



AIRCRAFT ACCIDENT FINAL REPORT
A 06/20
Air Accidents Investigation Bureau (AAIB)
Ministry of Transport

Accident Involving Two Guimbal Cabri G2
Registration 9M-HCA & 9M-HCB
in Taman Melawati, Kuala Lumpur
on the 8 November 2020



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**AIR ACCIDENTS INVESTIGATION BUREAU (AAIB)
MALAYSIA**

ACCIDENT REPORT NO. : A 06/20

OPERATOR	:	MY HELI CLUB
AIRCRAFT TYPE	:	GUIMBAL CABRI G2
NATIONALITY	:	MALAYSIA
REGISTRATION	:	9M-HCA & 9M-HCB
PLACE OF OCCURRENCE	:	TAMAN MELAWATI, KUALA LUMPUR
DATE AND TIME	:	8 NOVEMBER 2020 AT 1145 LT

This investigation is carried out to determine the circumstances and causes of the accident with the sole objective for the preservation of life and the avoidance of accidents in the future. It is not for the purpose of apportioning blame or liability (Annex 13 to the Chicago Convention).

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

INTRODUCTION

The Air Accidents Investigation Bureau Malaysia

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

The AAIB conducts the investigations in accordance with Annex 13 to the Chicago Convention, the Civil Aviation Act of Malaysia 1969 and the 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 processes has been undertaken for that purpose.

In accordance with ICAO Annex 13 paragraph 4.1, notification of the accident was sent out on 12 November 2020 to the French Accident Investigation Authority, the *Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA)*, France as the State of Design and Manufacturer.

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

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ABBREVIATIONS

AAIB	Air Accidents Investigation Bureau
AIP	Aeronautical Information Publication
AvGas	Aviation Gasoline
ADS-B	Automatic Dependent Surveillance – Broadcast
CAAM	Civil Aviation Authority of Malaysia
ELT	Emergency Locator Transmitter
FEW018	1 to 2 Oktas Cloud Cover at 1,800 ft
HUKM	Hospital Universiti Kebangsaan Malaysia
KLATCC	Kuala Lumpur Air Traffic Control Centre
KLRCC	Kuala Lumpur Rescue Coordination Centre
LT	Local Time
METAR	Meteorological Aerodrome Report
MGW	Maximum Gross Weight
MoGas	Motor Gasoline
MRO	Maintenance Repair & Overhaul
Pax	Passenger
POB	Persons on Board
RT	Radio Telephony
VHF	Very High Frequency
WMSA	ICAO Code for Sultan Abdul Aziz Shah Airport
UTC	Universal Time Coordinated

DEFINITIONS

ADS-B

ADS-B is a surveillance technology in which an aircraft determines its position via satellite navigation or other sensors and periodically broadcasts it, enabling it to be tracked.

AIP

An Aeronautical Information Publication (AIP) is a publication issued by or with the authority of a State containing details of regulations, procedures and other information pertinent to the operation of aircraft in the particular country to which it relates.

AUTOROTATION

Aut rotation is a condition of helicopter flight during which the main rotor of a helicopter is driven only by aerodynamic forces with no power from the engine. It is a manoeuvre where the engine is disengaged from the main rotor system and the rotor blades are driven solely by the upward flow of air through the rotor.

CHORD LINE

An imaginary straight line drawn between the leading edge and the trailing edge of an aerofoil, in the direction of the normal airflow, is referred to as a Chord Line.

COSPAS-SARSAT

A satellite-based monitoring system that detects and locates emergency beacons. Professional operators then notify search-and-rescue (SAR) authorities. The beacons comply with internationally agreed standards for radio communication and identification of beacon owners.

CYCLIC

The cyclic control, commonly called the cyclic stick or just cyclic, is similar in appearance on most helicopters to a control stick from a conventional aircraft. During forward flight, the cyclic control inputs cause flight path changes similar to fixed-wing aircraft flight.

DETRESFA

Distress phase: A situation wherein there is a reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger and require immediate assistance.

DEFINITIONS (CONT...)

OKTAS

Meteorological scale of cloud cover measured in eighths. Sky conditions are estimated in terms of how many eighths of the sky are covered in cloud, ranging from 0 oktas (completely clear sky) through to 8 oktas (completely overcast).

SYNOPSIS

On 8 November 2020, two Guimbal Cabri G2 light helicopters from a local flying club bearing registrations 9M-HCA & 9M-HCB were involved in a mid-air collision overhead Taman Melawati in Kuala Lumpur. Each aircraft had 2 POB.

9M-HCB crashed onto a road shoulder causing fatalities to both of its occupants whilst 9M-HCA although damaged managed to execute an emergency landing in a nearby school field. Its occupants were uninjured.

The AAIB Chief Inspector was notified within the hour and an investigation team was dispatched immediately.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

On Sunday, 8 November 2020, at approximately 1112, the two helicopters took-off from Sultan Abdul Aziz Shah Airport, Subang (WMSA). The intended route as per the Flight Plan (**Appendix A**) was WMSA – Batu Caves – Genting Sempah – Batu Caves – WMSA with an expected flight time of 28 minutes.

The flight plan was filed for 9M-HCA with remarks that it would be 'Flying in company with 9M-HCB'. Subsequent RT calls between the helicopters with Subang Ground (121.9 MHz) that morning established that the callsign 'My Heli Combined' would be used to identify the pair of helicopters.

Both helicopters then proceeded to Genting Sempah via Batu Caves before returning. On the way back, a request was made to operate at Batu Dam for approximately 10 minutes. This was followed-on by another request to operate this time at Klang Gates Dam for approximately 20 minutes. This communication at 1139 was to be the last RT call made by My Heli Combined.

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At approximately 1145 both helicopters collided with one another. The exact circumstances of the collision will be discussed in detail later in this report. 9M-HCA received damage to its landing skids but was still controllable and the pilot managed to land safely at a nearby school field.

