AIRCRAFT ACCIDENT FINAL REPORT

A 01/22P

Air Accident Investigation Bureau (AAIB)

Ministry of Transport Malaysia

Diamond DA 40 D, Registration 9M-HMW

at Langkawi International Airport, Kedah

on the 30 March 2022

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FINAL REPORT A 01/22P

AIR ACCIDENT INVESTIGATION BUREAU (AAIB)
MALAYSIA

ACCIDENT REPORT NO.: A 01/22

OPERATOR	**: HM AEROSPACE SDN BHD**
AIRCRAFT TYPE	**: DIAMOND DA 40 D**
NATIONALITY OF AIRCRAFT	**: MALAYSIA**
REGISTRATION	**: 9M-HMW**
PLACE OF OCCURRENCE	**: LANGKAWI INTERNATIONAL AIRPORT, KEDAH**
DATE AND TIME	**: 30 MARCH 2022 AT 2004 LT**

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 incidents when the occurrence shows evidence to have safety issues concerned.

AAIB conducts all accident and serious incident 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 accident was sent on 05 April 2022 to Transportation Safety Board of Canada as State of Manufacturer and Federal Safety Investigation Authority of Austria as State of Design. A copy of the Preliminary Report was subsequently submitted to the above organisation, Civil Aviation Authority of Malaysia (CAAM) and the Aircraft Operator on 21 April 2022.

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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GLOSSARY OF ABBREVIATIONS

A

A	Accident
AAIB	Air Accident Investigation Bureau
AFRS	Airport Fire and Rescue Services
AGL	Above Ground Level
ATC	Air Traffic Controller
ATCO	Air Traffic Controller Officer
ATO	Approved Training Organisation
ATPL	Air Transport Pilot Licence

B

BMR	Base Maintenance Release

C

CAAM	Civil Aviation Authority Malaysia
CAD	Civil Aviation Directive
CB	Cumulonimbus Clouds
CCT	Circuits
CFI	Chief Flight Instructor
CI/HOT	Chief Instructor/Head of Training
CP	Cadet Pilot
CPL	Commercial Pilot’s Licence
CVR	Cockpit Voice Recorder

D

DFE	Designated Flight Examiner

E

ECU	Engine Control Unit

F

FDR	Flight Data Recorder

FEW	few
FI	Flight Instructor
FOI	Flight Operations Inspectors

G

GH	General Handling

H

HFACS	Human Factors Analysis and Classification System
HMA	HM Aerospace Flight Training Centre
Hrs	hours

I

ICAO	International Civil Aviation Organisation
i.e.	id est or ‘that is’
IF	Instrument Flying
IR	Instrument Rating

K

KLIA	Kuala Lumpur International Airport

L

LH	Left Hand
LIA	Langkawi International Airport
LT	Local Time

M

m	metres
MASB	Malaysia Airports Sendirian Berhad
MAX	Maximum
MCO	Movement Control Order
MEMO	Memorandum
MOR	Mandatory Occurrence Report

N

NF	Night Flying
No	Number.

O

OEM	Original Equipment Manufacturer

P

PT	Progress Test

R

RH	Right Hand
RPM	Revolution per Minute
R/T	Radiotelephony

S

SEP	Single Engine Piston
SOP	Standard Operating Procedures
SPL	Student Pilot Licence

T

TO	Take-Off

U

UTC	Coordinated Universal Time

V

VFR	Visual Flight Rule

X

XC	Cross Country

SYNOPSIS

A Diamond DA 40 D aircraft was on a plan 1st solo night training flight callsign MAHA181. The aircraft departed Langkawi International Airport (LIA) at 1950 hours for circuit and landing for Night Flying 5 (NF 5) flight as per flight training syllabus.

The aircraft was cleared to land on Runway 03 and the approach was uneventful. The aircraft bounced on landing and subsequently ballooned into the air. It then veered to the right during the go-around and crash landed approximately 140 metres from the right-side edge of Runway 03 in an area of long grass.

The aircraft suffered major damage and there was no fire. The Cadet Pilot vacated the aircraft and did not suffer any physical injuries but was in a state of shock. The Cadet Pilot was brought to safety by the Airport Fire Rescue Services (AFRS) personnel and was immediately sent to Langkawi Hospital by ambulance for post-accident medical check-up.

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 accident.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

MAHA181 was a planned night flying 1st solo circuits flight for the Cadet Pilot (CP), program in the Flight Training Syllabus as Night Flying 5 (NF 5).

Pre-flight checks, start up and taxi were normal. MAHA181 took-off at 1950 hours from LIA Runway 03 and was asked to make a hold at left hand downwind at 2,000 feet due to departing traffic. During the hold, Air Traffic Control (ATC) reminded MAHA181 to squawk on the transponder code given which MAHA181 responded by switching the aircraft transponder 'ON' when the aircraft was not visual on radar. The CP had mistakenly informing the Duty Flight Instructor (MAHA08) that was airborne on her intention for a full stop on the ATC Approach frequency instead of the company frequency. MAHA181 subsequently requested for a full stop landing to the ATC.

MAHA181 was cleared to descend to 1,000 feet to resume circuits and subsequently final Runway 03 behind MAHA08. At 2003 hours, MAHA181 reported final Runway 03. The approach was uneventful but shortly after landing the aircraft was seen to veer to the right and exited the runway coming to a stop approximately 140 metres from the right-side edge of Runway 03 in an area of long grass. The aircraft suffered major damage to the undercarriage, engine nacelle lower section and rear tail plane.

The CP managed to vacate the wreckage and contacted HM Aerospace Despatch via handphone to advise of her situation and aircraft position. The CP was unable to contact Langkawi ATC who were thus not aware that the aircraft had veered off the runway and crashed landed.

Aircraft Operator Despatch contacted MAHA08 via company frequency to inform that MAHA181 had crashed on the right side of Runway 03 and instructed MAHA08 to inform Langkawi ATC. Airfield Fire Rescue Services (AFRS) were activated by Langkawi ATC and two vehicles were despatched to look for the crashed aircraft. AFRS located the crash site at 2010 hours and informed that the CP was conscious

with no physical injuries but in a state of shock. Ambulance arrived on site and the CP was sent to Langkawi hospital for post-accident medical check-up.

At 2150 hours, both training aircraft MAHA344 and MAHA08 on hold in circuits due to runway closure landed safely. On completion of runway inspection at 2250 hours, the runway resumed normal operations.

The aircraft wreckage was cleared from the runway and placed in Aircraft Operator's hanger by 0120 hours. It was impounded for AAIB investigation.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	Nil	Nil	Nil	Nil
Serious	Nil	Nil	Nil	Nil
None	1	Nil	Nil	1

Figure 1: Injuries to Persons

1.3 Damage to Aircraft

Post-accident inspection revealed the following damages to the aircraft:

a. All propeller blades broken.
b. Nose spinner damaged.
c. Gear box casing broken.
d. Lower engine cowling broken and detached.
e. Upper engine cowling broken at right intercooler duct.
f. Upper cowling damage right hand side top and forward side of firewall.
g. Nose landing gear broken.
h. Left main tyre assembly broken and detached from strut.

i. Left main landing gear strut bent and twisted.

j. Tail cone / empennage fully broken 5ft from rudder.

Figure 2: Aircraft parked and impounded at hanger after salvage activities from crash site

1.4 Other Damage

No reported damages to aerodrome facilities or other properties.

1.5 Personnel Information – Pilot in Command

The CP joins HM Aerospace on April 2019 as Batch No. 71 for the Commercial Pilot Licence (CPL) course. Below are the CP's personnel information:

Nationality	Malaysian
Age	28
Gender	Female

License Type		SPL
License Expiry		31 March 2023
Medical Expiry		16 February 2023
Aircraft Rating		N/A
Instructor Rating		N/A
Flying Hours	**Total**	122.35
	Total on Type	122.35

Figure 3: Personnel Information – Pilot in Command

1.6 Aircraft Information

1.6.1 Aircraft Data

Aircraft Type	Diamond DA 40 D
Manufacturer	Diamond Aircraft Industries GmbH
Year of Manufacture	2004
Owner	HM Aerospace Sdn Bhd
Registration No.	9M-HMW
Aircraft Serial No.	D4.154
Certificate of Airworthiness Issue / Expiry date	16 Jul 21 / 1 Aug 22
Certificate of Registration Issue / Expiry date	16 Jul 21 / 31 Jul 24
Total Flight Hours	9360.55

Figure 4: Aircraft Data

1.6.2 Aircraft Mass and Balance

NO	CONDITION	MASS (kg)	ARM (m)
1	Zero Fuel Mass	897.5	2.41
2	Take-Off Mass	1021.47	2.43
3	Landing Mass	1003.76	2.43

Figure 5: Aircraft Mass and Balance Data

1.6.3 Aircraft Stall, Approach and Threshold Speed

NO	CONDITION	STALL SPEED (KIAS)			APPROACH & THRESHOLD SPEED (KIAS)	
	Flaps	0°	T/O	LDG	0°	LDG
1	Landing Mass – 1003.76 kg	52	51	49	85 / 80	80 / 75

Figure 6: Aircraft Stall, Approach and Threshold Speed

1.6.4 Aircraft Airworthiness

The aircraft was in an airworthy condition. There was no reported abnormalities or malfunction by the CP before and during the 1st solo night flight. The Aircraft Journey Log shows the aircraft had flown 3 flights for the day with a total of 1.40hrs prior to the accident. The aircraft mass and balance are within operating limits during the accident.

The latest schedule maintenance i.e. 200hrs Inspection and Engine change (9276.05hrs) was completed on 21 February 2022. A maintenance check flight on the outcome of the 200hrs Inspection and Engine change was carried out satisfactory on 21 February 2022. Maintenance record inspection revealed that the aircraft had flown 83hrs after the schedule maintenance with no defect recorded till the accident date. Defect observed and repair status during the 200hrs Inspection are as follows:

NO	DEFECT	REPAIR STATUS
1	Air intake hose found deteriorated	Replaced
2	Turbocharged air intake cracked	Replaced
3	Heater exchanger air hose deteriorated	Replaced
4	Expansion tank mounting sheet corroded	Replaced
5	Co-pilot rudder pedal adjustment cable broken	Replaced
6	LH main wheel tyre worn to limit	Replaced
7	RH main wheel tyre worn asymmetrically	Replaced
8	Pitot caution light still 'ON' after switching on heater	Thermal switch replaced

Figure 7: Aircraft 200 hours Inspection and Engine change defect and repair status

1.7 Meteorological Information

The accident happened at night. Actual weather was fine, visibility reported as more than 10km and wind 360° at 05kts. Nil weather reported with FEW CB clouds at 1,700ft. The weather conditions are well within the weather minima for student pilot solo flight as stated in Procedures Manual HMA.TRG.DOC.02 – 121 Part 1.15 Flight Planning Paragraph 1.15.8 to 1.15.10.

1.8 Aids to Navigation

All aerodrome navigation aids were operating normally.

1.9 Communications

All ATC communication frequencies were operating normally. Crash alarm was not activated by the ATC Controller on duty while the crash information was transmitted to AFRS Watch Room via ATC direct line.

The ATC Controller highlighted that it was the practice of the AFRS vehicles to enter runway immediately without informing or obtaining clearance from the ATC Tower

when the crash alarm is activated. Therefore, the use of direct line to convey crash information instead of activating the crash alarm was preferred as there were active traffic in circuits and the crash area could not be seen from ATC tower due to darkness.

1.10 Aerodrome Information

Airfield	Langkawi International Airport (LIA)
Runway	03/21
Length	3813m
Width	45m
ICAO Designator	WMKL
IATA Designator	LGK
Elevation	28ft

Figure 8: Langkawi Aerodrome Information

1.11 Flight Recorders

The aircraft was not installed with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR).

1.12 Wreckage and Impact Information

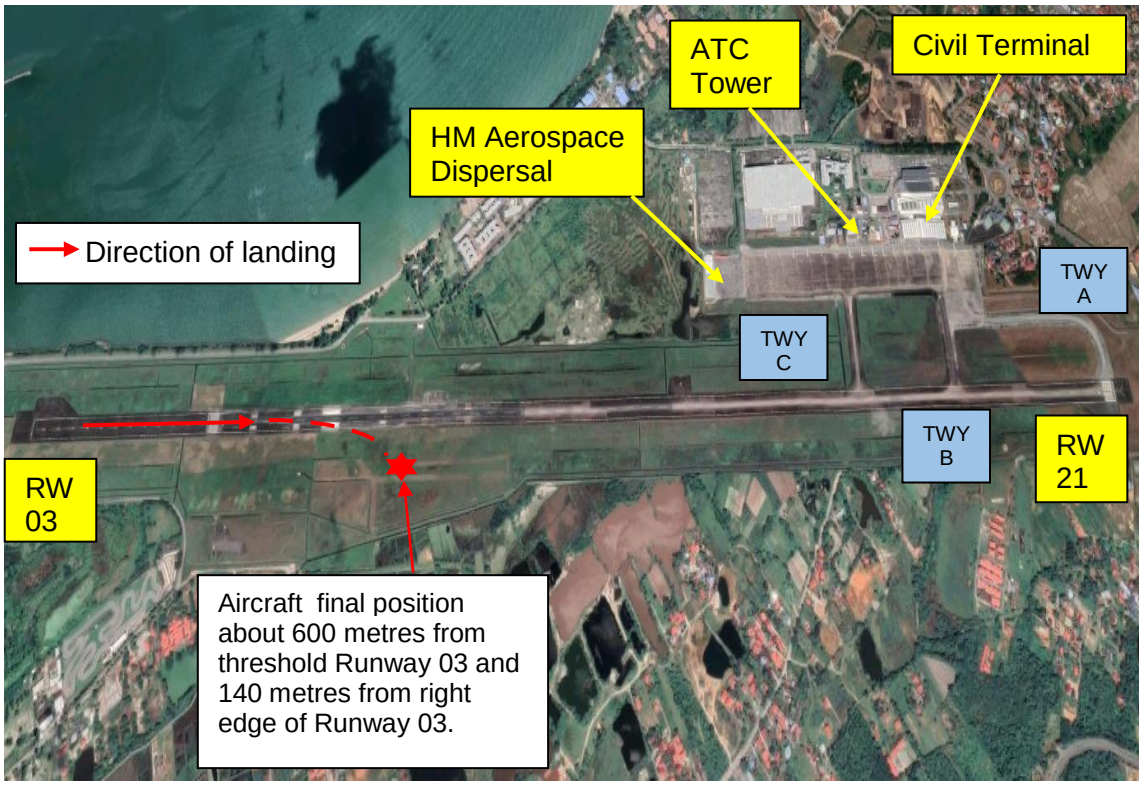

Figure 9: Landing path and final position of aircraft
(Diagram not to scale)

The aircraft suffered major damage in this accident. The aircraft had bounced while attempting to land and veered to the right side of the runway during the attempt go-around. The first impact point was about 120m from the right runway edge and about 600m from Runway 03 threshold. No skid marks were observed on the runway and grass area till the first impact point. The aircraft came to a rest about 140m from the right runway edge with the aircraft nose pointing to the ATC tower.

The aircraft recovery was performed on the same night by the Aircraft Operator and was successfully removed from the side of the runway. It was parked at the Aircraft Operator's hanger and impounded for investigation.

1.13 Medical and Pathological Information

The CP was evacuated by ambulance to the Langkawi Hospital for post-accident examination. The CP underwent urine drug test and results were negative for substance abuse. The Aircraft Operator had referred the CP for a post air crash medical review conducted by CAAM's Chief Medical Assessor (see paragraph 3.4).

The CP was assessed by an authorised Psychiatrist, Ophthalmologist and Psychologist. A Post Air Crash Medical Report by CAAM Chief Medical Assessor was submitted to AAIB on completion of the medical review (refer CAAM/BOP/4/7/.2. Vol.3(100) dated 31 May 2022). It was assessed that a combination of human factors such as fear of the dark (Nyctophobia) causing anxiety, Type I Spatial Disorientation which led to degraded visual acuity during night flying and decreased situation awareness which resulted in the lack of perception of the aircraft attitude and altitude had contributed to the CP's lack of comprehension of the potential risk lying within the night landing.

