



**AIRCRAFT ACCIDENT
PRELIMINARY REPORT**

A 03/24

**Air Accident Investigation Bureau (AAIB)
Ministry of Transport Malaysia**

**Accident Involving Fixed-Wing Aircraft Blackshape BK 160TR,
Registration I-POOC, at Kapar, Selangor
on 13 February 2024**



Air Accident Investigation Bureau
Ministry of Transport
No.26, Jalan Tun Hussein, Precinct 4
Federal Government Administrative Centre
62100 PUTRAJAYA
Phone: +603-8892 1072
Fax: +603-8888 0163
E-mail: AAIB@mot.gov.my
Website: <http://www.mot.gov.my/en>

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AIR ACCIDENT INVESTIGATION BUREAU (AAIB) MALAYSIA

PRELIMINARY REPORT NO: A 03/24

OPERATOR : AVIATION SAFETY TECHNOLOGY PTE LTD,
SINGAPORE

AIRCRAFT TYPE : BLACKSHAPE BK 160TR

STATE OF REGISTRATION : ITALY

REGISTRATION : I-POOC

PLACE OF OCCURRENCE : KAPAR, SELANGOR

DATE AND TIME : 13 FEBRUARY 2024 AT 1336 LT (0536 UTC)

This preliminary report contains statement of facts which have been determined up to the time of issue only. It must be regarded as tentative, and is subject to alteration or correction if additional evidence becomes available.

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

INTRODUCTION

The Air Accident Investigation Bureau of Malaysia

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

The AAIB also conducts investigation into incidents when the occurrence shows evidence to have safety concerns.

The AAIB conducts investigations in accordance with the Annex 13 to the Chicago Convention and Civil Aviation Regulations of Malaysia 2016. The AAIB adheres to the International Civil Aviation Organisation's (ICAO's) stated objective, which is as follows:

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

Accordingly, 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.

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AIRCRAFT ACCIDENT REPORT

Aircraft Type : BLACKSHAPE BS 115
Model : BK 160TR
Owner : BLACKSHAPE S.P.A.
Nationality : ITALY
Year of Manufacture : 2022
Aircraft Registration : I-POOC
Serial Number : BCV.21010
State of Registration : ITALY
Place and State of Occurrence : KAMPUNG TOK MUDA, KAPAR, SELANGOR
MALAYSIA
Date and Time of Occurrence : 13 FEBRUARY 2024 at 1336 LT (0536 UTC)

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

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GLOSSARY OF ABBREVIATIONS

A

AAIB	Air Accident Investigation Bureau
AAFC	Air Adventure Flying Club
Accrep	Accredited Representative
ANSV	<i>Agenzia Nazionale per la Sicurezza del Volo</i> (National Agency for the Safety of Flight) (Italy)
ARC	Airworthiness Review Certificate
AST	Aviation Safety Technology Pte Ltd (Singapore)
ATC	Air Traffic Control

C

CAAM	Civil Aviation Authority Malaysia
CFRP	Carbon Fibre Reinforced Epoxy
CO	Carbon Monoxide
CoA	Certificate of Airworthiness
CPL (A)	Commercial Pilot Licence (Aeroplane)

D

DETRESFA	Distress Phase (ICAO emergency phase)
DGAC	<i>Direction Générale de l'Aviation Civile</i> (Directorate General of Civil Aviation) (France)

E

EASA	European Union Aviation Safety Agency
ENAC	<i>Ente Nazionale per l'Aviazione Civile</i> (Italian Civil Aviation Authority)
EFIS	Electronic Flight Instrument System

F

ft	feet
FI (A)	Flight Instructor (Aeroplane)
FIS N	Flight Information Service North
FWD	forward

I

IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IR	Instrument Rating
IR/SE	Instrument Rating/Single-Engine

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J

JBPM *Jabatan Bomba Dan Penyelamat Malaysia*
(Fire and Rescue Department of Malaysia)

K

kg kilogramme

L

LG landing gear

LH Left-Hand

LT Local Time

M

m metre

METAR Meteorological Aerodrome Report

MLG Main Landing Gear

mm millimetre

Max. Maximum

MAC Mean Aerodynamic Chord

MEP Land Multi-Engine Piston Aeroplane

MOR Mandatory Occurrence Report

N

NLG Nose Landing Gear

NOSAS Non-Scheduled Application System (CAAM)

NTSB National Transportation Safety Board (United States of America)

O

OEM Original Equipment Manufacturer

P

POB persons on board

P/N Part Number

ppm parts per million

PPL Private Pilot License

R

RH Right-Hand

RWD rear

S

SEP Land Single-Engine Piston Aeroplane

S/N Serial Number

S.p.A. *Società per Azioni* (Joint-Share Company) (Italian)

SZB Sultan Abdul Aziz Shah Airport, Subang (IATA Designator)

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T

TA Technical Advisor

U

UTC Coordinated Universal Time

W

WMSA Sultan Abdul Aziz Shah Airport, Subang

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SYNOPSIS

On 13 February 2024, at approximately 1328 LT, a Blackshape Gabriél BK 160TR (bearing the registration mark of I-POOC), with the call sign ADV429 and operated by Aviation Safety Technology Pte Ltd (AST) Singapore, departed the Sultan Abdul Aziz Shah Airport (WMSA), Subang, Selangor, Malaysia to the West of Kapar area for a leisure/recreational flight. At about 1336 LT, ADV429 crashed into a small-holding oil palm plantation located at the village of Kampung Tok Muda near Kapar, Selangor. The aircraft was found destroyed, and the two (2) occupants of the aircraft were fatally injured.

A Mandatory Occurrence Report (MOR) was submitted by AST, the operator of the aircraft, to the Air Accident Investigation Bureau, Malaysia (AAIB) as notification of the accident. The Civil Aviation Authority of Malaysia (CAAM) also submitted a MOR to notify the AAIB of the accident

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1.0 FACTUAL INFORMATION

1.1 History of the Flight

At approximately 1300 LT, ADV429 filed a flight plan to depart WMSA to the West of Kapar area for about an hour of leisure/recreational flight before returning to WMSA. The aircraft had two (2) persons on board (POB) and a reported 3.5 hours of flight endurance. Prior to this ADV429 flight, the two POB, who was the pilot and passenger, had flown together earlier in the morning of the same day for three (3) flights on the Piper PA28 aircraft under the call sign of ADV891. The pilot was a flight instructor at the Air Adventure Flying Club (AAFC), while the passenger was a student pilot (whose call sign was ADV891) undergoing flight training instruction by the pilot/flight instructor. The third and final ADV891 flight of the day landed at WMSA at 1152 LT.

ADV429, with the pilot and passenger, departed WMSA at 1328 LT. The aircraft was cleared to take off on Runway 15, and then to turn right to altitude of 1500 feet. At 1335 LT, ADV429 reported to Flight Information Service North (FIS N), the air traffic service unit for the area, that the aircraft was established at the West of Kapar area operating at 1500 feet and below. That was the last radio transmission from ADV429. There was no distress call from the aircraft. At 1357 LT, the WMSA aerodrome air traffic controller, Subang Tower, was informed by the Fire and Rescue Department of Malaysia (JBPM) that an aircraft had crashed at Kapar. FIS N was then informed by Subang Tower of the JPBM report. Subsequent attempts to contact ADV429 by FIS N were unsuccessful. At 1411 LT, DETRESFA was declared by FIS N.

ADV429 was found destroyed, with the main aircraft wreckage located at a small-holding oil palm plantation located at the Kampung Tok Muda, Kapar (3° 07' 56.9"N 101° 20' 18.7"E). Both the pilot and passenger were fatally injured.

The flight path and profile of ADV429 are recreated using ADS-B data¹ and Air Traffic Control (ATC) radar data², as illustrated in Figure 1.1.

¹ Source: ADB-B WMSA and ADS-B Flightradar 24.

² Source: Kuala Lumpur Air Traffic Control Centre (KLATCC) fused radar data (CAT 062).