9M-HCB on the other hand severely damaged its main rotor blades and immediately began auto-rotating but crash landed onto a road shoulder not far away. Civilians from the surrounding area were the first to reach the crash site. This was followed minutes later by both the Police and Fire & Rescue Services.

On-site investigations were carried out by the Police, AAIB and the Forensic Unit from HUKM. By late afternoon on-site investigations were completed and the wreckage was then cleared and transported back to the facilities of the responsible MRO service provider later that evening.

1.2 Injuries to Persons

The occupants of 9M-HCA were uninjured. Those however in 9M-HCB succumbed to their injuries and were pronounced deceased by paramedics on-site. No one on ground was injured.

<i>Injuries</i>	9M-HCA		9M-HCB	
	Crew	Pax	Crew	Pax
Fatal	-	-	1	1
Serious	-	-	-	-
Minor / None	1	1	-	-

1.3 Damage to Aircraft

For images of damage to the aircraft on-site please refer to **Appendix B1**.

For the Damage Assessment Reports by the responsible MRO service provider please refer to **Appendix B2 & B3**.

1.4 Other Damages

The area onto which 9M-HCB crashed was a road shoulder off Jalan Taman Melawati extending into an empty land reserve. Apart from impact marks on the ground and a nearby tree with a few branches sheared off, no damage to other property was noticed. There was no post-impact fire.

1.5 Personnel Information

The occupants of both helicopters were all members of the same local flying club. The pilot of 9M-HCA was its Club President and the passenger an ordinary member while 9M-HCB's pilot was its Club Captain and Chief Flying Instructor and the passenger a student pilot.

9M-HCA

Pilot

Nationality	Malaysia
Age	66
Gender	Male
License Type	PPL No. 8047/H
License Validity	31 July 2021
Medical Certificate Validity	31 July 2021
Aircraft Rating	Cabri G2, R66
Instructor Rating	Nil
Certificate of Test Due	3 August 2021
Flying Hours	Total: 1,072 Hrs Type: 87 Hrs

Pax

Nationality	Malaysia
Age	51
Gender	Female

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9M-HCB

Pilot

Nationality	Malaysia
Age	56
Gender	Male
License Type	ATPL No. 2473/H
License Validity	30 April 2021
Medical Certificate Validity	30 April 2021
Aircraft Rating	AS350, G2, MD600N, R66
Instructor Rating	31 January 2023
Certificate of Test Due	22 July 2021
Flying Hours	Total: TBN Type: TBN

Pax

Nationality	Malaysia
Age	41
Gender	Male
License Type	SPL for PPL No. 13926
License Validity	31 July 2022
Medical Certificate Validity	31 July 2022
Aircraft Rating	Nil
Instructor Rating	Nil
Certificate of Test Due	Nil
Flying Hours	Nil

1.6 Aircraft Information

The helicopters were bought brand new by the flying club in 2018 from France. So far they had achieved less than 200 flying hours each.

Both Aircraft	Cabri G2
Manufacturer	Helicopteres Guimbal
Year of Manufacture	2018
C of A Category	CS-27 Small Rotorcraft
C of A Issue	21 February 2020
C of A Expiry	21 February 2021
C of R Issue	21 December 2018
C of R Expiry	20 December 2021

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Registration	9M-HCA
Serial No.	1230
Owner	Cabri Rouge Sdn. Bhd.
Airframe & Engine Flight Hours	122.2 Hours
Landing Cycles	293
Fuel used	AvGas

Registration	9M-HCB
Serial No.	1231
Owner	Cabri Blu Sdn. Bhd.
Airframe & Engine Flight Hours	159.6 Hours
Landing Cycles	389
Fuel used	AvGas & MoGas

1.7 Meteorological Information

Attached to this report is a METAR for WMSA, the point of departure and intended final landing point for both helicopters **(Appendix C)**.

For a visual assessment of the actual weather, please see the last photograph taken from 9M-HCA a few minutes before the collision **(Appendix D)**. 9M-HCB is circled in blue.

As can be seen from the photograph the sky was overcast with no direct sunlight visible. Scattered cloud can also be seen as per the METAR of FEW018. Wind was light at 4 kts with forward visibility more than 10 km.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

Both helicopters were equipped with 2 x VHF radios. One would be set to the current ATC VHF frequency whilst the other would be set to the flying club's 'company frequency' of 123.45 MHz which would enable the pilots to talk to one another.

On that fateful day, 9M-HCB was agreed upon to be the 'lead aircraft' and would handle all radio communications with the ATC. 9M-HCA would just listen out.

No distress calls were made that day over the RT. Information about the accident was only relayed to Subang Tower's land line by 9M-HCA's pilot using his handphone after he had landed.

1.10 Aerodrome Information

Not applicable.

1.11 Flight Recorders

These Guimbal Cabri G2 light helicopters with a Maximum Gross Weight (MGW) of 700kg are not equipped with flight recorders nor are they mandated by law to do so.

1.12 Wreckage and Impact Information

A visual assessment at the crash site revealed that 9M-HCB descended at a very steep angle. This was ascertained by its descent through and damage to a nearby tree to the point of impact.

From its final resting position and pattern of damages it can be deduced that 9M-HCB came down in a relatively level attitude with the right front quarter of the helicopter taking the brunt of the impact. There

were also no skid or slip marks meaning the helicopter came down with very minimal forward speed.

Please also refer to the Damage Assessment Reports by the MRO service provider in **Appendix B2 & B3**.

1.13 Medical and Pathological Information

Both occupants of 9M-HCA were sent for a medical check-up by the police immediately after the accident. Other than the pilot experiencing high blood pressure no other abnormalities were recorded.

For the fatalities, a preliminary post-mortem report indicates that the cause of death as probably due to multiple injuries consistent with an aviation accident.

1.14 Fire

There was no post-impact fire.

1.15 Survival Aspects

As was seen earlier in this report, the pilot of 9M-HCA managed to land the helicopter safely although it had lost substantial parts of its skids.

