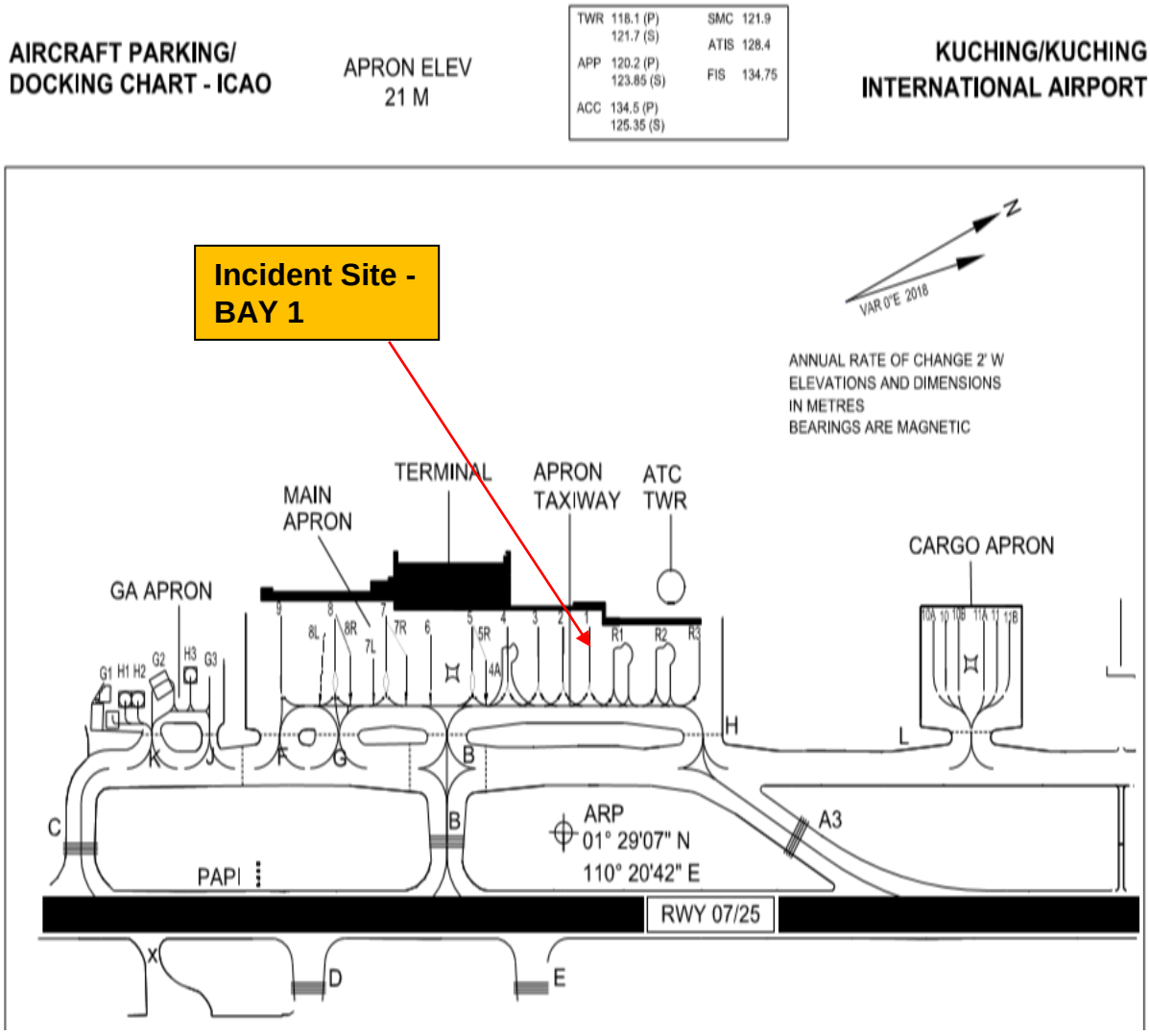

Figure 9: Aircraft parking / docking location at Kuching International Airport

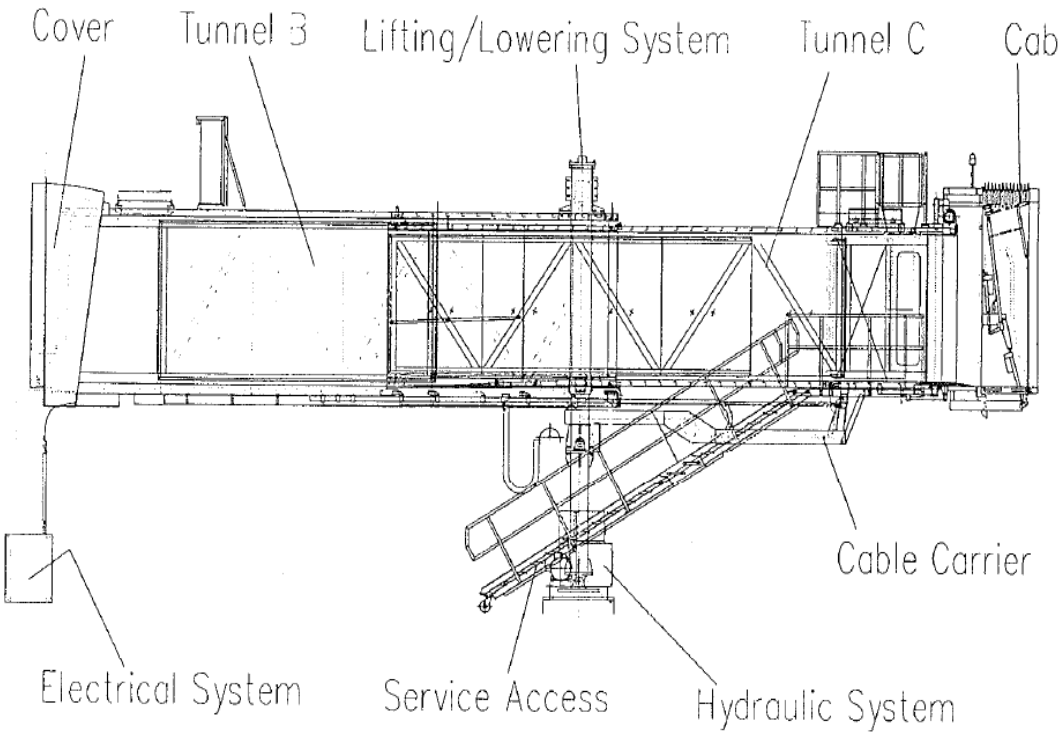

Figure 10: Noseloader PBB Schematic Diagram

Figure 11: Noseloader Bridge Bay 1 at Kuching International Airport

1.11 Flight Recorders

Information in the aircraft flight recorder was not downloaded as it was not applicable to this incident.

1.12 Wreckage and Impact Information

Aircraft declared unserviceable and parked at Bay 1 for rectification by Aircraft Operator's Engineers.

1.13 Medical and Pathological Information

Nil.

1.14 Fire

Nil.

1.15 Survival Aspects

There were no fatalities or injuries to passengers and crews.

1.16 Tests and Research

AAIB recommended a temporary suspension on the operations of PBB Bay 1 on 16 November 2021 till an inspection and test was carried out by the PBB Original Equipment Manufacturer (OEM) to verify its operational status.

The OEM, CIMC Tianda's local contractor Wee Hock Electronic and Electrical Company conducted an inspection and testing on PBB Bay 1 to determine its operational status on 17 and 22 November 2021.

Inspection and testing on the PBB system operation and all safety features ie Bumper Limit Switch, Auto Leveller, Safety Shoe and Programmable Logic Control (PLC) found all systems are in good and serviceable condition **(Appendix A)**.

1.17 Organisational and Management Information

The Aircraft Operator's headquarters is situated in Kuala Lumpur International Airport (KLIA), with Kuching International Airport, Sarawak as one of its secondary hubs. The hub in Kuching operates Airbus 320 aircrafts and act as a centre for flights to Sabah and Peninsula Malaysia and also within Sarawak region.

The Aerodrome Operator for Kuching International Airport (KIA) is Malaysia Airports Sdn Bhd (MASB). MASB is licenced by Ministry of Transport Malaysia to operate, manage, and maintain all aerodrome in Malaysia except Kuala Lumpur International Airport (KLIA) valid till year 2034.

1.17.1 Post Incident Aircraft Inspection and Maintenance

The Aircraft Operator had undertaken and completed the post incident inspection and maintenance tasks to recover the aircraft. All findings had been consolidated and shared with Airbus, France to return the aircraft to an airworthy state.

The temporary repair on the forward Passenger Door lower edge skin tear damage was successfully carried out by AirAsia Engineering Team on 11 November 2021 as authorised by Airbus in the Repair and Design Approval Form.

CAAM authorised a non-pressurised and non-revenue flight back to Kuala Lumpur to undergo permanent repair on the said tear damage. The permanent repair was completed on 16 November 2021 and aircraft returned to service as airworthy on 17 November 2021.

1.17.2 Post Incident PBB Inspection and Maintenance

Preliminary evidence observed during site investigation by AAIB investigation team found the following:

a. Aircraft crew observed fault indication “Level Fault” at PBB LCD Touch Screen Display when the PBB siren was activated.

b. Screen shot for record of event indicating Safety Shoe had been activated twice during the incident (Figure 12).

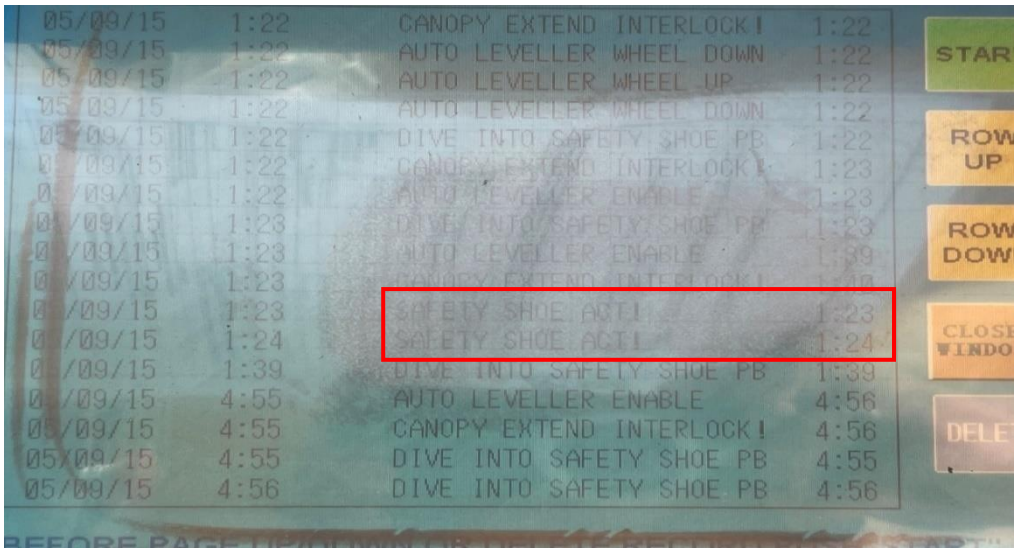

Figure 12: Screen shot of PBB LCD touch screen display showing safety shoe activated twice

Base on the preliminary evidence above, AAIB recommended to the Aerodrome Operator the following to determine the cause of a probable PBB malfunction and as a safety precaution to prevent a similar incident from happening again at PBB Bay 1:

a. Conduct a maintenance inspection and test by the OEM to determine the operational status of the PBB Bay 1.

b. Temporary suspension on the operation of PBB Bay 1 till the inspection and test results are made available.

Based on test report results from the OEM’s local contractor **(refer paragraph 1.16 and Appendix A)**, PBB Bay 1 was declared safe for operations and was returned to service by the Aerodrome Operator on 26 November 2021.

1.17.3 PBB Bay 1 LCD Touch Screen Display

On-site investigation revealed that the PBB LCD touch screen display had the following malfunction (Figure 13):

a. Screen time function cannot be set to actual date and time. All history of event recorded cannot be verified to actual date and time.

b. Function buttons were inoperative therefore limiting the display function.

c. History of recorded event of the PBB and other functions cannot be view due to scroll buttons inoperative. The history of recorded event displayed show the latest recorded activities of the PBB only.

Nevertheless, it was observed that the PBB was still operating normally as the control buttons for manoeuvring the PBB are located separately below the touch screen display (Figure 13).

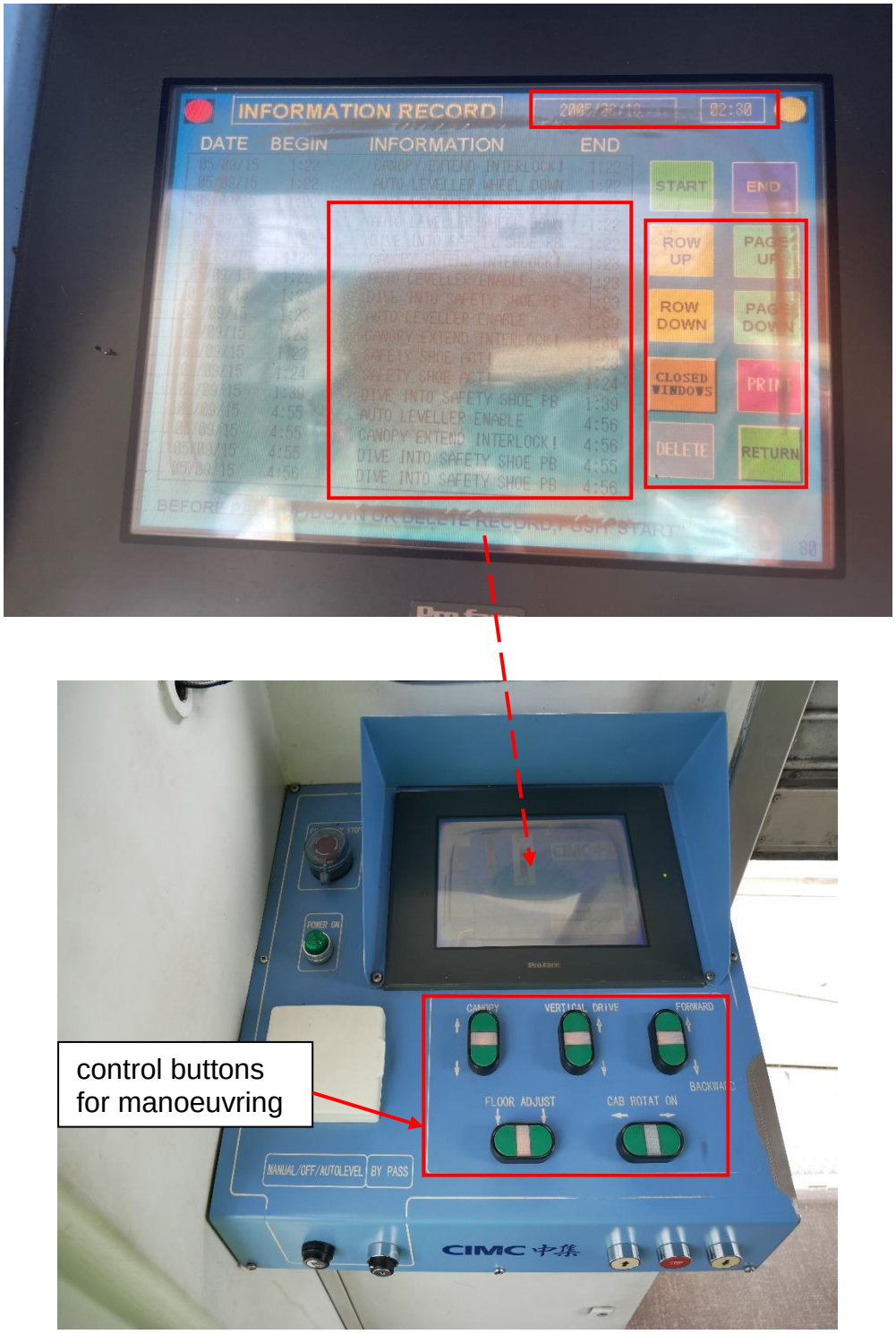

Figure 13: PBB Bay 1 LCD touch screen display after the incident (above) and control buttons for manoeuvring (below)

1.17.4 Video Surveillance Camera Recording

Three video surveillance camera recording were downloaded and analysed by the investigation team. The surveillance cameras were situated at the following position:

a. Bay 1 – Recording of the following:

i. Aircraft parking and docking to PBB. Crowding at PBB Operating Console area by the aircraft operator's personnel and aircraft cleaners during the aircraft docking and passenger disembarkation process.

ii. PBB Operator arrival at PBB before aircraft parking and leaving immediately after PBB engaged.

iii. Aircraft significant nose down attitude movement seen during passenger disembarkation and offloading of baggage/cargo at aircraft Cargo Hold 1.

iv. PBB malfunction indicated by the retraction of PBB canopy.

b. Gate 1 – Recording of passengers' disembarkation and proceeding to arrival hall.

c. Gate 3 – Recording of PBB Operator walking towards the arrival hall with intention to proceed to office to record aircraft docking particulars.