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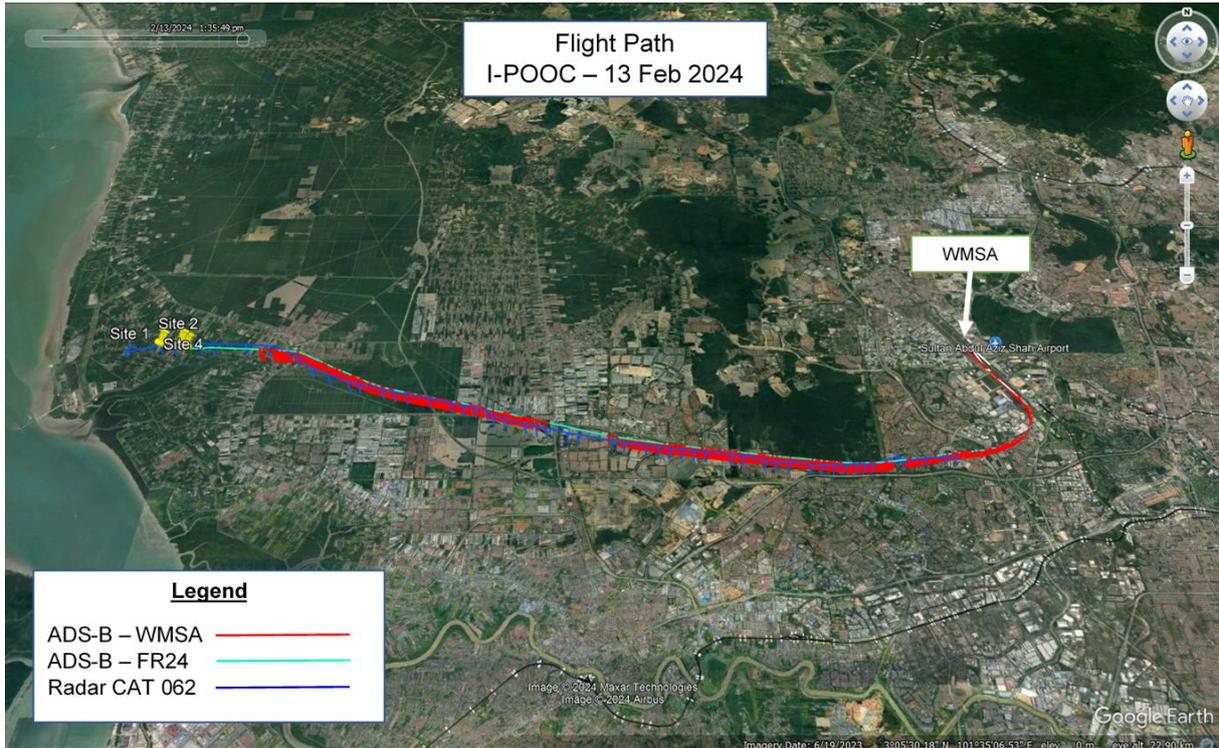


Figure 1.1: ADV429 Flight Path

Figures 1.2 dan 1.3 illustrate the final phase of the flight with locations of where the wreckage and debris were found.

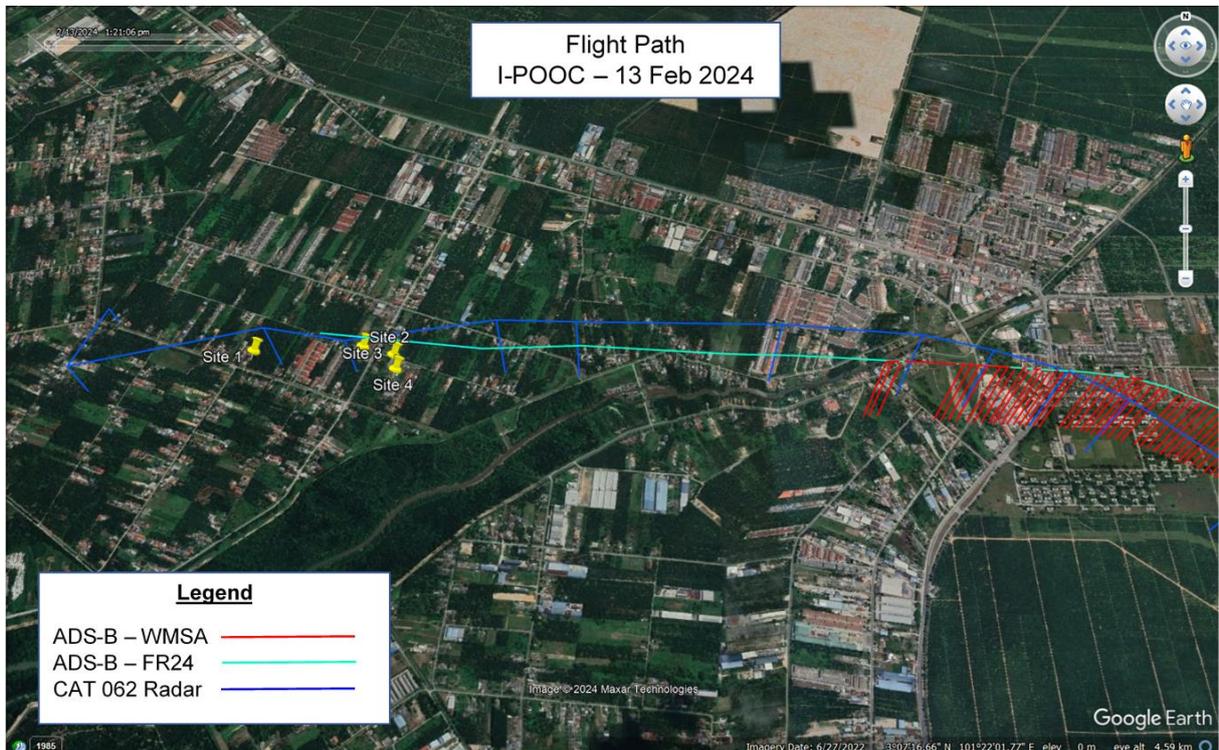


Figure 1.2: Final Phase of Flight and Wreckage/Debris Locations

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Figure 1.3: Wreckage and Debris Locations

Figures 1.4 to 1.7 show the sites of the wreckage and debris. Site 1 is the location of the main wreckage, along with the bodies of the pilot and passenger. Sites 2 to 4 are in an area of about 250 to 300 metres in diameter where various aircraft debris were scattered. Before the arrival of investigators, most of the scattered debris were found by local villagers who had then pooled the collection, particularly at Site 3. Site 2, the nearest of the three sites to the main wreckage, is about 560 metres to east of Site 1.



Figure 1.4: Site 1

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Site 2. Next to House Kitchen – Right Wing – 3°07'57.8"N 101°20'36.8"E



Figure 1.5: Site 2

Site 3. Uninhabited House – Various Debris & Cap – 3°07'56.1"N 101°20'42.1"E



Figure 1.6: Site 3

Site 4. Front of House – Wing Parts – 3°07'53.3"N 101°20'42.7"E



Figure 1.7: Site 4

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Figures 1.8 to 1.10 respectively illustrate the aircraft altitude, ground speed and heading during the flight. The charts are plotted using data from ADS-B and ATC radar.