For 9M-HCB however, the excessive vertical deceleration forces meant it exceeded the design limits of the helicopter skids and also the cabin's high-energy absorbing, stroking seats.

It must be noted that 9M-HCB's fuel tank survived the impact intact. There were no fuel leakages which could have led to a post-impact fire.

Additionally, 9M-HCB's ELT was activated on impact and a COSPAS-SARSAT ground station in Singapore managed to pick-up the

signal. However, KLRCC was only notified 4 hours later via a DETRESFA Signal.

1.16 Tests and Research

The results of a forensic test on one of the main rotor blades plus a fuel and engine oil sample test showed no abnormalities.

1.17 Organisational and Management Information

The operator of the two helicopters, My Heli Club, is a non-commercial establishment under the Registrar of Societies. It was formed on 3 August 2018.

Its members consist of helicopter pilots, owners, retired aviation industry professionals and flying enthusiasts. The club not only facilitates its members' enthusiasm for helicopters but also offers a platform for them to become certified helicopter pilots at an affordable price.

The club had obtained approval from CAAM on 19 August 2019 to offer the Helicopters' Private Pilots Licence [PPL(H)] helicopter flight training programme to its members.

1.18 Additional Information

Nil.

1.19 Useful or Effective Investigation Techniques

As both the helicopters were not equipped with Flight Recorders, investigators had to rely on ADS-B Data, eye-witness accounts and

wreckage reconstruction techniques to ascertain what transpired that day.

2.0 ANALYSIS

Convergence and Collision

2.1 Initial investigations confirmed that a mid-air collision did indeed occur. Focus was then prioritised to ascertain how this happened and what could have been done to prevent it.

2.2 Raw ADS-B Data shows that both helicopters left Batu Dam for Klang Gates as per **Appendix E** (The flight path of 9M-HCA is in red). During transit, their paths maintained a separation of between 50 – 120m at all times. However at 1144, for reasons still unknown, the helicopters start to converge and collided a few seconds later (**Appendix F**).

2.3 The pilot of 9M-HCA on being alerted by his passenger to the proximity of the other helicopter took evasive action by slamming his cyclic to the right but it was too late. Wreckage reconstruction later indicated that the main rotor blades of 9M-HCB impacted the skids of 9M-HCA.

2.4 A piece of 9M-HCB's main rotor blade flew off in flight and this was confirmed by 9M-HCA's pilot. That piece was later recovered and identified as being part of the green blade (helicopter blades are colour coded). The blade had split longitudinally from its tip along the plane of the chord line and the upper portion measuring 88cm in length had separated in flight (**Appendix G**).

2.5 9M-HCA managed to safely land on SJKT Taman Melawati's school field. 9M-HCB on the other hand immediately entered into an auto-rotation but due to the severity of damage to its main rotors was unable to maintain a controlled rate of descent required for a safe landing. ADS-B Data shows that

during the initial part of its auto-rotation 9M-HCB was already descending in excess of 2,000 ft/min (**Appendix H**).

2.6 Further analyses into the ADS-B Data (heading, height, rates of climb/descent, speed) did not reveal any additional information. Investigators are unable to ascertain exactly how the helicopters collided, for instance why the helicopters converged in the first place.

Rules and Procedures

2.7 A point of contention was raised by the phrase 'flying in company' which was written in the Flight Plan. It is not defined anywhere but nonetheless in local aviation circles it has come to mean a group of aircraft flying together. When it comes to navigation and position reporting this group of aircraft would act as one, i.e. one callsign and one radio call to cover the whole group. Hence the usage of the callsign My Heli Combined in this instance.

2.8 A quick check into the the local AIP reveals that the only rule similar to what has been practiced can be found under ENR 1.1.2.3.19 Formation Flights (**Appendix I**). The question now is whether those who have been requesting such clearances are adequately trained to carry out formation flying.

2.9 It may be argued that the term 'flying in company' does not entail flying in a 'tight' formation but rather that of a 'loose' one. The rules do not define these additional terms ('tight or loose') but they do spell out the maximum distance between aircraft as being not more than 1 km (0.5 nm). It must be noted however that no minimum separation is specified.

2.10 That being said, formation flying ('tight or loose') is without a doubt a discipline in itself. It requires proper training, a detailed briefing before the flight and each and every element in the formation must know his distinct roles and responsibilities in order to ensure the safety and success of the flight. Any lapse in discipline could lead to catastrophic results.

3.0 CONCLUSION

3.1. Whatever findings the investigators have uncovered have been presented in the preceding paragraphs above. From this, two main issues arise.

- a. There was no evidence whatsoever of any form of formal training and/or pre-flight briefing with regards to formation flying being conducted prior to the accident.
- b. The present Rules and Procedures in the AIP pertaining to the practice of 'flying in company' need to be reviewed.

4.0 SAFETY RECOMMENDATIONS

4.1. CAAM is to take a critical look into the practice of ‘flying in company’ among local aviation enthusiasts. A review of the current Rules and Procedures is needed to identify any inadequacies present and improve on them in order that such occurrences like this one do not happen again.