1.14 Fire

There was no pre or post impact fire.

1.15 Survival Aspects

The CP vacated the aircraft via the open canopy after the impact and was not physically injured.

1.16 Tests and Research

The engine has 2 Engine Control Unit (ECU) i.e. ECU A and ECU B. For normal operation the switch is set to AUTOMATIC and is controlled by ECU A. In case of a failure of the active engine control unit i.e. ECU A, there should be an automatic switchover to the ECU B. If the automatic switch-over fails, switch-over can be done manually by switching to ECU B. This procedure should only be applied in an emergency.

Engine parameters from the aircraft's ECU A internal data logger had been extracted for investigation analysis using the software provided by the engine OEM. These parameters are for maintenance purposes, nevertheless, it provides reliable indication of the engine performance during the flight. The engine parameters that are provided for maintenance purposes are as follows:

a. Revs – Engine RPM (Note – not Propeller RPM).
b. Load – Power lever setting in %.
c. MAP – Manifold Air Pressure.
d. TH2O – Engine Coolant Temperature.
e. TAir – Air temperature at manifold.
f. Toil – Oil Temperature.
g. Poil – Oil Pressure.
h. PRail – Fuel Pressure.
i. PBaro – Barometric Pressure in hectopascal.
j. VBatt – Battery Voltage.
k. TGear – Gear Box temperature.

The 5 sequences of engine start and stop parameters for all flights on 30 March 2022 obtained from ECU A are as follows:

a. 1st sequence from 8:32 UTC until 9:35 UTC (1st Sortie)
b. 2nd sequence from 9:43 UTC until 10:45 UTC (2nd Sortie)
c. 3rd sequence from 10:50 UTC until 11:10 UTC (3rd Sortie)
d. 4th sequence from 11:12 UTC until 11:16 UTC (Ground run only)
e. 5th sequence from 11:44 UTC until 12:08 UTC (aircraft accident)

The parameters analysis was concentrated on the 5th sequence from 11:44 UTC until 12:08 UTC which was the accident event. Three engine parameters were focus and the parameters summary are as below. All other parameters did not reveal any abnormalities as stated in the Engine Data Analysis Report.

NO	TIME (UTC)	FLIGHT	PARAMETERS
1	1144:42	Engine start-up	RPM 1906, Load 0%, PBaro 1017
2	1155:51	Aircraft airborne	RPM 3883 Load 99.9% Pbaro 1016
3	1159:02	Aircraft cruise	RPM 3883 Load 67.9% PBaro 949
4	1202:32	Aircraft decent	RPM 2976 Load 35.6% PBaro 952
5	1202:49	Aircraft decent	RPM 3012 Load 32.5% PBaro 956
6	1203:50	Aircraft level	RPM 3287 Load 64.9% PBaro 983
7	1206:24	Aircraft decent	RPM 2976 Load 27.9% PBaro 984
8	1206:53	Aircraft decent	RPM 2633 Load 0 PBaro 995
9	1207:09	Aircraft decent	RPM 2789 Load 39.2% Pbaro 1002
10	1208:24	Aircraft on ground	RPM 3907 Load 99.9% Pbaro 1017
11	1208:30	Data stop	RPM0 Load 0.4% Pbaro 1017

Figure 10: Engine parameters form ECU A

The engine parameters summary shows that the engine performed normally as per the circuits flight profile. Point to note is that the engine power was selected to idle and subsequently was increased slowly to about 39.2% before the engine stops on ground with maximum power recorded (99.9%). The were no evidence to indicate that the engine performance had contributed to the accident.

1.17 Organisational and Management Information

The Aircraft Operator is a Flight Training Centre for pilot training established since year 2004 and is situated in Langkawi International Airport, Kedah. It is a Civil Aviation Authority of Malaysia (CAAM) Approved Training Organisation (ATO) which operates 2 types of aircraft i.e. 12 x single engine Diamond DA 40 and 5 x twin engine Diamond DA 42. The main flying course conducted by the ATO is the Integrated Course of Commercial Pilot Licence (CPL) (A)/IR with Frozen Air Transport Pilot Licence (ATPL).

The Maintenance Organisation which performed all aircraft maintenance activities is Prima Air Sdn Bhd. It is a CAAM Approved Maintenance Organisation (approved

number AMO/2016/14) and the approval is valid till 9 September 2022. HM Aerospace and Prima Air are both subsidiary of Halim Mazmim Group.

The Aerodrome Operator for Langkawi International Airport (LIA) is Malaysia Airports Sdn Bhd (MASB). MASB is licenced by Ministry of Transport Malaysia to operate, manage, and maintain all airports in Malaysia except Kuala Lumpur International Airport (KLIA).

1.17.1 Post Accident Damage Assessment Report

The Maintenance Organisation had completed a physical damage assessment on the aircraft. The aircraft had been assessed as beyond economic repair due to major damage on the engine, fuselage, empennage and landing gear. The Post Accident Damage Assessment Report can be viewed at Maintenance Organisation's file reference PASB/ACI/2022/01 dated 04 April 2022.

1.17.2 Flight Instructor (FI) Competency for Cadet Pilot's Night Flying Flight

The FI is a 53 years old former military pilot. The FI holds a valid Commercial Pilot Licence (CPL) with Instrument Rating (IR) and was a former FI and fighter pilot in the RMAF. The FI joins HM Aerospace Sdn Bhd in year 2017 and currently is the Chief Instructor/ Head of Training (CI/HOT). He has a total of about 5,600 hours on all types and about 3,000 hours instructional.

The FI as the CI/HOT is responsible for the overall planning and programming for the course in accordance with HMA's Training Manual. The CI/HOT is empowered to authorised all flights that involve Instructors, Cadet Pilot's training and flights for the purpose of aircraft flight testing after maintenance (refer HMA Procedure Manual HMA.TRG.DOC.02 – 121 dated 20 February 2021).

1.17.3 Cadet Pilot's SEP VFR Phase Progress and Solo Day Flight

The CP's flying progression was normal until 1st solo day check (Circuits 7) in the SEP VFR phase. The CP was assessed as unable to land the aircraft safely despite flying

all 3 attempts in circuits for 1st solo circuits check (CCT 7, 8 & 9). A change to a senior FI (CFI) was carried out when the CP did not clear the 1st solo circuits check flight in CCT 7. The chronology of flights starting from the CP's 1st solo circuits check flight till the 1st solo training area flight compared between the Flying Training Syllabus and the Actual Flight are as Figure 11.

NO	PIC	SOLO/ DUAL	FLIGHT TRAINING SYLLABUS	ACTUAL FLIGHT	REMARKS
1	MAHA 15	DUAL	CCT 7 (1st solo day check).	CCT 7 - 1st solo ccts attempt.	Change FI to a Senior FI i.e. CFI at CCT 8.
2			1st solo CCT.	Not cleared.	
3	MAHA 02	DUAL	CCT 8.	CCT 8 - 2nd solo ccts attempt.	Not cleared.
4	MAHA 02	DUAL	CCT 9.	CCT 9 - 3rd solo cct attempt.	Not cleared.
5			2nd solo CCT.	N/A - Not cleared 1st solo ccts yet.	
6	MAHA 02	DUAL	GH 1 (1st solo check for training area.	GH 1 – flown as 1st solo ccts check and cleared.	All 3 flights are flown on the same day.
7	MAHA 181	SOLO	Refer para 2 above.	1st solo ccts.	
8	MAHA 181	SOLO	Refer para 5 above.	2nd solo ccts.	
9			GH 2 - 1st solo training area.	N/A - Not check for 1st solo training area yet.	
10	MAHA 15	DUAL	GH 3 - 2nd solo check for training area.	GH 3 – flown as 1st solo check for training area and cleared for ccts only (refer para 11).	
11	MAHA 181	SOLO	Refer para 9 above.	Flown as solo ccts only instead of training area.	Did not fly to training area as GH 1 was used as 1st solo ccts check.

12			GH 4 - 2nd solo training area.	N/A - Not check for 2nd solo training area yet.	
13	MAHA 15	DUAL	GH 5.	GH 5.	Did training area check and cleared
					1st solo training area in GH 4.
14	MAHA 181	SOLO	Refer para 12 above.	GH 4 – flown as 1st solo training area.	

Figure 11: Comparison between Flight Training Syllabus and Actual Flight
(Source: Actual Flight – Student Pilot's Flying Logbook)

A Slow Progress Report was raised by the FI (CFI) after CCT 8 and CCT 9 due to the CP's under-performance. The CP continued to progress to GH 1 which was flown as a 1st solo circuits check flight despite not flying two solo flight i.e. 1st solo circuits and CCT 10 (2nd solo circuits) as required by the Flight Training Syllabus. Both these solo circuits flights (CCT 7 & 10) were flown on the same day after the 1st solo circuits check flight carried out on GH 1.

All critical exercises for 1st solo circuits were taught and completed satisfactory. After the 1st solo circuits, the CP was further cleared for two more solo circuits flight (CCT 10 & GH 2) of which one flight (GH 2) was supposed to be 1st solo training area but flew circuits only as the check flight to training area (GH 1) was used to perform 1st solo circuits check at circuits.

The CP continued to fly the General Handling sortie (GH 3) before being cleared for her 1st solo training area flight (GH 4) which was supposed to be the 2nd training area solo flight. All critical exercises for 1st solo training area were taught and completed satisfactory.

The CP completed the SEP VFR phase syllabus (Figure 12) and subsequently passed the Flight Progress Test 1 (PT-1 GH) which was performed by an HMA Designated Flight Examiner.

Evidence above shows that the Flight Training Syllabus had been reshuffled instead of approving additional flights to progress the CP in the critical phase of 1st solo circuits and 1st solo training area despite the underperformance shown by the CP.

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1.5 SEP VFR DETAILED SYLLABUS

SEP VFR Phase Exercises and Hours details.

S/ NO	EXERCISES	FLIG HTTI ME	DUAL	PIC / SOLO	SPIC	GH	IF	X-COUNT	TOTAL
1	Effects of Control **(Familiarization)**	01:30	01:30			01:30			01:30
2	Straight & Level 1 & 2	01:30	01:30			01:30			03:00
3	Climbing Descending 1	01:00	01:00			01:00			04:00
4	Descending 2	01:00	01:00			01:00			05:00
5	Medium Turns	01:00	01:00			01:00			06:00
6	Stalling 1	01:00	01:00			01:00			07:00
7	Stalling 2	01:00	01:00			01:00			08:00
8	Circuits 1	01:00	01:00			01:00			09:00
9	Circuits 2	01:00	01:00			01:00			10:00
10	Circuits 3	01:00	01:00			01:00			11:00
11	Circuits 4	01:00	01:00			01:00			12:00
12	Circuits 5	01:00	01:00			01:00			13:00
13	Circuits 6	01:00	01:00			01:00			14:00
14	Circuits 7 (1st SOLO CX)	01:00	01:00			01:00			15:00
15	First Circuit Solo	00:30		00:30		00:30			15:30
16	Circuits 8	01:00	01:00			01:00			16:30
17	Circuits 9	00:30	00:30			00:30			17:00
18	Circuits 10 (2nd Circuit Solo)	00:30		00:30		00:30			17:30
19	General Handling 1 (Solo Check for T/A)	01:00	01:00			01:00			18:30
20	General Handling 2 (1st Solo T/A)	01:00		01:00		01:00			19:30
21	General Handling 3 (2nd attempt Cx for T/A Solo)	01:00	01:00			01:00			20:30
22	General Handling 4 (T/A Solo)	01:00		01:00		01:00			21:30
23	Instrument Flying 1 (IF 01)	01:00	01:00				01:00		22:30
24	Instrument Flying 1 (IF 02)	01:00	01:00				01:00		23:30
25	General Handling 5	01:00	01:00			01:00			24:30
26	Instrument Flying 3 (IF 03)	01:00	01:00				01:00		25:30
27	Instrument Flying 4 (IF 04)	01:00	01:00				01:00		26:30
28	Navigation 1 Nav intro (XC 01) Solo Cx	02:00	02:00					02:00	28:30
29	Navigation 2 (XC 02) Nav Solo	01:30		01:30				01:30	30:00
30	Navigation 3 (XC 03)	03:00	03:00					03:00	33:00
	RTOL ASSESSMENT								
31	General Handling 6	01:00	01:00			01:00			34:00
32	General Handling 7	01:00		01:00		01:00			35:00
33	Navigation 4 (XC 04)	03:30		03:30				03:30	38:30
34	General Handling 8	01:00	01:00			01:00			39:30
35	General Handling 9	01:30	01:30			01:30			41:00

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S/ NO	EXERCISES	FLIG HTTI ME	DUAL	PIC / SOLO	SPIC	GH	IF	X-COUNT	TOTAL
36	General Handling 10	01:00		01:00		01:00			42:00
37	General Handling 11	01:30	01:30			01:30			43:30
38	**PROGRESS TEST 1 (PT-1 GH)**	01:30			01:30	01:30			45:00
TOTAL SEP VFR PHASE		**45:00**	**33:30**	**10:00**	**01:30**	**31:00**	**04:00**	**10:00**	**45:00**

Figure 12: Flight Training Syllabus - SEP VFR Detailed Syllabus

1.17.4 Cadet Pilot's SEP IR, Consolidation, Navigation and Night Flying Phase Progress and Solo Night Flight

The CP started the SEP IR, Consolidation, Navigation and Night Flying phase on completion of the SEP VFR phase. There were no reported problems in the Instrument and Navigation Flying phase. The CP had in fact completed all the IF flights that are programmed after NF 5 and had also passed the Flight Progress Test 2 (PT-2 IF) before commencing the NF phase (Figure 13).