1.17.5 Standard Operating Procedure (SOP) – PBB Operations

The following non-compliances to the MASB SOP – PBB Operations by the PBB Operator was observed during the video surveillance camera recording analysis (Figure 14):

a. PBB Operator was not on standby at the PBB until the last passenger had disembarked. The PBB Operator was observed leaving the PBB immediately after it was safely engaged to the aircraft.

	MALAYSIA AIRPORTS SDN BHD	Effective Date: 1/4/ 2020
MALAYSIA AIRPORTS	STANDARD OPERATING PROCEDURE	Edition: 3
		Revision: 3
	PASSENGER BOARDING BRIDGE OPERATIONS	Page 7 of 8
		Doc No: MAHB/MSB/OPS/SOP/03

g) Engineering maintenance team shall carry out the repairing works.

6.3 AIRCRAFT DOCKING & RETRACTING OF PBB

6.3.1. Aircraft shall dock at designated bay and AO shall ensure that PBB is clear from any object or person during aircraft docking and retracting process.

6.3.2. AO shall ensure that the PBB floor is levelled with the aircraft door.

6.3.3 AO shall position the PBB safety shoes (if provided).

6.3.4 Airlines ground staff shall be responsible to notify the aircraft cabin crew to open aircraft door.

6.3.5. AO shall fill up the Docking Sheet as per MAHB/MSB/OPS/SOP/03/02, and submit to the IO/IA on daily basis for recording purposes.

6.3.6 Aircraft stand shall be monitored visually by AO to ensure that the clearance distances is sufficient from an aircraft to PBB or object.

6.4 DISEMBARKATION OF PASSENGERS

6.4.1 Passengers shall disembark the aircraft through PBB pier into terminal building.

6.4.2 AO shall standby at the PBB until the last passenger is disembarked.

Figure 14: MASB SOP – PBB Operations

It was observed that the instruction to place the safety shoe and the standby location for the PBB Operator during passenger disembarkation is not specific (Figure 14). The width of the passenger door is quick wide and the safety shoe can be understood to be placed anywhere along the bottom of the aircraft passenger door while the instruction to standby at the PBB can be understood as anywhere at or in the PBB.

A review to update the MASB SOP – PBB Operations needs to be conducted by the Aerodrome Operator to ensure the instructions stated are clear and concise to avoid misinterpretation and confusion which can jeopardise safety.

1.17.6 PBB Safety Shoe Functional Check and Placement

The Manufacturer's PBB Operations Instruction clearly states that the PBB Operator is to perform a functional check on the safety shoe to ensure it operates normally before the aircraft docks (Figure 15). Nevertheless, this functional check was not stated in the MASB SOP – PBB Operations and taught during PBB Operator's Training, therefore the PBB Operator did not perform this check.

The Manufacturer's PBB Operations Instruction also states that the safety shoe should be placed in a suitable position (Figure 15) while the MASB SOP – PBB Operations states that the PBB Operator shall position the safety shoe if provided (Figure 14). This is to ensure the safety shoe provides the necessary safety protection to the aircraft passenger door when the PBB is engaged to the aircraft.

Both these publications did not provide clear instructions to the PBB Operator on the placement position of the safety shoe under the aircraft passenger door. Nevertheless, all PBB Operators were verbally informed in training that the safety shoe shall be placed in the middle under the aircraft passenger door.

Witness statement also revealed that there is a difference in the understanding on the need to perform a functional check on the safety shoe by the PBB Operator every time before the aircraft docked as required in Figure 15. The Aerodrome Operator Engineer was aware of the manufacturer's requirement while the Aerodrome Operator Operation Manager was not made known of this requirement.

(8). Door protection switch

There is a removable protection switch for safety shoe in the left front of floor panel of cab to prevent from damage to outwards opening Safety shoe because of aircraft declining, boarding bridge rising, etc. When safety shoe press stretch tactile rod of protection switch, boarding bridge declines automatically, so every time operators are required to check whether door protection switch works normally prior to picking up aircrafts. After the bridge connect with aircrafts safely, the switch should be placed in suitable position to ensure safety shoe under reliable protection.

Figure 15: Manufacturer PBB Operations Instruction

1.17.7 Standby Requirement at PBB Operating Console

The MASB SOP – PBB Operations clearly states that the PBB Operator is required to standby at the PBB till the last passenger disembarked (Figure 14). The Manufacturer's PBB Operations Instruction also clearly states that when the PBB is fixed against the aircraft and controlled by the AUTO LEVEL function, the operator is required to stand at the PBB Operating Console, not just standby at the PBB (Figure 16).

This instruction means that the PBB Operator must stand at the **PBB Operating Console**, not just standby at the **PBB**. It also means the PBB Operator must stand at the PBB Operating Console not only during passenger disembarkation but also during **embarkation** as the AUTO LEVEL function is engaged during both these phases of passenger movement.

The need to monitor fault indication at the PBB LCD touch screen display and switch MANUAL system when the AUTO LEVEL system indicates a fault or the safety shoe had been activated are the main reasons the PBB Operator must stand at the PBB Operating Console during passenger embarkation and disembarkation (Figure 16). The reason is to make adjustment to the PBB height to prevent damage to the aircraft passenger door when the above faults are identified by the PBB Operator.

Witness Statement indicated that it was a common practice by the PBB Operators to leave the PBB without waiting for the full disembarkation of

passengers as it is claimed by the PBB Operator that there are requirements to operate other PBB for incoming flights due to manpower shortage. Nevertheless, for this incident, there is no such requirement as seen in the PBB docking sheet (Figure 17).

(2). Approaching status

the Approaching status is referred to as that the boarding bridge is fixed against the aircraft and controlled by AUTO LEVEL, under such circumstances, operator is required to stand at console, the following precautions are shown as follows:

Caution:

a.The emergency brake should not be used(or released) during walking if not emergency situation!

b.The joining is only be carried out after the aircraft is stable position. During the process and its approach to aircraft, no person is allowed to stand under the cab!

(a).The working status of AUTO LEVEL unit

When assengers pass the aircraft door or cargoes are loaded and unloaded, the height of aircraft door varies, the boarding bridge will be at AUTO LEVEL status to track the height variation in the height of aircraft so as to adjust the height of aircraft door.As usual, the boarding bridge will implement track movement if the height variation reach 2-3cm. The AUTO LEVEL system is faulted if the boarding bridge does not adjust the height when the aircraft height variation exceeds 5cm. At the time, the operator is required to put the key switch to MANUAL Status to adjust the height of boarding bridge based on the aircraft height variation and inform the maintenance personnel immediately.

(b). Measures should be taken to prevent passengers (especially kids) from tampering the control unit.

(c).When the boarding bridge head are overcrowded, evacuation should be carried out.

(3). Boarding bridge retreat operation

When all passengers have gotten on the aircraft, the ground service perso nnel is informed to retreat the boarding bridge, the operator will do the following steps:

(a).Turn the key switch to MANUAL STATUS to put the boarding bridge into manual status(leveling wheel is retracted).

(b).Press canopy shrinking button for putting the canopy back to retracted position.

(c). Press tunnel shrinking button to drive the boarding bridge back to parking position.

(d).Turn the key switch to the middle OFF position and pull it out.

(e).Close front door of cab.

Figure 16: Manufacturer PBB Operations Instruction

1.17.8 PBB Operators Training Syllabus

It was observed that the PBB Operators Training Syllabus – Perform PBB Docking Operation states that the PBB Operator is to apply safety shoe under the aircraft door. It does not specify specifically that the safety shoe should be placed in the middle under the aircraft passenger door. Witness statement from the PBB Operator revealed that it was only mention verbally during the PBB Operator's training to place the safety shoe at the bottom centre of the aircraft passenger door.

It was also observed that there was no mention in the PBB Operators Training Syllabus to conduct a functional check on the safety shoe to ensure it operates normally before the aircraft docks. Therefore, all PBB Operators were not trained to conduct this safety procedure as required by the Manufacturer's PBB Operations Instruction. This requirement should also be included into the MASB SOP – PBB Operations.

The PBB Operators Training Syllabus provided to the investigation team was in power point slide brief format. It was not in a documented syllabus form with clear training objectives, training modules and learning outcomes. A proper training syllabus needs to be formulated by the Aerodrome Operator to ensure the training standards are met to produce qualified and skill PBB Operators to perform their duties.

1.17.9 PBB Operator Shift System

The Aerodrome Operator had implemented 2 circles shift pattern per day with 4 teams of 3 personnel in each team. The duty hours are from 0800 to 2000 hours and 2000 to 0800 hours ie 12 hours per shift per day. On the incident day, there were only 3 PBB Operators scheduled on duty for the shift.

For this shift, there were a total of 15 flights recorded docking at various PBB as shown in the PBB Docking Sheet in Figure 17. Evidence from the PBB docking sheet shows that the PBB Operator involved in this incident was task

to operate the PBB for a total of 6 times only during his shift. It also shows on the day of the incident, 3 PBB Operators on duty were sufficient to handle all aircraft docking requirements for the day without any overlapping of duties between each PBB operators.

It was observed that the 12 hours duration shift system is very long. During the witness interview with the PBB Operator, it had been mentioned that the long working hours had been challenging to the majority of the PBB Operators. It was made known to the investigation team that the 12 hours shift system was implemented due to shortage of personnel since August 2020. It also coincides with the COVID -19 pandemic flight restriction period. The previous shift system was an 8 hours 3 circles shift pattern per day with 4 teams of 4 personnel in each team.

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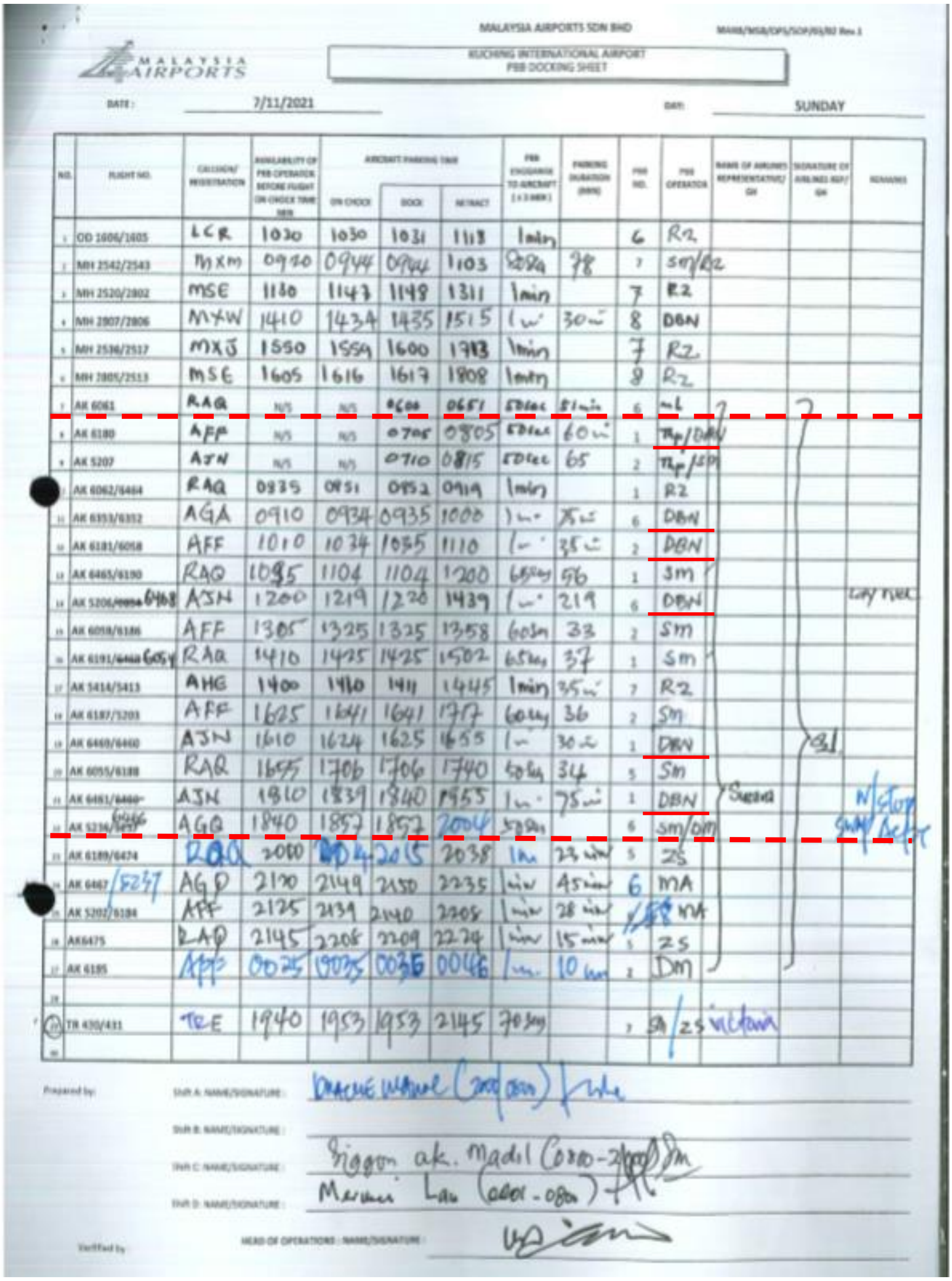