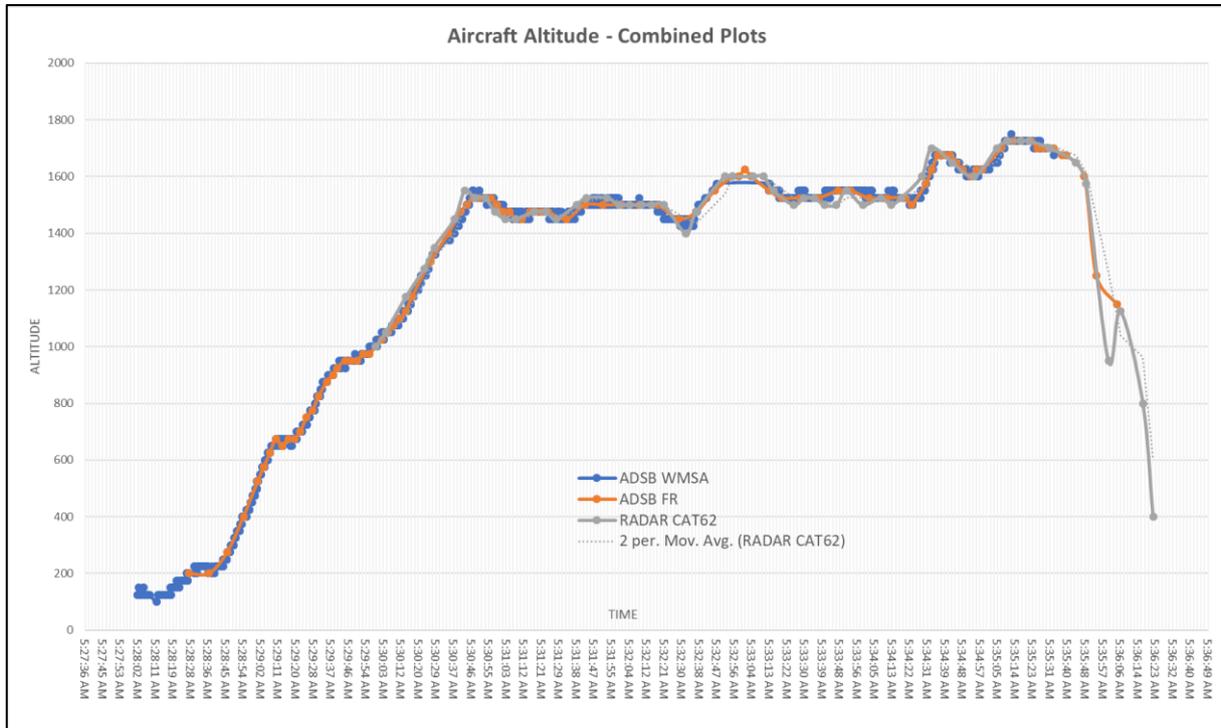


Figure 1.8: Aircraft Altitude

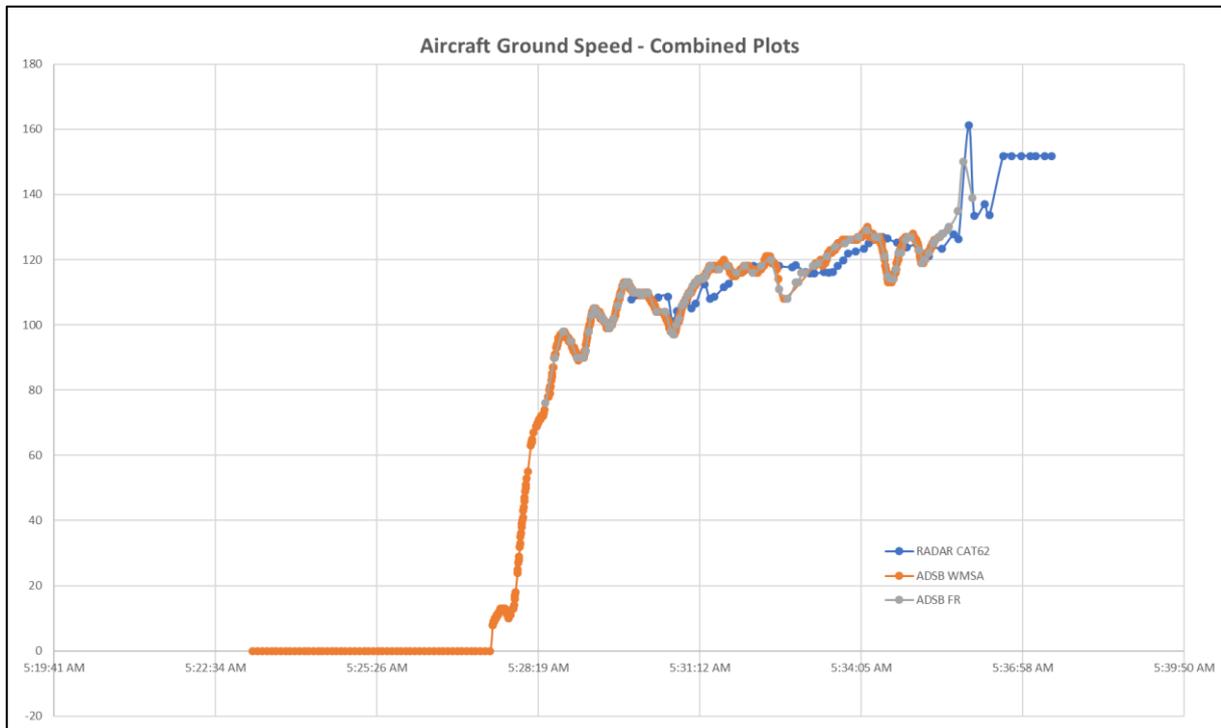


Figure 1.9: Aircraft Ground Speed

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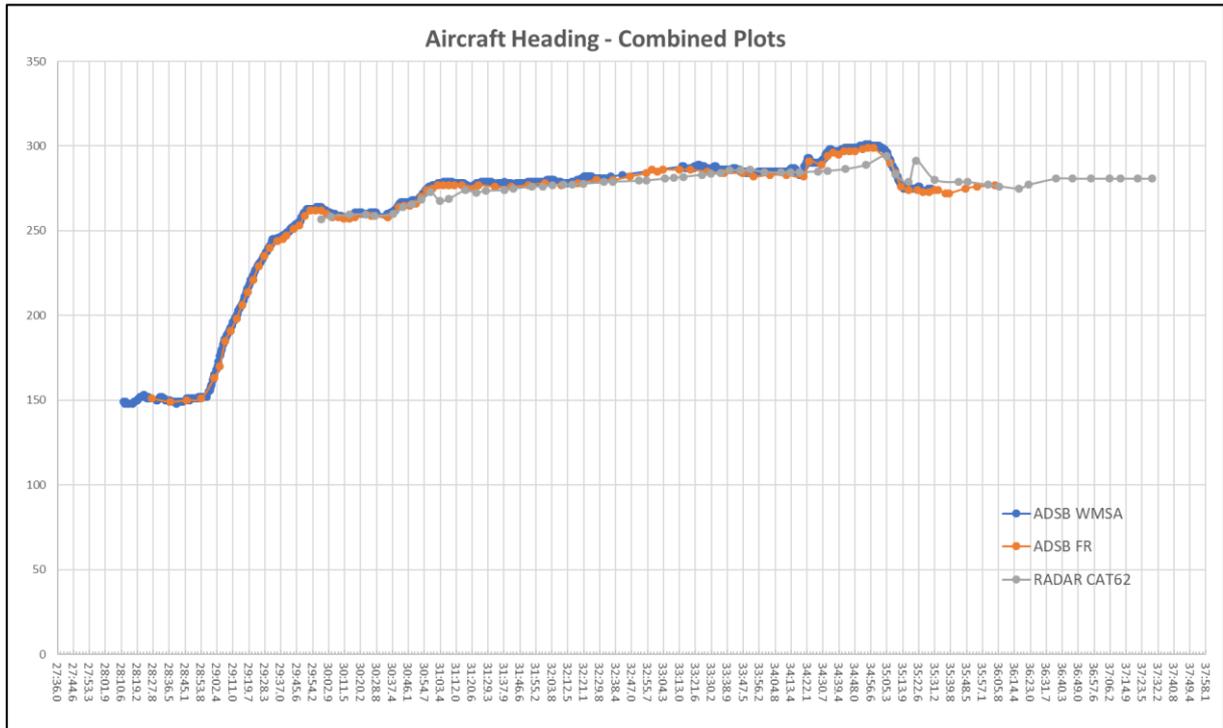


Figure 1.10: Aircraft Heading

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	1	1	-	2
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	1	1	-	2

Table 1.1: Injuries to Persons

1.3 Damage to Aircraft

The airplane was destroyed. Preliminary damage assessment of the recovered aircraft components and systems is provided in paragraph 1.12.3.

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1.4 Other Damage

There was minor damage to the oil palm plantation (i.e. damaged oil palm trees) where the main wreckage impacted ground. Otherwise, there was no notable damage to public or private property due to the aircraft crash, and neither was there any significant damage to the environment.

1.5 Personnel Information

1.5.1 Pilot

Nationality	Malaysian	
Age	30	
Gender	Male	
License Type	CPL (A) by DGAC France Issued on 2 February 2021	
Medical Certificate	Class 1 Issued on 3 May 2023 Expires on 31 May 2024	
Aircraft Ratings	MEP Land (Including IR) valid until 30 November 2023 SEP Land valid until 30 November 2024 IR/SE valid until 30 November 2023	
Instructor Rating	FI (A) valid until 30 November 2024	
Flying Hours	Total Hours	1725.4 hours
	Total on Type (BK 160TR)	60.2 hours
	Last 24 Hours	6.5 hours
	Last 7 Days	34.0 hours
	Last 90 Days	212.3 hours

Table 1.2: Personnel Information – Pilot

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At the time of the accident, the pilot possessed a valid CPL (A)³ license and SEP Land⁴ rating. The pilot was appropriately endorsed by the test pilot of the BK 160TR from Blackshape S.p.A, the manufacturer of the aircraft, to operate the BK 160TR. So, he was properly licensed and qualified to operate the BK 160TR.

The pilot also had a valid FI (A)⁵ rating and was qualified to perform flight instruction on the Piper PA28 and Cessna 172 aircraft. However, he was not certified to instruct on the BK 160TR.

1.5.2 Passenger

The 42-year old passenger was a student pilot undergoing training for the Private Pilot Licence (PPL) at the Air Adventure Flying Club (AAFC). He had flown three (3) flights with his assigned flight instructor, the pilot of ADV429, on the same morning of, and just prior to, the accident flight – which was two (2) dual flights and one (1) solo flight under the passenger’s personal AAFC call sign ADV891. The late pilot of ADV429 was the sole flight instructor of the passenger at AAFC. The passenger had clocked a total of 27.6 hours on the Piper PA28 aircraft. As far as can be ascertained, the passenger had never flown on the BK 160TR before the accident flight.

1.6 Aircraft Information

1.6.1 Aircraft General Information

The BK 160TR aircraft (S/N BCV.21010) was a manufactured in Italy by Blackshape S.p.A. and was registered in Italy with the I-POOC registration mark on 2 August 2022 (refer to Appendix A). The aircraft was exported and shipped to Singapore in October 2022. It was later transferred from Singapore to Malaysia in July 2023.

In addition to flights in Singapore and Malaysia, the I-POOC aircraft had also flown long distance trips with multiple stops to Myanmar and Thailand, as well as an aborted

³ CPL (A) - Commercial Pilot License (Aeroplane).

⁴ SEP Land - Single-Engine Piston Aeroplanes.

⁵ FI (A) - Flight Instructor (Aeroplane).

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trip to the Philippines (the aircraft returned to Kuala Lumpur after encountering a fuel transfer indication system issue while in-flight in Indonesian airspace). The aircraft was planned to participate in the Singapore Airshow 2024 in February 2024. The aircraft had logged approximately a total of 85.5 hours before the accident flight.

Aircraft Type / Model	Blackshape BS 115 / BK 160TR
Manufacturer	Blackshape S.p.A.
Year of Manufacture	2022
EASA Type Certification	14 June 2022
Owner	Blackshape S.p.A.
Certificate of Registration	Issued on 2 August 2022
Registration Number	I-POOC
Aircraft Serial Number	BCV.21010
Certificate of Airworthiness	Issued on 26 August 2022
Airworthiness Review Certificate	Issued on 18 October 2023 Expires on 18 October 2024
Total Flight Hours	85.5 hours

Table 1.3: Aircraft General Information

1.6.2 General Technical Data and Operational Limitations

The BK 160TR is a single-engine low wing monoplane, with a tandem two-seater configuration. The aircraft is equipped with retractable landing gear and a variable pitch constant speed propeller driven by a 160 shp Lycoming IO-320 engine. The airframe is made from composite material, Carbon Fibre Reinforced Epoxy (CFRP).