INVESTIGATOR-IN-CHARGE

Air Accidents Investigation Bureau

Ministry of Transport

8 November 2021

FLIGHT PLAN

DEPARTMENT OF CIVIL AVIATION, MALAYSIA
FLIGHT PLAN

PRIORITY: **FF** ADDRESS(ES):

FLIGHT TIME: **02** ORIGINATOR: **0300**

SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR:

1. AIRCRAFT IDENTIFICATION: **9M-HCA** 2. FLIGHT RULES: **V** 3. TYPE OF FLIGHT: **G**

4. NUMBER: **02** 5. TYPE OF AIRCRAFT: **G2CA** 6. WING TUNNELS (AT): **L** 7. EQUIPMENT: **VIS**

12. DEPARTURE AERODROME: **WMSA** 13. TIME: **0300**

14. DRUGGING SPEED: **N0000** 15. LEVEL: **A010** 16. ROUTE: **B. CAVES / GENTING SEMPAH / B. CAVES / WMSA //**

17. DESTINATION AERODROME: **WMSA** 18. TOTAL FUEL: **0030** 19. ALT. AERODROME: **ZZZZ** 20. ALT. AERODROME: **ZZZZ**

21. OTHER INFORMATION: **EET / B. CAVES 0007 / GENTING SEMPAH 0007 / B. CAVES 0007 / WMSA 0007 //**

RMK /
DOF / 08 NOV 20 ALTN / ANY FIELD
OPR / MY HELI CLUB
FLYING IN COMPANY WITH 9M-HCB

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED BY MESSAGE):

22. ENDURANCE: **E** **T B N** 23. PERSON ON BOARD: **T B N** 24. EMERGENCY RADIO: **R** **U** **V** **E**

25. SURVIVAL EQUIPMENT: **POLAR** **DESERT** **MARINE** **ANGULAR** 26. JACKETS: **L** **U** **R** **X** **V**

27. DIVERS: **X** **R** **B** **X** **U** 28. LIGHT: **L** **U** **R** **X** **V**

29. NUMBER: **0** / **0** 30. CAPACITY: **0** 31. COVER: **0** 32. COLOUR: **WHITE WITH RED/BLUE STRIPE AND LOGO 9M-HCA / 9M-HCB**

33. **A** / **WHITE WITH RED/BLUE STRIPE AND LOGO 9M-HCA / 9M-HCB**

34. **N** / **NIL**

35. **C** / **AHMAD JAUHARI / MOHD SABRI**

FILED BY: COR MOHD SABRI HP 919 384487

SPACE RESERVED FOR ADDITIONAL REQUIREMENTS

1-2PR, KL

DAMAGE ASSESSMENT (IMAGES ON-SITE)

9M-HCA



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9M-HCA (Cont...)



9M-HCB



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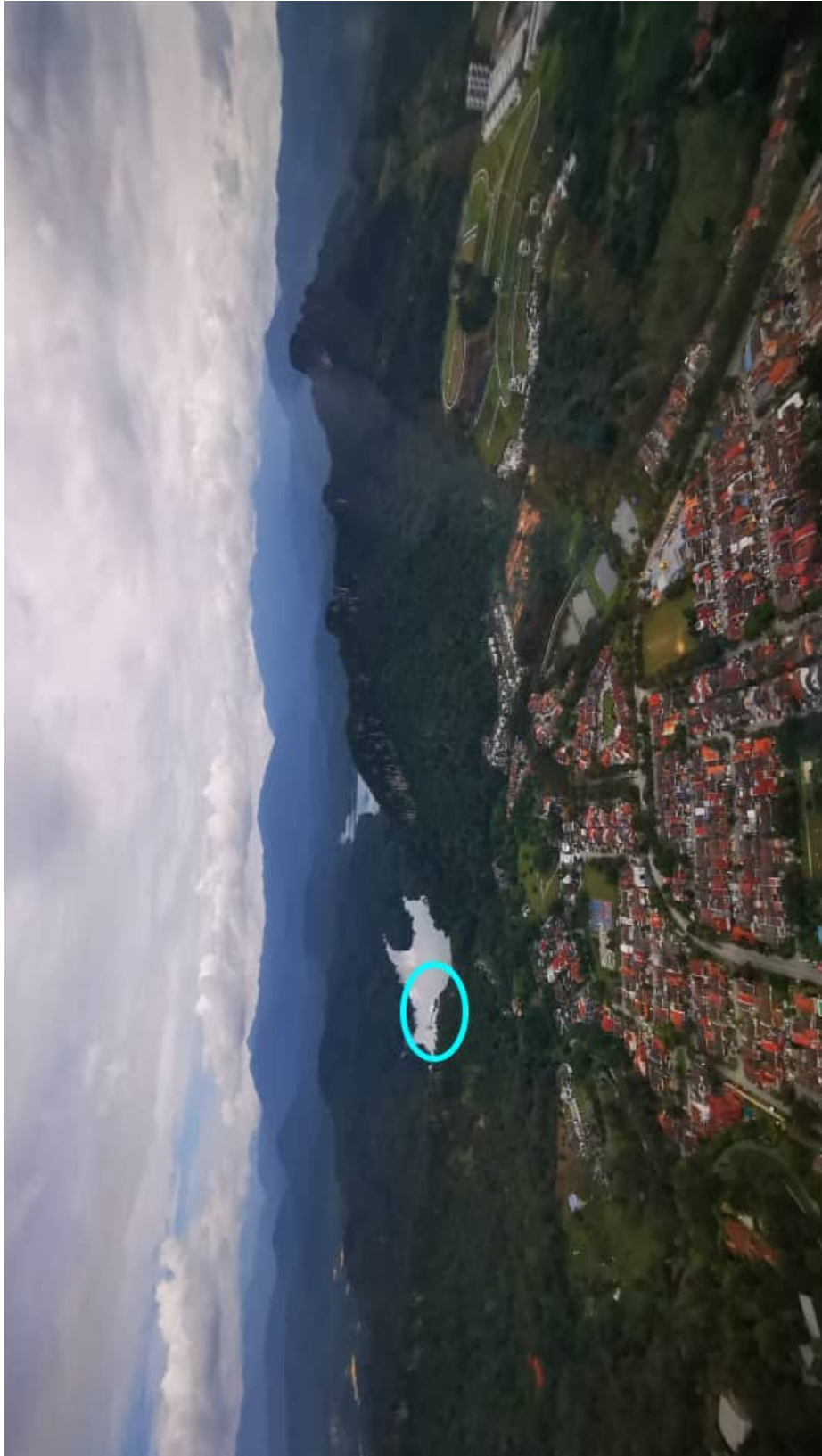
9M-HCB (Cont...)