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S/ NO	EXERCISES	SORTIE TIME	DUAL	PIC / SOLO	SPIC	GH	IF	X-COUNT.	FNPT II	PROG TOTAL
58	Simulator 20 Airways	**01:00**	01:00				01:00		01:00	**65:00**
59	General Handling 12	**01:30**	01:30			01:30				**66:30**
60	Navigation 5 (XC 05)	**02:30**			02:30			02:30		**69:00**
61	Navigation 6 (XC 06)	**03:30**		03:30				03:30		**72:30**
62	Navigation 7 (XC 07)	**05:00**		05:00				05:00		**77:30**
63	Navigation 8 (XC 08)	**03:30**		03:30				03:30		**81:00**
64	Navigation 9 (XC 09)	**03:30**			03:30			03:30		**84:30**
65	Navigation 10 (XC 10)	**03:30**		03:30				03:30		**88:00**
66	Navigation 11 (XC 11)	**03:30**		03:30				03:30		**91:30**
67	Navigation 12 (XC 12)	**03:30**		03:30				03:30		**95:00**
68	Navigation 13 (XC 13)	**03:00**		03:00				03:00		**98:00**
69	Night Flying 1	**01:00**	01:00			01:00				**99:00**
70	Night Flying 2	**01:00**	01:00			01:00				**100:00**
71	Night Flying 3	**01:00**		01:00		01:00				**101:00**
72	Night Flying 4	**01:00**	01:00			01:00				**102:00**
73	Night Flying 5	**01:00**		01:00		01:00				**103:00**
74	Instrument Flying 5 (IF 05)	**01:00**	01:00				01:00			**104:00**
75	Instrument Flying 6 (IF 06)	**01:00**	01:00				01:00			**105:00**
76	Instrument Flying 7 (IF 07)	**01:00**	01:00				01:00			**106:00**
77	Instrument Flying 8 (IF 08)	**01:00**	01:00				01:00			**107:00**
78	Instrument Flying 9 (IF 09)	**01:00**	01:00				01:00			**108:00**
79	Instrument Flying 10 (IF 10)	**01:00**	01:00				01:00			**109:00**
80	Instrument Flying 11 (IF 11)	**01:00**	01:00				01:00			**110:00**
81	Instrument Flying 12 (IF 12)	**01:30**	01:30				01:30			**111:30**
82	Instrument Flying 13 (IF 13)	**01:30**	01:30				01:30			**113:00**
83	Instrument Flying 14 (IF 14)	**01:30**	01:30				01:30			**114:30**
84	Instrument Flying 15 (IF 15)	**01:30**	01:30				01:30			**116:00**
85	Instrument Flying 16 (IF 16)	**01:30**	01:30				01:30			**117:30**
86	Instrument Flying 17 (IF 17)	**01:30**	01:30				01:30			**119:00**
87	Instrument Flying 18 (IF 18)	**01:30**	01:30				01:30			**120:30**
88	Instrument Flying 19 (IF 19)	**01:30**	01:30				01:30			**122:00**
89	Instrument Flying 20 (IF 20)	**01:30**	01:30				01:30			**123:30**
90	Instrument Cross Country 01 (IXC 01)	**02:00**			02:00		02:00	02:00		**125:30**
91	Instrument Cross Country 02 (IXC 02)	**02:00**			02:00		02:00	02:00		**127:30**
92	Instrument Cross Country 03 (IXC 03)	**02:00**			02:00		02:00	02:00		**129:30**
93	Instrument Cross Country 04 (IXC 04)	**02:00**			02:00		02:00	02:00		**131:30**
94	Instrument Cross Country 05 (IXC 05)	**02:00**			02:00		02:00	02:00		**133:30**
95	Instrument Flying 21 (IF 21)	**01:00**			01:00		01:00			**134:30**

S/ NO	EXERCISES	SORTIE TIME	DUAL	PIC / SOLO	SPIC	GH	IF	X-COUNT.	FNPT II	PROG TOTAL
96	Instrument Flying 22 (IF 22)	01:30			01:30		01:30			136:00
97	Instrument Flying 23 (IF 23)	01:30			01:30		01:30			137:30
98	Instrument Flying 24 (IF 24)	01:30			01:30		01:30			139:00
99	Instrument Flying 25 (IF 25)	01:30			01:30		01:30			140:30
100	**PROGRESS TEST 2 (PT-2 IF)**	01:30			01:30		01:30			142:00
101	UPRT 01 (IF)	01:00	01:00				01:00			143:00
102	UPRT 02 (IF)	01:00	01:00				01:00			144:00
103	UPRT 03 (IF)	01:00	01:00				01:00			145:00
104	General Handling 13	01:30	01:30			01:30				146:30
105	General Handling 14	01:30	01:30			01:30				148:00
106	General Handling 15	01:30	01:30			01:30				149:30
107	General Handling 16	01:30	01:30			01:30				151:00
108	General Handling 17 (GH/XC)	02:00			02:00	00:30		01:30		153:00
109	**PROGRESS TEST 3 (PT-3 GH/XC)**	02:00			02:00	00:30		01:30		155:00
	Total SEP IR, Consolidation, Navigation and Night flying Phase	110:00	54:00	27:30	28:30	13:30	62:00	44:30	20:00	110:00
	TOTAL SEP VFR PHASE	45:00	33:30	10:00	01:30	31:00	04:00	10:00	00:00	45:00
	TOTAL FOR THE 2 PHASES	155:00	87:30	37:30	30:00	44:30	66:00	54:30	20:00	155:00

Figure 13: Flight Training Syllabus – SEP IR, Consolidation, Navigation And Night Flying Detailed Syllabus

During the Night Flying phase, the CP had encountered similar problems faced in the day circuits i.e. unable to land the aircraft safely. The first night flying flight (NF 1) was flown with a different FI. The CP was handed over to a senior FI who was the CI/HOT for the NF 2 flight. During the NF 2 solo check flight, the CP was not cleared for solo night (NF 3) as the approach and landing was assessed as Grade D (under-performance). Slow Progress Report was not raised by the FI as required by the Flight Training Syllabus.

Another solo check flight was carried on the next day (NF 4) and the CP was cleared for solo night (NF 5). This solo night flight (NF 5) was carried out on the following day which was the accident night. The CP flew the NF 3 as a solo night flight with the FI as the safety pilot on the same night as NF 4 flight.

The NF 3 flight was logged as solo flight in the CP's flying log book despite flying with a safety pilot. There is no provision in the Flight Training Syllabus which states that a safety pilot can be employed for CP's night flying solo flight. Although the CP had no confidence to fly the solo flight (NF 3), the FI approved the CP to fly solo on the following night (NF 5). The chronology of flights starting from NF 1 till NF 5 flight

compared between the Flying Training Syllabus and the Actual Flight are as Figure 14.

NO	DATE	PIC	SOLO/ DUAL	FLIGHT TRAINING SYLLABUS	ACTUAL FLIGHT
1	21.3.22	MAHA 08	DUAL	Night Flying (NF) 1.	Night Flying (NF) 1 Change FI to a Senior FI i.e. CI/HOT at NF 2.
2	28.3.22	MAHA 01	DUAL	NF 2 Solo Check.	NF 2 Solo Check.
3				NF 3 Solo.	Not cleared solo.
4	29.3.22	MAHA 01	DUAL	NF 4.	NF 4 Solo Check
5	29.3.22	MAHA 01	SOLO – Safety Pilot	Refer para 3 above.	NF 3 Solo with Safety Pilot
6	30.3.22	MAHA 181	SOLO	NF 5	NF 5 Aircraft crashed.

Figure 14: Comparison between Flight Training Syllabus and Actual Flight
(Source: Actual Flight - Student Pilot's Flying Logbook)

The CP was also properly authorised for her solo night flight as in the Aircraft Authorisation Sheet and all Critical Exercises – Night Flying were taught and completed satisfactory. It was the first flight of the day for the CP. The previous night, the CP had flown two flights for a total of 2 hours. Therefore, the CP is current in flying and flying fatigue was not a contributing factor in this incident.

Evidence above again shows that the Flight Training Syllabus had been reshuffled instead of approving additional flights to progress the CP in the critical phase of 1st solo night of the flight training course despite the underperformance shown by the CP.

1.17.5 Cadet Pilot Slow Progress Performance

A Slow Progress Report was raised due to under-performance by the FI who is also the Chief Flight Instructor (CFI) after the 3rd attempt solo check flight i.e. CCT 9. The FI remarked that the CP is expected to be cleared 1st solo circuits in the next flight i.e. GH 1 and remarked that an assessment flight is not required. This is contrary to the Flight Training Syllabus which states that additional flying/training is to be approved by the CFI if the CP cannot clear his/her 1st solo by CCT 9 (Figure 15).

1.2.13 First SOLO slow progress

If a Cadet Pilot can't clear his/her 1st SOLO by Circuit 9 (20 hours), additional flying /training is to be approved by the CFI/DCFI; and a Senior FI should be appointed to conduct the additional training.

Figure 15: Flight Training Syllabus – Slow Progress report

Evidence also shows that the Slow Progress Report was submitted by the FI and informed to the CP but the CP did not sign the Slow Progress Report contrary to the requirement in the Flight Training Syllabus (Figure 16).

1.1.14 Slow Progress Report

a. In the event a Cadet Pilot under-performed (FTR Grade D or E), or he is unable to progress as per Syllabus, a Slow Progress Report (Appendix C, Blue Colour) shall be raised by the Instructor after the sortie and submitted to Flight Operations for the CFI/DCFI/HOT/SO to review.

b. Following a Slow Progress Report being raised:

(1) The CFI/DCFI/HOT/SO can either decide for the Cadet Pilot to continue training as per Syllabus without additional or extra sortie(s), or;

(2) The CFI/DCFI/HOT/SO/FI can request for an assessment flight to be carried out on the Cadet Pilot to get a second opinion; and then based on the outcome of the flight, decide to:

(a) Give the Cadet Pilot extra sortie(s) from the Syllabus at his own discretion, or;

(b) Charge the Cadet Pilot for additional sortie(s).

c. Depending on the above decision, if additional sortie(s) is/are required, the Sponsor(s) as well as HMA's Finance department must be notified/informed accordingly.

d. A Slow Progress Report must always be briefed to the Cadet Pilot and signed/acknowledged by him.

Figure 16: Flight Training Syllabus – Slow Progress Report

1.17.6 Cadet Pilot Misperception[1] and Inattention[2] Factors

The CP was assessed by the FI to exhibit misperception and inattention factors during flying. It was reported that the CP panics and becomes nervous if things do not go as plan in flight or if the CP does minor mistakes on communications during the flight. Examples of misperception and inattention factors exhibited by the CP's during solo flight are as follows:

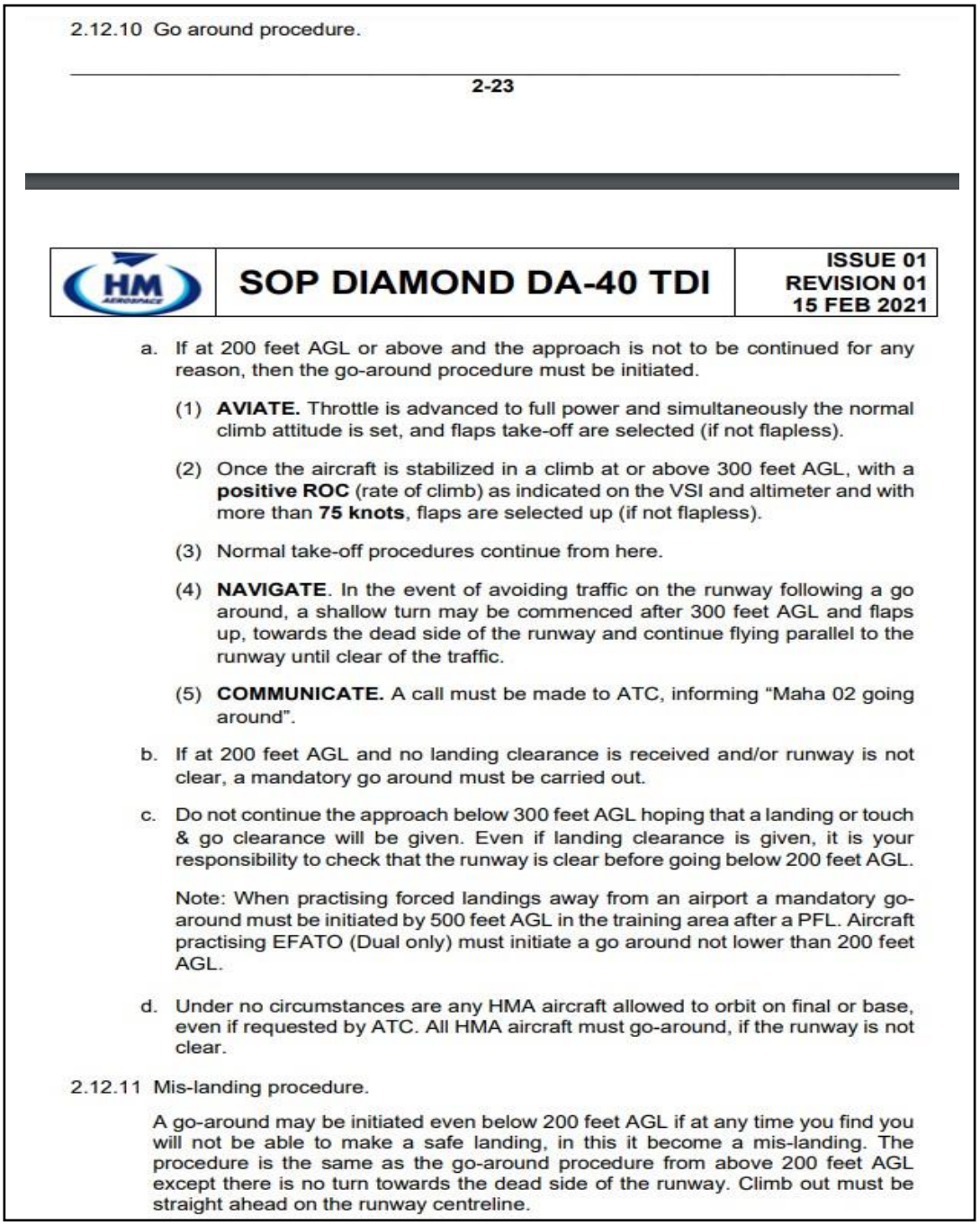
a. Panicked due to some misunderstanding with the ATC during 1st solo training area.
b. Became anxious and requested for a full stop landing when ATC was not visual with the aircraft on radar during 1st solo night.
c. Feels uncomfortable with the bright runway lights which cause visual illusion and affect judgement during 1st solo night landing.
d. Apprehension of darkness during night circuits.
e. Lack of self-confidence to fly 1st solo night when cleared by FI.

1.17.7 Go-around and Mis-landing Procedure

It is mandatory for CP to carry out a go-around or a mis-landing procedure in the event the approach is assessed to be not safe. Evidence shows that the CP only decided to commence a go-around after a bounce landing. The go-around and mis-landing procedure are stated in the Standard Operating Procedure DA-40 as in Figure 17.

[1] **Misperception**. Error due to Misperception is a factor when an individual act or fails to act based on an illusion; misperception or disorientation state and this act or failure to act creates an unsafe situation.

[2] **Inattention**. Inattention is a factor when the individual has a state of reduced conscious attention due to a sense of security, self-confidence, boredom or a perceived absence of threat from the environment which degrades crew performance. (This may often be a result of highly repetitive tasks.
Lack of a state of alertness or readiness to process immediately available information)



2.12.10 Go around procedure.

2-23

SOP DIAMOND DA-40 TDI | ISSUE 01 REVISION 01 15 FEB 2021

a. If at 200 feet AGL or above and the approach is not to be continued for any reason, then the go-around procedure must be initiated.

(1) **AVIATE.** Throttle is advanced to full power and simultaneously the normal climb attitude is set, and flaps take-off are selected (if not flapless).

(2) Once the aircraft is stabilized in a climb at or above 300 feet AGL, with a **positive ROC** (rate of climb) as indicated on the VSI and altimeter and with more than **75 knots**, flaps are selected up (if not flapless).

(3) Normal take-off procedures continue from here.

(4) **NAVIGATE**. In the event of avoiding traffic on the runway following a go around, a shallow turn may be commenced after 300 feet AGL and flaps up, towards the dead side of the runway and continue flying parallel to the runway until clear of the traffic.

(5) **COMMUNICATE.** A call must be made to ATC, informing "Maha 02 going around".

b. If at 200 feet AGL and no landing clearance is received and/or runway is not clear, a mandatory go around must be carried out.

c. Do not continue the approach below 300 feet AGL hoping that a landing or touch & go clearance will be given. Even if landing clearance is given, it is your responsibility to check that the runway is clear before going below 200 feet AGL.

Note: When practising forced landings away from an airport a mandatory go-around must be initiated by 500 feet AGL in the training area after a PFL. Aircraft practising EFATO (Dual only) must initiate a go around not lower than 200 feet AGL.

d. Under no circumstances are any HMA aircraft allowed to orbit on final or base, even if requested by ATC. All HMA aircraft must go-around, if the runway is not clear.

2.12.11 Mis-landing procedure.

A go-around may be initiated even below 200 feet AGL if at any time you find you will not be able to make a safe landing, in this it become a mis-landing. The procedure is the same as the go-around procedure from above 200 feet AGL except there is no turn towards the dead side of the runway. Climb out must be straight ahead on the runway centreline.

Figure 17: Standard Operating Procedure DA- 40 – Go-around and Mis-landing Procedure

1.17.8 Flights Remaining to Complete SEP IR, Consolidation, Navigation and Night Flying Phase

In accordance to the Flight Training Syllabus, the CP has 3 more GH flights and one more GH cross country navigation flight before attempting the Flight Progress Test 3 (PT-3 GH/XC) as in Figure 18. This is excluding one-night solo flight (NF 5) which is

outstanding due to non-completion. On completion of PT-3 GH/XC, the CP will progress to the Multi Engine Instrument Rating (ME IR) phase.