Aircraft Dimensions	Span:	9.000 m (29.53 ft)
	Length:	7.437 m (24.40 ft)
	Height:	2.455 m (8.05 ft)
	Wing Area:	10.31 m ² (111.00 ft ²)

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Load Factors	Flap UP	Flap DOWN
	Max positive: +4.4 Max negative: -2.0	Max positive: +2.0 Max negative: 0
Air Speeds	Never Exceed Speed V_{NE} : 172 KCAS Max. Structural Cruising Speed V_{NO} : 148 KCAS Operating Manoeuvring Speed V_A : 122 KCAS	
Air Speeds	Max. speed with landing gear extended: V_{LE} : 110 KCAS Max. speed for landing gear operation V_{LO} : 110 KCAS Max. speed with flaps fully deployed V_{FE} : 100 KCAS	
Maximum Operating Altitude	11,500 ft – Density Altitude	
Maximum Masses	Max. Take-off: 850 kg (1874 lbs) Max. Landing: 850 kg (1874 lbs)	
Centre of Gravity Range	23% MAC – 28.5% MAC at 850 Kg 19% MAC – 28.5% MAC at 800 Kg	
Mean Aerodynamic Chord	1360.26 mm (4,46 ft)	
Datum	800 mm aft of composite bulkhead. 165 mm up from airplane fuselage centreline.	
Minimum Flight Crew	1 pilot seated at the front seat	
Maximum Passenger Seating Capacity	1	
Baggage/Cargo Compartment	33 kg capacity, 2.5 m aft of datum	

Table 1.4: General Technical Data and Operational Limitations

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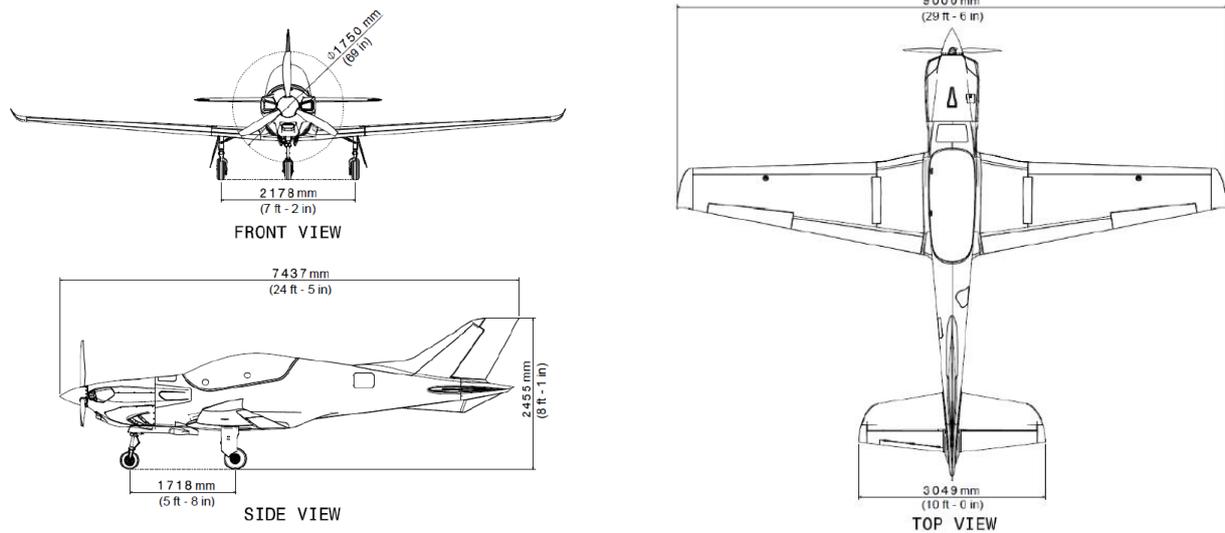


Figure 1.11: Aircraft Dimensions

1.6.3 Aircraft Airworthiness

The aircraft was issued a Certificate of Airworthiness (CoA) by the Italian Civil Aviation Authority (ENAC) on 26 August 2022. The CoA is attached with an Airworthiness Review Certificate (ARC) that was issued on 18 October 2023 and it is valid until 18 October 2024 (refer to Appendix B). As such, the aircraft had valid airworthiness certification at the time of the accident.

1.6.4 Aircraft Grounding Instruction

On 25 October 2023, Blackshape S.p.A. informed the European Union Aviation Safety Agency (EASA) about an occurrence to the fuel selector indication system of the BK 160TR aircraft (registration I-POOC) of which the owner is Blackshape. Blackshape informed that considering that, only one BK160TR had been delivered at the time and the owner of the particular aircraft (I-POOC) was Blackshape themselves, the aircraft was to be grounded while waiting for the root cause of the fuel selector indication system issue to be identified and actions taken to resolve the issue.

There was another aircraft grounding instruction issued by Blackshape earlier on 27 May 2023. The apparent reason for this aircraft grounding instruction was the issue

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concerning the transfer of ownership and registration of the aircraft to the purchaser of the aircraft, which was Sky Media Ltd, Hong Kong. Whether this aircraft grounding instruction issued on 27 May 2023, as well as the later instruction on 25 October 2023, were properly communicated to and clearly understood by all the relevant parties, shall be determined with the availability of further relevant evidence and will be discussed in Section 2 below.

However Irrespective of whether the grounding instructions were communicated and understood clearly by the relevant parties, it can be ascertained with available evidence that the BK 160TR (I-POOC) had continued to be flown during the period when the aircraft was supposed to be grounded. The circumstances on why the aircraft had continued to be operated despite the grounding orders, and the consequent impact on the aircraft airworthiness status, will be determined as further evidence are made available and shall be discussed in Section 2.

The CAAM was not aware of the issuance of any aircraft grounding instruction that may have jeopardised the airworthiness status of the BK 160TR (I-POOC) during the time the aircraft operated in Malaysia.

1.6.5 Irregular Maintenance Activities

There is evidence indicating that irregular maintenance activities had been performed on the BK 160TR (I-POOC). These irregular maintenance activities include installation of uncertified/non-conforming aircraft parts, as well as installation of aircraft parts and aircraft servicing by unauthorised maintenance organisation or persons who were not properly qualified to carry out the maintenance activities. The irregular maintenance activities that are determined up to the time of the issuance of this report are as follows:

- Removal of the aircraft's nose landing gear (NLG) and installation of a new NLG in February 2024 by unauthorised maintenance personnel or persons who were not appropriately qualified. Installation of the new NLG was completed just prior to the accident flight on 13 February 2024. The apparent purpose of the accident flight was to test the newly installed NLG.



Figure 1.12: Old NLG Found at AAFC Hangar (Left) and Newly Installed NLG on Wreckage (Right)

- Installation of a non-certified 'tie-down ring' part on the underside of each of the aircraft's wing near the main landing gear wheel well. The parts were installed through the composite material skin of the wing and were bolted onto the joint of the wing fitting with the main spar. Witness testimony indicates that the installation of these non-certified parts was completed by the pilot on 23 November 2023.

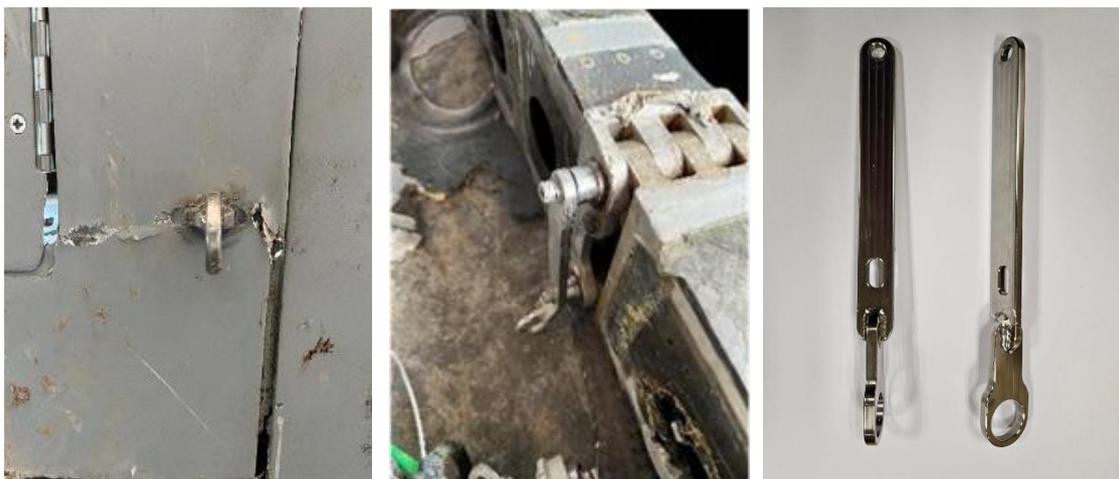


Figure 1.13: Tie-Down Ring Underside of Wing (Left); Tie-Down Ring Bolted to the Wing Joint (Centre); Two New Similar Parts Found at Pilot's Locker at AAFC (Right)

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- Routine maintenance activities had been performed on the aircraft by unauthorised and unqualified maintenance personnel, i.e. replacement of sparks plugs and air filter element as well as other servicing works that were conducted at the end of November 2023. There is high likelihood that there were other irregular maintenance works, based on the entries in the maintenance log kept by the late pilot.