METAR

SBA0415 080310
GG WMSAZTZ
080308 WMKKYMYX
SAMS32 WMKK 080300
METAR WBGG 080300Z VRB03KT 9999 SCT014 31/25 Q1012 NOSIG=
METAR WBKK 080300Z 23006KT 170V280 9999 FEW014 FEW016CB 31/25 Q1010
NOSIG=
METAR COR WMKJ 080300Z VRB03KT 9999 FEW017CB SCT018 29/25 Q1012=
METAR WMKK 080300Z VRB03KT 9999 FEW017CB SCT018 30/25 Q1012 NOSIG=
~~METAR WMKK 080300Z 00000KT 8000 FEW020 30/25 Q1012 NOSIG=~~
METAR WMSA 080300Z 30004KT 250V030 9999 FEW018 32/23 Q1012=

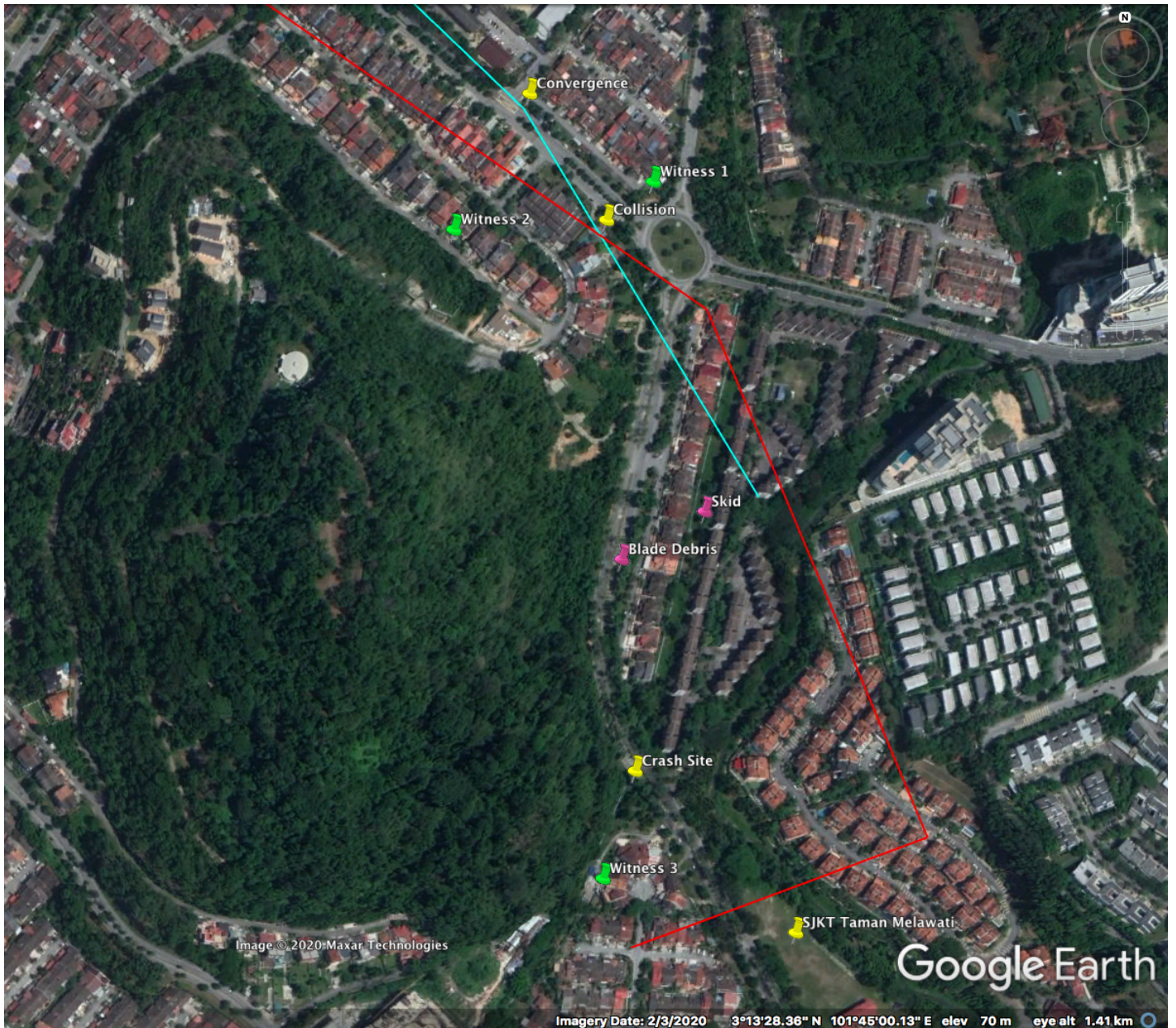
ACTUAL WEATHER



**FLIGHT PATH
(BATU DAM – KLANG GATES)**



CONVERGENCE AND COLLISION



SEPARATED MAIN ROTOR BLADE (9M-HCB)

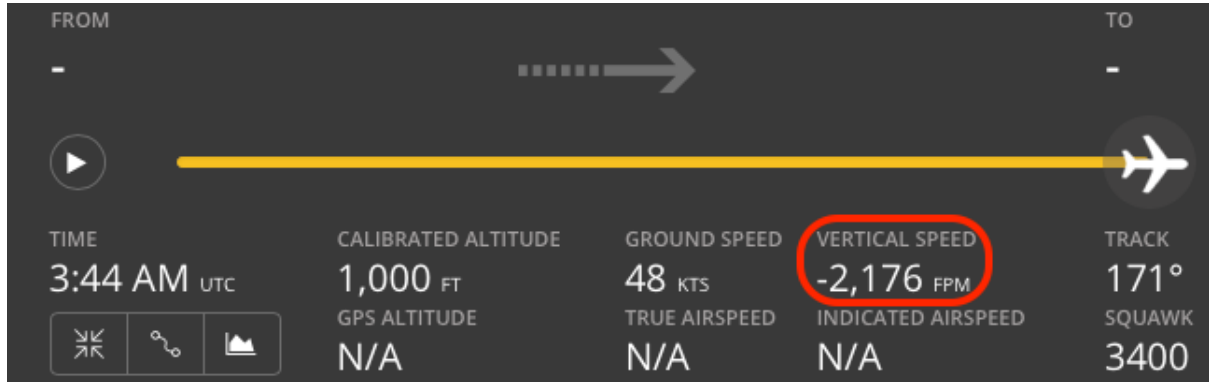


Cont...