In terms of hours remaining, the CP has 12 hours and 45 minutes (Dual 11:45 hours and Solo (Day) 01:00 hour). For night flying, CP had flown 4 hours and 20 minutes, out of which 3 hours and 5 minutes were dual, 01:00 hour of Solo (with Safety Pilot on board) and 15 minutes of Solo flight on the date of incident. (CAAM requirements for night flying is 03:00 hours dual and 02:00 hours solo).

S/ NO	EXERCISES	SORTIE TIME	DUAL	PIC / SOLO	SPIC	GH	IF	X-COUNT.	FNPT II	PROG TOTAL
96	Instrument Flying 22 (IF 22)	**01:30**			01:30		01:30			**136:00**
97	Instrument Flying 23 (IF 23)	**01:30**			01:30		01:30			**137:30**
98	Instrument Flying 24 (IF 24)	**01:30**			01:30		01:30			**139:00**
99	Instrument Flying 25 (IF 25)	**01:30**			01:30		01:30			**140:30**
100	**PROGRESS TEST 2 (PT-2 IF)**	**01:30**			01:30		01:30			**142:00**
101	UPRT 01 (IF)	**01:00**	01:00				01:00			**143:00**
102	UPRT 02 (IF)	**01:00**	01:00				01:00			**144:00**
103	UPRT 03 (IF)	**01:00**	01:00				01:00			**145:00**
104	General Handling 13	**01:30**	01:30			01:30				**146:30**
105	General Handling 14	**01:30**	01:30			01:30				**148:00**
106	General Handling 15	**01:30**	01:30			01:30				**149:30**
107	General Handling 16	**01:30**	01:30			01:30				**151:00**
108	General Handling 17 (GH/XC)	**02:00**			02:00	00:30		01:30		**153:00**
109	**PROGRESS TEST 3 (PT-3 GH/XC)**	**02:00**			02:00	00:30		01:30		**155:00**
	Total SEP IR, Consolidation, Navigation and Night flying Phase	**110:00**	**54:00**	**27:30**	**28:30**	**13:30**	62:00	44:30	**20:00**	**110:00**
	TOTAL SEP VFR PHASE	**45:00**	**33:30**	**10:00**	**01:30**	**31:00**	04:00	10:00	**00:00**	**45:00**
	TOTAL FOR THE 2 PHASES	**155:00**	**87:30**	**37:30**	**30:00**	**44:30**	66:00	54:30	**20:00**	**155:00**

Figure 18: Flight Training Syllabus – SEP IR, Consolidation, Navigation and Night Flying Detailed Syllabus

1.17.9 Course Suspension due to Movement Restriction Order

Due to Covid-19 pandemic in Malaysia, the government had declared a Movement Control Order (MCO) to arrest the spreading of the Covid-19 virus. The MCO resulted in the temporary suspension of flying training from 01 June 2021 until 26 September 2021. This resulted in the CP's Batch 71 being delayed for about 4 months. Normal flying training resume in October 2021 and the CP has been active flying till the accident date. The temporary suspension of flying training did not affect the CP's flying currency and was not a contributing factor in this accident.

1.17.10 Flying Skill Test

Record for the last 4 batches of flying course shows that all CP's skill tests were conducted by Designated Flight Examiner (DFE) who are themselves FI of the Aircraft Operator (Figure 19). Currently there are no provisions in Civil Aviation Directive (CAD) 1006 – Designated Flight Examiner, for CAAM Flight Operations Inspectors (FOI) to conduct Skill Test on the CPs. Nevertheless, CAD clearly states that CAAM FOI are to monitor checks conducted by DFE on CPs and to monitor the standards of all DFE.

NO	BATCH NO	TOTAL CADETS	NUMBER OF CADETS SKILL TEST BY				
			PT 1	PT 2	PT 3	ME IR PT 4	ME IR PT 5
			HMA	HMA	HMA	HMA	HMA
1	68	19	Completed	Completed	Completed	Completed	N/A
2	69	16	Completed	Completed	Completed	Completed	12
3	70	16	Completed	Completed	Completed	Completed	N/A
4	71	10	Completed	Completed	9	9	0

Figure 19: Skill Test conducted by HMA Authorised Examiner on the latest 4 Batches of CPs

1.17.11 Recent Previous Air Accident involving Cadet Pilot's Under-Performance and Unsafe Landing (AAIB Final Report A 03/20)

The most recent air accident involving an aircraft from the Aircraft Operator had occurred on 13 February 2020 when the aircraft crashed on landing at Kuala Terengganu Airport, Terengganu, Malaysia. The cause of the accident was attributed to hard landing after previous 2 attempts to land the aircraft was unsuccessfully due to multiple bounce landing on the CP 1st solo training area flight.

The main under-performance of the CP in this accident was the poor flaring technique during landing. The understanding of ATC instruction was also very weak which leads to a sense of feeling lost and unable to comply to ATC instructions. This accident had very similar under-performance issues with the current accident where proficiency and self-confidence were lacking during the CP's 1st solo training area flight.

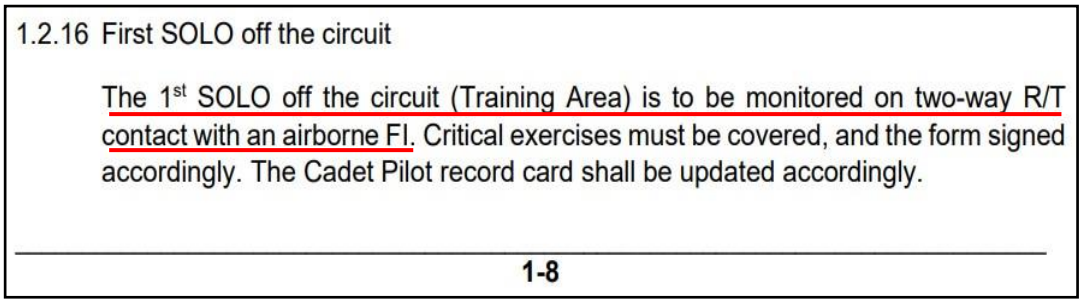
1.17.12 Safety Observation

Below are safety observations observed by the Investigation Team for safety improvement. These observations did not cause or contribute to this accident.

1.17.12.1 Flight Training Syllabus – Student 1st Training Area Solo

The current Flight Training Syllabus Issue 02 Revision 00 dated 1 September 2020 paragraph 1.2.16, First SOLO off the circuit states that the 1st SOLO off the circuit (Training Area) is to be monitored on two-way R/T contact with an airborne FI (Figure 20). This directive had been superseded by CAAM CAD 1011 Approved Training Organisation Issue 01 Revision 01 dated 15 November 2021 paragraph 5.5, Flight Instructor's Presence at Air Traffic Control Tower for Student Pilots' 1st Solo Flights (Figure 21). The new CAAM directive states that a Flight Instructor is to be positioned at the Air Traffic Control Tower to monitor student pilots 1st solo flight to and from the training area and return.

An amendment is required from the Aircraft Operator to update the Flight Training Syllabus to comply with the new directive issued by CAAM for flight safety purposes.



1.2.16 First SOLO off the circuit

The 1st SOLO off the circuit (Training Area) is to be monitored on two-way R/T contact with an airborne FI. Critical exercises must be covered, and the form signed accordingly. The Cadet Pilot record card shall be updated accordingly.

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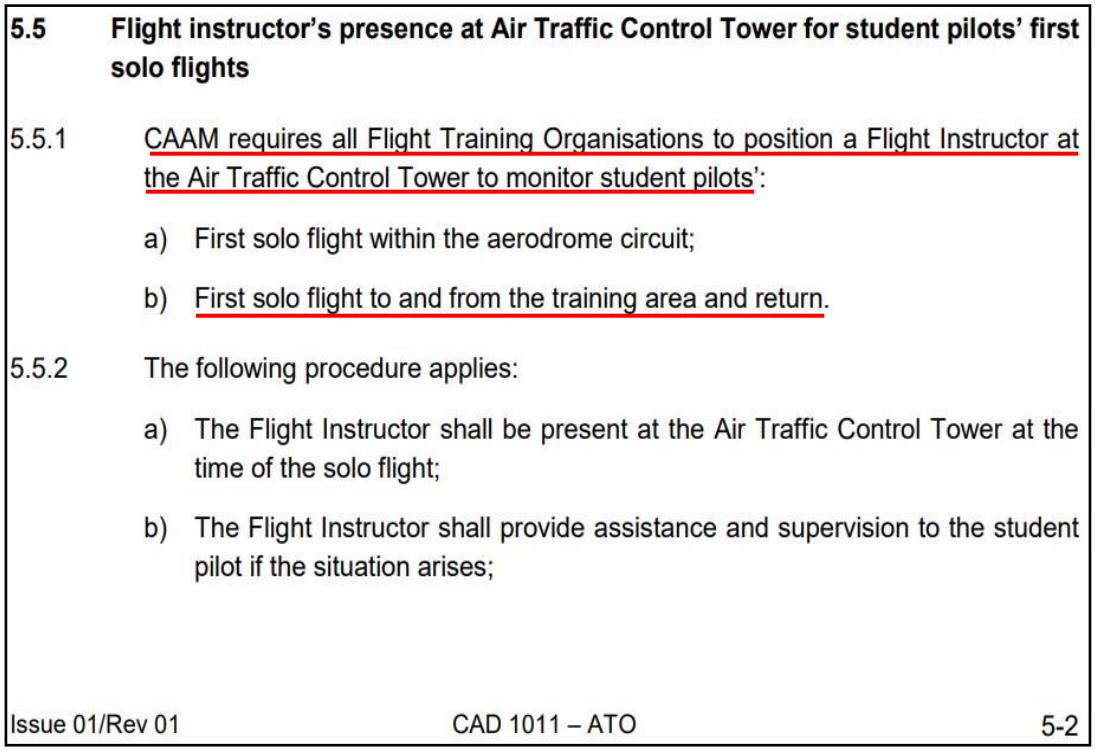
Figure 20: Flight Training Syllabus – 1st SOLO off the circuit (Training Area)



5.5 Flight instructor's presence at Air Traffic Control Tower for student pilots' first solo flights

5.5.1 CAAM requires all Flight Training Organisations to position a Flight Instructor at the Air Traffic Control Tower to monitor student pilots':

a) First solo flight within the aerodrome circuit;

b) First solo flight to and from the training area and return.

5.5.2 The following procedure applies:

a) The Flight Instructor shall be present at the Air Traffic Control Tower at the time of the solo flight;

b) The Flight Instructor shall provide assistance and supervision to the student pilot if the situation arises;

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Figure 21: Civil Aviation Directive 1011 - Flight Instructor's Presence at Air Traffic Control Tower for Student Pilots' First Solo Flights

1.17.12.2 CAAM Langkawi ATC Staff Manning

Flying activities had progressively increased with the progressive increase of schedule commercial flights since mid-2021 and also the return of flying training activities by the Aircraft Operator since October 2021 when MCO restrictions were gradually lifted.

During the investigation, it was observed that there were ATCO staffing issues at CAAM Langkawi which were highlighted to the CAAM Headquarters through a Safety

Risk Assessment Report – Fatigue Risk Management System. The main safety issue was insufficient manpower to meet the minimum requirement of 4 ATCO per shift on the current duty roster. The shortage of manpower has the potential to cause fatigue as the current roster does not meet the requirement for rest period of at least 12 hours between the end of one duty period and the beginning of the next as stated in ICAO DOC 9966, Appendix D, Point D[3].

The Safety Risk Assessment Report – Fatigue Risk Management System carried out by CAAM Langkawi is very commendable effort as it had allowed all ATCOs to know the potential risk, understand safety issue concern and aware of the appropriate mitigation actions taken. CAAM Headquarters is to look into the request for additional manpower as highlighted in the Safety Risk Assessment Report – PROC/2021/002 dated 04 July 2021 to mitigate the risk of inadequate rest period requirement when on duty as stated in ICAO DOC 9966.

1.18 Additional Information

1.18.1 Interview and Statements

AAIB investigation team conducted separate interview sessions with CPs, FIs, Duty Commanding Officer AFRS, Duty Air Traffic Controllers and Maintenance Organisation Engineers/Technician. 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.

[3] ICAO DOC 9966 Second Edition Version 2 (Revised) 2020 Manual for the Oversight of Fatigue Management Approaches, Appendix D Prescriptive Limitation Parameters for Air Traffic Controllers, Point D3 - Duty Limitation Parameters, D3.1 Duty Period - There must be at least 12 hours between the end of one duty period and the beginning of the next.

1.19. Useful or Effective Investigation Techniques

1.19.1 On-Site Investigation

The aircraft was not installed with an FDR or a CVR. On-site investigation was conducted to look for evidence which will assist in reconstructing the probable chain of event leading to this accident.

1.19.2 Reason's "Swiss Cheese" Model

From evidence studied from the on-site investigation, it is analysed that this accident is Human Factor related, hence the Reason's "Swiss Cheese" Model (Figure 22) will be used to describe the layers of defences at which active failures/conditions and latent failures/conditions may occur in this accident.

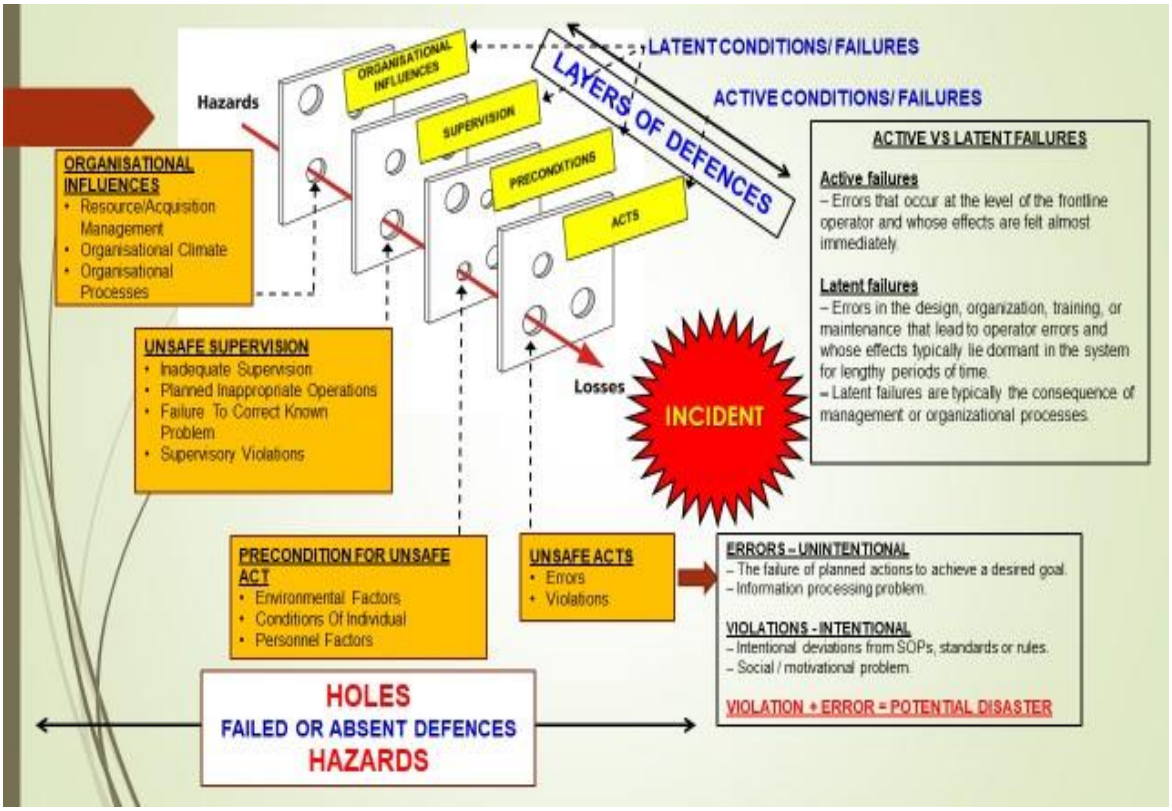

Figure 22: Reason's 'Swiss Cheese' Model

1.19.3 Human Factors Analysis and Classification System (HFACS)

From the described layers of defences in the Swiss Cheese model at which active failures/conditions and latent failures/conditions may had occur in this accident, 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 picture of all the event that led up to the accident as in Figure 23.

