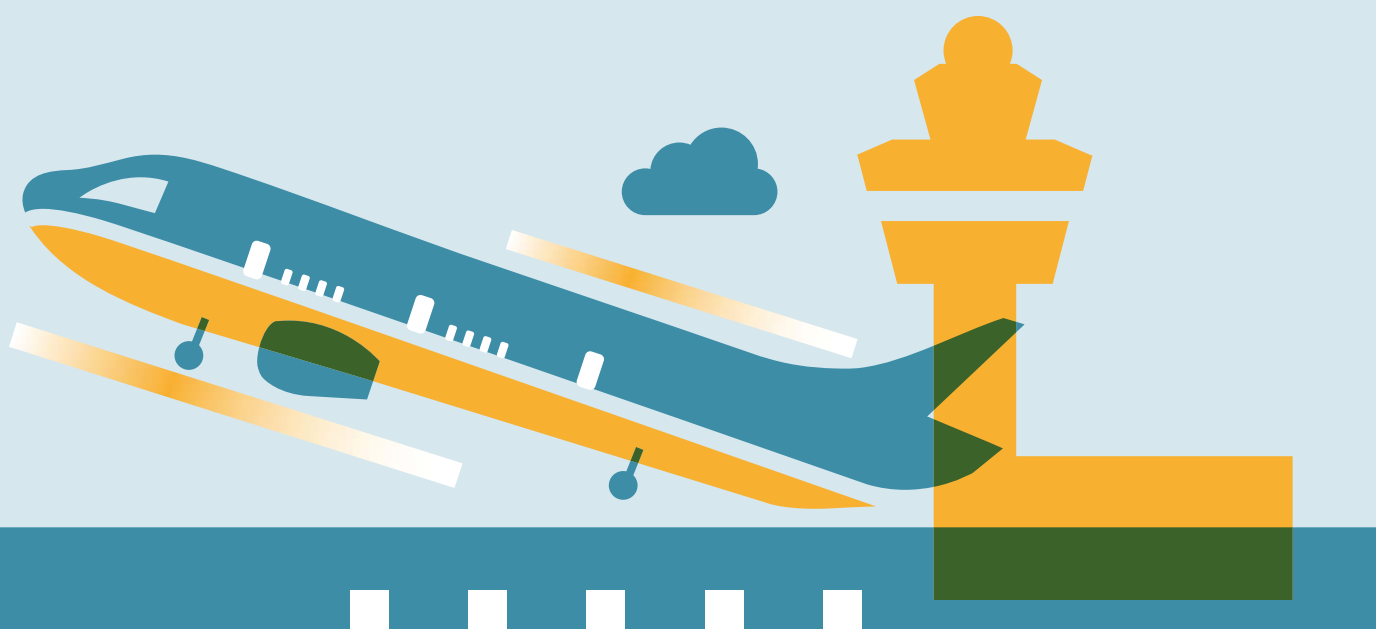




Crashed, Blackshape S.p.A. BS 115, Zwarte Meer, 28 June 2022



Aviation Investigation Preliminary Report

| General Information | |
|---------------------|----------------------------------|
| Date & Time: | 28 June 2022, approx. 09.04 UTC |
| Location: | Zwarte Meer, near Genemuiden, NL |
| Aircraft: | Blackshape BS 115, model BK 160 |
| Registration: | PH-TRC |
| Classification: | Accident |
| Injuries: | Fatal (2) |
| Aircraft damage: | Destroyed |
| DSB reference: | 2022077 |

This preliminary report provides an update on the ongoing accident investigation. It presents initial findings regarding the history of flight and aircraft wreckage. Please note that the information in this report is preliminary and may be subject to change.

History of the flight

On 28 June 2022, an instructor pilot and a student pilot were scheduled for an instruction flight with the Blackshape BS 115 from Lelystad Airport. This flight was the final instructional basic instrument flying sortie as preparation for the so-called Core Phase Check. During this sortie, the student must show the required level of, amongst other things, steep turns with 45 degrees angle of bank, recognition of, and recovery from, incipient and full stalls, recovery from unusual attitudes, standard rate turns and basic instrument flying.

Prior to the flight, the crew had prepared and planned the flight and the student had made a weight and balance sheet. Subsequently, the aircraft taxied to the fuel station for refueling, as shown by camera footage at the aerodrome. The aircraft was refueled with AVGAS 100LL. The student pilot occupied the front seat and the instructor was in the rear seat.

At 08.27¹ hrs, the crew requested start-up clearance for a Bravo departure. Lelystad Delivery² cleared the aircraft for start-up and informed the crew that Runway 23 was in use and provided the QNH of 1021 hPa. A few minutes later, Lelystad Tower cleared the aircraft to taxi to the holding point Sierra 1 (S1) of Runway 23. At 08.40 hrs, Lelystad Tower cleared the aircraft for take-off from Runway 23 and a Bravo departure. After take-off, at 08.44 hrs, the crew informed Lelystad Tower flying over Bravo, prompting a frequency change to Dutch Mil (Air Operations Control Station Nieuw Milligen).

¹ All times in this report are expressed in UTC (local time = UTC + 2 hours).

² Air Traffic Control the Netherlands (LVNL) provides Air Traffic Control Service at Lelystad Airport.

At 08.46 hrs, the crew called Dutch Mil on its frequency, who replied that flight information would be provided and that the QNH was 1021 hPa. The crew confirmed this and informed Dutch Mil about two persons on board. This was the last known radio contact with the aircraft.