Picture 38 shows the broken piece of the upper section of the green main rotor blade. Some portion of the trailing edge also can be seen missing from the blade.

INITIAL RATE OF DESCENT



AIP ENR 1.1.2.3.19 FORMATION FLIGHTS

1.1.2.3.19.1 Aircraft shall not be flown in formation except by prearrangement taking part in the flight and, for formation flight in controlled airspace, in accordance with the conditions prescribed by the appropriate ATS authority (ies). These conditions shall include the following:

- a. the formation operates as a single aircraft with regard to navigation and position reporting;
- b. separation between aircraft in the flight shall be the responsibility of the flight leader and the pilots-in-command of the other aircraft in the flight and shall include periods of transition when aircraft are manoeuvring to attain their own separation within the formation and during join-up and break-away; and
- c. a distance not exceeding 1 km (0.5 nm) laterally and longitudinally and 30m (100 ft) vertically from the flight leader shall be maintained by each aircraft.



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APPENDIX B2

DAMAGE ASSESMENT 9M-HCA

Aircraft Registration : 9M-HCA
Manufacturer : Guimbal
Serial Number : 1230
Occurrence Date and Day : 8th November 2020
Occurrence Time : Local Time 1130 Hrs
Last Known Position : Melawati
Accident Location Coordinate : 3°13'8" N 101°44'54" E

1. Structure

Initial damage assessment has been carried out based on the assumption of a hard landing. Reference to the MM Section B-64 HARD LANDING based of Guimbal Cabri G2 AMM J70-002, Issue 06, Dated 7th December 2018.

- I. Landing gear fuselage/attachment inspection carried out and found substantial cracks on the forward and aft lower fuselage. Damage has been inspected visually and found that the cracks on the forward lower fuselage protrude the cabin area and the ATC transponder antenna is bent. Damage found on the aft lower fuselage found that a hole has developed, and the fuel bladder could be seen from the hole.



Picture 1 shows the crack on the Right-hand side of lower fuselage looking from aft of the aircraft. Measurement of the crack spanwise is at 7 inches.



Picture 2 shows the measurement of the crack along the fuselage is at 8.7 inches.



Picture 3 show the extensive damage of the crack, view inside of the cabin on the Pilot side (Left-hand seat).



*Picture 4 shows the measurement of the crack view from inside of the cabin is measured more than 6 inches.
(Measurement taken show 7 inches).*



*Picture 5 shows the damage on the lower fuselage structure (top view).
The bent ATC transponder antenna could be seen on the lower left side of the picture.*



Picture 6 shows the two-damage front cross tube attachment bars of the aircraft.



Picture 7 shows the aft left-hand lower fuselage punctured found during inspection. The hole is measured roughly at 4 inches spanwise. Length including the crack spanwise is roughly at 8 inches.



Picture 8 shows crack on the fuselage adjacent to the punctured area. Measurement of the crack is roughly 3.5 inches. View is taken from the left-side of the fuselage. (Near to left engine cowl door latch).



Picture 9 shows the view from aft to forward of the aircraft. The circle shown the area where the fuel bladder cell is slightly visible from the outside.



Picture 10 shows the hole from the left-hand side of the fuselage body adjacent to the skid attachment.



Picture 11 shows the condition of the aircraft skid after the incident (the left-hand skid missing)



Picture 12 shows the damage on the Left-hand side forward cross tube on the landing gear.



Picture 13 shows the damage on the right-hand side of the forward cross tube attachment to the right-hand skid.

- II. Visual inspection on the engine mount attachment to the structure carried out and found no cracks on the engine mount and truss structure.
No sign of oil is found on the engine mount truss and its lower struts showing that the hermetically seal are still intact.
- III. Visual inspection on the tail boom attachment and structure carried out.
No sign of debonding, delamination, cracks and loose rivets found on the surface of the tail boom structure and the tail boom fittings rivets.
Tail boom attachment bolt torque seals are found still intact.
- IV. Visual inspection on the main gearbox attachment through the luggage compartment carried out and found all torque seals on the attachment bolt are still intact.
- V. Visual inspection on the tail boom upper fin root carried out and found no sign on main rotor blade strike on the fin
- VI. Visual inspection on the tail rotor shroud carried out and find no marks of blades contact around the shroud.
- VII. Visual inspection on the stinger carried out and found no deflection or damage on the stinger found.
- VIII. Visual inspection on the droop stops carried out and found no damage on the stops.
- IX. Visual inspection on the main rotor mast cap and mating blades forks edges carried out and found no marks of interference.
- X. Lead-lag Damper detailed inspection carried out and found no cracks or impact damage on all 3 of the damper body. All 3 dampers elastomeric are found still within the operable limit.
- XI. Visual inspection on all 3 main rotor blades carried out and found no damages and debonding on all 3 blades.

2. Interior

- i. Visual inspections on the insides of the cabin also has been carried out and found no cracks on the upper side of the cabin ceiling or on the aft wall.



Picture 14 shows the upper cabin ceiling of the cabin of the aircraft.

- ii. Visual inspection on the seats carried out and found that both seats upper seat slide is slightly flush with the slide rail.
- iii. Visual inspection on the instrument panels carried out and found no sign on external instrument damage without power ON.
- iv. Inspection performed on the flight control including collective, cyclic and pedal, found all the control move freely without have any sign of obstruction and rubbing.