The investigation report on the maintenance practices of this aircraft will be updated as further evidence are being made available. The analysis on the impact of irregular maintenance activities on the cause of the accident shall be discussed in Section 2.

1.6.6 Exceeding Weight Limitation

There is evidence that the BK 160TR (i-POOC) had exceeded the maximum take-off weight of the aircraft, which is 850 kg, during the accident flight on 13 February 2024.

The approximate take-off weight of the aircraft on that day is as follows:

Aircraft (S/N BCV,21010) Empty Weight ⁶	653.4 kg	Max. Take-off Weight Max. Landing Weight
Aircraft Fuel Upload – 129 litres ⁷	92.9 kg	
Pilot's Weight ⁸	87 kg	
Passenger's Weight ⁹	92 kg	
Minus Nominal Start-Up and Taxy Fuel	– 4 kg	
TOTAL (Take- Off Weight)	921.3 kg	850 kg

Table 1. 5: Aircraft Weight Calculation

Presuming that there was no luggage taken onboard, and no significant change to the weight of either the pilot or passenger since the time that their weights were recorded

⁶ As recorded in the aircraft (S/N BCV.21010) weighing form by Blackshape dated 12 July 2022.

⁷ Aircraft was fully fuelled based on witness account. Weight of fuel calculated using SG = 0,72.

⁸ Based on medical examination record, weight reading taken on 3 May 2023.

⁹ Based on medical examination record, weight reading taken on 5 July 2023.

(there is no evidence to suggest so), the aircraft's actual total weight had exceeded the maximum take-off weight limitation by approximately 8.4% for the accident flight.

The BK 160TR is a relatively weight sensitive aircraft, and based on evidence, there is high probability that there were other flights flown by the late pilot previously that had also exceeded the limitation of the aircraft operating weight. The probable flights that might have exceeded weight limitation are the long sectors flown during the overseas trips to Myanmar, the Philippines and Thailand that had two (2) POB and heavy fuel loads. There may also be other local flights that had exceeded weight limitation (2 POB and heavy fuel loads), just like the flight on 13 February 2024.

Further evidence is being gathered to determine the number of such occurrences. The analysis on the impact of multiple occasions of exceeding the aircraft weight limitation on the cause of the accident shall be discussed in Section 2.

1.6.7. Carbon Monoxide (CO) Contamination

The pilot had reported to Blackshape that the aircraft Master Caution and CO Master Caution on the Garmin G3X flight display had come on in-flight occasionally. The CO indicator strip in the front cockpit was also reported by the pilot to be partially black. These occurrences indicate the possibility of high levels of CO in the cockpit. The pilot had jury-rigged two (2) portable CO detectors, one each in the front and rear of the cockpit, to measure CO levels.¹⁰ He reported that CO levels had reached the peak of 285 ppm during the aircraft climb phase and 45 ppm during the cruise phase.¹¹

The accident flight on 13 February 2024 lasted about eight (8) minutes, and the aircraft had short climb to and then cruised at 1500 feet. While both the climb phase duration and flight duration were relatively short, the possibility of CO poisoning of the pilot and passenger shall still be examined in Section 1.13 and Section 2 (if necessary) when the post-mortem and toxicology reports are made available.

¹⁰ Both the CO detectors were recovered from the wreckage. Both units were damaged and no data could be read or recovered.

¹¹ The high level of CO apparently persisted even after the Blackshape Service Bulletin No BK-2023-08 dated 16/10/2023 for 'Improvement of Sealing of the Pass-Through in the Forward Cabin' was performed on I-POOC aircraft in October 2023.



Figure 1.14: Jury-Rigged Portable CO Detector

1.7 Meteorological Information

The accident happened in day time. The weather at WMSA at 1300 LT was fine, with visibility reported to be more than 10 kilometres, and wind was variable at 4 knots. At 1400 LT, wind at WMSA was reported to be gusting up to 20 knots varying from 340° to 150°. The following METARs were active:

(130500Z VRB04KT 9999 FEW018 33/21 Q1013)

(130600Z 06007G20KT 340V150 9999 FEW018 34/22 Q1012)

Detailed weather data is being gathered, specifically local meteorological conditions around the Kapar area at the time of the accident, to determine whether any weather factors might have affected the ADV429 flight.

1.8 Aids to Navigation

Navigation aids in the area were operating normally.

1.9 Communications

All ATC communication frequencies were operating normally.

1.10 Aerodrome Information

Airfield	Sultan Abdul Aziz Shah Airport, Subang (WMSA)
Runway	15 / 33
Length	3782 m
Width	45 m
ICAO Designator	WMSA
IATA Designator	SZB
Elevation	21.5 m

Table 1.6: WMSA Aerodrome Information

1.11 Flight Recorders

The aircraft was not equipped with any flight data recorders.

However, this aircraft was equipped with two Garmin G3X GDU 460 primary flight displays, one each at the front and rear cabins of the aircraft. There have been past successful attempts by air accident investigation laboratories abroad in extracting parametric data recorded on similar accident damaged devices.

One of the Garmin G3X primary flight displays of I-POOC aircraft was recovered in heavily damaged condition from the aircraft wreckage. The damaged unit is being dispatched to the National Transportation Safety Board, USA (NTSB), who has offered to assist in recovering data from the unit. The details of the recovered flight display are as follows:

- Device: Garmin G3X Flight Display
- Model: GDU 460
- Part No.: 011-02920-05
- Serial No. 350008350



Figure 1.15: Damaged Garmin G3X GDU 460

1.12 Wreckage and Impact Information

1.12.1 In-Flight Separation of Aircraft Structural Parts

Section 1.1 above provided the illustration of the general area (Figures 1.2 and 1,3) and the geographical locations and illustrations of the sites where the main aircraft wreckage and debris were found (Figures 1.4 to 1.7). Site 1 is where the main wreckage and the bodies of the late pilot and passenger were located. Sites 2 to 4 are where various aircraft debris were found. These various aircraft debris include large structural parts of the aircraft that were found scattered over an area of at least 500 meters away to the east of the impact point of the main wreckage. Notably, among the debris found at or near Site 3 were fragments of the cockpit canopy of various sizes and the passenger's baseball cap, suggesting that the canopy had broken up in-flight before the aircraft impacted ground at Site 1.

The distribution of the debris around the area at Sites 2, 3 and 4 strongly suggests that large structural parts had separated from the aircraft while in-flight before ground impact at the oil palm plantation. There was no sign of any pre-crash or post-crash fire on any of the debris found at all the sites.

The following figure shows the structural parts that were separated in-flight (smaller debris distribution is not shown in this illustration):