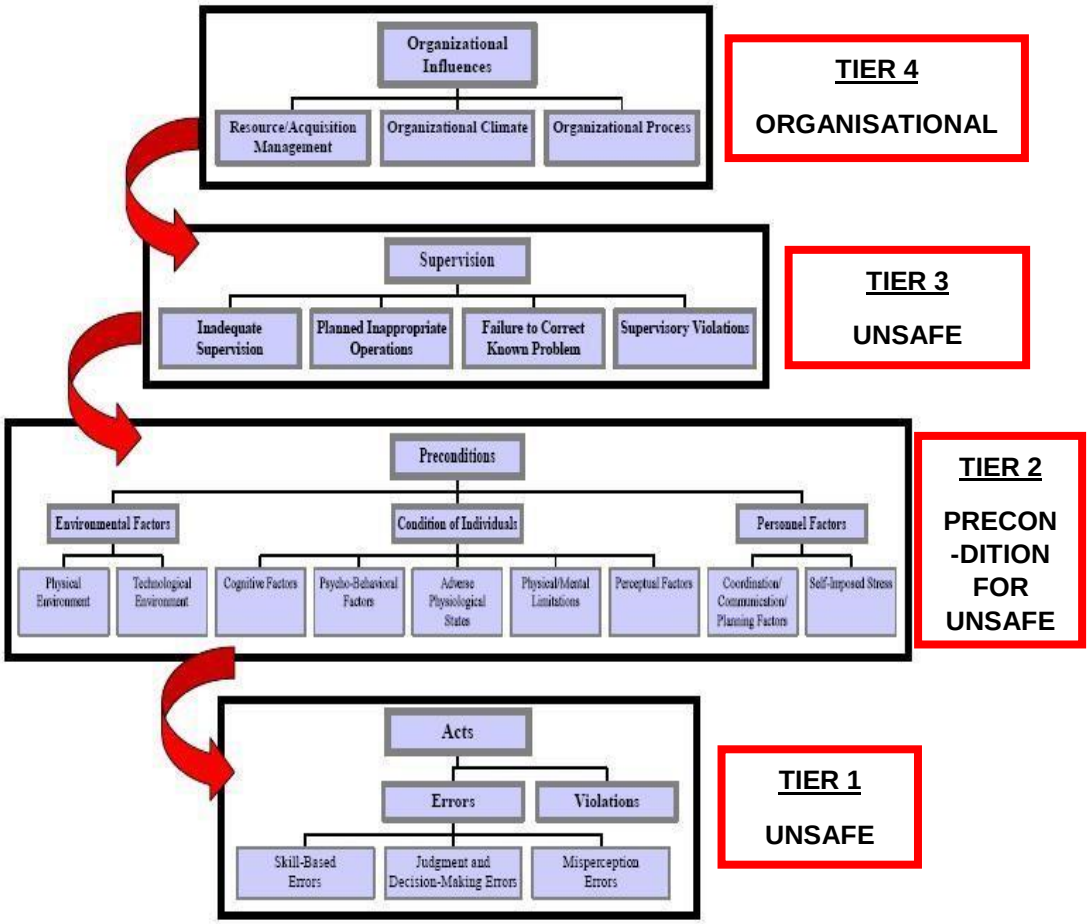

Figure 23: Human Factors Analysis and Classification System (HFACS)

2.0 ANALYSIS

2.1 On-Site Investigation

Aircraft veering off the runway will always provide on-site evidence of aircraft tyre track marks and impact marks which are usually very obvious. These tyre track marks and impact marks or the lack of marks will assist in providing crucial evidence and information on what actually happened. Sequence of event of the incident can be traced and reconstructed as in paragraph 2.1.1.

2.1.1 Tyre Track Marks and Impact Marks

Figure 24: Night – **Evidence Limitation**: Aircraft skid marks and grass foliage evidence around the first impact point to aircraft final stop position were mostly lost due to rescue work by AFRS vehicle and wreckage salvage work by heavy lift crane and personnel movement. Nevertheless, first impact point and final aircraft rest position can be identified clearly.

Figure 25: Day - No aircraft tyre track marks were observed on the runway at possible landing area or exiting the runway towards crash site.

Figure 26: Day - No aircraft tyre track marks were observed exiting the runway towards the crash site. Only AFRS vehicle tyre marks were observed leading towards the crash site.

Figure 27: Day - First impact point area and aircraft final stop position view from right side edge of Runway 03.

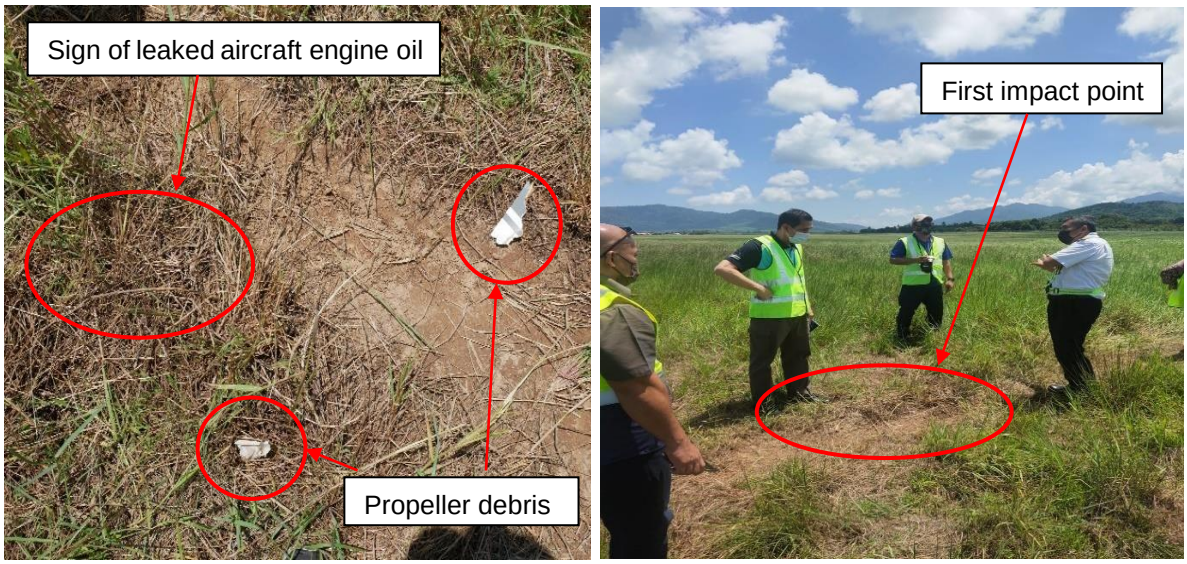

Figure 28: Day - First impact point area. Sign of leaked aircraft engine oil and propeller debris at impact area.

Figure 29: Night – Evidence of heavy impact on the nose section of the aircraft which resulted in major damage to all the propellers, propeller spinner and gearbox at first impact point. The nose landing gear broke and the nosewheel detached from nose landing gear strut on impact to the ground. The lower engine cowling and the tail skid was also found nearby this area.

Figure 30: Day - LH main landing gear strut twisted and bent with the left main wheel detached from landing gear strut. RH main landing gear strut remained intact.

Figure 31: Day - Tail empennage broke and snap downwards on impact. The aircraft tail skid was missing and found near the first impact point area.

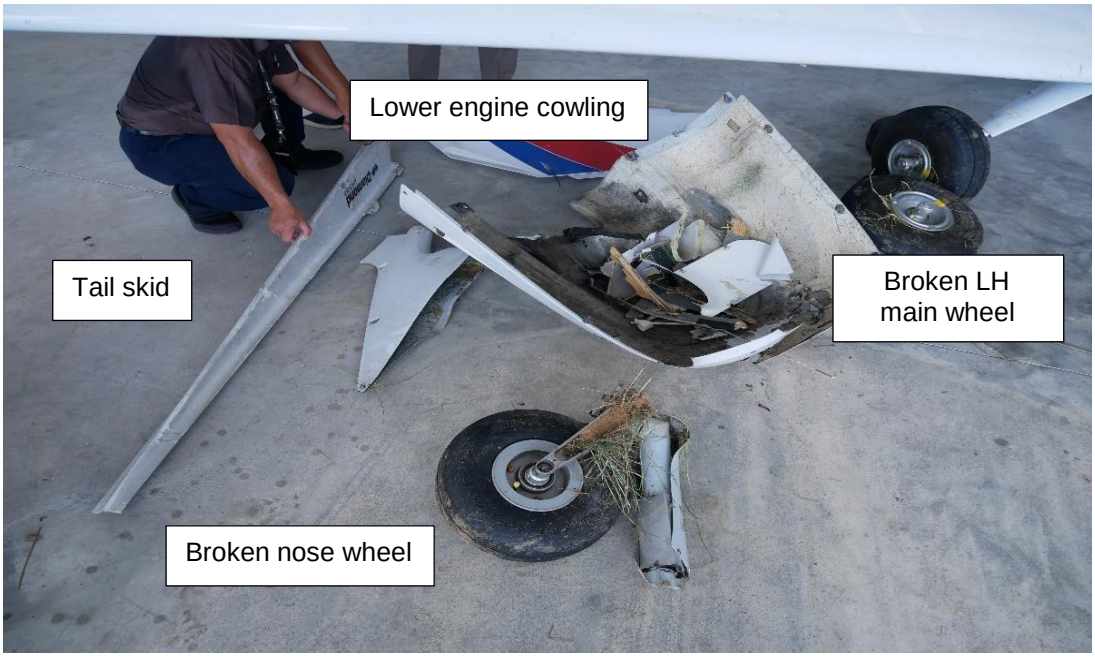

Figure 32: Day – Nose wheel, LH main wheel, Lower engine cowling and Tail Skid

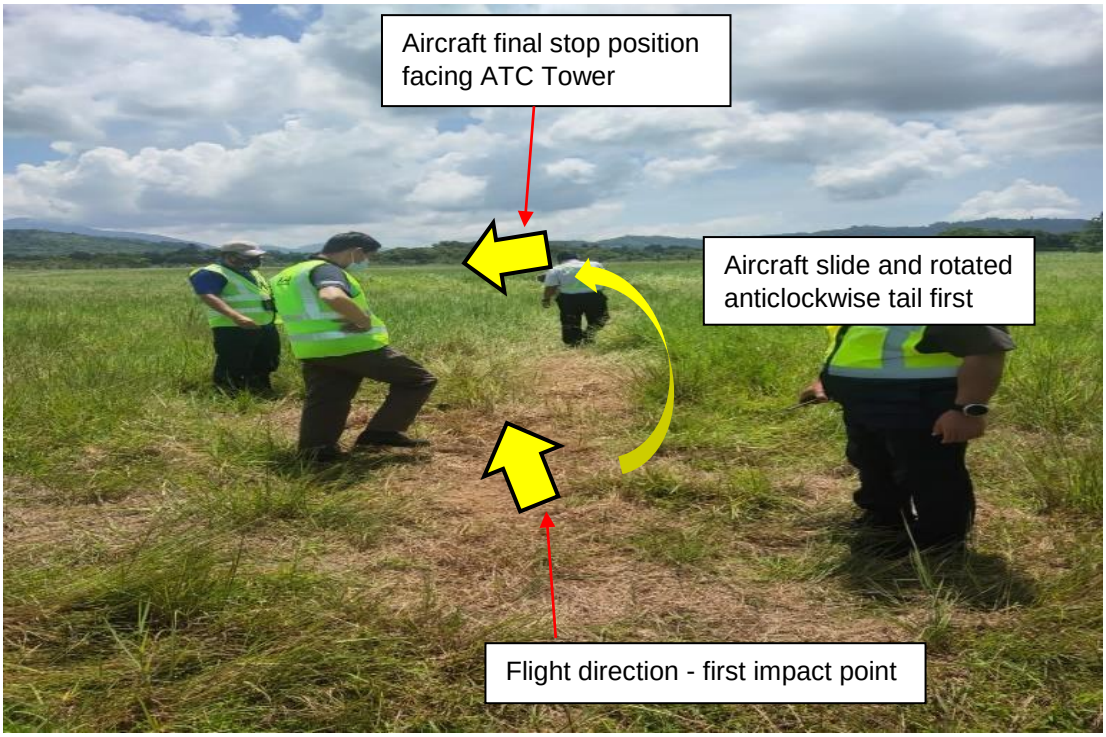

Figure 33: Day - Aircraft slide and rotated anticlockwise tail first before coming to rest with aircraft nose facing the ATC Tower.