3. Conclusion

- i. Furthermore, the pilot reported during the incident he felt severe vibrations on the aircraft. Both the main gearbox and the tail gearbox magnetic chip detector has been inspected and found no traces of chips or flakes.
- ii. Further action on regards of this damage assessment should be carried out. Recommend contacting the manufacturer (Guimbal) for further actions in regards of inspections or assessments to verify the status of the aircraft either is still repairable or to be written off.

Prepared by: Izwan Zain
Designation: LAE
Date: 24/11/2020

Verify by : Hairudeen Mat
Designation : Engineering Manager
Date : 24/11/2020

DAMAGE ASSESMENT 9M-HCB

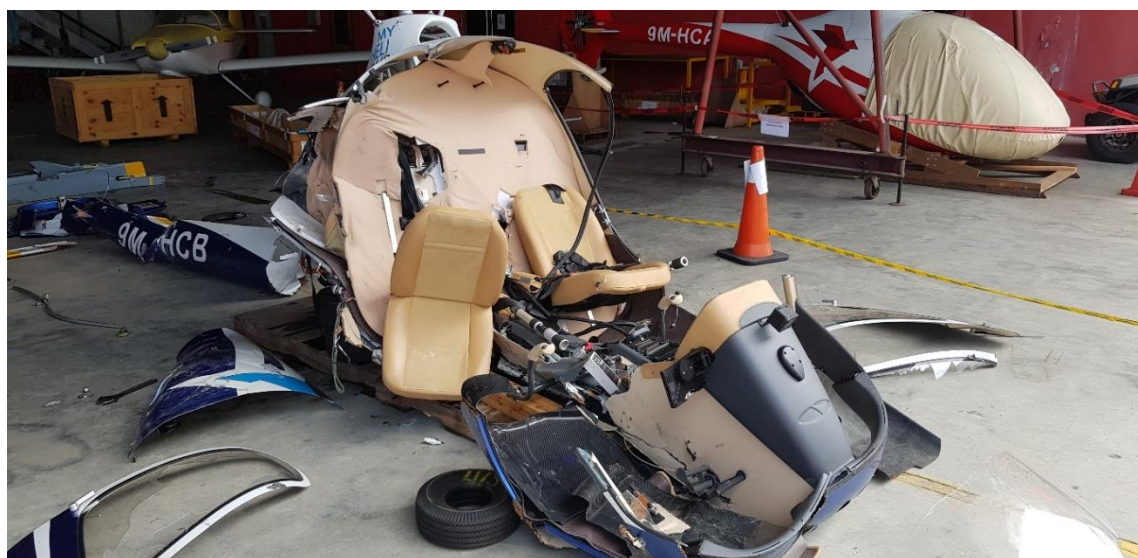
FINAL REPORT A 06/20
APPENDIX B3

Aircraft Registration : **9M-HCB**
Manufacturer : **Guimbal**
Serial Number : **1231**
Occurrence Date and Day : **8th November 2020**
Occurrence Time : **Local Time 1130 Hrs**
Last Known Position : **Melawati**
Accident Location Coordinate : **3°13'8" N 101°44'54" E**

1. Structure

This damage assessment has been carried out to assess the extensive damage of the aircraft. Most structural parts of the aircraft suffered substantial damage while the front section of the fuselage, landing gear and the tail section of the aircraft is mostly destroyed due to impact after hitting the ground.

FUSELAGE



Picture 1 shows the extensive damage of the front section of the fuselage. The windscreen and the doors of the aircraft were found detach at the crash site.



Picture 2 shows the portions of the windscreen and the forward left-hand side of the fuselage. Shown in the circle are the forward right-hand member of the front portion of the fuselage.



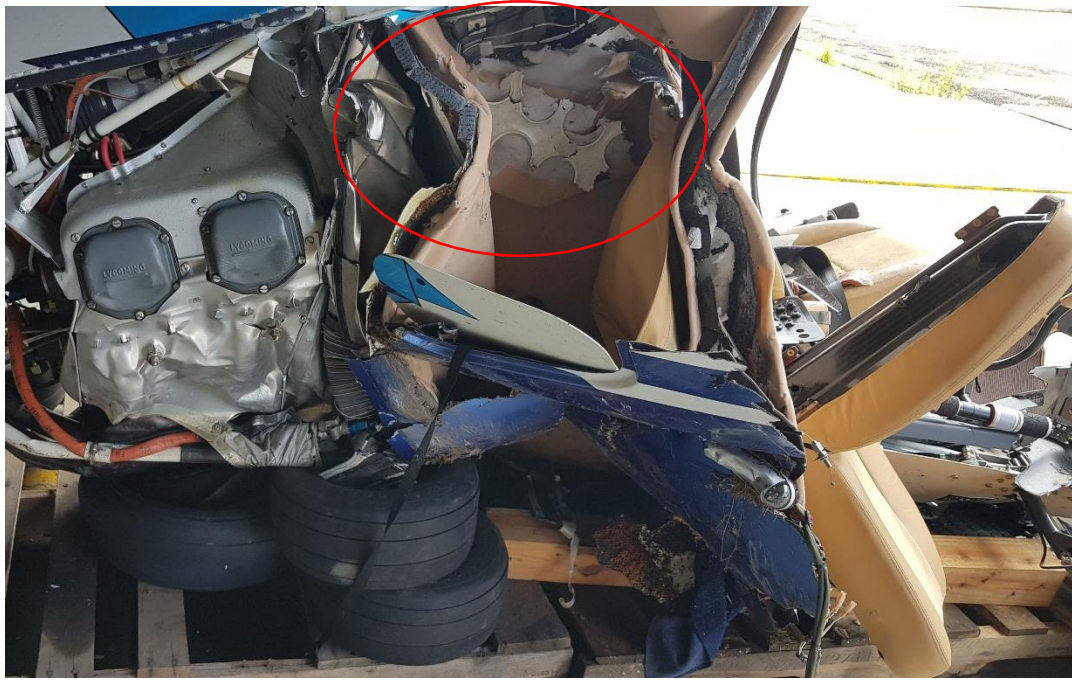
Picture 3 shows the right-hand side of the fuselage. The circle shown in the picture shows the substantial damaged to the airframe structure.