MALAYSIA AIRPORTS SDN BHD

KUCHING INTERNATIONAL AIRPORT
PBB DOCKING SHEET

DATE: 7/11/2021 DAY: SUNDAY

NO.	FLIGHT NO.	CALLSIGN/ REGISTRATION	AVAILABILITY OF PBB OPERATOR BEFORE FLIGHT ON CHOCK TIME	AIRCRAFT PARKING TIME: ON CHOCK	DOCK	RETRACT	PBB ENGAGE TO AIRCRAFT	PARKING DURATION (MIN)	PBB NO.	PBB OPERATOR	NAME OF AIRLINES REPRESENTATIVE/ GH	SIGNATURE OF AIRLINES REP/ GH	REMARKS
1	OD 1606/1605	LCR	1030	1030	1031	1113	1min		6	R2			
2	MH 2542/2543	MXM	0920	0944	0944	1103	20sec	78	7	SM/R2			
3	MH 2520/2802	MSE	1130	1147	1148	1311	1min		7	R2			
4	MH 2807/2806	MXW	1410	1434	1435	1515	1min	30min	8	DBN			
5	MH 2536/2517	MXJ	1550	1559	1600	1713	1min		7	R2			
6	MH 2805/2513	MSE	1605	1616	1617	1808	1min		8	R2			
7	AK 6061	RAQ	N/S	N/S	0600	0651	50sec	51min	6	ML			
8	AK 6180	AFF	N/S	N/S	0705	0805	50sec	60min	1	TP/DBN			
9	AK 5207	AJN	N/S	N/S	0710	0815	50sec	65	2	TP/SP			
10	AK 6062/6464	RAQ	0835	0851	0852	0919	1min		1	R2			
11	AK 6353/6352	AGA	0910	0934	0935	1000	1min	25min	6	DBN			
12	AK 6181/6058	AFF	1010	1034	1035	1110	1min	35min	2	DBN			
13	AK 6465/6190	RAQ	1035	1104	1104	1200	65sec	56	1	SM			
14	AK 5206/6468	AJN	1200	1219	1220	1439	1min	219	6	DBN			[illegible]
15	AK 6059/6186	AFF	1305	1325	1325	1358	60sec	33	2	SM			
16	AK 6191/6059	RAQ	1410	1425	1425	1502	65sec	37	1	SM			
17	AK 5414/5413	AHG	1400	1410	1411	1445	1min	35min	7	R2			
18	AK 6187/5203	AFF	1625	1641	1641	1717	60sec	36	2	SM			
19	AK 6460/6460	AJN	1610	1624	1625	1655	1min	30min	1	DBN		31	
20	AK 6055/6188	RAQ	1655	1706	1706	1740	50sec	34	5	SM			
21	AK 6461/6460	AJN	1810	1839	1840	1955	1min	75min	1	DBN	Suana		
22	AK 5236/6466	AGQ	1840	1857	1857	2004	50sec		6	SM/DM			N/stop SWAP Aft
23	AK 6189/6474	RAQ	2000	2014	2015	2038	1min	23min	5	ZS			
24	AK 6467/5237	AGD	2130	2149	2150	2235	1min	45min	6	MA			
25	AK 5202/6184	AFF	2125	2139	2140	2208	1min	28min	1/5	MA			
26	AK6475	RAQ	2145	2206	2209	2224	1min	15min	5	ZS			
27	AK 6185	AFF	0025	0035	0035	0046	1min	10min	2	DM			
28													
29	TR 430/431	TRE	1940	1953	1953	2145	70sec		7	SA/ZS	incident		
30													

Prepared by: SHR A: NAME/SIGNATURE: Dracue Wanal (2nd Sm)
SHR B: NAME/SIGNATURE:
SHR C: NAME/SIGNATURE: Siggon ak. Madil (0300-2400) Sm
SHR D: NAME/SIGNATURE: Marian Lau (0001-0800)
Verified by: HEAD OF OPERATIONS: NAME/SIGNATURE:

Figure 17: PBB Docking Sheet on incident day

1.17.10 PBB Operators Bay Duty Allocation

The Aerodrome Operator Operation Manager stated that all PBB Operators were briefed and assigned to their respective PBB bay duties by their Shift Leader on the day of their shift. The Daily Bay Allocation Sheet shows that all PBB Operators are not pre-assigned to the respective bay on the day they start their shift but are allocated to the respective bay duties prior to the arrival of the aircraft (Figure 17 and 18). Evidence shows that the PBB Operator in this incident was assigned to Gate 1 by his Shift Leader about half hour before the arrival of the aircraft.

MALAYSIA AIRPORTS

MALAYSIA AIRPORTS SDN. BHD. (230646-U) MASB/MSB/ SOP/OP/11/02
DAILY BAY ALLOCATION SHEET
KUCHING INTERNATIONAL AIRPORT

DATE: 07.11.2021 DAY: SUNDAY

NO	FLIGHT NO	ROUTE			TIME STA	TIME STD	ACFT TYPE	BAY	OPERATOR	REMARKS
01	AK (9M-RAO)	---	---	---				4		AOG
				- OPERATING FLTS -						
01	AK 6061	N/S	KCH	BTU	N/S	0700	A320	6		
02	AK 6180	N/S	KCH	MYY	N/S	0815	A320	1		
03	AK 5207	N/S	KCH	KUL	N/S	0820	A320	2		
04	MH 3415	N/S	KCH	MKM	N/S	0900	DH6	R2		
05	AK 6062/ 6464	BTU	KCH	SBW	0910	0935	A320	1		
06	AK 6353/ 6352	BKI	KCH	BKI	0930	0955	A320	6		
07	MH 2542/ 2543	KUL	KCH	KUL	0940	1055	B738	7		
08	OD 1606/ 1605	KUL	KCH	KUL	1030	1120	B738	6		
09	MH 3412/ 3413	MKM	KCH	MKM	1035	1100	DH6	R1		
10	AK 6181/ 6058	MYY	KCH	BTU	1045	1110	A320	2		
11	AK 6465/ 6190	SBW	KCH	MYY	1120	1145	A320	1		
12	MH 2520/ 2802	KUL	KCH	MYY	1150	1320	B738	7		
13	AK 5206/ 6054	KUL	KCH	BTU	1220	1510	A320	6		
14	MH 3414/ 3417	MKM	KCH	MKM	1300	1320	DH6	R1		
15	AK 6059/ 6186	BTU	KCH	MYY	1320	1345	A320	2		
16	MH 3416/ 3711	MKM	KCH	TGC	1330	1350	DH6	R2		
17	AK 6191/ 6468	MYY	KCH	SBW	1415	1440	A320	1		
18	AK 5414/ 5413	JHB	KCH	JHB	1425	1450	A320	7		
19	MH 2807/ 2806	BKI	KCH	BKI	1425	1525	B738	8		
20	MH 3712	TGC	KCH	N/S	1530	N/S	DH6	R2		
21	MH 2536/ 2517	KUL	KCH	KUL	1555	1710	B738	7		
22	AK 6187/ 5203	MYY	KCH	KUL	1615	1700	A320	2		
23	MH 2805/ 2513	MYY	KCH	KUL	1625	1810	B738	8		
24	AK 6469/ 6460	SBW	KCH	SBW	1630	1655	A320	1		
25	AK 6055/ 6188	BTU	KCH	MYY	1720	1745	A320	5		
26	AK 6461/ 6466	SBW	KCH	SBW	1840	1905	A320	1		
27	AK 5236/ 5237	KUL	KCH	KUL	1900	1925	A320	6		
28	TR 430/ 431	SIN	KCH	SIN	1940	2020	A320	7		
29	AK 6189/ 6474	MYY	KCH	SBW	2015	2040	A320	5		
30	AK 6467	SBW	KCH	N/S	2050	N/S	A320	1		
31	AK 5202/ 6184	KUL	KCH	MYY	2055	2120	A320	6		
32	AK 6475	SBW	KCH	N/S	2225	N/S	A320	5		
33	AK 6185	MYY	KCH	N/S	2350	N/S	A320	2		
				- CARGO -						
01	3G 6602/ 860	KUL	KCH	MFM	0750	0825	B738F	CA10		
02	N7 341/ 342	KUL	KCH	KUL	1520	1605	B733F	CA10		
03	N7 345/ 360	KUL	KCH	BKI	1525	1605	B733F	CA11		
04	TH 543/ 544	SZB	KCH	SZB	2145	2205	B762F	CA10		
05	N7 375/ 375	BKI	KCH	KUL	0335	0415	B733F	CA10		08/11/2021

1. SAM, OM, AOCC
2. CAAM
3. AIRASIA
4. MAB (DEP, ODC, ENGG)
5. ROYAL BRUNEI
06. INFORMATION (MASB)
07. KESIHATAN
08. PETRONAS
09. POS AVIATION
10. AEROBRIDGE OPERATOR
11. MALINDO AIR
12. RAYA AIRWAYS
13. TASK FORCE (AVSEC)
14. TCO (PDRM)

Figure 18: Daily bay allocation sheet

1.17.11 PBB Operators Manpower

The Aerodrome Operator Operation Manager had identified the issue of PBB Operator manpower shortage due to the progressive increased in flights with the opening of borders within Malaysia during COVID-19 pandemic and also the pending retirement of two PBB Operators. Four personnel from within the company were identified and had completed the PBB Operator's training on 21 and 22 October 2021. As of November 2021, there are 14 active PBB Operators rostered in 4 shifts of 12 hours per shift of 2 cycles shift per day (Figure 19).

This internal arrangement is a short-term mitigating action to the manpower shortage for this 12 hour shift system.

NO	POSITION	STRENGTH (AUG 21)	ADDITION (TRAIN IN OCT 21)	RETIRED (NOV 21)	TOTAL (NOV 21)
1	PBB Operator	12	4	2	14

Figure 19: PBB Operators strength as of November 2021

1.17.12 Defect Reporting

There was only one corrective maintenance performed for a faulty air condition which was dated 11 Jun 2021 for PBB Gate 1 for the year 2021. There was no evidence to show that the following defects below observed during investigation site inspection were reported for corrective maintenance. Both the Aerodrome Operator Engineer and the Operation Manager were not notified of these defects when enquired by the investigation team. Although both these defects were not contributing factors to the incident, it plays an important role in providing historical recorded evidence and vital communication when an emergency situation arises.

1.17.12.1 PBB LCD Touch Screen Display Malfunction

The PBB LCD touch screen display is divided into 3 main display function area:

a. Button area – supply operable buttons.

b. Animation display area for parameters – display all the parameters of PBB by means of animation.

c. Status display area – display status, faults, and information of PBB.

The investigation site inspection on the PBB status display area on recorded faults history page revealed that the LCD touch screen display had frozen at the last recorded event. The buttons in the button area could not be operated to scroll up or down. Other functions that needed the scroll function were not accessible too.

It was also observed that the screen time function cannot be set to actual date and time. Therefore, the history of event recorded in the status display area cannot be verified to actual date and time.

Figure 20: PBB Operating Console LCD Touch Screen Display PBB Bay 1

The maintenance inspection carried out by the manufacturer's local contractor dated 15 October 2021 revealed that the LCD touch screen display was serviceable. Nevertheless, the inspection did not state if the buttons area and status display area on the LCD touch screen were tested for its functionality (Figure 21).

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Report No: 0377/PBB/KIA
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WEE HOCK ELECTRONIC & ELECTRICAL COMPANY

SERVICE REPORT FOR PASSENGER BOARDING BRIDGE

KUCHING INTERNATIONAL AIRPORT KUCHING SARAWAK

DATE INSPECTED : 15.10.2021 **PBB BAY NO. :** 1

DESCRIPTION	ACTION
Check Painting	✓
Check Rotunda and A Tunnel (Pin)	✓
Check Safety Shoes	✓
Check Lifting Columns and Left / Right	✓
Bridgehead, Roller Shutter, Wall (Slide), Chain, Motor, Roller Bearing	✓
Tunnel Extending and Retracting, Bridgehead Rotating	✓
Lubricating System (Grease Nipple)	✓
Control Valve	✓
Safety Inspection Emergency Stop / Limit Switch	✓
Bridge Lighting	✓
External Lights	✓
Stair Light	✓
Floodlights	✓
Emergency Lights	✓
Key Switch Off, Manual And Auto	✓
Manual Operation Function Canopy Extend & Retract	✓
LCD Display	✓
PLC	✓
Hydraulic Hose	✓
Cabin Rotation Left / Right	✓
Valve Amplifier Board Right Left	✓
Floor Moving Up / Down	✓
The Auto-Leveler Function	✓
Interlock Function Slope Limit	✓
Main Contactor, Relay, 3 Phase Monitor Relay	✓

Figure 21: Service Report for PBB Bay 1

1.17.12.2 Telephone/Intercom Inoperative

The telephone/intercom located at the PBB Operating Console was inoperative (Figure 22). It was made known to the investigation team that the telephone/intercom was disconnected and not in used for some time. Nevertheless, walkie-talkie was provided to all PBB Operators as the main communication source for the PBB Operators to the Operations Department during their shift hours.

Figure 22: PBB Telephone/Intercom at PBB Operating Console

1.17.13 Communication During PBB Malfunction

The PBB Operator left the PBB immediately after safely engaging the PBB to the aircraft. When the PBB alarm sounded which indicates a fault or malfunction, the PBB Operator was not contactable immediately by the respective aircraft operator's personnel on site. Video surveillance camera recording shows that the PBB Operator only arrive at the PBB about 10 minutes after the alarm sounded (indicated by the retracting PBB canopy).

The PBB Operator was only contactable by personal handphone when the Shift Leader notified the PBB Operator of the PBB malfunction.

The PBB Operator alleged that the battery to the walkie-talkie was weak and needed charging at the time.

1.17.14 Crowding near the PBB Operating Console Area

Video surveillance camera recording shows that there were 6 personnel standing near the PBB Operating Console area along the PBB tunnel side wall when the aircraft was taxiing in for parking excluding the PBB Operator. The investigation team observed that the tunnel area of the PBB is reasonably narrow, hence the present of significant numbers of personnel causes unnecessary crowding especially when passengers start to disembark with their hand carry personal belongings.

With reference to the Manufacturer's PBB Operations Instruction, it states that when boarding bridge head is overcrowded, evacuation should be carried out (Figure 16). Therefore, there is a need to avoid unnecessary crowding for safety reasons and also for the PBB Operator to perform his duty safely without unnecessary distraction from the extra personnel present.

The aircraft operator needs to review and allow only essential personnel to standby near the PBB Operating Console area especially during aircraft docking and passenger disembarkation process to avoid unnecessary crowding in the PBB (Figure 23). Non-essential personnel example aircraft cleaners and extra ramp or engineering personnel can standby further away from the PBB Operating Console area and to only proceed inside the aircraft after all passengers had fully disembarked or when required only.

To avoid distraction to the PBB Operator, all aircraft operator's personnel on duty must keep clear of the PBB Operating Console which is the working area for the PBB Operator on duty (Figure 24).

Figure 23: Video surveillance recording capture crowding at PBB tunnel area just before passengers start to disembark (left). Example of PBB narrow tunnel walk way when crowded with personnel (right)

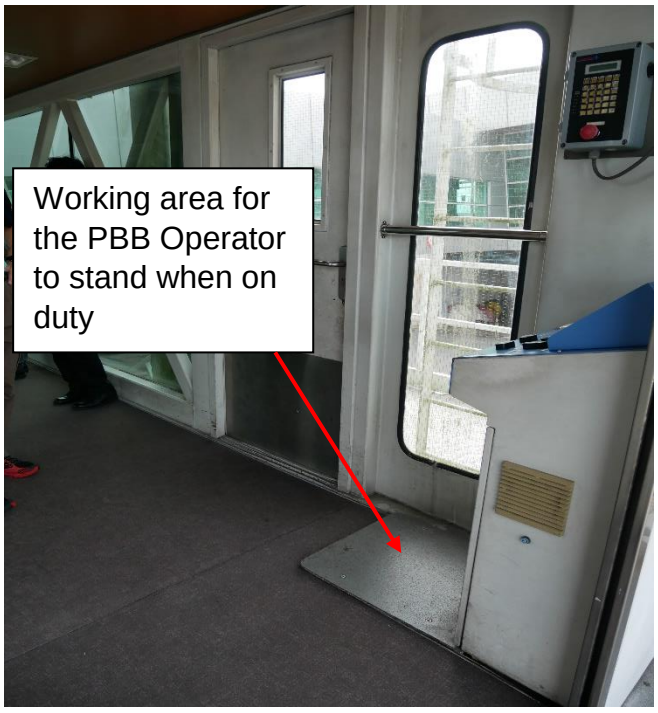

Figure 24: PBB Operating Console

1.18 Additional Information

1.18.1 Interview and Written Statements

The AAIB investigation team conducted separate interview sessions with the Pilots, Cabin Crew, Aircraft Ground and Ramp Crews, and Aerodrome Operator personnel concern. The interview sessions were all recorded under the express knowledge of all the parties. All of the above personnel had also submitted a written statement.

1.18.2 PBB Auto Level Operations

The PBB Operator will switch the key switch to AUTO LEVEL to extend the levelling wheel to be flush to the aircraft fuselage after safely engaging the PBB to the aircraft (Figure 25). The function of the AUTO LEVEL is to track the height difference of the aircraft fuselage when passengers embark or disembark and cargoes are loaded or unloaded. It allows the PBB to make height adjustment automatically if the aircraft fuselage height difference reaches 2cm between the advancing edge of the PBB and the aircraft door step. It functions to assist passengers embarking or disembarking conveniently by ensuring a safe height difference between the PBB advancing edge and aircraft door step (Figure 26).