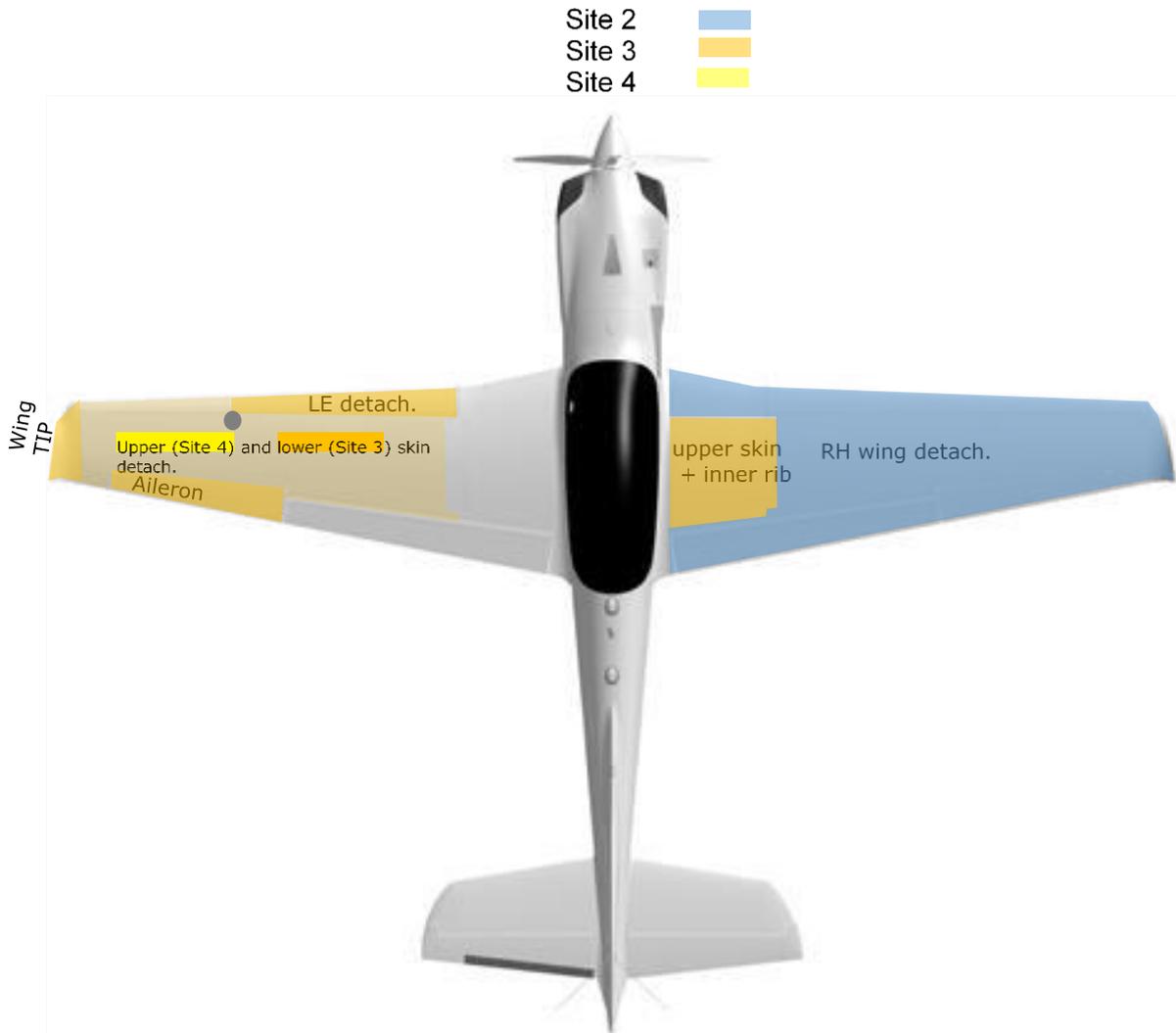


Figure 1.16: Structural Parts Recovered from Various Sites Vs Main Wreckage¹²

1.12.2 Impact Point of Main Wreckage

The front portion of the main aircraft wreckage, including the engine and front part of the cockpit, was buried about two (2) metres in the relatively soft ground of the oil palm plantation. The back section of the fuselage with the aircraft tail and vertical stabiliser remained above the ground. Numerous wreckage debris and aircraft parts were scattered around the impact point, but not more than 50 metres away, approximately. There was no sign of any pre-crash or post-crash fire on any of the wreckage found at and around the impact point.

¹² Smaller debris, including canopy fragments found in Site 3, are not shown. LH aileron detached was from the hinges. The aileron connecting rod was detached from the bellcrank. RH inner upper skin was detached together with the inner rib. RH wing was detached at the front and rear spar.



Figure 1.17: Impact Point of Main Wreckage

Based on the direction of partially buried fuselage, ground markings to the wreckage and freshly broken branches at the top of an adjacent palm tree, the aircraft impacted ground at an approximate direction of 292° . Based on the vertical angle from the impact point on the ground to the top of the broken branches of the adjacent palm tree, the aircraft had impacted ground at an approximately 45° downwards trajectory.



Figure 1.18: Impact Point of Main Wreckage and Travel Direction of Aircraft Impacting Ground



Figure 1.19: Broken Palm Branches (Left)
and Aircraft Downwards Trajectory (Right)

1.12.3 Preliminary Aircraft Damage Assessment

A preliminary damage assessment on the I-POOC aircraft was conducted following the accident. The damage assessment was performed with the assistance provided by the Accredited Representative (Accrep) from the National Agency for the Safety of Flight, Italy (ANSV) and his team of three Technical Advisers (TA) from Blackshape S.p.A., Italy. The team was dispatched from Italy to Kuala Lumpur, Malaysia to provide technical assistance to the investigation of the accident. The report on the preliminary damage assessment is provided in Appendix C.

1.13 Medical and Pathological Information

Two victims were fatally injured in this accident – the pilot in the front seat and the passenger in the rear seat. Evidence indicates that the pilot was psychologically and physically well prior to the flight. There is no evidence to indicate that the victims were in any form of financial, social, family, and emotional distress.

1,13.1 Cause of Death

Pending results in the post-mortem report.

1.13.2 Toxicology Information

Pending results in the post-mortem report.

1.13.3 Medical Fitness Status of Pilot

The pilot had a valid Class One Medical Certificate issued by the Directorate General of Civil Aviation, France (DGAC) with a limitation “VDL – Valid only with correction for defective distant vision” at the time of the accident. Concurrently, he held a CAAM Class One Medical Certificate with VDL. Review of the medical documentation indicated that the pilot had no significant medical concerns, and the attending Designated Medical Examiner identified no significant conditions on physical examination. Based on available history and physical examinations, this pilot had no known medical conditions that could pose significant hazards to flight safety.

The passenger in the rear seat had a valid Class Two Medical Certificate issued by the CAAM without limitation. Review of the medical documentation indicated that the passenger had no significant medical concerns, and the attending Designated Medical Examiner identified no significant conditions on physical examination. Based on available history and physical examinations, this passenger had no known medical conditions that could pose significant hazards to flight safety.

1.14 Fire

There was no indication of pre-crash or post-crash fire.

1.15 Survival Aspects

There were no survivors in this catastrophic accident.

1.15.1 Analysis of Aircraft Crashworthiness and Post-Crash Survivability

Crash survivability and human tolerance to impact were analysed using the reference tool C.R.E.E.P (Container, Restrain, Environment, Energy Absorption, Post-crash factors). Assessment of the factors below are used to determine causes of injuries and survivability of the occupants of the aircraft.

1.15.1.1 Container

Container refers to the space occupied by the aircrew, encompassing both the cockpit and cabin spaces. The container was designed to be robust to withstand deformation as a reduction in this occupiable space is likely to cause injury or death.



Figure 1.20: Location of Cockpit



Figure 1.21: Container Shattered into Debris
Survivability Almost Impossible

The I-POOC aircraft container was shattered into pieces due to the high-energy impact. This disintegration of the container failed to prevent intrusion of outside objects, resulting in fatal injuries to the occupants.

1.15.1.2 Restrain

The restraint system kept the individuals within their workspace, maintaining control of the aircraft and equipment. The restraint system was also designed to attenuate the crash dynamic and restrict movement of the occupants to avoid impact with aircraft structures. The four-point restraint system of the I-POOC aircraft was found intact and functioning at the time of the accident. However, wreckage examination noted only the left seat belt at the front seat was cut during extrication of the pilot, suggesting that the pilot had fastened the seat belt partially to two points. This finding was consistent with the posture of the pilot found submarining through the seat during the search and rescue mission. The restraint system of the passenger was lost; hence the inspection was not able to be conducted.

1.15.1.3 Environment

Environment refers to the volume space of the container; if the container maintained its integrity, the aircraft occupants could still be injured by contact collision with cabin structures. The brace position reduces the strike envelope of the body, protects the head and vital parts from missile injury, and stabilizes occupants. Survivability of this element was not applicable, as the energy environment involved was lethal.

The interaction between the cockpit structure, control levers and the human body parts cause various injuries and fracture patterns on the occupant. Detailed analysis of the injury pattern could give information on the pilot flying the aircraft around the time of accident.

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Figure 1.22: Pilot's Rudder Pedal
Broken into Two Pieces



Figure 1.23: Rear Seat Rudder Pedal
Relatively Intact



Figure 1.24: Pilot's Control Column Broken into Half.

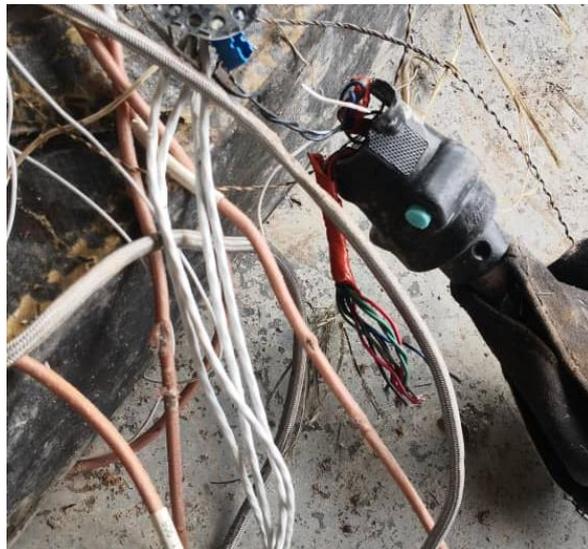


Figure 1.25: Rear Seat Control Column Broken into Half

15.1.4. Energy Absorption

This crumple zone crushes and deforms in a controlled manner during the impact, increasing the stopping distance. This crushing and deforming ultimately reduced the deceleration force acting on the occupants. In this accident, the impact forces were not absorbed by the landing gear as all of the landing gear was in a stowed position. Besides that, the aircraft impacted on the ground in a 45° downwards attitude. In such aircraft attitude at the impact, the engine and its housing acted as the only crumple zone to increase the deceleration time.



Figure 1.26: Nose Wheel Retracted; Impact Not Absorbed by Landing Gear.

1.15.1.3 Post-Crash Factor

This referred to everything that can affect cabin occupants after the immediate impact event and should encompass all hazards present at the crash. No post-crash hazards were identified that could diminish survivability.

1.16 Tests and Research

Identified aircraft components and structural parts of the composite material airframe shall be sent for further inspection and examination at relevant laboratories locally and/or abroad, or original equipment manufacturer (OEM) facilities, where necessary. Close examination and failure mode analysis of the aircraft composite material is

especially critical in the effort to determine the cause of the apparent separation of structural parts from aircraft during flight before the crash.

1.17 Organisational and Management Information

1.17.1 Blackshape S.p.A.

The manufacturer of the BK 160TR aircraft (S/N BCV.21010, bearing registration mark I-POOC) is Blackshape S.p.A., an Italian Company. Blackshape S.p.A. is also the owner of this BK 160TR aircraft (refer to Appendix A).

1.17.2 Sky Media Ltd

The distributor of Blackshape's aircraft in the South East Asia region is Sky Media Ltd, a Hong Kong company, under an exclusive distribution agreement with Blackshape S.p.A. that was signed in 2022. Sky Media had ordered and paid for the BK 160TR aircraft (S/N BCV.21010, registration mark I-POOC). The aircraft was exported and shipped from Italy to Singapore on 11 October 2022. However, the ownership of the aircraft has not yet been transferred and registered to Sky Media Ltd. There is an ongoing business dispute between Blackshape S.p.A. and Sky Media Ltd relating to the ownership transfer and aircraft registration, among other disagreements.