Picture 4 shows the pilot seat are mostly detach from the rails on the wall of the cabin. Can be seen in the picture also most of the right-hand side of the lower fuselage are destroyed due to the crash.



Picture 5 shows the right-hand side of the of aircraft fuselage. Most of the sections were destroyed due to the crash. Shown in the picture the right-hand engine cowling.



Picture 6 shows the right-hand side of the aircraft fuselage. The circle shown in the picture shows the damage luggage compartment of the aircraft. Some portion of the main gearbox could be seen also in this picture.



Picture 7 shows the broken wall section of luggage compartment. Can be seen in this picture the main gear box of the aircraft.



Picture 8 shows the right-hand side of the engine. Shown in the circle in this picture are the damaged lower engine baffled and the bent left-hand engine truss.



Picture 9 shows damaged right-hand side of the engine cowling.



Picture 10 shows the left-hand side of the aircraft fuselage. In comparison to the left side, most of the structural parts of the aircraft are still attached. Can be seen in this picture, the co-pilot seat is still attached to wall of the cabin.



Picture 11 shows the left side of the aircraft where the fuel bladder is positioned. Can be seen the fuel cap is still attached to the fuel bladder and has moved inwards into the fuselage. The fuel bladder is still intact, and no leak was found.



Picture 12 shows the left-hand side door with the left-hand side of the front member of the forward fuselage. These parts were found detached from the aircraft and were recovered at the crash site.



Picture 13 shows the front portion of the left-hand side of the aircraft. Can be seen in this picture the damaged center pedestal and detached pilot seat.



Picture 14 shows the left-hand side of the engine. Can be seen in this picture the damaged upper and lower baffles of the engine. Also, can be seen in this picture the point where the tail section believed to be broken off from the aircraft.



Picture 15 shows the aft engine firewall of the aircraft. Can be seen in this picture the tail attachments of the aircraft still attached to the truss structure.

TAIL SECTION



Picture 16 shows the tail section and the tail driveshaft of the aircraft. Most of the tail section are broken and were recovered at the crash site.



Picture 17 shows another angle of the broken tail section. Can be seen in this picture the broken right-hand side of the horizontal stabilizer.



Picture 18 shows the left-hand side of the tail boom. Can be seen in this picture most of the tail boom are broken to several pieces.



Picture 19 shows the broken horizontal stabilizer view from above.



Picture 20 shows the fenestron of the aircraft. Can be seen in this picture most of the fin structure was broken and were recovered at the crash site.



Picture 21 shows the broken lower fin of the tail section of the aircraft.



Picture 22 shows the tail gearbox of the aircraft. The tail gearbox was found detached from the aircraft were recovered at the crash site. Most of the engine oil have leak out upon recovering the gearbox.



Picture 23 shows broken section of the entire fin. The circle shown in the picture shows the sheared portion of the tail rotor driveshaft.



Picture 24 shows the broken pieces of the tail rotor driveshaft. Most of the driveshaft found evidence of torsional and shear damage. Can be seen also in this picture the hanger bearing that is detached from the aft engine firewall and were recovered at the crash site.



Picture 25 shows the damaged tail rotor cable. Half portion of the cable are found still attached to the fuselage of the aircraft. Can be seen also in this picture the damaged fin of the aircraft.

LANDING GEAR



*Picture 26 show the broken landing gear of the aircraft. Can be seen in this picture the landing gear are broken to 3 pieces.
All the broken pieces were recovered from the crash site.*



Picture 27 shows the broken piece of the right-hand skid assembly.



Picture 28 shows the aft bow of the landing gear assembly. Shown in the circle the rear bow attachment to the fuselage detached from the lower fuselage.



Picture 29 shows another angle of the rear bow landing gear attachment found detach from the lower fuselage.



Picture 30 shows the left-hand skid of the landing gear assembly. Shown in the picture the landing gear is bent and the rear bow is detached from the attachment to the skid.

MAIN ROTOR HEAD AND BLADE



Picture 31 shows the extensive damage to the main rotor head. Shown in this picture the upper scissors fittings rivets are sheared off from the rotor head. Can be seen also the droop stop ring were detached from the main rotor head. All of the pitch links and main rotor blades were removed for ease of transportation from the crash site.



Picture 32 shows the yellow main rotor blade of the aircraft. The blade suffered substantial damage to the leading edge of the blade and delamination. The lead-lag damper was found detached from its body.



Picture 33 shows the half portion of the yellow lead-lag damper that is found detached from the body.



Picture 34 shows the body of the yellow lead-lag damper still attached to the main rotor head.



Picture 35 shows the damage portion of the leading edge of the yellow main rotor blade.



Picture 36 shows the green main rotor blade of the aircraft. Substantial damage on the blade could be seen in this picture



Picture 37 shows the broken portion of the trailing edge of the green main rotor blade.



Picture 38 shows the broken piece of the upper section of the green main rotor blade. Some portion of the trailing edge also can be seen missing from the blade.



Picture 39 shows the damaged blade root of the red main rotor blade. The rotor blade was found partially attached at the crash site.



Picture 40 shows the damaged leading and trailing edge of the red main rotor blade.



Picture 41 shows the damaged tip of the red main rotor blade. Can be seen in this picture also missing portion on the trailing edge of the blade.

2. Conclusion

Based on this assessment, most of the damage found on the aircraft structure and parts are substantial and some are damaged beyond repaired. It can be concluded that the aircraft should be written off.

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Date: 25/11/2020

Verify by : Hairudeen Mat

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Date : 25/11/2020