The operating principle of the levelling system is that it will function when the aircraft fuselage moves up or down, a relative movement between the fuselage and the levelling wheels will caused the levelling wheels to rotate clockwise or anticlockwise. When the angle of rotation reaches 15 degrees (relevant height difference of about 2cm), a limit switch will send electrical signal to drive the PBB up or down. When the original height difference had recovered, the limit switch is reset, eliminating signal for up or down causing the PBB to stop motion which completes the levelling cycle. If the aircraft fuselage moves again, another levelling cycle starts again until the original height difference recovers (Figure 27).

If the PBB does not make height adjustment when the aircraft fuselage height variation reaches 5cm, the AUTO LEVEL system will indicate AUTO LEVEL FAULT at the PBB Operating Console LCD screen and a buzzer will sound to alert the PBB Operator. The PBB Operator is required to put the key switch to MANUAL to adjust the height of the PBB based on the aircraft fuselage height variation and inform the maintenance department (Figure 28).

In this incident, the PBB Operator was not at the PBB Console, therefore there was no immediate actions taken which subsequently led to the safety shoe being pressed as the aircraft fuselage continue to move downwards.

Figure 25: MANUAL / OFF / AUTO LEVEL Key Switch

Figure 26: Auto Leveller retracted (Left) and extended to aircraft fuselage (Right) position

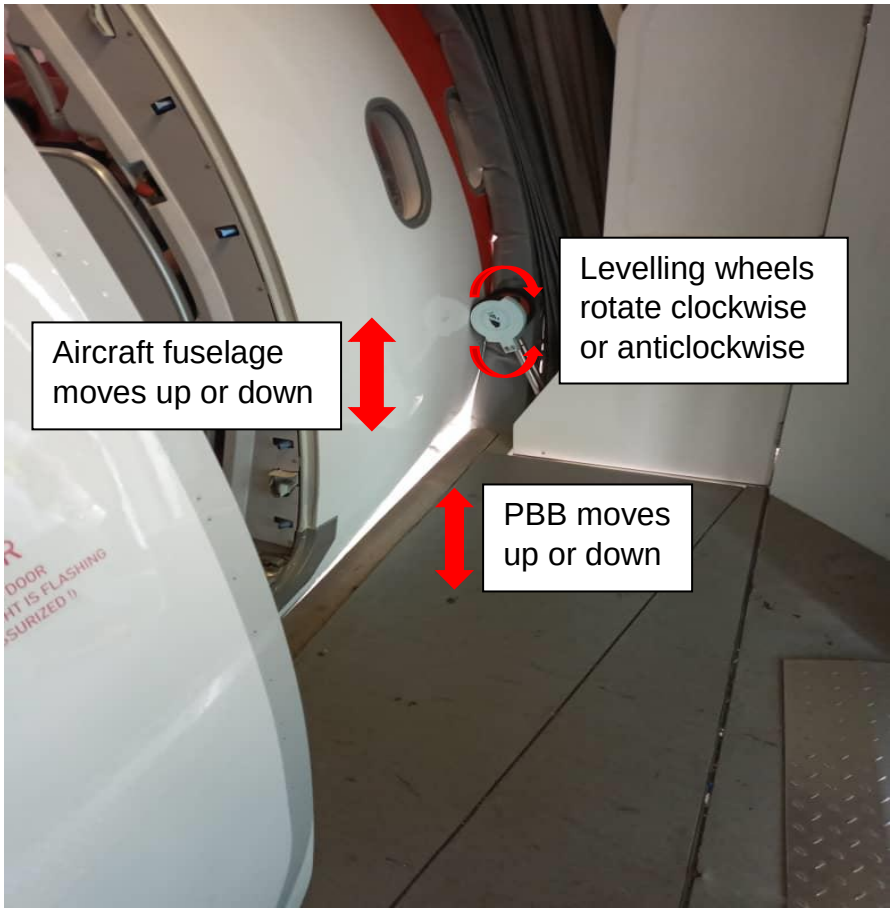

Figure 27: Operating principle of the Levelling System

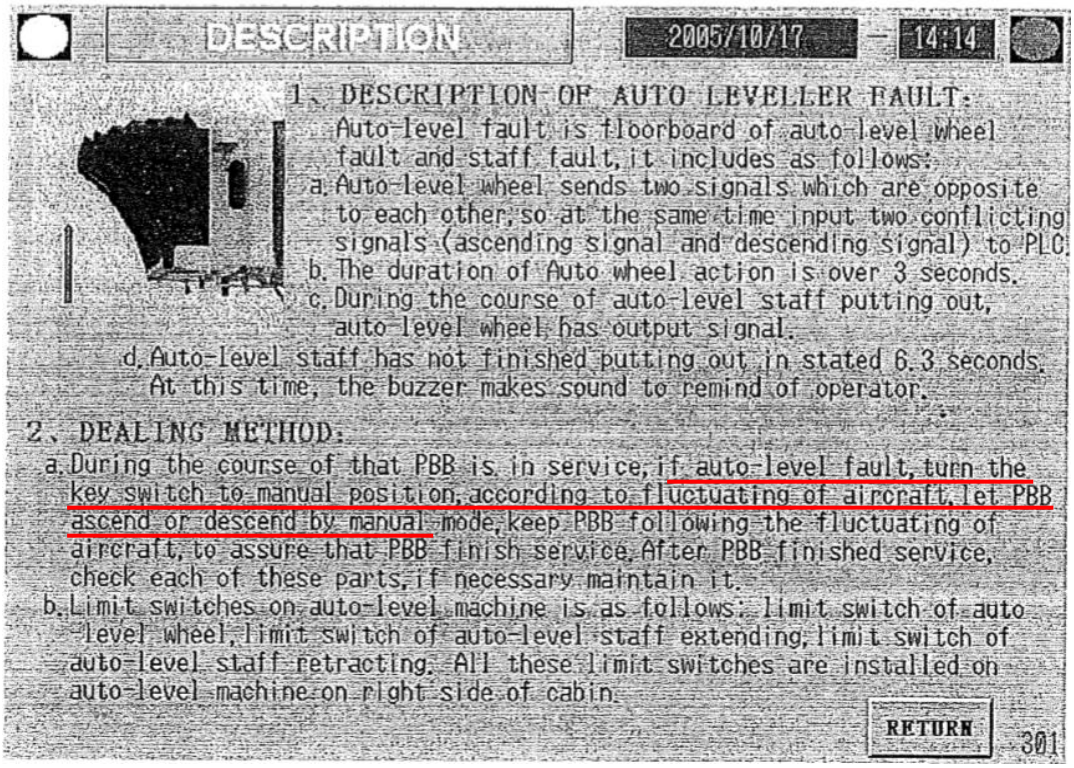

Figure 28: Manufacturer's PBB Operations Instruction – Auto leveller fault description

1.18.3 PBB Safety Shoe Operations

After the aircraft passenger door had been fully open, the PPB Operator will take the safety shoe from its stowed position on the left side of the cab and place the it below the aircraft door (Figure 29). The PBB Operator is required to press the 'Safety Shoe On' button at the LCD screen within 2 minutes after under AUTO LEVEL status, otherwise a prompt message will be display on the LCD screen and a buzzer will sound to alert the PBB Operator to activate the 'Safety Shoe On' button.

The function of the safety shoe is to protect the aircraft open door in the event the auto leveller fault or malfunction when the aircraft fuselage moves down during passengers' embarkation or disembarkation and cargoes loading or unloading.

Figure 29: Safety shoe at stowed position (Left) and safety shoe placed below aircraft open door

The operating principle of the safety shoe is that it will function when the stretch tactile rod of the limit switch had been pressed by the open door as a result of the aircraft fuselage moving down (Figure 30). When the limit switch is activated, it will cause the PBB to move down by 2cm follow by the canopy and auto leveller retracting to its original position to prevent damage to the aircraft. When the PBB moves down 2cm it will release the limit switch and the canopy and auto leveller will extend out again. The cycle repeats itself for three times if the limit switch had been activated again by the open door.

On the fourth time, the canopy and auto leveller will not extend out again. The PBB Operator is required to put the key switch to MANUAL to adjust the height of the PBB with the aircraft door and inform the maintenance department immediately.

With reference to the Manufacturer's PBB Operations Instruction, the immediate actions to be taken by the PBB Operator is to put the key switch to MANUAL and descend the PBB in manual mode when the aircraft

passenger door remains in contact with the safety shoe after the PBB stop movement (Figure 31).

In this incident, the PBB Operator tried to unstuck the door by retracting the PBB first instead of descending the PBB which causes a loud clicking sound. It further aggravated the situation when the aircraft passenger door was still stuck with the safety shoe metal structure frame. The door was unstuck only after the Aircraft Captain had instructed the PBB Operator to descend the PBB first before retracting to reposition it.

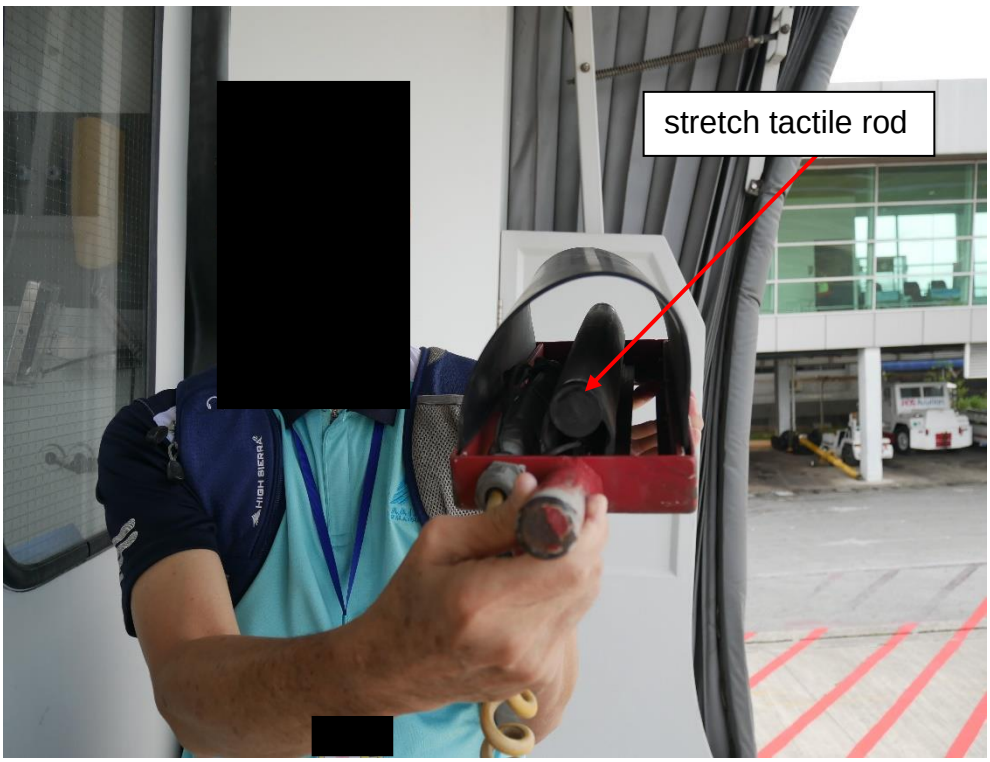

Figure 30: PBB Safety Shoe stretch tactile rod

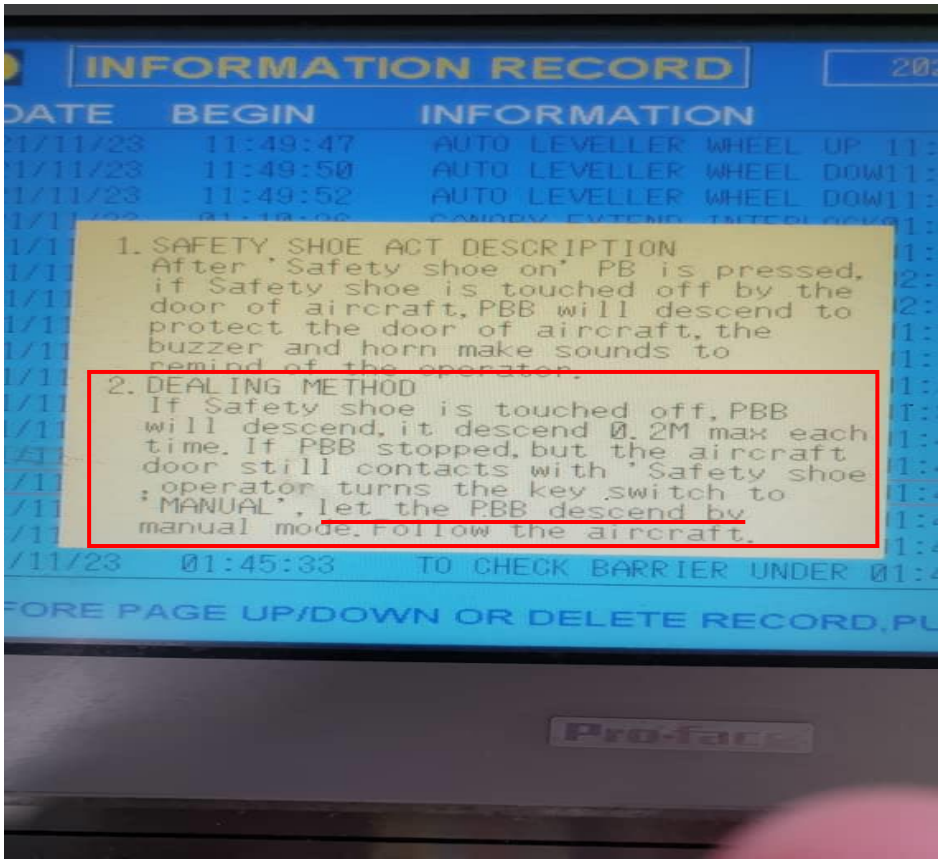

Figure 31: Manufacturer's PBB Operations Instruction – Safety shoe act description

1.18.4 Compliance to Civil Aviation (Aerodrome Operations) Regulations 2016 (Amendment 2018) – Regulation 14 - Competence of Personnel

The aerodrome operator is obligated under Regulation 14 to ensure that there are adequate number of competent PPB Operators daily to perform their duties to ensure the smooth operation of the aerodrome and also to implement any programmes to upgrade their competencies (Figure 32). This is done via proper manpower management and shift system. To upgrade competencies, proper training syllabus is mandatory to provide correct guidance to the instructor to teach and train the PBB Operators to meet the skill standards required.

Competence of personnel

14. (1) An aerodrome operator shall—

(a) ensure that there is an adequate number of qualified and skilled personnel to perform the duties relevant for aerodrome maintenance and operation; and

(b) implement any programmes so as to upgrade the competency of the aerodrome operator's personnel.

(2) The Director General may, at any time, direct an aerodrome operator to furnish evidence that the aerodrome operator complies with the requirements under paragraphs (1)*(a)* and *(b)* and the aerodrome operator shall comply with the direction.

Figure 32: Civil Aviation (Aerodrome Operations) Regulations 2016 (Amendment 2018) - Regulation 14 - Competence of Personnel

It was observed that the MASB SOP – PBB Operations and PBB Operators Training Syllabus - Perform PBB Docking Operation presently do not require CAAM to approve the publication before it can be officially used. To improve the standards of the SOP and Training Syllabus formulated by the aerodrome operator, it is highly recommended that the PBB Operators SOP and Training Syllabus be approved by CAAM before it is used officially as a document. This will assist to improve the training content quality of the publication therefore improving the standards of training for all the PBB Operators.

1.19. Useful or Effective Investigation Techniques

1.19.1 On-Site Investigation

On-site investigation which include site visit, witness interview and video surveillance camera recording review were conducted to look for evidence which will assist in reconstructing the probable chain of event leading to this incident.

1.19.2 Human Factor - Reason's Swiss Cheese Model

The Reason's Swiss Cheese Model is used to analyse human factor issues related to this incident (Figure 33). The model is used to describe the layers of defences at which active failures/conditions and latent failures/conditions may have occurred in this incident.