Further investigation on the dispute between two parties is necessary to determine whether the consequent impact from the dispute had compromised the airworthiness status and safe operation of the aircraft.

1.17.3 Aviation Safety Technology Pte Ltd (AST)

Sky Media Ltd has appointed AST, a company incorporated in Singapore, to provide marketing and promotion services for Blackshape BK 160TR aircraft. AST appointed the late pilot of the accident aircraft to operate the aircraft for promotion of the aircraft to potential customers. AST was indicated or implied as the owner and/or operator of the aircraft in various documents, i.e. business and contract documents, such as insurance document, property lease, service contract, and business correspondence;

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flight permit application through the CAAM's Non-Scheduled Application System (NOSAS); and the MOR for the I-POOC accident submitted to the AAIB.



Figure 27: AST Logo on the Aircraft

1.17.4 Other Organisations

The I-POOC aircraft was based at WMSA, operating from the hangar facility sub-leased from **Aurotel Sdn Bhd (Aurotel)** in a contractual agreement with AST. Aurotel is closely linked to the **Air Adventure Flying Club (AAFC)**, where the former leases its aircraft to the latter to be used for leisure and flight training purposes by AAFC members. In the AAFC's NOSAS account, Aurotel is named in the 'Airline/ Operator' field, while AAFC is named in the 'Trading Name' field.

The late pilot of the I-POOC was a member and flight instructor of AAFC. He had used his personal AAFC callsign (AVD429) for filling ATC flight plans with CAAM for I-POOC flights. Additionally, the late pilot had also used the AAFC's NOSAS account to apply to CAAM for non-scheduled flight permits for I-POOC flights. In doing so, both AAFC and Aurotel were explicitly indicated as the operator of the I-POOC to the knowledge of CAAM. Notably, the AAFC logo was conspicuously painted on the aircraft.

In addition to the hangar facility sub-lease arrangement, flight permit application and flight plan submission, there is evidence to suggest that Aurotel had also provided other forms of support for the I-POOC operation, such as aircraft refuelling and servicing support.



Figure 28: AAFC Logo on the Aircraft

Further investigation is necessary to determine whether any organisational factors might have compromised the airworthiness and safe operation of the aircraft. The analysis of relevant organisational factors shall be discussed in Section 2.

1.18 Additional Information

Nil.

1.19 Useful or Effective Investigation Techniques

Shall be included in the Final Report.

2.0 Analysis

Shall be included in the Final Report.

3.0 Conclusion

3.1 Findings

The preliminary findings of the investigation are as follows:

3.1.1 The pilot was properly licensed and qualified for the flight.

- 3.1.2 The aircraft had valid airworthiness certification.
- 3.1.3 The accident was not survivable due to the magnitude of the deceleration force.
- 3.1.4 The aircraft actual take-off weight had exceeded the maximum take-off weight limitation of the aircraft.
- 3.1.5 Irregular maintenance activities had been performed on the aircraft.
- 3.1.6 (Additional findings shall be included in the Final Report.)

3.2 Causes/Contributing Factors

Shall be included in the Final Report.

(Note: The focus of the ongoing investigation is to determine the causes and contributing factors that have led to the apparent catastrophic in-flight separation of the aircraft structural parts before the aircraft impacted ground. Results from the pending examination and analysis of related aircraft parts, components and systems at the NTSB, OEM and other laboratories are necessary to provide collaborative and/or conclusive evidence in establishing the cause of the accident. Additionally, the other lines of inquiry that are still ongoing include operation and human factors, maintenance practices, meteorological conditions, medical and pathology factors and organisational factors.)

4.0 Safety Recommendations

- 4.1 CAAM is recommended to implement appropriate measures that provide closer scrutiny on non-scheduled flight operation in Malaysia by foreign registered aircraft and foreign licensed aircrew to ensure safe operation.
- 4.2 Other safety recommendations shall be included in the Final Report.

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5.0 List of Appendices

A	Aircraft Registration	A-1 to A-3
B	Certificate of Airworthiness and Airworthiness Review Certificate	B-1 to B-2
C	Preliminary Aircraft Damage Assessment	C-1 to C-13

INVESTIGATOR IN-CHARGE

Air Accident Investigation Bureau

Ministry of Transport Malaysia

Aircraft Certificate of Registration



Funzione Organizzativa
RAN-ENG

Spett.le
BLACKSHAPE SPA
Pec: blackshapeaircraft@legalmail.it

ENAC - DIREZIONE OPERAZIONI SUD
ENAC - FUNZIONE ORGANIZZATIVA FATTURAZIONE

Oggetto: BK160TR - S/N BCV.21010 - MARCHE I-POOC
Immatricolazione Autocostruito

Si comunica che in data 02 Agosto 2022 l'aeromobile in oggetto è stato immatricolato nel Registro Aeronautico Nazionale.

Si allega il Certificato di Immatricolazione n.12921 rev.0.

Cordiali saluti

Il Responsabile
Eugenia Mannelli

documento informatico firmato digitalmente
ai sensi dell'art. 24 D.Lgs. 82/2005 e ss.mm.ii.



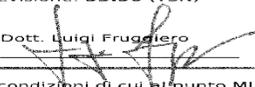
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REPUBBLICA ITALIANA  ENTE NAZIONALE PER L'AVIAZIONE CIVILE ITALIAN CIVIL AVIATION AUTHORITY		N.12921 del (dated) 02/08/2022 Rev. N. 0 del (dated) 02/08/2022	
CERTIFICATO DI IMMATRICOLAZIONE CERTIFICATE OF REGISTRATION			
1. Marche di nazionalità e di immatricolazione <i>Nationality and registration marks</i> I - POOC	2. Costruttore e tipo dell'aeromobile <i>Manufacturer and manufacturer's designation of aircraft</i> BLACKSHAPE SPA - BK160TR	3. Numero di serie <i>Serial number</i> BCV.21010	
4. Proprietario <i>Owner</i> BLACKSHAPE SPA S.S. 16 KM 841+900 Z.I. - 70043 Monopoli (BA) - Italia			
5. Il presente Certificato attesta che il sopra indicato aeromobile è stato iscritto nel Registro Aeronautico Nazionale in accordo con le disposizioni contenute nella Convenzione per l'Aviazione Civile Internazionale del 7 Dicembre 1944 e nel Codice della Navigazione <i>It is hereby certified that the above described aircraft has been duly entered on the Italian Civil Aircraft Register in accordance with the Convention on International Civil Aviation dated 7 December 1944 and with the Italian Air Navigation Code.</i>			
Data <i>date</i>	02/08/2022	Firma <i>signature</i>	Funzione Organizzativa RAN-ENGA Il Responsabile <i>Elisabetta Mannelli</i> 
		Bollo assolto in modo virtuale aut. Diraz. Reg. Entrate Lazio n. 135047/98 del 30/11/1998	

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Esercente <i>(authorized operator):</i>
Ipoteche <i>(mortgage):</i>
NESSUNA / NONE
Atti esecutivi o provvedimenti cautelari <i>(executive deed / interim injunction):</i>
NESSUNO / NONE

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REPUBBLICA ITALIANA Stato Membro dell'Unione Europea [a Member of the European Union]			
CERTIFICATO DI REVISIONE DELL'AERONAVIGABILITÀ (ARC - per aeromobili conformi alla Parte ML) (AIRWORTHINESS REVIEW CERTIFICATE (ARC)) (for aircraft complying with Part-ML)			
RIFERIMENTO ARC (CRA): 2023-0095-1810-I-POOC (ARC Reference):			
A norma del regolamento (UE) 2018/1139 del Parlamento Europeo e del Consiglio: (Pursuant to Regulation (EC) 2018/1139 of the European Parliament and of the Council:)			
		Cantor Air - CAMO Riferimento Approvazione: EASA IT.CAMO.1041 (Approval Reference):	
certifica di aver effettuato una revisione dell'aeronavigabilità in conformità al Regolamento (EU) 1321/2014 sull'aeromobile seguente: (Hereby certifies that it has performed an airworthiness review in accordance with Regulation (EU) No 1321/2014 on the following aircraft:)			
Fabbricante dell'aeromobile: (Aircraft Manufacturer)	Blackshape	Registrazione dell'aeromobile: (Aircraft Registration)	I-POOC
Designazione dell'aeromobile a cura del fabbricante: (Manufacturer's Designation)	8K160TR	Numero di serie dell'aeromobile: (Aircraft Serial Number)	BVC.21010
e che l'aeromobile in questione è ritenuto aeronavigabile alla data della revisione. (and this considered airworthy at the time of the review.)			
Data di rilascio: (Date of issue)	18 Ottobre 2023 18 October 2023	Data di scadenza: (Date of expiry)	18 Ottobre 2024 18 October 2024
Ore di volo della cellula (FH) alla data della revisione: 53:50 (TSN) (Airframe Flight Hours at date of review)			
Firma: (Signed)	 Dott. Luigi Fruggiero	Autorizzazione n.: (Authorisation No.)	IT-TSU-ARS-VC1041-001-D
Primo rinnovo: l'aeromobile è conforme alle condizioni di cui al punto ML.A.901 lettera c), dell'Allegato Vter (Parte-ML). (First extension: the aircraft complies with the conditions of ML.A.901(c) of Annex Vb (Part-ML).)			
Data di rilascio: (Date of issue)		Data di scadenza: (Date of expiry)	
Ore di volo della cellula (FH) alla data della revisione: (TSN) (Airframe Flight Hours at date of review)			
Firma: (Signed)		Autorizzazione n.: (Authorisation No.)	
Nome dell'impresa: (Company Name)		Riferimento dell'approvazione: (Approval Reference)	
Secondo rinnovo: l'aeromobile è conforme alle condizioni di cui al punto ML.A.901 lettera c), dell'Allegato Vter (Parte-ML). (Second extension: the aircraft complies with the conditions of ML.A.901(c) of Annex Vb (Part-ML).)			
Data di rilascio: (Date of issue)		Data di scadenza: (Date of expiry)	
Ore di volo della cellula (FH) alla data della revisione: (TSN) (Airframe Flight Hours at date of review)			
Firma: (Signed)		Autorizzazione n.: (Authorisation No.)	
Nome dell'impresa: (Company Name)		Riferimento dell'approvazione: (Approval Reference)	