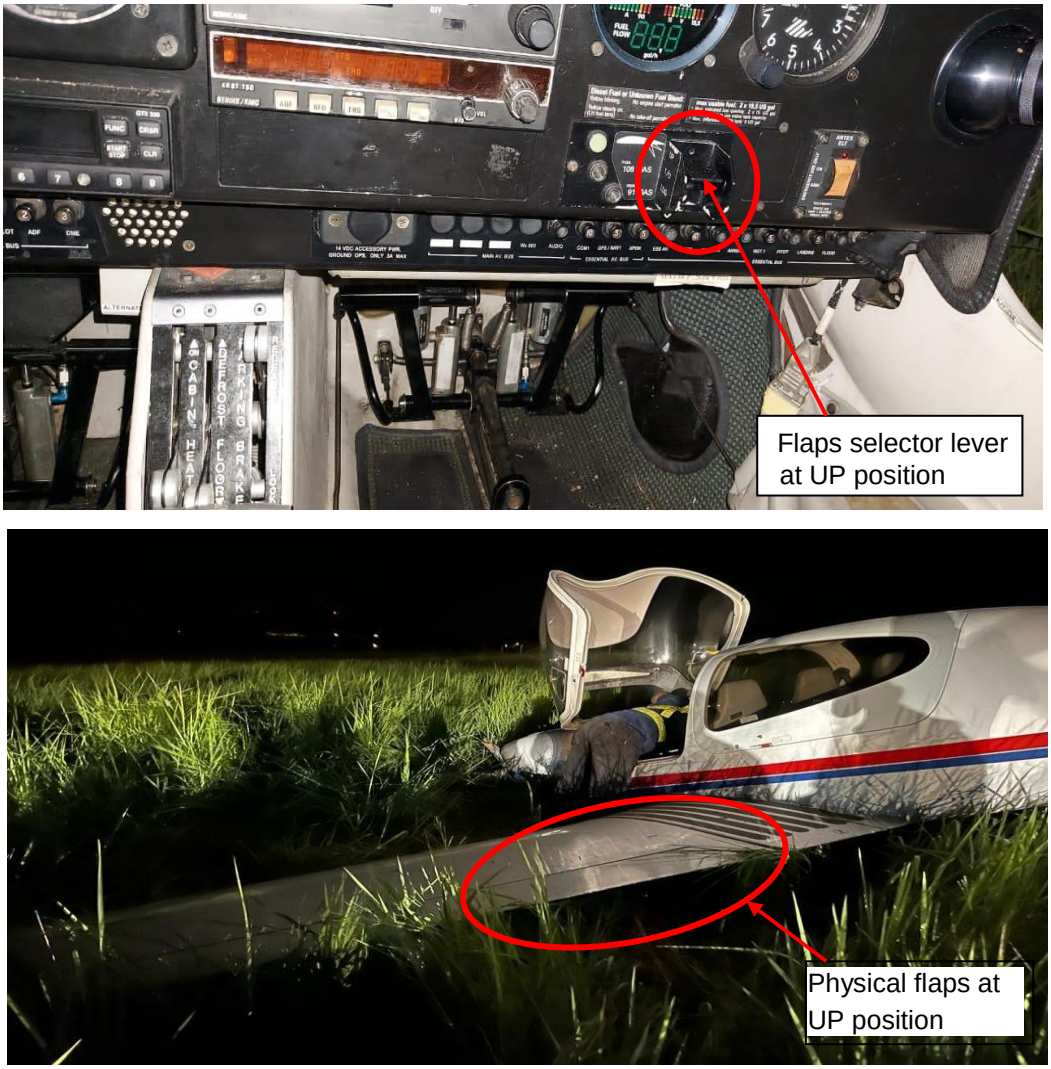

Figure 34: Night - Flaps Selector Lever and physical flaps at UP position

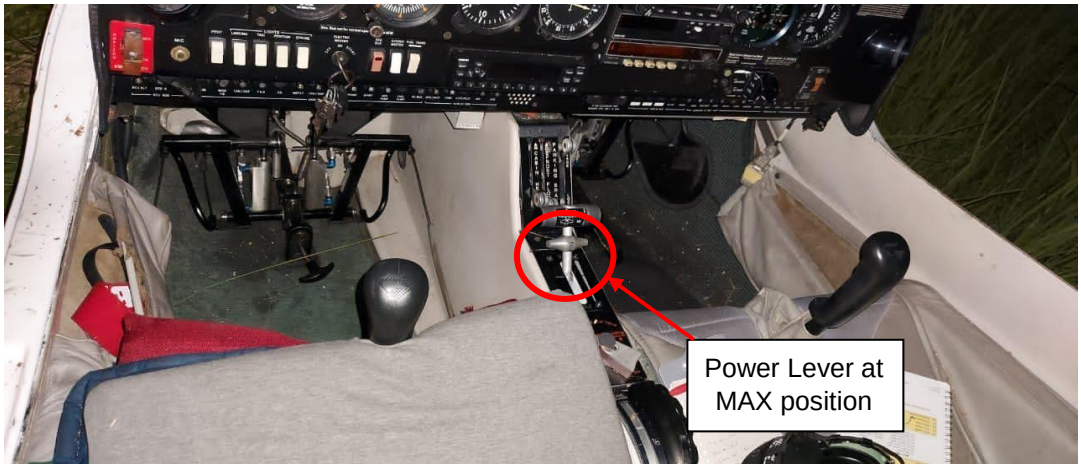

Figure 35: Night - Power Lever at MAX position

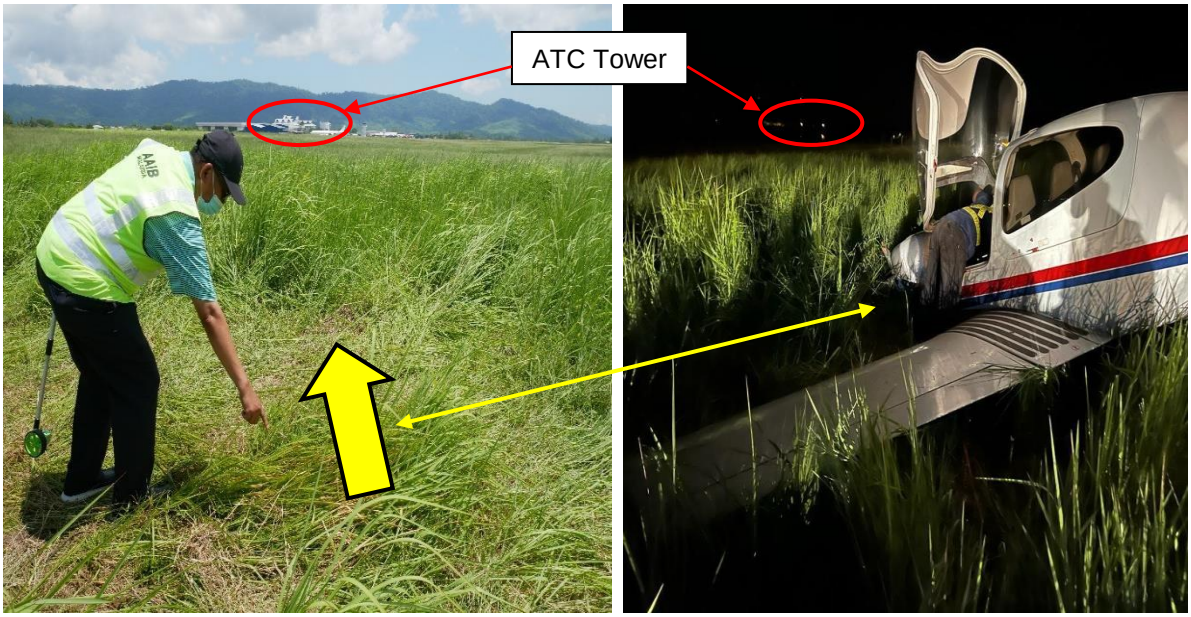

Figure 36: Day & Night - Aircraft final stop position facing ATC Tower.

Figure 37: Day & Night - Aircraft final stop position with the broken tail empennage.

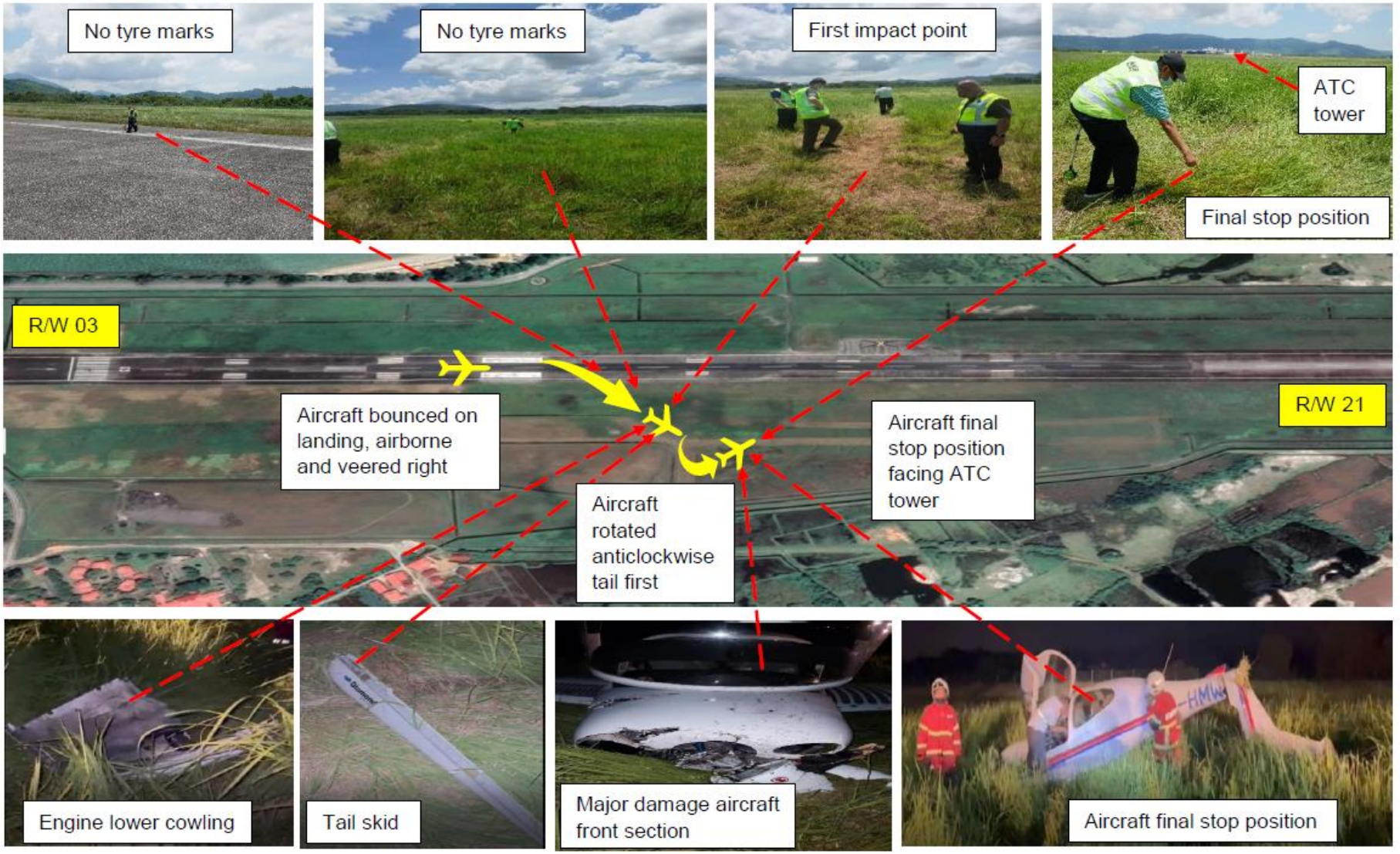

Figure 38: Aerial view location of first impact point, debris location and aircraft final position (Diagram not to scale) 38

2.2 On-Site Investigation Analysis

From the CP's interview statement, a normal approach was carried out for a full stop landing (flaps LAND, approach speed 80kts & threshold speed 75kts). The CP started to feel nervous during the holding at downwind when the ATC could not identify the aircraft on radar. The CP requested for a full stop landing due to anxiety of not being safe. During the approach to land, the CP also felt uncomfortable with the bright runway lights which caused her to lose visual cues to judge the aircraft flaring attitude for landing. The aircraft bounced on landing and the CP carried out a go-around procedure as per SOP. The CP could not remember subsequent events till the aircraft impacted the ground on the right side of the runway.

During the site investigation, the aircraft wreckage had already been removed and placed in the Aircraft Operator's hanger. Aircraft skid marks and grass foliage evidence around the first impact point to aircraft final stop position were mostly lost. This is due to vehicle and personnel movement at the crash site during the rescue and wreckage salvage work (Figure 24). Nevertheless, first impact point and final aircraft rest position can be identified clearly.

Evidence on-site revealed that there were no tyre track marks observed on the possible landing point on the runway or exiting the runway to support a possible aircraft veering out of the runway during the landing roll (Figure 25 & 26).

The first impact point was about 120m from the right runway edge while the aircraft final rest position was about 20m ahead of the first impact point (Figure 27). Clear evidence of leaked aircraft engine oil and propeller debris was found at the first impact point (Figure 28). The lower engine cowling and tail skid which detached on impact was also located very close to this impact point (Figure 29).

Post-accident damage assessment revealed that there were major damages to all the propellers, propeller spinner and gearbox. The nose landing gear strut was found broken and the nosewheel had detached from nose landing gear strut. The LH main landing gear strut had twisted and bent with the left main wheel detached from the landing gear strut while the RH main landing gear strut remains intact. The tail skid

detached from the tail empennage which snapped on impact to the ground but did not detached off from the aircraft fuselage (Figure 30, 31 & 32).

Evidence also shows that the flaps selector lever and the physical position of the flaps was at UP while the physical position of the Power Lever was at MAX after the aircraft crashed (Figure 34 & 35). Engine parameters from ECU A (Figure 10) shows that the Power Lever had been reduced to idle (0%) for landing and subsequently had increased progressively to 39.2% before reaching maximum (99.9%) when the aircraft impacted the ground before the engine ceased.

Based on the flaps position and go-around procedure (retract flaps at altitude 300ft AGL or above and speed 75kts or more), a possible scenario was that the aircraft could have probably descended and crash landed at an altitude of 300ft or above and at speed more 75kts. This scenario is highly unlikely as evidence shows that the Power Lever was increased at a progressive rate achieving MAX power only when aircraft impacted the ground. The slow increase in Power Lever would not have provided sufficient thrust for the aircraft to climb above 300ft.

The aircraft altitude was not high when it impacted ground as the first impact point was reasonably close from the runway edge (120m). The close distance between the first impact point to the final aircraft stop position (20m) shows that the aircraft speed was low. The stall speed for flaps UP at the aircraft recorded landing weight of 1,003.76kg is 52 KIAS (Figure 6). Overall, the relative intact of the aircraft wing and fuselage indicates that the impact was from very low altitude (below 300ft) and at very low speed (between 52kts to 75kts).

It is analysed that the CP had initiated a go-around but the execution of the go- around did not comply with the procedure stated in the SOP. Evidence shows that the Power Lever was selected at a slow rate from IDLE to 39.2% and then to MAX. Engine parameters from ECU A shows that the Power Lever reached MAX only when aircraft had contacted ground. The most probable scenario for the Power Lever to reach MAX position is when the CP inadvertently pushed the Power Lever forward due to the forward momentum when the aircraft impacted with ground.

During the execution of go-around, the flaps was most probably selected from LAND to UP instead of TAKE-OFF position at a speed of below 75kts. The slow rate in increasing the Power Lever is an indication that the CP was late to commence a go-around while trying to control the bounce landing. The unexpected change in aircraft configuration when the flaps were selected to UP had most probably affected the CP's ability to maintain positive control of the aircraft. The situation is further aggravated when the aircraft veered right causing the CP to lose sight of the runway lights i.e. visual cues at night. This led to the loss of situation awareness and disorientation which cause the CP to lose control of the aircraft.

It is also analysed that the aircraft had impacted the ground nose section first with the aircraft nose facing roughly about 30° to the right of Runway 03 centreline. This is supported by the duty airborne FI's statement that he saw the aircraft suddenly veering off to the right on landing. Evidence also shows that the aircraft had impacted the ground with a left wing low as the left-hand side of the aircraft suffered heavy damage. The aircraft tail empennage had also impacted the ground and snapped as the aircraft tail skid was also found close to the first impact point.

The forward momentum of the impact most probably caused the aircraft to slide sideways for about 20m before coming to a full stop. The aircraft had rotated anticlockwise tail first for about 50° (estimated) while sliding sideways pivoting on the LH main landing gear strut which had twisted and broken off (Figure 33). The broken LH main landing gear strut and damage propeller spinner provided movement resistance for the aircraft to stop facing the ATC Tower (Figure 36 & 37). The aerial view location of first impact point, debris location and final aircraft position are shown in Figure 38.

In summary, the poor flaring technique of the CP led to a bounce landing. The aircraft got airborne after the bounce at very low altitude and speed while the CP hesitated to commence a go-around. The CP's misperception, inattention and couple with disorientation at night had caused the aircraft to veer to the right of the runway when executing the go-around. The loss of situation awareness and control of the aircraft by the CP subsequently caused the aircraft to crash land on the right side of the runway.

2.3 Human Factors Analysis

Human factor issues related to this accident were examined using the Reason's Swiss Cheese model and HFACS worksheet. From the HFACS worksheet, 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	EVIDENCE
AE 1	**Skill-Based Errors**	
AE 1.4	**Over-Control/Under-Control**. Overcontrol/Under-control is a factor when an individual response inappropriately to conditions by either over-controlling or under-controlling the aircraft/vehicle/ system. The error may be a result of preconditions or a temporary failure of coordination.	1. Over controlling the flare attitude during landing resulting in a bounced landing. 2. Slow to select maximum power and did not carry out the go-around procedure correctly. 3. Selected flaps UP instead of TO position when commencing a go-around.
AE 2	**Judgement and Decision-Making Errors**	
AE 2.6	**Decision-Making During Operation.** Decision-Making During Operation is a factor when the individual through faulty logic selects the wrong course of action in a time-constrained environment.	Attempting to salvage a bounce landing and commencing a go-around very late.
AE 3	**Misperception Errors**	

AE 3.1	**Error due to Misperception.** Error due to Misperception is a factor when an individual act or fails to act based on an illusion; misperception or disorientation state and this act or failure to act creates an unsafe situation.	1. Misperception of aircraft having problem when ATC queried to inform that the aircraft was not identified on radar during the 1st solo night flight. CP requested full stop landing immediately after the query from ATC. 2. Having difficulty to adapt to bright runway lights during night landing which led to loss of visual cue. 3. Disorientated in darkness when commencing a go- around very late after trying to salvage the bounce landing.