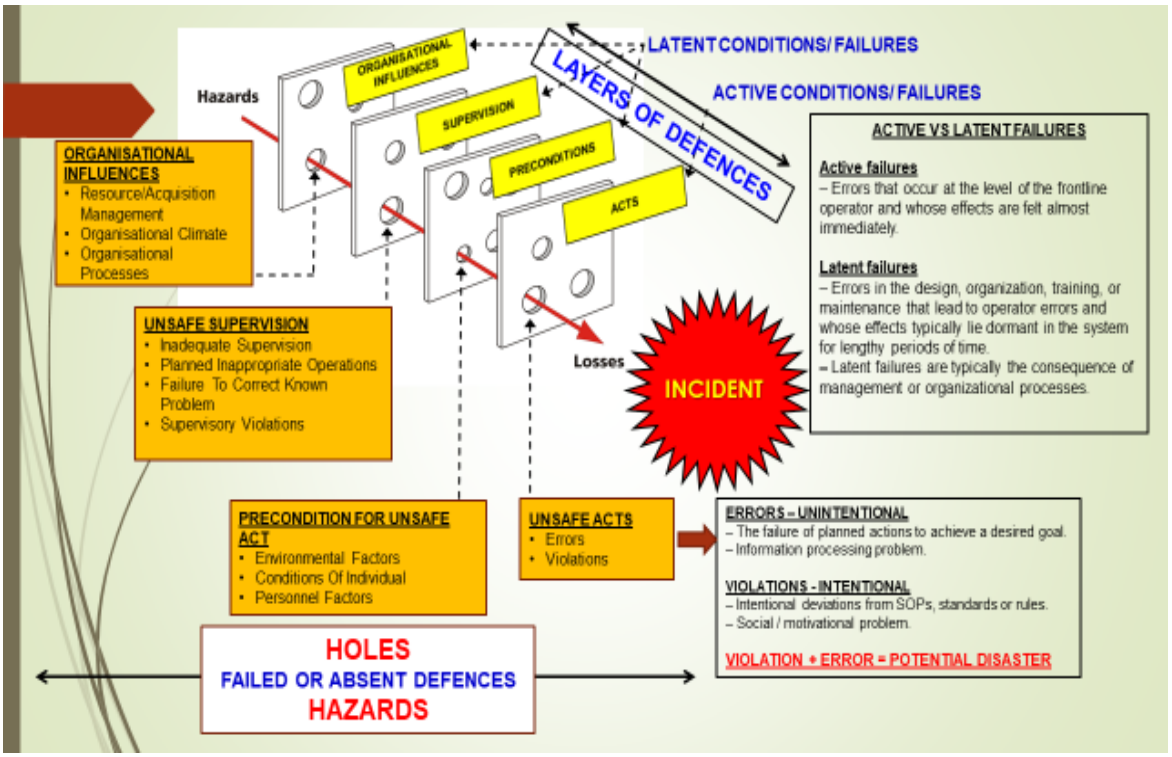

Figure 33: Reason's 'Swiss Cheese' Model

From the describe layers of defences in the Swiss Cheese model at which active failures/conditions and latent failures/conditions may had occur in this incident, Human Factors Analysis and Classification System (HFACS) will be used to evaluate and rule in or eliminate the various preconditions that resulted in the unsafe act. It will then evaluate the supervisory and subsequent organisational issues that had contributed to the precondition. Finally, this will provide a detailed human factors analysis of all the event that led up to the incident as in Figure 34.

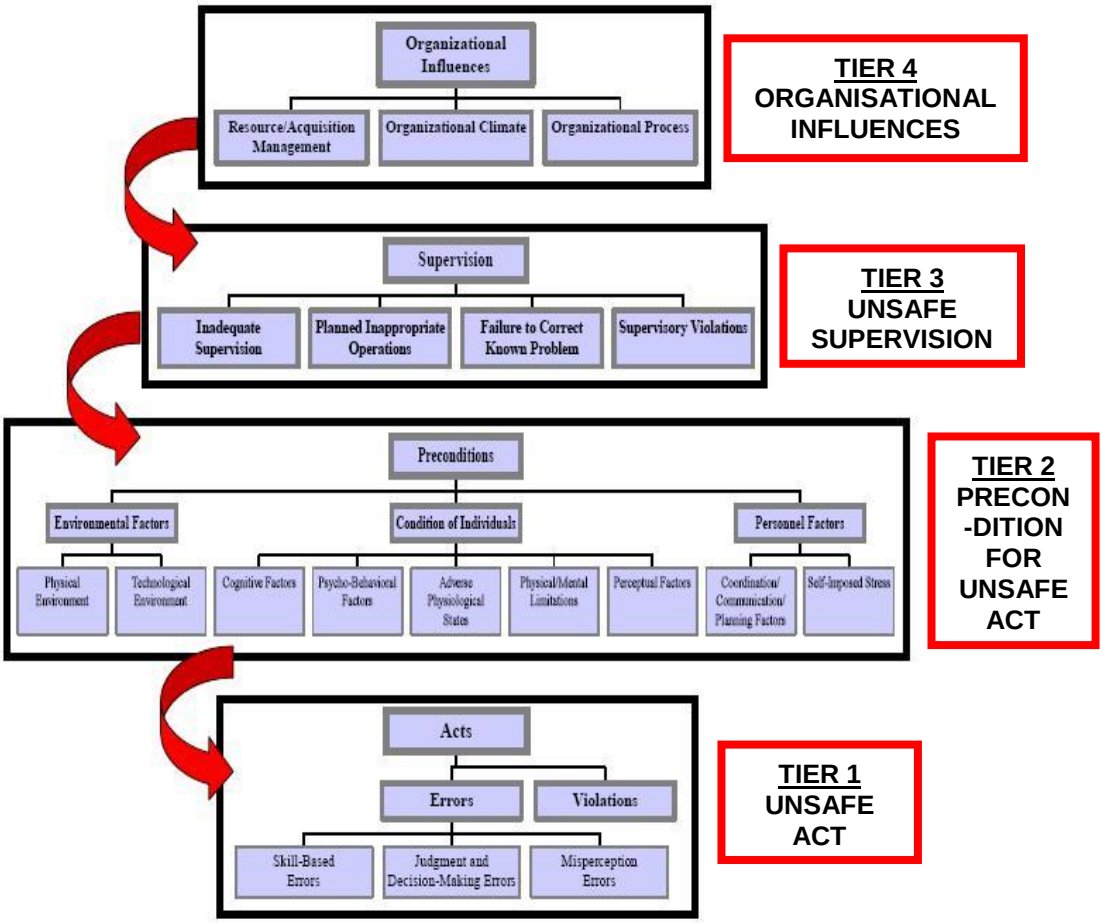

Figure 34: Human Factors Analysis and Classification System (HFACS)

2.0 Analysis

2.1 On-Site Investigation

2.1.1 Video Surveillance Camera Recording

The on-site evidence recorded by the video surveillance camera situated at Aircraft Parking Area Bay 1 shows the following chronology of events:

NO	EVENT	TIME	REMARK
1	PBB Operator arrive at PBB Operating Console	18:44:25	
2	Aircraft safely dock	18:46:24	
3	PBB fully engaged	18:47:37	
4	PBB Operator leaves PBB	18:47:51	PBB Operator not on standby at the PBB until last passenger disembark as required by PBB SOP. PBB Operator was at PBB for 14 seconds only.
5	Observed 3 x Ramp Staff & 3 x Cleaners waiting near the PBB Operating Console area	18.47.53	PBB Operating Console area crowded with Aircraft Operator's staff.
5	1st passenger disembark	18:47:54	
6	PBB Operator seen walking towards arrival hall in front of Passenger Gate 3 **(Video Camera front of Passenger Gate 3)**	18:49:25	PBB Operator not on standby at the PBB until the last passenger disembark as required by PBB SOP.
7	Aircraft nose down attitude movement	18:51:27 to 18:51:33	Occurrence for 6 seconds.
8	PBB canopy start to retract	18:51:34	PBB encountered problem.
9	PBB canopy fully retract	18:51:41	
10	Passenger temporary stop disembarkation	18:51:45	
11	Passenger resume disembarkation	18:59:32	
12	PBB Operator arrived back at PBB Operating Console	19:02:35	PBB Operator arrive back at PBB Operating Console after 11 minutes PBB had encountered problem.
13	Passenger temporary stop disembarkation	19:02:42	
14	PBB slight rearward movement and follow by down movement. PBB reposition back again.	19:02:55 to 19:04:00	
15	Passenger resume disembarkation till complete disembarkation	19:04:02	

Figure 35: Chronology of event recorded by video surveillance camera at Aircraft Parking Area Bay 1

2.1.2 PBB LCD Touch Screen Display Information

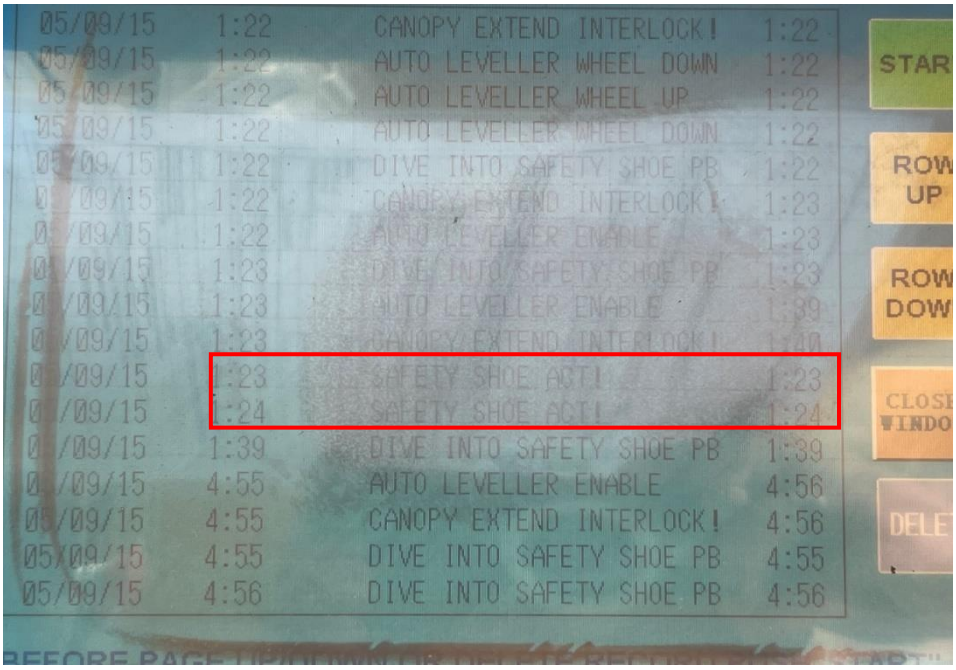

Figure 36: PBB LCD touch screen display showing the safety shoe had been activated two times

2.1.3 PBB Safety Shoe Placement

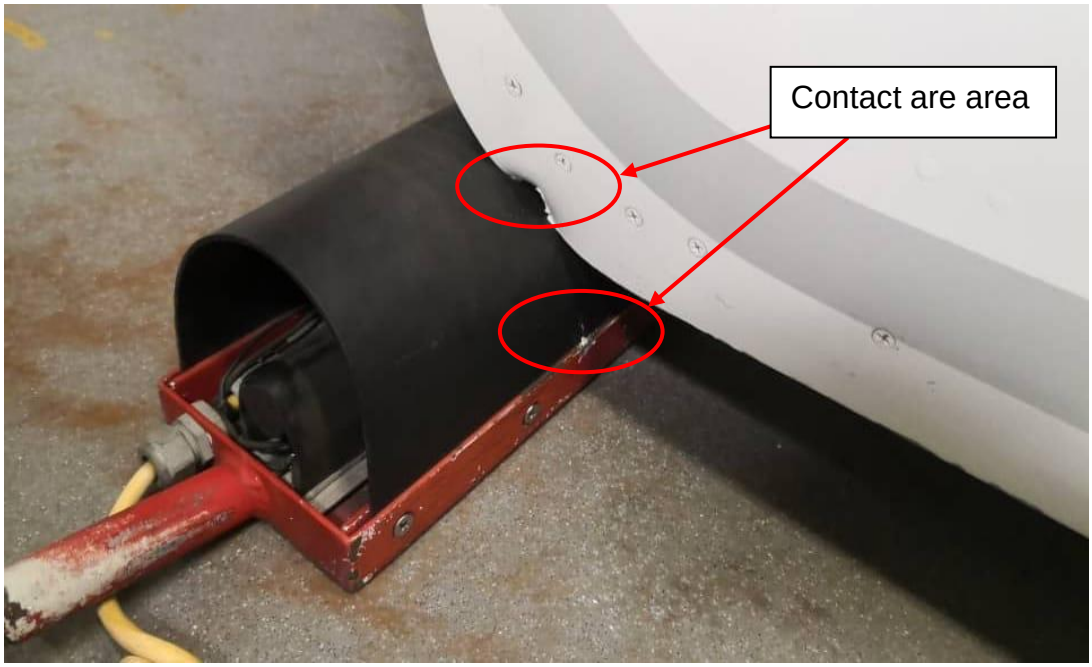

Figure 37: Position of the Safety Shoe at the lower left edge of the aircraft door after the incident showing the contact area

2.2 On-Site Investigation Analysis

From chronology of event recorded by video surveillance camera at Aircraft Parking Area Bay 1, it was observed that there was a significant aircraft nose down attitude movement seen for about 6 seconds (Figure 35). The nose down attitude movement is most probably attributed to the forward movement of the aircraft's centre of gravity when passengers disembarked via the front passenger door together with the offloading of baggage/cargo at the aircraft's Cargo Hold 1.

The aircraft nose down attitude causes a relative movement between the aircraft fuselage and leveller wheels which in turn rotates the leveller wheels to drive the PBB downwards. Nevertheless, due to the significant movement of the aircraft fuselage of most probably more than 5cm for about 6 seconds, it is suspected that the PBB did not manage to make the downward height adjustment to recover the height difference. This resulted in the AUTO LEVEL FAULT indication at the PBB Operating Console LCD screen as observed by the aircraft Senior Cabin Crew.

Since the PBB Operator was not at the PBB Operating Console when the AUTO LEVEL FAULT indication came on, immediate actions was not taken to switch to MANUAL mode to adjust the height of the PBB based on the aircraft fuselage height variation. As the aircraft's fuselage move further down, it resulted in the bottom of the aircraft door pressing against the safety shoe's tactile rod limit switch. Due to the position of the safety shoe being most probably placed on the left edge bottom of the aircraft door and the PBB not making the automatic downward movement to recover the height variation, the left edge bottom of the aircraft door most probably presses the safety shoe's tactile rod limit switch once and subsequently slide sideway following the aircraft's door rounded edge where the bottom left edge strikes the safety shoe's metal structural frame. It was stuck in the final position with the bottom of the door resting on the PBB floor. This action most probably activated the limit switch the second time within one second as seen in the PBB Operating Console LCD touch screen display in Figure 36.

Since the aircraft door edge is stuck with the safety shoe metal structural frame, an automatic downward movement of the PBB when the safety shoe limit switch is activated did not unstuck the door. The continuous pressing of the safety shoe's tactile rod limit switch by the aircraft's bottom door edge causes the canopy and the leveller wheels to retract and the PBB alarm to sound. It resulted in the Forward Passenger Door lower edge skin found torn and slight dent mark on the safety shoe metal structural frame as seen in Figure 37.

The PBB Operator's action to unstuck the door from the safety shoe metal structure frame by retracting the PBB first instead of descending the PBB further aggravated the situation. The door was unstuck only after the Aircraft Captain had instructed the PBB Operator to descend the PBB first before retracting to reposition it.

Post incident inspection and test conducted by the PBB OEM's local contractor **(refer paragraph 1.16 and Appendix A)** revealed no fault or abnormalities on PBB Gate 1.