Preliminary Aircraft Damage Assessment

1 Introduction

This preliminary damage assessment report on the BK 160TR aircraft (S/N BCV.21010, registration mark I-POOC) is based on the report prepared by the Blackshape Technical Advisers (TA) to the ANSV Accrep.

2 Left Hand (LH) Wing

The LH wing main spar, aft spar and ribs were found at Site 1, the main wreckage area. The front and rear spar breaking points are compatible with high energy impact.



Figure 1: LH Wing

The wing upper skin, the lower skin with part of the wing leading edge and wing tip were detached. The wing upper skin was detached from the front and rear spar. The failure mode seems to be interlaminar failure of the skin. Part of the wing leading edge, i.e. from the wing fitting to the fuel cap location, was detached. The failure mode is also in this case interlaminar failure, in correspondence of the bonding flange.

3 LH Aileron

The LH aileron was found bent almost in the middle of its span. The aileron was detached from the hinges. The connecting rod was detached from the bellcrank.



Figure 2: LH Aileron, Connecting Rod, and Bellcrank

4 Right Hand (RH) Wing and Main Landing Gear (MLG)

The whole RH wing (except for the inner upper skin) was found in a Site 2, about 560 metres to the east of the main wreckage. The RH wing inner upper skin, together with the inner rib, was found at Site 3. Refer to paragraph 5 below for the failure mode of the upper skin. The failure mode of the inner rib is interlaminar failure. The RH flap and aileron were found connected to the wing.



Figure 3: RH Wing

The MLG was found installed in the wing box in its retracted position. The forward (FWD) and rear (RWD) wing spars were totally cracked at the intersection with the fuselage monocoque, where the lower side fuselage spars are installed.



Figure 4: RH MLG

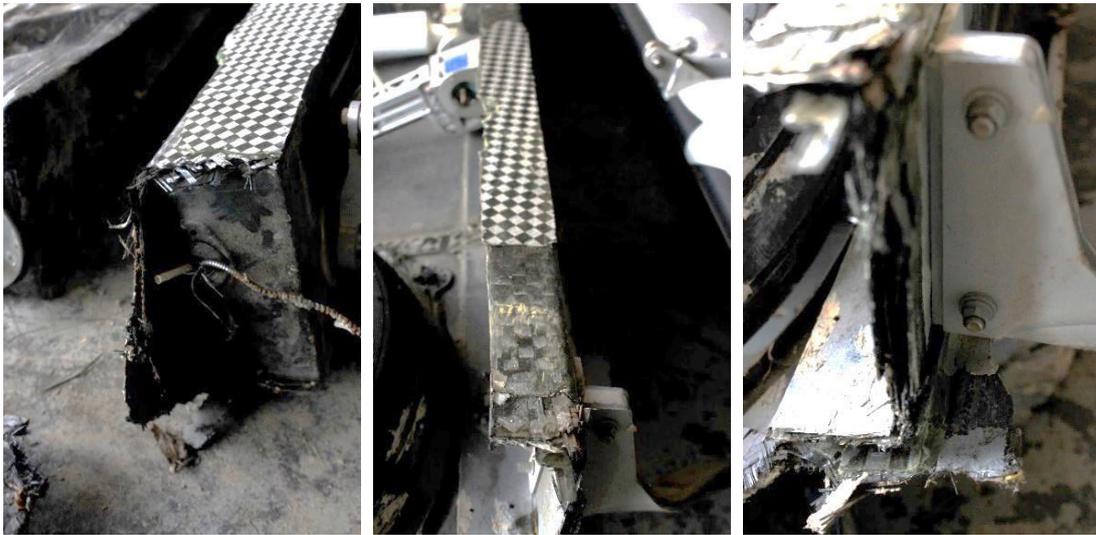


Figure 5: RH Wing Main and Rear Spar Crack

5 Skin/Spar Failure Mode

The failure of the skin/spar junction seems to be an interlaminar failure. The portion of laminate bonded to the wing spar remained attached to the spar cap revealing no failure of the bonding. The inner ribs of the wing box seem to have experienced the same failure mode.



Figure 6: Skin/Spar Failure Mode

6 Main Spar Fuselage

The web of the main spar is totally lost.



Figure 7: Main Spar Fuselage

7 Fuel Tank

7.1 LH Fuel Tank. The bladder of the LH fuel tank appears to be torn apart in correspondence of the filler cap. The rest of the damage is probably due to the ground impact with the main wreckage.



Figure 8: LH Fuel Tank

7.2 RH Fuel Tank. The RH fuel tank appears in good condition. There is no sign of collapse. Signs of rupture are found in the inner part of the tank.



Figure 9: RH Fuel Tank

8 Engine Compartment

The engine compartment was found two metres under the ground. All damages appear to be caused by the high energy ground impact. Two blades were found cracked around the root. One blade is missing from the rotating shaft.



Figure 10: Engine Compartment and Propeller

9 Cockpit

Both cockpits were found destroyed by the high energy ground impact. The roll bar and the seat cushions are retrieved as shown below.



Figure 11: Cockpit (Destroyed)

10 Electro-Avionics Components

The following are the main electro-avionics components that were retrieved from the wreckage:

- Rear only EFIS / Garmin GDU 460

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- Front and rear Garmin G5
- Front and rear LG panel
- Front and rear audio panel PM8000 and radio GNC255a
- Battery box
- Mode selector switch
- Alternator



Figure 12: Rear EFIS /
Garmin GDU 460



Figure 13: Front and Rear
Garmin G5, Rear LG Panel



Figure 14: Front LG Panel



Figure 15: Front and Rear Audio
Panel PM8000 and Radio GNC255a



Figure 16: Battery Box



Figure 17: Mode Selector
(Passenger Mode Selected)



Figure 18: Alternator

11 Aircraft Tail

The rudder was found detached from the vertical stabiliser through the hinges. The horizontal stabiliser was found detached from the fuselage. The elevator was partially detached from the horizontal stabiliser through the hinges. The elevator trim was found detached from the elevator through the hinges. The lever to the trim motor was found in place.



Figure 19: Tail Destroyed (Left), Tail Reconstructed (Middle),
Trim Tab (Right)

12 Flight Controls

12.1 Longitudinal. All connecting rods are found disconnected from the forks (weakest elements).



Figure 20: Longitudinal Control: Control Column (Top Left),
First Connecting Rod (Top Right), Last Connecting Rod (Bottom)

12.2 Lateral. The connecting forks to the control column are broken, probably due to high energy impact. The end connecting rod is detached from the bellcrank (refer to paragraph 3).



Figure 21: RH and LH Aileron Connecting Forks to The Control Column

12.3 Directional control. The forward and aft pedal systems, and their connecting elements are found broken, compatible with the high energy impact,



Figure 22: Front and Rear Pedal Assembly

12.4 Flap Control. The flap motor is found detached from the rear spar, compatible with high energy impact. The RH connecting rod is disconnected from the gear motor and from the wing flap actuator by the rotating joints. The RH connecting is bent, probably due to the in-flight RH wing detachment.



Figure 23: Flap Control System: Flap Motor and Connecting Rods

13 Landing Gear

The RH Main Landing Gear (MLG) was found installed in its compartment (RH wing box) apparently in retracted position. The LH MLG was found attached on the LH wing main spar only. The Nose Landing Gear (NLG) was found installed in its position (engine mount), apparently in retracted position.

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Figure 24: Main Landing Gear (LH and RH)



Figure 25: Nose Landing Gear

14 Canopy

Fragments of the canopy was found at or around Site 3. The front canopy handle was retrieved. The position of the handle was not closed. However, the opening system was broken.



Figure 26: Fragments of Canopy Found at or Around Site 3



Figure 27: Front Canopy Opening Handle

15 Non-Conforming / Non-Certified Parts

As discussed in paragraph 1.6.5, two 'tie-down ring' parts were installed at the joints of the wing fitting and main spar, i.e. one 'tie-down ring' on each wing. These parts are not part of the approved aircraft configuration.



Figure 28: Non-Conforming Parts Installed on The RH And LH Wing Fitting

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A fire extinguisher was found together with the wreckage. It was not part of the approved configuration. There is no provision of a storage place in the cabin for the fire extinguisher.



Figure 29: Fire Extinguisher