Analysis Tier 1 – Unsafe Acts

A chain of latent failures as analysed in paragraph 2.3.1 to 2.3.4 had led to the unsafe acts as described in paragraph 2.2 which had caused the aircraft to bounce on landing, got airborne, veered right and crash landed on the right side of the runway.

The unsafe acts were a result of chain of events that happened from the moment the CP was airborne for the 1st solo night flight. Misperception of the aircraft having problem in flight when the ATC could not identify the aircraft on radar caused the CP to have anxiety and resulted in the CP requesting for a full stop landing immediately. During the approach to land, the CP felt uncomfortable and was having difficulties to adapt to the bright runway lights. The confusing visual cues due to the bright runway lights resulted in the CP over controlling the flare attitude during landing and caused a bounce landing. The decision to salvage the bounced landing and attempt to land instead of commencing a go-around immediately was most probably due to the CP's misperception and anxiety that the aircraft was having problems during the flight.
The over control of the flare attitude during landing and the incorrect execution of the go-around technique was the main unsafe act in this accident. The decision to salvage the bounced landing had caused the CP to act hesitantly to commence an immediate go-around. During the critical moment when the aircraft was airborne after the

bounced, the CP's was hesitant to move the power lever to MAX and had incorrectly selected the flaps selector lever from LAND to UP instead of TAKE-OFF position.

The incorrect selection of the flaps lever to UP had caused a change in the aircraft configuration which the CP was not familiar with. While hesitating to commence a go-around and trying to control the aircraft with minimum power, the aircraft had veered right away from the runway facing darkness which most probably caused the CP to panic. The CP subsequently got disorientated on the actual flight path and loss control of the aircraft.

2.3.2 Tier 2 – Preconditions for Unsafe Acts

PC	CONDITION OF INDIVIDUALS	Evidence
PC 1	**Cognitive Factors**	
PC 1.1	**Inattention**. Inattention is a factor when the individual has a state of reduced conscious attention due to a sense of security, self-confidence, boredom or a perceived absence of threat from the environment which degrades crew performance. (This may often be a result of highly repetitive tasks. Lack of a state of alertness or readiness to process immediately available information)	1. Lack of self-confidence to flying 1st solo on the previous night and flew the flight with FI as safety pilot. 2. Became nervous or feel anxious when things do not go as plan during flight: a. Panic due to is communication with ATC during 1st solo training area. b. Requesting for full stop landing due to misperception of aircraft having problem during 1st solo night flight.
PC 4	**Physical / Mental Limitation**	
PC 4.4	**Motor Skill/Coordination or Timing Deficiency.** Motor Skill/Coordination or Timing Deficiency is a factor when the individual lacks the required psychomotor skills, coordination or timing skills necessary to accomplish the task attempted.	1. Poor flaring technique to land the aircraft. 2. Poor coordination when executing a go-around. Slow to apply MAX power and selected flaps selector lever to UP instead of TO position when commencing the go-around.

PC 5	Perceptual Factors	
PC 5.3	**Illusion – Visual.** Illusion – Visual is a factor when visual stimuli result in an erroneous perception of orientation, motion or acceleration, leading to degraded performance. (If this illusion leads to spatial disorientation you must mark and rate PC 5.8, PC 5.9 or PC 5.10.).	Brightness from runway lights during landing and transition to darkness during go-around had led to loss of visual cue resulting in disorientation and loss of situation awareness.
PC 5.8	**Spatial Disorientation (Type 1)** **Unrecognized.** Spatial Disorientation is a failure to correctly sense a position, motion or attitude of the aircraft or of oneself within the fixed coordinate system provided by the surface of the earth and the gravitational vertical. Spatial Disorientation (Type 1) Unrecognized is a factor when a person's cognitive awareness of one or more of the following varies from reality: attitude; position; velocity; direction of motion or acceleration. Proper control inputs are not made because the need is unknown.	Visual illusion and spatial disorientation had in combination affected CP's motor skill function resulting in inappropriate or inadequate control response during landing and go-around.

Analysis Tier 2 – Preconditions for Unsafe Acts

The breach in the precondition for unsafe act defence layer is a combination of cognitive, physical/mental limitation and perceptual factors which had contributed to the unsafe act analysed in paragraph 2.3.1. Evidence from the medical report and interview statements from the FIs revealed that the CP had a history of inattention since the start of the flying course. The CP reduced state of conscious attention due to sense of insecurity and lack of self-confidence had caused nervousness or anxiety especially when things do not go as plan during flight. Clear evidence of these conditions of individual factors were observed during the CP's 1st solo training area and 1st solo night when there were queries from ATC on her flight condition resulted in the CP panicking or became nervous during the flight. Lack of self-confidence to fly 1st solo night when cleared by the FI was another inattention factor which was observed in this accident.

Visual illusion which leads to spatial disorientation was another individual factor that had led the CP to erroneous perception of orientation during the 1st solo night flight. During the approach to land, the bright runway lights created confusing visual illusion to the CP to correctly judge the correct approach path and the flare height to land. The subsequent transition to darkness during the execution of the go-around had caused the CP to lose sense of direction and became disorientated on the actual aircraft flight path. When the aircraft veered to the right instead of maintaining runway heading as in a go-around procedure, the change in the aircraft heading caused the CP to lose situation awareness and lose control of the aircraft.

Circuits is a repetitive flying exercise taught in high workload environment to harness and improve the psychomotor and coordination skill to take-off and land the aircraft safely. The CP was assessed to have flaring technique problem during day circuits and had persisted into the night circuits phase. The above condition of individual factors i.e. cognitive and perceptual factors was more prominent at night than day and had affect the CP's motor skill and coordination ability during the 1st solo night flight. Evidence shows that lack of confidence, visual illusion and spatial disorientation had in combination affected the motor skill function of the CP resulting in inappropriate or inadequate control response. The inappropriate or inadequate control response had led to the crash landing. This analysis is also supported by CAAM Chief Medical Assessor's Post Air Crash Report.

The poor of flaring and poor coordination skill to land and execute a go around at night was the main preconditions for unsafe act in this accident. The CP's lack of self-confidence, visual illusion experience during landing, and spatial disorientation experience during go-around had in combination resulted in a degraded flying performance during the 1st solo night flight. The above factors had resulted in the breached of precondition defence layer which ultimately contributed to the unsafe act.

2.3.3 Tier 3 – Unsafe Supervision

SI	INADEQUATE SUPERVISION	
SI 1	**Leadership/Supervision/Oversight** **Inadequate.** Leadership/ Supervision/Oversight Inadequate is a factor when the availability, competency, quality or timeliness of leadership, supervision or oversight does not meet task demands and creates an unsafe situation. Inappropriate supervisory pressures are also captured under this code.	1. Converted CP's 1st solo night flight to fly with FI as safety pilot when CP was not confident to fly solo after the solo check flight. 2. FI cleared student 1st night solo for the next day although CP was not confident to fly solo on the solo check flight day (flew with FI as safety pilot).
SI 3	**Local Training Issues/Programs.** Local Training Issues/Programs area factor when one-time or recurrent training programs, upgrade programs, transition programs or any other local training is inadequate or unavailable (etc) and this creates an unsafe situation.	Reshuffling flights in the Flight Training Syllabus to provide consolidation training for the previous under-performance flight during the 1st solo circuit phase, 1st solo training area phase and 1st solo night phase in order to progress the under-performing CP to the next flying phase of the course.
SP	**PLANNED INAPPROPRIATE OPERATIONS**	
SP 5	**Proficiency.** Proficiency is a factor when an individual is not proficient in a task, mission or event.	Cleared CP 1st solo night despite not meeting the required skill standards as stated in the Flight Training Syllabus.
SP 6	**Risk Assessment –** Formal. Risk Assessment – Formal is a factor when supervision does not adequately evaluate the risks associated with a mission or when pre-mission risk assessment tools or risk assessment programs are inadequate.	Did not submit Slow Progress Report to assess risk associated with the under-performance when the CP was not cleared for 1st solo night.

Analysis Tier 3 – Unsafe Supervision

The supervision role of a FI is of paramount importance in a flight training environment more so in monitoring the progress and ensuring the compliance to skill standards especially for under-performing CPs. The CP was assessed to have under-performed (Graded D) for NF 2 which was a 1st solo night (NF 3) assessment flight. Despite the under-performance, the FI who was the CI/HOT did not submit a Slow Progress Report to ensure a formal assessment is carried out to mitigate the CP's under-performance as required in the Flight Training Syllabus.

Nevertheless, the FI (CI/HOT) decided to progress the CP despite being assessed as under-performed (NF 2) by using the next flight in the syllabus (NF 4) to provide teaching and assessment in hope to clear the CP for 1st solo night (NF3). Despite assessing the CP to be ready for 1st solo night after the NF 4 flight, the CP was not confident to fly solo that night. The FI converted the 1st solo night flight for the CP to fly with the FI as the safety pilot and the flight was recorded as a solo flight in the CP's flying logbook.

Despite the CP's under-performance and self-confidence issues, the CP was cleared for the 2nd solo night (NF 5) the next day (NF 5 is actually CP's 1st solo night as NF 3 flight was flown with a FI as safety pilot). By completing NF 5 which is the last flight for the night flying phase (see paragraph 1.17.4), the CP would be able to continue with the remainder flights in the Flight Training Syllabus and attempt Progress Test 3 to complete the Single Engine Piston Visual Flight Rule (SEP VFR) Phase and progress to Multi Engine Instrument Rating (ME IR) Phase.

Evidence above shows that night training flights were reshuffled to provide extra training to consolidate for under-performing flights to progress the CP to the next flying phase of the course instead of mitigating the under-performance by approving assessment flights or additional flights. The actions above had in fact deprived an under-performing and slow progress CP an opportunity for extra training and instructions from the FI to improve the CP's skill standards before advancing to the next flight in the Flight Training Syllabus. It has also deprived the training organisation

a formal risk assessment to evaluate the potential safety risk a slow progress CP will pose and to take the appropriate safety measure to mitigate the risk.

The above scenario is also observed to have happened during the CP's basic circuits to 1st solo training area phase. The FI who is the CFI had submitted a Slow Progress Report and self-remark that there is no requirement for an assessment flight or additional flights. It was observed that training flights were also reshuffled by using advance GH flights in the Flight Training Syllabus to provide the extra training to consolidate for under-performing flights to progress the CP to the next flying phase of the course instead of mitigating the slow progress by approving assessment flight or additional flights. (see paragraph 1.17.3).

It was observed that there were similar proficiency issues involving 1st solo CP which was highlighted in the recent accident involving the Aircraft Operator. AAIB Final Report A 03/20 dated 17 December 2021 shows that the proficiency standards of the CP involved in this accident was lacking. The CP was also assessed to have poor flaring skill during landing and had crash landed the aircraft during the CP's 1st solo training area flight. Evidence also shows that the CP lacked of confidence and was weak in understanding ATC instructions.

The above evidence revealed that inadequate supervision and monitoring by the FI had created an unsafe situation for the CP to fly solo on the accident night. With the slow progress history of the CP, proper supervision and monitoring by the FI is paramount to ensure the CP had achieved the required skill standards before approving the CP for the solo night flights. The reluctance by the FI to submit Slow Progress Report to request for an assessment flight or approval of additional flights, the practice to reshuffle flights to consolidate under-performance flights to progress the CP especially during the 1st solo circuits phase, 1st solo training area phase and 1st solo night phase, and the practice of flying 1st solo flights with FI as safety pilot when the CP are not confident to fly solo were the main unsafe supervision factors that had in combination affected the CP's skill and proficiency standards to fly the 1st solo night flight.

Corrective actions needed to be taken by the Aircraft Operator to discontinue the non-standard practices of reshuffling flights in the Flight Training Syllabus to progress under-performing CP especially during the 1st solo circuits phase, 1st solo training area phase and 1st solo night phase, the reluctance to submit Slow Progress Report when CP are assessed as underperformed and the practice of flying 1st solo flights with FI as safety pilot when the CP are not confident to fly solo. Although these non-standard practices had progressed the CP in accordance with the Flight Training Syllabus, in actual fact, the training provided to the CP had not progress in tandem to meet the required skill standards for the CP to be proficient to fly the 1st solo flight.
This accident provides clear evidence that all the above non-standard practices had resulted in the breached of supervision defence layers which ultimately contributed this very unfortunate accident.

2.3.4 Tier 4 – Organisation Influence

OP	ORGANISATIONAL PROCESSES	
OP 2	**Program and Policy Risk Assessment.** Program and Policy Risk Assessment is a factor when the potential risks of a large program, operation, acquisition or process are not adequately assessed and this inadequacy leads to an unsafe situation.	Formal Slow Progress Report process was not adhered to by the FI to assess and mitigate risk before approving an underperforming CP to fly 1st solo night which contravened with the requirement stated in the Flight Training Syllabus.

Analysis Tier 4 – Organisation Influence

A formal Slow Progress Report process had been established in the Flight Training Syllabus by the Aircraft Operator to mitigate any underperformance issues by the CPs. The main objective of a Slow Progress Report is to identify and report the CP's under-performance, analysed and take mitigating actions to ensure under-performing CP flying progression are properly supervised and monitored to achieve the required skill standards in a clear and transparent process.

Authority is given individually to FI who are appointed as CFI/DCFI/HOT/SO to review and decide on further actions once a Slow Progress Report is submitted. In this accident, for the night flying phase, the FI who was the CI/HOT decided a Slow Progress Report was not required although the CP was assessed to have under-performed during the night training flight and was not cleared 1st solo night. The decision contravenes with the requirement stated in the Flight Training Syllabus where a Slow Progress Report shall be raised when a CP had under-performed (FTR Graded D).

For the basic circuits phase, the FI who was the CFI had submitted a Slow Progress Report in accordance to requirement stated in the Flight Training Syllabus when the CP under-performed in circuits training and was not cleared 1st solo circuits. Nevertheless, the FI (CFI) himself had decided that no assessment flight or additional hours are required. The submission of the Slow Progress Report was notified to the CP but was not signed by the CP. The decision and action contravened with the requirement stated in the Flight Training Syllabus where additional flights are to be approved by the CFI if the CP cannot clear his/her 1st Solo by CCT 9. The Flight Training Syllabus also states that the Slow Progress Report must be signed by the CP.

A lack of transparency in decision making process exists when a FI who is also an appointment holder (CFI/DCFI/HOT/SO) is task to supervise and assess a slow progress CP. Evidence above shows that both the FI (CI & CFI) decided and self-remarked the actions required to progress the CP. Both the FI reshuffled the training flight in the syllabus to progress the under-performed CP instead of requesting for an independent assessment or approval of additional flights for the benefit of the slow progress CP. By doing so, and in particular for this under-performing CP, the push to advance the CP's flying progression by using training flight ahead to consolidate the under-performance of the previous flight had affected the CP's skill standards and proficiency to fly solo, in this case 1st night solo.

The present formal Slow Progress Report process needs to be reviewed to incorporate a collective decision-making committee consisting of various appointment holders instead of the current practice of decision-making by individual appointment holders.

Collective decision-making process will provide clear and transparent actions taken to improve the skill standards of the under-performing CP and to uphold training standards of the organisation as required by the Flight Training Syllabus. A more transparent decision-making process will also ensure the slow progress CP is provided with proper supervision and appropriate opportunity to improve skill standards and advance in the flying course.

For check and balance purposes, and to maintain skill standards for slow progress CP, a review is proposed in the Skill Test process. It is recommended that CPs that had been assessed as slow progress or have Slow Progress Report record are to undergo their Skill Test with DFE monitored by CAAM FOI. This will ensure transparent training organisational monitoring and management of the slow progress CP, thus ensuring skill standards and proficiency are met before the CP progresses to the next phase of the course syllabus. This will also ensure risk assessment process had been properly conducted by the training organisation and risk are mitigated to prevent a similar accident from occurring again.