2.3 Human Factors Analysis

Human factor issues related to this incident were examined using the Reason's Swiss Cheese model and HFACS worksheet as per **Appendix B**. From the HFACS worksheet in **Appendix B**, evidence statement will be provided for rating of 2,3, and 4 as shown in paragraph 2.3.1 to 2.3.4. Subsequently an Investigation Analysis Summary is tabulated in paragraph 2.4.

2.3.1 Tier 1 - Unsafe Acts

AE	**ERRORS**	
AE 2	**Judgement and Decision-Making Errors**	
AE 2.3	**Necessary Action (Rushed).** Necessary Action – Rushed is a factor when the individual takes	- PBB Operator left the PBB Operating Console about 14

	the necessary action as dictated by the situation but performs these actions too quickly and the rush in taking the action leads to an unsafe situation.	seconds after PBB safely engaged to the aircraft. - PBB Operator seen leaving Gate 1 towards the arrival hall. - Unintentionally placed safety shoe at the bottom left side of the aircraft door instead of bottom centre.
AV 3	**Lack of Discipline.** Violation - Lack of Discipline is a factor when an individual, crew or team intentionally violates procedures or policies without cause or need. These violations are unusual or isolated to specific individuals rather than larger groups. There is no evidence of these violations being condoned by leadership. These violations may also be referred to as “exceptional violations.” (NOTE: These violations may also carry legal consequences).	- Did not standby at PBB till last passenger disembark knowingly in violation to the MASB SOP – PBB Operations.

Analysis Tier 1 – Unsafe Acts

A chain of active and latent failures as described in paragraph 2.3.1 to 2.3.4 had led to an unsafe act as describe above which caused the aircraft forward passenger door lower left edge skin to contact the PBB safety shoe metal structure frame.

In accordance with the MASB SOP – PBB Operations, it states that the PBB Operator shall position the safety shoe after aircraft docking but it does not provide clear instructions where to place the safety shoe below the aircraft passenger door. Nevertheless, from the PBB Operator witness statement, all PBB Operators were informed verbally to place the safety shoe at the bottom centre of the aircraft open passenger door during their recurrent training. Evidence seen after the incident revealed that the safety shoe metal frame structure had contacted the lower left edge of the passenger door, not the centre of the passenger door.

Observation by the investigation team at KIA from aircraft docking to passenger disembarkation found no evidence to support the possibility of the aircraft operator's personnel or disembarking passengers accidentally moving or knocking to displace the safety shoe from its original position if it was placed in the centre as claimed by the PBB Operator. This is supported by evidence that the safety shoe placement area is a dead end with very limit space to stand for any aircraft operator's personnel especially when passengers are disembarking. It was observed that all passengers disembarking will walk straight ahead only looking to the opposite side of the safety shoe placement area to collect their prams for those with babies or young children.

In accordance with the MASB SOP – PBB Operations, it also states that the PBB Operator shall standby at the PBB until the last passenger disembarked. Witness statement from the PBB Operator revealed that the PBB Operator knows this SOP requirement. Evidence from video surveillance camera recording shows that the PBB Operator left the PBB immediately (14 seconds) after safely engaging the PBB to the aircraft. The action to leave the PBB without waiting for the last passenger to disembark to carry out other tasks as claim by the PBB Operator constitute a clear violation to the MASB SOP – PBB Operations.

From circumstantial evidence above, it is concluded that the PBB Operator most probably had placed the safety shoe to the left side of the aircraft passenger door unintentionally in his hurry to leave the PBB for another task. Nevertheless, there is no video camera recording to conclusively support this act.

The importance for the PBB Operator to stand at the PBB Operating Console cannot be over emphasised. In this incident, if the PBB Operator was at the PBB Operating Console when the AUTO LEVEL FAULT shows on the LCD screen, the PBB Operator would have switch to MANUAL mode to correct the fault indication by lowering the PBB manually to the original height difference to prevent the aircraft door from contacting the safety shoe as stated in the Manufacturer PBB Operations Instruction.

Since this was not carried out, the aircraft door subsequently pressed the safety shoe tactile rod limit switch. Unfortunately, as the safety shoe was most probably placed near the left edge bottom of the aircraft door, the left edge bottom of the aircraft door slide and contacted the safety shoe metal structural frame. It was stuck in position with the left edge bottom of the aircraft door continuously pressing the limit switch thus causing the canopy and auto leveller to retract while the alarm sounded.

The unsafe act that caused this incident were the probable incorrect placement of the safety shoe position which is more towards the bottom left edge of the aircraft passenger door rather than the bottom centre position and the violation of MASB SOP – PBB Operations by leaving the PBB before the last passenger had disembarked from the aircraft.

2.3.2 Tier 2 - Preconditions for Unsafe Acts

PE	**ENVIRONMENTAL FACTORS**	
PE 2	**Technology Environment**	
PE 2.4	**Controls and Switches.** Controls and Switches is a factor when the location, shape, size, design, reliability, lighting or other aspect of a control or switch is inadequate and this leads to an unsafe situation.	- PBB LCD touch screen time/date function, buttons and status display area function inoperative. - History of recorded event of the PBB and other functions cannot be view due to scroll buttons inoperative. - No reported history on corrective maintenance action on LCD screen.
PE 2.8	**Communications - Equipment** is a factor when comm. equipment is inadequate or unavailable to support mission demands. (i.e. aircraft/vehicle with no intercom) This includes electronically or physically blocked transmissions. Communications can be voice, data or multi-sensory.	- The telephone/intercom at the PBB Operating Console was inoperative. It was disconnected and not in used for some time. - Walkie-talkie was used but PBB Operator was not contactable due walkie-talkie battery weak. - PBB Operator was only contactable via personal handphone by the Shift

		Leader during PBB fault/malfunction.
PC	**CONDITIONS OF INDIVIDUAL**	
PC 1	**Cognitive Factors**	
PC 1.6	**Distraction**. Distraction is a factor when the individual has an interruption of attention and/or inappropriate redirection of attention by an environmental cue or mental process that degrades performance.	- Crowding by aircraft operator's personnel and aircraft cleaners resulted in workplace discomfort to the PBB Operator. - Wrong task priority to leave PBB Operating Console to record aircraft docking particulars at the office which can be completed after PBB duties.
PC 2	**Psycho-Behavioural Factors**	
PC 2.8	**Complacency.** Complacency is a factor when the individual's state of reduced conscious attention due to an attitude of overconfidence, under-motivation or the sense that others "have the situation under control" leads to an unsafe situation.	- PBB Operator leaving the PBB immediately after the PBB had been engaged to the aircraft. - Not contactable on walkie-talkie which is company requirement but rely on personal handphone for work communication.
PP	**PERSONAL FACTORS**	
PP 1	**Coordination/Communication/Planning Factors**	
PP 1.3	**Task Delegation.** Task delegation is a factor when the crew or team members failed to actively manage the distribution of mission tasks to prevent the overloading of any crewmember.	- Long shift hours due to manpower shortage and COVID-19 pandemic contributed to workload stress and fatigue.

Analysis Tier 2 – Preconditions for Unsafe Acts

Distraction, complacency and inappropriate task delegation were the main contributing factors to the unsafe act above in the precondition for unsafe act defence layer.

The change in task delegation to longer shift hours since August 2020 due to manpower shortage and COVID-19 pandemic cumulated over a period of time had most probably led to unnecessary workload stress and fatigue to the majority of the PBB Operators.

Complacency in performing their duties was observed as it had been a normal practice for the PBB Operator to leave the PBB before all passengers had disembarked from the aircraft. This was compounded by the inability to be contactable via walkie-talkie when the PBB Operator was needed, in this case when the PBB encountered a fault/malfunction.

Wrong task prioritisation by the PBB Operator to perform other task when on PBB standby duties was a distraction factor. The recording of aircraft docking particulars at the office can be achieved after the completion of duties at the PBB instead of during PBB standby duties. Crowding by the aircraft operator's personnel and aircraft cleaners near the PBB Operating Console area which caused workplace discomfort during the aircraft docking and passenger disembarkation process was also another distraction factor to the PBB Operators in performing their task.

The above precondition for unsafe acts were the major contributors to the PBB Operator's decision to leave the PBB before all passengers had disembarked despite the fact that the PBB Operator knows the act above will contravened the MASB SOP – PBB Operations.

The aerodrome operator also needs to ensure that the equipment at the PBB are fully functional to support the safe operations of the PBB. Corrective maintenance is needed to repair the unserviceable telephone/intercom, the defective function button and status area page at the LCD touch screen display. Both these factors were present in the precondition for unsafe act defence layer but was not a contributing factor to this incident.

2.3.3 Tier 3 - Unsafe Supervision

SI	**INADEQUATE SUPERVISION**	
SI 3	**Local Training Issues/Programs.** Local Training Issues/Programs area factor when one-time or recurrent training programs, upgrade programs, transition	- No clear training procedures on the placement of the safety shoe position under the aircraft passenger door in the PBB Operators Training Syllabus.

	programs or any other local training is inadequate or unavailable (etc) and this creates an unsafe situation.	- No safety shoe functional check procedures before aircraft docking in the PBB Operators Training Syllabus as required by Manufacturer PBB Operations Instruction.
SF	**FAILURE TO CORRECT KNOWN PROBLEM**	
SF 2	**Operations Management**. Operations management is a factor when a supervisor fails to correct known hazardous practices, conditions or guidance that allows for hazardous practices within the scope of his/her command.	- Failure by Shift Leader to correct known practice of not on standby at PBB Operating Console by the PBB Operators during passenger disembarkation.
SV	**SUPERVISORY VIOLATIONS**	
SV 1	**Supervision – Discipline Enforcement (Supervision act of Omission).** Supervision – Discipline Enforcement is a factor when unit (organisational) and operating rules have not been enforced by the normally constituted authority.	- No enforcement of MASB SOP – PBB Operations requirement by the Duty Manager which requires the PBB Operators to be on standby at the PBB during passenger disembarkation.

Analysis Tier 3 - Unsafe Supervision

2.3.3.1 Supervision and Enforcement of Instructions

The importance of supervision and enforcement of instructions cannot be overemphasised in this incident. Evidence revealed the PBB Operators knowingly disregard the SOP instructions to be on standby at the PBB till the last passenger disembarked from the aircraft. The lack of supervision to correct the known problem and enforced the PBB SOP instructions was a contributing factor in the unsafe supervision defence layer and had in fact further encourage this unhealthy practice by the PBB Operators.

It is important to educate all PBB Operators on the importance of being at the PBB Operating Console, not only during the passenger disembarkation but also during passenger embarkation process as the immediate action by the PBB Operator to manually operate the PBB is

crucial when there is a fault especially on the auto leveller and safety shoe system. It is also a requirement stated in the Manufacturer PBB Operations Instruction that the PBB Operator is required to stand at the PBB Operating Console and not standby at the PBB only when the PBB is engaged to the aircraft and control by AUTO LEVEL function.

2.3.3.2 Local Training Issues

The importance of comprehensive PBB Operator training cannot be overemphasised in this incident. Evidence revealed that the PBB Operators Training Syllabus did not clearly specify the correct position to place the safety shoe under the aircraft passenger door. It only states that to apply safety shoe under the aircraft door. The unclear instruction was a contributing factor to this incident.

To avoid misinterpretation and confusion on the placement of the safety shoe, it should be clearly specified that the safety shoe should be placed at the bottom centre of the aircraft passenger door. This is to ensure that the safety shoe performs its function to protect the aircraft passenger door when there is a fault with the PBB Auto Level function.

It was also observed that there was no training syllabus and no training conducted for the PBB Operators to perform functional checks on the safety shoe every time before the aircraft docks. This requirement was clearly stated in the Manufacturer's PBB Operations Instruction. This observation was a factor present in the unsafe supervision defence layer but was not a contributing factor to this incident.

2.3.4 Tier 4 - Organisation Influence

OR	**RESOURCE/ACQUISITION MANAGEMENT**	
OR 7	**Personnel Resources.** Personnel Resources is a factor when the process through which	- PBB Operators manpower shortage. 3 x PBB Operators on 12 hours shift of 2 cycles per day.

	manning, staffing or personnel placement or manning resource allocations are inadequate for mission demands and the inadequacy causes an unsafe situation.	- Very long working hours which led to work fatigue and stress in COVID pandemic situation.
OP	**ORGANISATIONAL PROCESSES**	
OP 1	**Ops Tempo/Workload.** Ops Tempo/Workload is a factor when the pace of deployments, workload, additional duties, off-duty education, or other workload-inducing condition of an individual or unit creates an unsafe situation.	Changes from 8 hours shift of 3 cycles per day to 12 hours shift of 2 cycles per day since August 2020 to cope with manpower shortage and COVID-19 pandemic causes increased workload to PBB Operators.
OP 3	**Procedural Guidance/Publications.** Procedural Guidance/ Publications is a factor when written direction, checklists, graphic depictions, tables, charts or other published guidance is inadequate, misleading or inappropriate and this creates an unsafe situation.	- To include the following in MASB SOP – PBB Operations: a. include requirement to stand at PBB Operating Console for the complete passenger embarkation and disembarkation process. b. includes clear instructions to place the PBB safety shoe at the bottom centre of the open aircraft passenger door after PBB safely engaged to aircraft. c. includes procedures and instructions to perform safety shoe functional check every time before the aircraft docked at the PBB. - To formulate a new PBB Operators Training Syllabus to include training objectives, training modules and learning outcomes to enhance competency of PBB Operators.

Analysis Tier 4 - Organisation Influence

2.3.4.1 PBB Operator Manpower Shortage

The COVID-19 pandemic restrictions and the retirement of a few PBB Operators had brought manpower challenges to the aerodrome operator. To ensure the smooth operations of the airport, the aerodrome

operator implemented changes to PBB Operator's shift system. A longer 12 hours shift system of 2 cycles per day instead of the previous 8 hours shift system of 3 cycles per day was implemented since August 2020 to mitigate the manpower shortage and the reduce flight operations into KIA.

The change in shift system had progressively affected their daily work performances. It is analysed that there will be a definite increase in workload to the PBB Operators as flights into KIA increases with the gradual relaxation of movement restriction and opening of state borders for travel.

To overcome the short-term manpower shortage, the aerodrome operator had internally trained 4 additional personnel in October 2021 for this 12-hour shift system. To address the manpower shortage issue permanently, additional manpower recruitment is required. This is in compliance to Civil Aviation (Aerodrome Operations) Regulations 2016 (Amendment 2018) Regulation 14 which states the aerodrome operator is to ensure there is an adequate number of qualified and skill personnel to perform the PBB Operators duties. A review to the PBB Operator's shift system to an appropriate working hour duration is also required for the benefit and welfare of all PBB Operators.

2.3.4.2 Publication

The MASB SOP – PBB Operations must be reviewed to include clear instructions to avoid misinterpretation or confusion to the published instructions. These include clear requirement to the PBB Operators to stand at the PBB Operating Console for the full passenger embarkation and disembarkation process, clear instructions to place the PBB safety shoe at the bottom centre of the aircraft passenger door, and procedures and instructions to conduct functional check on the safety shoe every time before the aircraft docked at the PBB.

The PBB Operators Training Syllabus power point brief slides are found to be lacking in details and training guidance. It does not provide proper structured training guidance for the instructors to conduct their training. A new PBB Operators Training Syllabus needs to be formulated by the Aerodrome Operator to ensure the training standards are met to produce qualified and skill PBB Operators to perform their duties. This is in compliance to Civil Aviation (Aerodrome Operations) Regulations 2016 (Amendment 2018) Regulation 14 which states that the aerodrome operator is required to ensure the competency of personnel are at the required standards.

In summary, the manpower shortage issue, longer shift hours system, unclear SOP instructions and the lack of proper training syllabus were the main contributing factors in the Organisation Influence defence layer.

2.4 INVESTIGATION ANALYSIS SUMMARY

FALLIBLE DECISIONS	HUMAN FACTORS HFACS	TIER 4 ORGANISATIONAL INFLUENCE	TIER 3 SUPERVISION FAILURES	TIER 2 PRECONDITIONS UNSAFE ACT	TIER 1 UNSAFE ACT	BREACHED BARRIERS	INCIDENT
To allow aircraft passenger door to contact PBB safety shoe metal structure frame: -PBB Operator not on standby at PBB during passenger disembarkation. -PBB Operator placed the PBB safety shoe at the incorrect position below the aircraft passenger door.	**Tier 1**-Judgement and Decision Making Errors. -Violations-Lack of Discipline.	PBB manpower shortage & long shift hours.	No clear training procedures on the placement of safety shoe position under the aircraft passenger door in the PBB Operators Training Syllabus.	-Crowding by aircraft operator's personnel and aircraft cleaners causes workplace discomfort to the PBB Operator. - Wrong task priority to leave PBB Operating Console to record aircraft docking particulars at the office which can be completed after PBB duties. -Normal work practice by PBB Operator not to standby at PBB Operating Console during passenger disembarkation. - Not contactable on walkie-talkie which is company requirement but rely on personal handphone for work communication. -Long shift hours and shift system change due to manpower shortage and COVID-19 pandemic.	- PBB Operator did not standby at PBB till last passenger disembark.	The non-compliance to MASB SOP – PBB Operations.	Aircraft front passenger door contacted PBB safety shoe metal structural frame.
	Tier 2- Cognitive Factors.	Change of shift system & shift working hours.			- PBB Operator placed the safety at the bottom left side near the edge of the aircraft passenger door instead of bottom centre.	Unclear instructions in MASB SOP – PBB Operations.	
	Tier 2- Psycho-Behavioural Factors.	Unclear instructions in MASB SOP – PBB Operations to place the PBB safety shoe at the bottom centre of the aircraft passenger door after PBB had safely engaged to aircraft.	Failure by Shift Leader to correct known practice of not on standby at PBB Console by the PBB Operators during passenger. disembarkation.			Change in Shift System Policy.	
	Tier 2- Coordination/ Communication /Planning Factors.	No proper PBB Operators Training Syllabus to provide proper training guidance to instructors.	No enforcement of MASB SOP – PBB Operations requirement by the Duty Manager which requires the PBB Operators to be on standby at the PBB Console during passenger disembarkation.				
	Tier 3-Inadequate Supervision. -Failure Correct Known Problem. -Supervisory Violations.						
	Tier 4- Resource/ Acquisition Management.						
	Tier 4-Organisational Processes.						

3.0 Conclusion

Test and inspection carried out on the PBB system and safety features did not revealed any abnormalities. Video surveillance camera recording and witness statements revealed that there was a significant nose down attitude of the aircraft for about 6 seconds during passengers' disembarkation and cargoes/baggage unloading process. The AUTO LEVEL system of the PBB would have operated normally to cater for this movement as per its design function by making height adjustment automatically to recover the original height difference if the aircraft fuselage height difference reaches 2cm between the advancing edge of the PBB and the aircraft door step. This is to ensure a safe height difference between the PBB advancing edge and aircraft door step to assist passengers embarking or disembarking conveniently.

In accordance to the Manufacturer PBB Operations Instruction, if the PBB does not make height adjustment when the aircraft fuselage height variation reaches 5cm, the AUTO LEVEL system will indicate AUTO LEVEL FAULT at the PBB Operating Console LCD screen. The PBB Operator is required to put the key switch to MANUAL to adjust the height of the PBB based on the aircraft fuselage height variation. Unfortunately, the PBB Operator was not at the PBB Operating Console to notice the fault indication and take the necessary immediate actions.

When no immediate actions were taken to correct the auto level fault indication, the safety shoe safety feature was activated. The continuous downward movement of the aircraft fuselage caused the aircraft passenger door to press against the stretch tactile rod of the limit switch when the auto leveller did not perform the automatic downward movement to recover the height variation. Due to the position of the safety shoe being most probably placed at the left edge bottom of the aircraft passenger door, the door most probably slides sideway following the aircraft's door rounded edge which resulted in the bottom left edge of the door to strike the safety shoe's metal structural frame. It caused the aircraft door to be stuck in position with the safety shoe's metal structural frame.

Since the aircraft door edge is stuck with the safety shoe metal structural frame, an automatic downward movement of the PBB when the safety shoe limit switch is

activated did not unstuck the door. The continuous pressing of the safety shoe's tactile rod limit switch by the aircraft's bottom door edge causes the canopy and the leveller wheels to retract and the PBB alarm to sound. It resulted in the Forward Passenger Door lower edge skin found torn and slight dent mark on the safety shoe metal structural frame.

The incorrect action by the PBB Operator to retract instead of descending the PBB first when the passenger door was stuck to the safety shoe metal frame structure further aggravated the situation.

Human factor was the main cause of this incident. The lack of discipline by the PBB Operator not to standby at the PBB till the last passenger disembark clearly violates the MASB SOP – PBB Operations. This violation resulted in no immediate actions taken when the PBB AUTO LEVEL fault indicated at the PBB Console LCD screen. Leaving the PBB immediately most probably resulted in a rushed action where the safety shoe was unintentionally placed at the bottom left side of the aircraft passenger door instead of the bottom centre. Both these unsafe acts by the PBB Operator were the primary cause of the incident.

Analysis using the Swiss Cheese model revealed there were three preconditions for the above unsafe act. Complacency was the main factor as it had been a practice of the PBB Operator to leave the PBB immediately after the PBB had been engaged to the aircraft. This was made worst by the fact that despite leaving and not being on standby at the PBB, the PBB Operator was also not contactable by walkie-talkie when the PBB encountered a fault/malfunction.

Lastly, crowding by aircraft operator's personnel and aircraft cleaners which caused workplace discomfort couple with wrong task priority to record aircraft docking particulars at the office was a distraction factor that had led the PBB Operator to leave the PBB immediately after the PBB was engaged to the aircraft.

Supervision factors played a major contributing role to this incident. Evidence revealed that the practice of PBB Operators to leave the PBB during standby duties was a normal work practice for some time despite contravening the MASB SOP – PBB

Operations instructions. The failure of the management to correct known problem and to enforced discipline had in fact encouraged the unsafe act by the PBB Operator.

The importance of training is paramount to ensure competency in performing a task safely. There is a requirement to ensure clear training procedures are documented and taught with regards to the safety shoe placement position under the aircraft passenger door in the PBB Operators Training Syllabus. This is to avoid misinterpretations and confusion which will lead to unsafe acts.

There is also a requirement to include the safety shoe functional check procedures before aircraft docking into the PBB Operators Training Syllabus as required by Manufacturer PBB Operations Instruction. This is a safety requirement by the PBB manufacturer and did not contribute to the incident.

Lastly, a proper PBB Operators Training Syllabus needs to be formulated by the Aerodrome Operator to ensure the training standards are met to produce qualified and skill PBB Operators to perform their duties.

Organisational influence factors also played a major contributing role to this incident. The change in the shift system to mitigate PBB Operators manpower shortage during the COVID-19 pandemic was the main contributing factor under organisational influence. A review to the shift system and working hours needs to be undertaken as soon as possible for the benefit and welfare of all PBB Operators.

There was effort taken in the short term to mitigate the PBB Operators manpower shortage by training personnel internally to perform PBB Operators task. However, to address the manpower shortage issue permanently, additional manpower recruitment is required.

Another organisational influence factor is the requirement to review the MASB SOP – PBB Operations and to formulate a new PBB Operators Training Syllabus to ensure clear instructions and procedures are documented for all PBB Operators to follow to avoid a recurrence of a similar incident.

All the above organisational influence factors are an obligation by the aerodrome operator to comply with Civil Aviation (Aerodrome Operations) Regulations 2016 (Amendment 2018) Regulation 14 – Competence of Personnel.

In summary, a violation to SOP is a serious unsafe act which can lead to a serious incident or a fatal accident. The importance of adhering to SOP diligently cannot be overemphasize. Adherence to SOP to standby at the PBB and the correct placement of the safety shoe under the aircraft passenger door is paramount to the safe operations of the PBB in this incident. Proper supervision, enforcement of discipline, good manpower management and the review of publication by the aerodrome operator will further aid this cause.

3.1 Findings

3.1.1 The Aircraft Commander and Captain were properly licensed to fly this schedule flight.

3.1.2 The aircraft was properly maintained and airworthy for the flight.

3.1.3 The PBB Operator was competent and properly authorised for duty.

3.1.4 Post incident inspection and functional test on the PBB found no abnormality.

3.1.5 The incident happened during twilight to dusk hours. Weather was fine.

3.1.6 Record of event for the PBB on the incident indicates the PBB safety shoe had been activated two times. The fault indication “Auto Level Fault” indicated at the PBB Operating Console LCD screen during the incident.

3.1.7 The PBB Operator was not on standby at the PBB until the last passenger had disembarked from the aircraft contravening the MASB SOP – PBB Operations.

3.1.8 The PBB Operator was not contactable via company walkie-talkie immediately when the incident happened. The PBB Operator was only contactable via personal handphone.

3.1.9 Lack of clear training procedures on the placement of safety shoe position under the aircraft passenger door in the PBB Operators Training Syllabus – Perform PBB Docking Operation.

3.1.10 Lack of clear instruction on the placement of safety shoe position under the aircraft passenger door in the MASB SOP – PBB Operations.

3.1.11 No procedures and instructions to conduct functional check on the safety shoe every time before the aircraft docked at the PBB in the PBB Operators Training Syllabus - Perform PBB Docking Operation and MASB SOP – PBB Operations.

3.1.12 The PBB telephone/Intercom was inoperative.

3.1.13 The button area and status display area at the PBB Operating Console LCD touch screen display had malfunction.

3.1.14 The time and date function of the PBB Operating Console LCD touch screen display was inoperative.

3.1.15 The PBB was crowded with aircraft operator’s personnel and aircraft cleaners during aircraft docking and passenger disembarkation process.

3.2 Preliminary Report Actions Recommended to Aerodrome Operator

3.2.1. To conduct a maintenance inspection and test by the Original Equipment Manufacturer (OEM) to determine the operational status of PBB Bay 1. The report on the inspection and test is to be made available to the AAIB Investigation Team within one month or earlier effective 16 November 2021.

3.2.2 To temporary suspend the operation of PBB Bay 1 till the test results are made available.

3.2.3. The operation of all PBB in Kuching International Airport follows strictly to the procedures as stated in the MASB SOP – PBB Operations.

3.3 Causes/Contributing Factors

3.3.1 Human factor was attributed to have caused this incident. From the human factor analysis as shown in the summary HFACS worksheet in Figure 38, it was determined that the above incident **primary causes** were attributed to:

a. **2 Unsafe Acts (Tier 1)** as follows:
   i. Judgement and Decision-Making Errors.
   ii. Violations – Lack of Discipline.

3.3.2 The **secondary causes (contributing factors)** were attributed to:

a. **3 Preconditions of Unsafe Acts (Tier 2)** as follows:
   i. Cognitive Factors.
   ii. Psycho-Behavioural Factors.
   iii. Coordination/Communication/Planning Factors.

b. **3 Unsafe Supervision (Tier 3)** as follows:

i. Inadequate Supervision.

ii. Failure Correct Known Problem.

iii. Supervisory Violations.

c. **3 Organisation Influence (Tier 4)** as follows:

i. 1 Resource/Acquisition Management.

ii. 2 Organisational Processes.

3.3.3 The first primary cause was attributed to the absent of the PBB Operator when the AUTO LEVEL Fault indicated at the PBB Operating Console LCD touch screen display. Failure to take immediate actions when the fault indicated had led to the safety shoe being activated two times.

3.3.4 The second primary cause was attributed to the placement of the safety shoe by the PBB Operator at the bottom left side near the edge of the aircraft passenger door instead of bottom centre. When the aircraft fuselage moves downward, the safety shoe was activated by the left edge of the passenger door which slide and contacted the safety shoe metal structure frame. It was stuck at the final position until the PBB Operator came and reposition the PBB.

UNSAFE ACTS – ERRORS		4	3	2	1
AE 1	Skill-Based Errors				6
AE 2	Judgement and Decision-Making Errors	1			5
AE 3	Misperception Error				1
UNSAFE ACTS – VIOLATIONS					
AV 1	Violations - Based on Risk Assessment				1
AV 2	Violations - Routine / Widespread				1
AV 3	Violations – Lack of Discipline	1			
UNSAFE ACTS SUB TOTAL		**2**	**0**	**0**	**14**
PRECONDITIONS FOR UNSAFE ACTS - ENVIRONMENTAL FACTORS					
PE 1	Physical Environment				11
PE 2	Technology Environment			2	6
PRECONDITIONS FOR UNSAFE ACTS - CONDITIONS OF INDIVIDUAL					
PC 1	Cognitive Factors		1		7
PC 2	Psycho-Behavioural Factors		1		14
PC 3	Adverse Physiological State				16
PC 4	Physical / Mental Limitation				5
PC 5	Perceptual Factors				11
PRECONDITIONS FOR UNSAFE ACTS - PERSONNEL FACTORS					
PP 1	Coordination/Communication/Planning Factors		1		11
PP 2	Self-Imposed Stress				6
PRECONDITIONS FOR UNSAFE ACTS SUB TOTAL			**3**	**2**	**87**
UNSAFE SUPERVISION					
SI	Inadequate Supervision		1		5
SP	Planned Inappropriate Operations				7
SF	Failure Correct Known Problem		1		1
SV	Supervisory Violations		1		3
UNSAFE SUPERVISION SUB TOTAL		**0**	**3**	**0**	**16**
ORGANISATIONAL INFLUENCES					
OR	Resource/Acquisition Management		1		8
OC	Organisational Climate				5
OP	Organisational Processes		2		4
ORGANISATIONAL INFLUENCES SUB TOTAL		**0**	**3**	**0**	**17**
TOTAL UNSAFE ACTS		**2**	**9**	**2**	**134**

Figure 38: Summary of HFACS Worksheet

4.0 Safety Recommendations

4.1 The Aerodrome Operator is to carry out the following safety recommendations:

4.1.1 To review the MASB SOP – PBB Operations as follows:

a. To amendment requirement for PBB Operator from **'to standby at PBB'** to **'to stand at PBB Operating Console'**.

b. To include the requirement for PBB Operator to stand at PBB Operating Console for the full passenger embarkation and disembarkation process.

c. To include instructions to place the PBB safety shoe at the bottom centre of the forward aircraft passenger door after the PBB had safely engaged to the aircraft.

d. To include instructions to perform safety shoe functional check every time before the aircraft docked at the PBB.

4.1.2 To formulate a new PBB Operators Training Syllabus - Perform PBB Docking Operation to include the followings:

a. To include teaching the procedures to place PBB safety shoe at the bottom centre of the forward aircraft passenger door after the PBB had safely engaged to the aircraft.

b. To include teaching the procedures to perform safety shoe functional check every time before the aircraft docked at the PBB.

c. To include teaching of immediate actions taken when the PBB shows fault indication at the PBB touch screen display.

4.1.3 To review the PBB Operator's shift system and shift hours to improve workplace condition.

4.1.4 To review the PBB Operator's manpower requirement and recruit additional personnel to mitigate the manpower shortage.

4.1.5 To take corrective maintenance actions to repair the Gate 1 PBB Operating Console LCD touch screen display to make it fully functional.

4.1.6 To review the communication requirement to use either the PBB Console telephone/intercom or the walkie-talkie for the PBB Operators' communications and document this communication requirement in the MASB SOP – PBB Operations.

4.2 The Aircraft Operator is to carry out the following safety recommendations:

4.2.1 To review the number of personnel required to standby near the PBB Operating Console area to avoid crowding in the PBB tunnel during aircraft docking, passengers' embarkation and disembarkation process.

4.2.2 To instruct the relevant personnel on duty at Kuching International Airport to keep clear of the PBB Operating Console which is the working area for the PBB Operator on duty during aircraft docking, passengers' embarkation and disembarkation process.