2.4 INVESTIGATION ANALYSIS SUMMARY

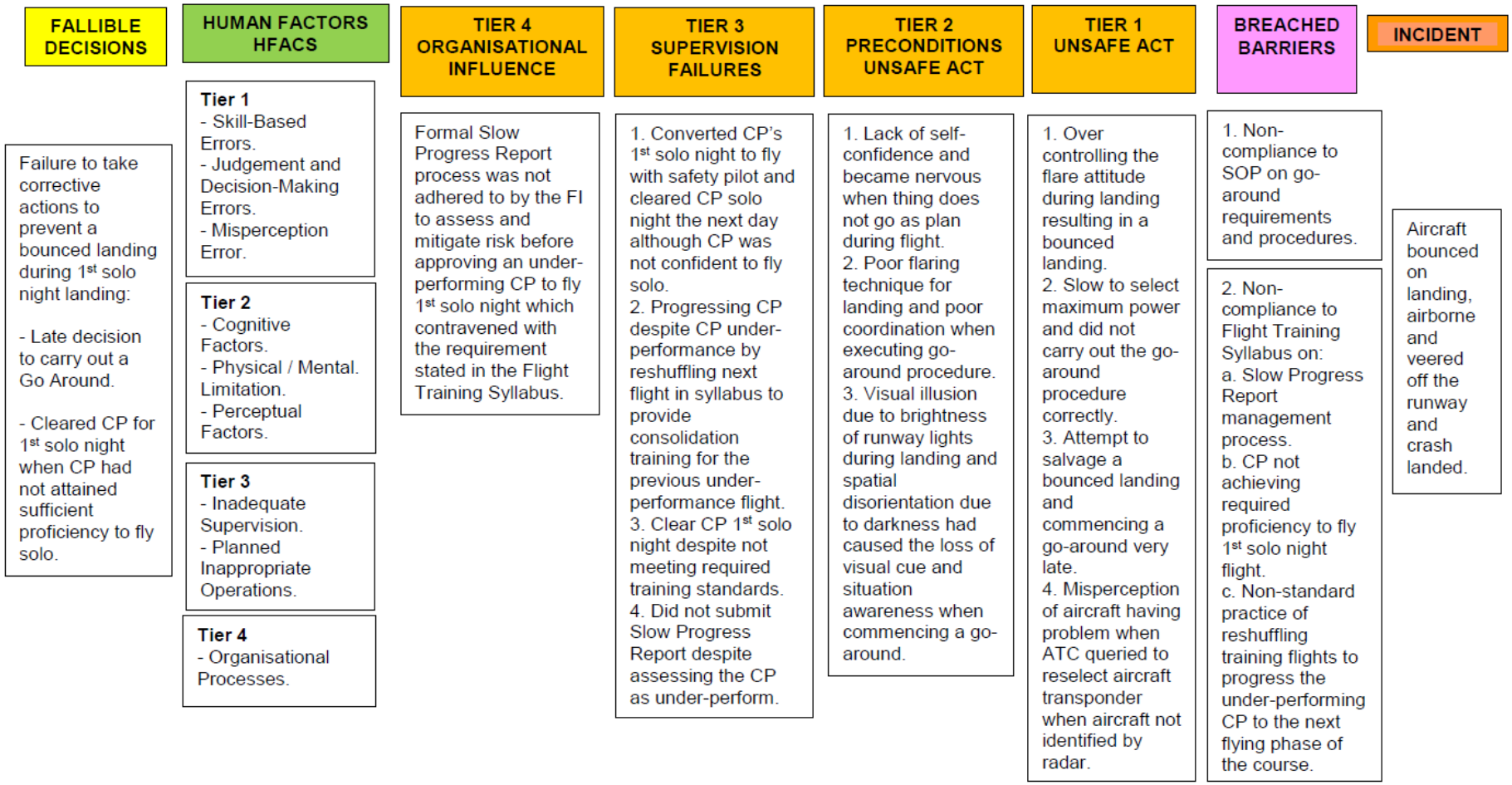

Figure 39. Summary of HFACS Analysis

3.0 CONCLUSIONS

Human factors issues had caused this very unfortunate accident. Active and latent condition failures had breached the various defence layers which had been systematically put in place to ensure the Aircraft Operator operates in a safe flight training environment. The various defence lawyers are put in place to ensure flight safety risk are mitigated and reduced to the minimum as basic flight training have inherent potential training and safety hazards due to the limited experience and skill standards of the trainees.

The main unsafe act for this accident was the over control of the flare attitude during landing and the incorrect execution of the go-around technique when the aircraft bounced on landing. The decision to salvage the bounced landing resulted in hesitant actions of the CP to advance the power lever to MAX and the inadvertent selection of the flaps selector lever from LAND to UP. These faulty actions had directly caused the CP to lose control of the aircraft during critical stage of flight in a high workload situation.

The CP individual precondition factors had further aided the unsafe act above. The CP reduced state of conscious attention due to sense of insecurity and lack of self-confidence had caused nervousness or anxiety to the CP especially when the things do not go as plan during flight. Visual illusion which leads to spatial disorientation was another individual factor that had led the CP to erroneous perception of orientation.

The above individual precondition factors were more prominent at night than day and had affect the CP's motor skill and coordination ability during the 1st solo night flight. The lack of confidence, visual illusion and spatial disorientation had in combination affected the motor skill function of the CP resulting in inappropriate or inadequate control response. The inappropriate or inadequate control response had led to the crash landing.

Inadequate supervision and the non-standard practice by the FI had created an unsafe situation for the CP to fly solo on the accident night. The non-standard practice of reluctance to submit Slow Progress Report to request for an assessment flight or

approval additional flights, the practice to reshuffle flights to consolidate underperformance flights to progress the CP especially during the 1st solo circuits phase, 1st solo training area phase and 1st solo night phase, and the practice of flying 1st solo flights with FI as safety pilot when the CP was not confident to fly solo were the main unsafe supervision factors that had affected the CP's flying skill and proficiency standards to fly the 1st solo night flight.

The above non-standard practices should be discontinued immediately as evidence shows it is counterproductive in maintaining training standards. Proper supervision and monitoring by the FI should be emphasize to ensure the slow progress CP had achieved the required skill and proficiency standards before being approved for any 1st solo flight.

A lack of transparency in decision making process exists when a FI who is also an appointment holder (CFI/DCFI/HOT/SO) is tasked to supervise and assess a slow progress CP. The authority given to appointment holders to individually decided and self-remarked the actions when the CP is assessed as under-performed or when a Slow Progress Report had been submitted needs to be reviewed.

A more transparent decision-making process which involved collective decision making by various appointment holders in the form of a committee should be incorporated in the Flight Training Syllabus to review and decide on all assessment flights and Slow Progress Reports.

Finally, to improve the monitoring and management of slow progress CP and provide organisational check and balance, it is recommended that skill test on CP with Slow Progress Report history be conduct by DFE and monitored by CAAM FOI before the CP advance into the next phase of the Flying Training Syllabus.

3.1 Findings

3.1.1 The Cadet Pilot was properly licensed to fly the night training flight.

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

3.1.3 Aircraft weight and balance is within the operating limit.

3.1.4 The incident happened at night. Weather was fine.

3.1.5 The Cadet Pilot reported no abnormalities on the aircraft during the night flight.

3.1.6 The Cadet Pilot 1st solo night was flown with a Flight Instructor as safety pilot due to the Cadet Pilot's lack of confidence.

3.1.7 The Flight Instructor was reluctant to submit a Slow Progress Report when the Cadet Pilot was assessed as under-performed (Grade D) during the 1st solo night assessment flight.

3.1.8 Formal Slow Progress Report process was not adhered to by the FI to assess and mitigate risk before approving an under-performing Cadet Pilot to fly 1st solo night.

3.1.9 Flights were reshuffled in the Flight Training Syllabus to provide consolidation training for the previous under-performance flight during the 1st solo circuit phase, 1st solo training area phase and 1st solo night phase to progress the under-performing Cadet Pilot to the next flying phase of the course.

3.1.10 The Cadet Pilot has the tendency to panic or become nervous when the things do not go according to plan during flight.

3.1.11 The Cadet Pilot is apprehensive of darkness during night flying.

3.1.12 The Cadet pilot commence a go-around after the aircraft bounced on landing.

3.1.13 The Cadet Pilot selected the aircraft flaps selector lever from LAND to UP instead of TAKE-OFF when commencing a go-around.

3.1.14 The Cadet Pilot crash landed on the first landing of the 1st solo night flight.

3.1.15 Crash alarm was not activated by the ATC Controller on duty. Crash information was transmitted by ATC tower to AFRS Watch Room via direct line.

3.1.16 The local practice where the AFRS vehicles enter runway without informing ATC Tower when responding to the crash alarm is a potential hazard to flight safety when circuits is active.

3.2 Preliminary Report Actions Recommended to Aircraft Operator

3.2.1 To retrain and reassess the CP's night flying proficiency as per the Flight Training Syllabus requirement.

3.2.2. To ensure all night solo flights in accordance with the Flight Training Syllabus are carried by the CP without the instructor acting as a safety pilot.

3.2.3. To ensure the CP is assessed as proficient in all night flying flights in accordance with Flight Training Syllabus requirement before the cadet advances to the next flying training phase.

3.3 Preliminary Report Feedback Actions from Aircraft Operator

The Aircraft Operator had provided feedback actions and a Safety Assessment - Risk Matrix for Night Flying (Solo Operations) to mitigate safety risk involved in night flying (solo operations). The CP was sent for a medical review to be conducted by CAAM Medical Assessor. The CP will be recalled for the remaining training if cleared by the CAAM Medical Assessor on completion of the medical review.

3.4 CAAM Chief Medical Assessor Post Air Crash Report and Recommendations

The CP was assessed by an authorised Psychiatrist, Ophthalmologist and Psychologist. A Post Air Crash Medical Report by CAAM Chief Medical Assessor was

submitted to AAIB on completion of the medical review (refer paragraph 1.13). The medical report supports the analysis on precondition for unsafe act factors in paragraph 2.3.2. The following are recommendation from CAAM Chief Medical Assessor extracted in verbatim from the Post Air Crash Medical Report:

3.4.1 Desensitisation of fear of the dark (Nyctophobia)

This can be overcome by practicing more night flying with an instructor until the CP is comfortable and not anxious to fly at night. This management should start with short and non-threatening (with trainer) night flight training exposure with gradual increment of frequency, intensity and eventually solo night flight according to full syllabus when the CP is ready.

3.4.2 Proficiency and competency training, including human factor training

The CP requires more training hours to grasp the piloting skill, especially the proficiency in Instrumental Flying (IFR). The CP needs also to be made aware of the human limitation in piloting an aircraft. This is aim to increase her situational awareness. Based on the medical report, the CP had been declared fit to resume flight duties by CAAM.

3.5 Preliminary Report Actions Recommended to Aerodrome Operator

3.5.1. To ensure all AFRS personnel understand and practice the crash alarm response requirement as stated in the Airport Fire and Rescue Services Standard Operating Procedures.

3.5.2. To ensure all AFRS vehicles inform or request permission from the ATC Tower for all movement in, at or out of an active runway when responding to crash alarm.

3.5.3. To conduct a coordination meeting between Aerodrome Operator AFRS and CAAM Langkawi to review and correct the current practices as stated in paragraph 3.1.15 and 3.1.16.

3.5.4. To issue a safety MEMO/circular to both the Aerodrome Operator AFRS and CAAM Langkawi to avoid confusion and to ensure correct actions are carried out by AFRS personnel when responding to a crash alarm.

3.6 Preliminary Report Feedback Actions from Aerodrome Operator

A MEMO was issued by the Aerodrome Operator Manager to CAAM Langkawi and Aerodrome Operator AFRS on completion the coordination meeting. To ensure safety is not jeopardised and response time are effectively met, the detail agreed actions in line with the Airport Fire and Rescue Services Standard Operating Procedures were formulated. **This Preliminary Report feedback closes all the recommendation in paragraph 3.5.**

3.7 Causes/Contributing Factors

3.7.1 The first primary cause was attributed to the over control of the flare attitude during landing and the incorrect execution of the go-around technique by the CP when the aircraft bounced on landing. The decision to salvage the bounced landing resulted in the late decision to commence a go around. Contributing factors to this late decision were the lack of self-confidence and visual illusion caused by the bright runway lights during landing. It further led to disorientation during the attempt to go around. Visual illusion and disorientation had in combination affected the motor skill function of the CP resulting in inappropriate or inadequate control response which caused a crash landing.

3.7.2 The second primary cause was attributed to the lack of proper supervision to ensure the under-performing CP had achieved the required skill and proficiency standards to fly the 1st solo night flight. Contributing factors to the lack of proper supervision is the reluctance by the FI to submit Slow Progress Report to request for an assessment flight or approval additional flights, the practice to reshuffle flights to consolidate under-performance flights to progress the CP especially during the 1st solo circuits phase, 1st solo training area phase and 1st solo night phase, and the practice of flying 1st solo flights with FI as safety

pilot when the CP was not confident to fly solo. These nonstandard practices had deprived the CP of additional training to improve self-confidence, skill standards and to achieve the proficiency standards required to fly the 1st solo night flight.

4.0 SAFETY RECOMMENDATIONS

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

4.1.1 To retrain and reassess the Cadet Pilot's night flying proficiency as per Flight Training Syllabus requirements and to incorporate the recommendations made by CAAM's Chief Medical Assessor in paragraph 3.4.1 and 3.4.2. during the retraining.

4.1.2 To review and incorporate in the Flight Training Syllabus a collective decision-making committee to evaluate and decide on all underperforming Cadet Pilots' assessment flights and Slow Progress Reports.

4.1.3 To ensure the Cadet Pilot's Skill Test – Progress Test 3 is conducted by a Designated Flight Examiner monitored by a CAAM Flight Operations Inspector before progressing to the next phase of the flight training course.

4.1.4 To update the Flight Training Syllabus Issue 02 Revision 00 dated 1 September 2020 paragraph 1.2.16 to comply with the new directive issued by CAAM CAD 1011 – Approved Training Organisation Issue 01 Revision 01 dated 15 November 2021 paragraph 5.5, Flight Instructor's Presence at Air Traffic Control Tower for Student Pilots' 1st Solo Flights.

4.2 CAAM is to carry out the following safety recommendations:

4.2.1 To monitor the conduct of the Cadet Pilot's Skill Test - Progress Test 3 by the Designated Flight Examiner when the Cadet Pilot is assessed ready for the Skill Test – Progress Test 3.

4.2.2 To consider implementing the requirement for CAAM Flight Operations Inspectors to monitor the conduct of relevant skill test on underperforming Cadet Pilots with Slow Progress Report record at all Approved Training Organisation by Designated Flight Examiners before the Cadet Pilot progresses into the next phase of flight training course.

4.2.3 To issue a directive to ensure the Aircraft Operator complies with the formal Slow Progress Report process and to discontinue the non-standard practices as follows:

4.2.3.1 Reshuffling of flights in the Flight Training Syllabus during the 1st solo circuits phase, 1st solo training area phase and 1st solo night phase to progress an under-performing Cadet Pilot to the next phase of the flight training course.

4.2.3.2 The practice of Cadet Pilot flying 1st solo flights with Flight Instructor as safety pilot.

4.2.3.3 The reluctance of Flight Instructors to submit Slow Progress Report on an under-performing Cadet Pilot as required by the Flight Training Syllabus.

4.2.3.4 Slow Progress Report submitted by Flight Instructor but not signed by Cadet Pilot.

4.2.4 To review and fulfil the request by CAAM Langkawi for additional Air Traffic Controller Officer as highlighted in the Safety Risk Assessment Report – PROC/2021/002 dated 04 July 2021 to meet the minimum rest period requirement when on duty as stated in ICAO DOC 9966.

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