4.3 CAAM is to carry out the following safety recommendations:

4.3.1 To conduct a Safety Regulatory Oversight on the aerodrome operator to ensure compliance to Civil Aviation (Aerodrome Operations) Regulations 2016 (Amendment 2018) Regulation 14 on the competence of personnel as follows:

4.3.1.1 MASB SOP – PBB Operations instructions are reviewed and formulated clearly and correctly.

4.3.1.2 A new PBB Operators Training Syllabus - Perform PBB Docking Operation is formulated to enhance PBB Operators competency.

4.3.1.3 The availability of adequate number of qualified PBB Operators to perform their duties in a suitable shift system for the safe operations of Kuching International Airport.

4.3.2 To require the aerodrome operator to submit and obtain approval from CAAM before the official use of the reviewed MASB SOP – PBB Operations and the newly formulated PBB Operators Training Syllabus – Perform PBB Docking Operation.

4.3.3 To consider the implementation of requirement for the aerodrome operator to submit and obtain approval from CAAM before the official use of all SOPs and Training Syllabus pertaining to aerodrome operation to improve training standards and competency of personnel.

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

As required by ICAO Annex 13, paragraph 6.3, the draft Final Report was sent to State of Registry (CAAM), State of Manufacturer (BEA France), State of Manufacturer Technical Adviser (Airbus), European Aviation Safety Agency (EASA), Aircraft Operator and the Aerodrome Operator inviting their significant and substantiated comments on the Report. The following are the status of the comments received: -

Organisations	Status of Significant and Substantiated Comments
Civil Aviation Authority of Malaysia (CAAM)	Accepted and with no comments.
BEA France	Accepted and with no comments.
Airbus France	Accepted and with no comments.
EASA	Accepted and with no comments.
Aircraft Operator	Accepted and with no comments.
Aerodrome Operator	Comments accepted and amended accordingly.

APPENDICES

APPENDIX A

INSPECTION AND TESTING REPORT FOR PASSENGER BOARDING BRIDGE (PBB) BAY 1

Wee Hock Electronic & Electrical Company
Lot 1999, Jalan Semangat, Bintawa, 93450 Kuching,
P.O Box 965, 93720 Kuching, Sarawak.
Tel: 082-333661 & 339961 Fax: 082-333668 H/P: 019-8860396
Email : weehock4@gmail.com

REPORT FOR PASSENGER BOARDING BRIDGE SYSTEM BAY 1 AT KUCHING INTERNATIONAL AIRPORT

Date : 23 November 2021

Reference to the recent accident at Aerobride Bay 1, we have conducted site inspection and testing on 17/11/2021 and 22/11/ 2021 on the following PBB operation.

1. Bumper limit switch
2. Auto leveller
3. Safety shoe
4. PLC

Based on our inspection and testing we have found out that the Bumper limit switch, Auto Leveller, Safety Shoe and PLC system are in good condition and well functioning.

Based on these findings, we would like to confirm that PBB No.1 is safe for operation

Functions

Safety Shoe:

- To protect the aircraft contact with the PBB.
- When the aircraft door active the PBB will decent approximately 200mm.

Auto Level:

- To follow movement of Aircraft up and down.
- If the Auto Level hold for 3 second the canopy will retract back and stop going up or down to make sure it doesn't contact with the aircraft.

Wee Hock Electronic & Electrical Company
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P.O Box 965, 93720 Kuching, Sarawak.
Tel: 082-333661 & 339961 Fax: 082-333668 H/P: 019-8860396
Email : weehock4@gmail.com

PHOTO Attachment

The CORRECT Location

The purpose of Safety Shoe is protecting the Aircraft Door from contact with the Passenger Boarding Bridge (PBB) in a proper position (Refer the photo as Attached).

Wee Hock Electronic & Electrical Co.
威福電子電器公司
Lot 1999 Jln. Semangat Bintawa

GENERAL ENGINEERING Contractor For:
Supply, Install & Maintenance Service-; Baggage Handling System and Weighing Scale System Passenger Boarding Bridge & Visual Docking Guidance System; Aircondition system, air curtain and all kinds of Mechanical &Electrical Works; Stainless Steel works; Elevator (Lift) & Escalator & Household Home Appliances.

INSPECTION AND TESTING OF PASSENGER BOARDING BRIDGE (PBB) BAY NO. 1

Introduction

The purpose of site inspection and testing of Pbb at bay no. 1 is to verify and confirm the operational status of the equipment after the incidence involving an aircraft on 7th November 2021. Inspection and testing of the equipment were carried out by CIMC (OEM) local agent, Wee Hock Electronic & Electrical Company and MASB engineering team on 17th and 22nd November 2021.

Testing

The following tests were carried out on the operation and safety features of the Pbb.

Item	Method	Remarks
Pbb Operation	1. Extend and retract aerobridge	Normal
	2. Lift and lower aerobridge	Normal
	3. Press up/down button simultaneously	Pbb movement is locked
	4. Press forward/retract button simultaneously	Pbb movement is locked
	5. Press 'Emergency' stop button	Power supply is cut off
Programmable Logic Controller (PLC)	Switched to 'Manual' status	Both right and left round display symbols on top left/right are flashing indicates communication with PLC is normal
Bumper limit	1. Extend the tunnel forward and activate the slowdown limit switches underneath the bumper	Tunnel forward movement is slowed down
	2. Extend the tunnel forward and activate the stop limit switches underneath the bumper	Tunnel forward movement stop

Auto leveller	1. Roll down auto leveller wheels	Aerobridge descends to adjust its height. PLC points 33 and 35 lighted
	2. Roll up auto leveller wheels	Aerobridge ascends to adjust its height. PLC points 30 and 34 lighted
	3. Roll up/down wheel continuously for 3 seconds	Alarm went off, canopy and auto leveller returned to original position
	4. Check wiring and connection of limit switches	No bad contact and sign of rust
Safety shoe	1. Step on the safety to activate the limit switch	Alarm went off, canopy and auto leveller returned to original position and the aerobridge descend approximately by 20mm
	2. Release the limit switch	Canopy and auto leveller extend out
	3. Repeat step 1 & 2 for 4 times	On the 4th activation, canopy and auto leveller will not extend out and remained at original position

Conclusions

The outcome of tests confirm that all Pbb safety features are fully functioning.

Prepared by:

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Malaysia Airports Sdn. Bhd.
Kuching International Airport

Verified by

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Engineering Manager
Malaysia Airports Sdn Bhd
Kuching International Airport

APPENDIX B

HUMAN FACTORS ANALYSIS AND CLASSIFICATION SYSTEM (HFACS) WORKSHEET I 04/21 AIRBUS 320-216 9M-AJN

1. This worksheet is on HFACS. It is divided into four (4) sections having question pertaining to that area. There are total 147 statements and each statement are to be rated on a 4-point scale, where:

a. **4 - Primary cause**. Main factors that directly contributed to/responsible for accident/incident.

b. **3 - Secondary cause (contributing factor)**. Factor was present but not the most important/ critical factor responsible for accident / incident and contributed indirectly.

c. **2 -** Factor was present but didn't affect the outcome at all, was not contributory.

d. **1 -** Factor was not present.

2. It is mandatory to rate each statement. Wherever the rating is 2, 3 or 4 the explanation has to be provided for the reasons responsible in a narrative form at the end of the rating sheet.

TIER 1 - UNSAFE ACTS

AE - Errors

		4	3	2	1
AE 1	**Skill-Based Errors**				
AE 1.1	Inadvertent Operation				√
AE 1.2	Checklist Error				√
AE 1.3	Procedural Error				√
AE 1.4	Over-control / Under-control				√
AE 1.5	Breakdown in Visual Scan				√
AE 1.6	Inadequate Anti-'G' Straining Manoeuvre				√

		4	3	2	1
AE 2	**Judgement and Decision-Making Errors**				
AE 2.1	Risk Assessment – During Operation				√
AE 2.2	Task Mis-prioritization				√
AE 2.3	Necessary Action – Rushed	√			
AE 2.4	Necessary Action – Delayed				√
AE 2.5	Caution / Warning – Ignored				√
AE 2.6	Decision-making During Operation				√
		4	3	2	1
AE 3	**Misperception Error**				
AE 3.1	Errors due to Misperception				√

AV – Violations

		4	3	2	1
AV 1	Violations - Based on Risk Assessment				√
AV 2	Violations - Routine / Widespread				√
AV 3	Violations – Lack of Discipline	√			

TIER 2 - PRECONDITIONS FOR UNSAFE ACTS

PE - Environmental Factors

		4	3	2	1
PE 1	**Physical Environment**				
PE 1.1	Vision Restricted by Icing/Windows Fogging/etc.				√
PE 1.2	Vision Restricted by Meteorology Conditions				√
PE 1.3	Vibration				√
PE 1.4	Vision Restricted in Workspace by Dust/Smoke/etc.				√
PE 1.5	Windblast				√
PE 1.6	Thermal Stress-Cold				√
PE 1.7	Thermal Stress-Heat				√
PE 1.8	Manoeuvring Forces-In-Flight				√
PE 1.9	Lighting of other Aircraft / Vehicle				√
PE1.10	Noise Interference				√
PE 1.11	Brownout / Whiteout				√

		4	3	2	1
PE 2	**Technology Environment**				
PE 2.1	Seating and Restraints				√
PE 2.2	Instrumentation and Sensory Feedback Systems				√
PE 2.3	Visibility Restriction				√
PE 2.4	Controls and Switches			√	
PE 2.5	Automation				√
PE 2.6	Workspace Incompatible with Human				√
PE 2.7	Personal Equipment Interference				√
PE 2.8	Communications - Equipment			√	

PC - Conditions of Individual

		4	3	2	1
PC 1	**Cognitive Factors**				
PC 1.1	Inattention				√
PC 1.2	Channelized attention				√
PC 1.3	Cognitive Task Oversaturation				√
PC 1.4	Confusion				√
PC 1.5	Negative Transfer				√
PC 1.6	Distraction		√		
PC 1.7	Geographic Misorientation (Lost)				√
PC 1.8	Checklist Interference				√

		4	3	2	1
PC 2	**Psycho-Behavioural Factors**				
PC 2.1	Pre-Existing Personality Disorder				√
PC 2.2	Pre-Existing Psychological Disorder				√
PC 2.3	Pre-Existing Psychosocial Disorder				√
PC 2.4	Emotional State				√
PC 2.5	Personality Style				√
PC 2.6	Overconfidence				√
PC 2.7	Pressing Beyond Limits				√
PC 2.8	Complacency		√		
PC 2.9	Inadequate Motivation				√
PC 2.10	Misplaced Motivation				√
PC 2.11	Overaggressive				√
PC 2.12	Excessive Motivation to Succeed				√
PC 2.13	Get-Home-It is / Get-There-Itis				√
PC 2.14	Response Set				√
PC 2.15	Motivational Exhaustion (Burn out)				√

		4	3	2	1
PC 3	**Adverse Physiological State**				
PC 3.1	Effects of G-Forces (G-LOC, etc,)				√
PC 3.2	Prescribed Drugs				√
PC 3.3	Operational Injury/Illness				√
PC 3.4	Sudden Incapacitation / Unconsciousness				√
PC 3.5	Pre-Existing Physical Illness/Deficit				√
PC 3.6	Physical Fatigue (Overexertion)				√
PC 3.7	Fatigue – Physiological / Mental				√
PC 3.8	Circadian Rhythm Desynchrony				√
PC 3.9	Motion Sickness				√
PC 3.10	Trapped Gas Disorders				√
PC 3.11	Evolved Gas Disorders				√
PC 3.12	Hypoxia				√
PC 3.13	Hyperventilation				√
PC 3.14	Visual Adaption				√
PC 3.15	Dehydration				√
PC 3.16	Physical Task Oversaturation				√

		4	3	2	1
PC 4	**Physical / Mental Limitation**				
PC 4.1	Learning Ability / Rate				√
PC 4.2	Memory Ability / Lapses				√
PC 4.3	Anthropometric / Biomechanical Limitations				√
PC 4.4	Motor skill / Coordination or Timing deficiency				√
PC 4.5	Technical / Procedural Knowledge				√

		4	3	2	1
PC 5	**Perceptual Factors**				
PC 5.1	Illusion – Kinesthetics				√

PC 5.2	Illusion – Vestibular				√
PC 5.3	Illusion – Visual				√
PC 5.4	Misperception of Operational Conditions				√
PC 5.5	Misinterpreted / Misread Instrument				√
PC 5.6	Expectancy				√
PC 5.7	Auditory Cues				√
PC 5.8	Spatial Disorientation (Type 1) Unrecognized				√
PC 5.9	Spatial Disorientation (Type 2) Recognized				√
PC 5.10	Spatial Disorientation (Type 3) Incapacitating				√
PC 5.11	Temporal Distortion				√

PP - Personnel Factors

		4	3	2	1
PP 1	**Coordination/Communication/Planning Factors**				
PP 1.1	Crew/Team Leadership				√
PP 1.2	Cross-Monitoring Performance				√
PP 1.3	Task Delegation		√		
PP 1.4	Rank / Position Authority Gradient				√
PP 1.5	Assertiveness				√
PP 1.6	Communicating Critical Information				√
PP 1.7	Standard / Proper Terminology				√
PP 1.8	Challenge and Reply				√
PP 1.9	Mission Planning				√
PP 1.10	Mission Briefing				√
PP 1.11	Task/Mission-In-Progress Re-Planning				√
PP 1.12	Miscommunication				√

		4	3	2	1
PP 2	**Self-Imposed Stress**				
PP 2.1	Physical Fitness				√
PP 2.2	Alcohol				√
PP 2.3	Drugs/Supplements/Self-Medication				√
PP 2.4	Nutrition				√
PP 2.5	Inadequate Rest				√
PP 2.6	Unreported Disqualifying Medical Condition				√

TIER 3 – UNSAFE SUPERVISION

SI - Inadequate Supervision

		4	3	2	1
SI 1	Leadership / Supervision / Oversight Inadequate				√
SI 2	Supervision-Modelling				√
SI 3	Local Training Issues / Programs		√		
SI 4	Supervision – Policy				√
SI 5	Supervision – Personality Conflict				√
SI 6	Supervision-Lack of Feedback				√

SP – Planned Inappropriate Operations

		4	3	2	1
SP 1	Ordered / Led on Mission Beyond Capability				√
SP 2	Crew / Team / Flight Makeup / Composition				√
SP 3	Limited Recent Experience				√
SP 4	Limited Total Experience				√
SP 5	Proficiency				√
SP 6	Risk Assessment – Formal				√
SP 7	Authorized Unnecessary Hazard				√

SF - Failure Correct Known Problem

		4	3	2	1
SF 1	Personnel Management				√
SF 2	Operations Management		√		

SV - Supervisory Violations

		4	3	2	1
SV 1	Supervision – Discipline Enforcement (Supervision act of Omission)		√		
SV 2	Supervision – Defacto Policy				√
SV 3	Directed Violation				√
SV 4	Currency				√

TIER 4 - ORGANISATIONAL INFLUENCES

OR - Resource/Acquisition Management

		4	3	2	1
OR 1	Air Traffic Control Resources				√
OR 2	Air Field Resources				√
OR 3	Operator Support				√
OR 4	Acquisition Policies / Design Processes				√
OR 5	Attrition Policies				√
OR 6	Accession/Selection Policies				√
OR 7	Personnel Resources		√		
OR 8	Informational Resources / Support				√
OR 9	Financial Resources / Support				√

OC - Organisational Climate

		4	3	2	1
OC 1	Unit / Organisational Values / Culture				√
OC 2	Evaluation / Promotion / Upgrade				√
OC 3	Perceptions of Equipment				√
OC 4	Unit Mission / Aircraft / Vehicle / Equipment Change or Unit Deactivation				√
OC 5	Organisational Structure				√

OP - Organisational Processes

		4	3	2	1
OP 1	Ops Tempo / Workload		√		
OP 2	Program and Policy Risk Assessment				√
OP 3	Procedural Guidance / Publications		√		
OP 4	Organisational Training Issues / Programs				√
OP 5	Doctrine				√
OP 6	Program Oversight / Program Management				√