The flight path was reconstructed using radar data and on board Engine Data Monitoring (EDM) system data.³ According to the data, after passing reporting point Bravo, the aircraft flew in a north-easterly direction. North-west of Zwolle, at 08.56 hrs, the aircraft made a left 360° turn at an altitude of approximately 5,000 feet⁴, followed by a right 360° turn.

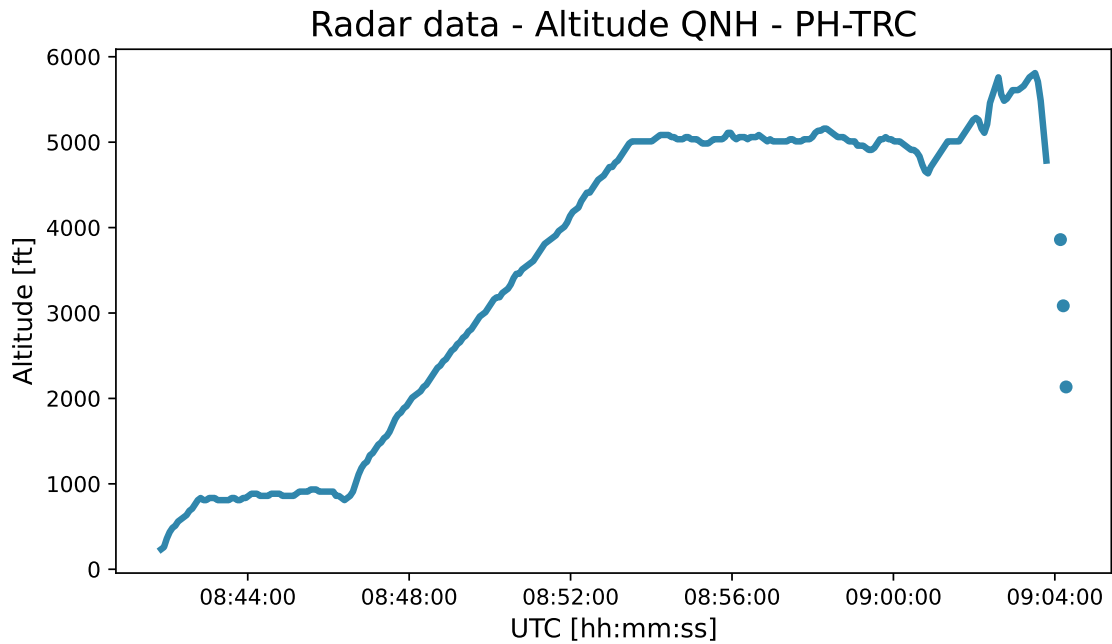
Maintaining a north-easterly course at approximately 4,900 feet, the aircraft executed a left 180° turn above Hasselt, followed by a right turn towards a north-westerly direction. The aircraft climbed to around 5,500 feet. At 09.03 hrs, a 180-degree descending right turn was initiated, descending from 5,800 feet to 5,200 feet. At 09.04 hrs, the EDM ceased recording data from the on board Garmin GTN650 system. Radar contact was lost shortly after. The last few radar readings indicate a descent to 2,130 feet.⁵

The aircraft crashed in the lake *Zwarte Meer*. The instructor and student were fatally injured. The aircraft was destroyed upon impact.



▲ Figure 1: The flight of the aircraft and crash site in the Zwarte Meer. (Source: radar data LVNL)

- 3 The EDM system records altitude and location via GPS. Since the time stamp of the EDM differed from the radar data time, the time was synchronized to the time of the radar data.
- 4 All altitudes in this report are expressed in feet above sea level (QNH of 1021 hPa).
- 5 Between 09.04:03 hrs and 09.04:21 hrs, the EDM unit continued to record other parameters.



▲ Figure 2: Altitude of the aircraft, expressed in feet above sea level. (Source: radar data LVNL)

Meteorological Information

| General Information | |
|------------------------------|-------------------|
| Conditions at accident site: | VMC |
| Observation facility: | EHLE |
| Distance from accident site: | 39 km/20 nm |
| Lowest cloud condition: | Few 3400 feet AGL |
| Lowest ceiling: | - |
| Condition of light: | Daylight |
| Observation time: | 08.55 hrs |
| Temperature / Dew point: | 19 °C /13 °C |
| Wind direction/speed/gusts: | 200°/6 knots |
| Visibility: | More than 10 km |

Aircraft Information

| General Information | |
|------------------------|---------------------|
| Aircraft manufacturer: | Blackshape |
| Aircraft model: | BS 115 model BK 160 |
| Year of manufacture: | 2020 |
| Serial number: | BCV.21003 |
| Registration: | PH-TRC |
| Maximum takeoff mass: | 850 kg |
| Engine manufacturer: | Lycoming |
| Engine model: | IO-320-D1B |

The Blackshape BS 115 model BK 160 is a single-engine low wing aeroplane with a tandem two-seater configuration. It is mainly manufactured from carbon fibre reinforced epoxy. The aircraft is equipped with a retractable landing gear. It is powered by a 160-horsepower Lycoming IO-320-D1B engine and a Hartzell three-blade composite variable pitch constant speed propeller. The aircraft type is certified by the European Union Aviation Safety Agency (EASA) in accordance with the airworthiness requirements of CS-VLA and has a maximum takeoff mass of 850 kg. At the time of the accident, the aircraft had a valid Certificate of Registration and Certificate of Airworthiness. The accompanying Airworthiness Review Certificate was valid until 11 February 2023.

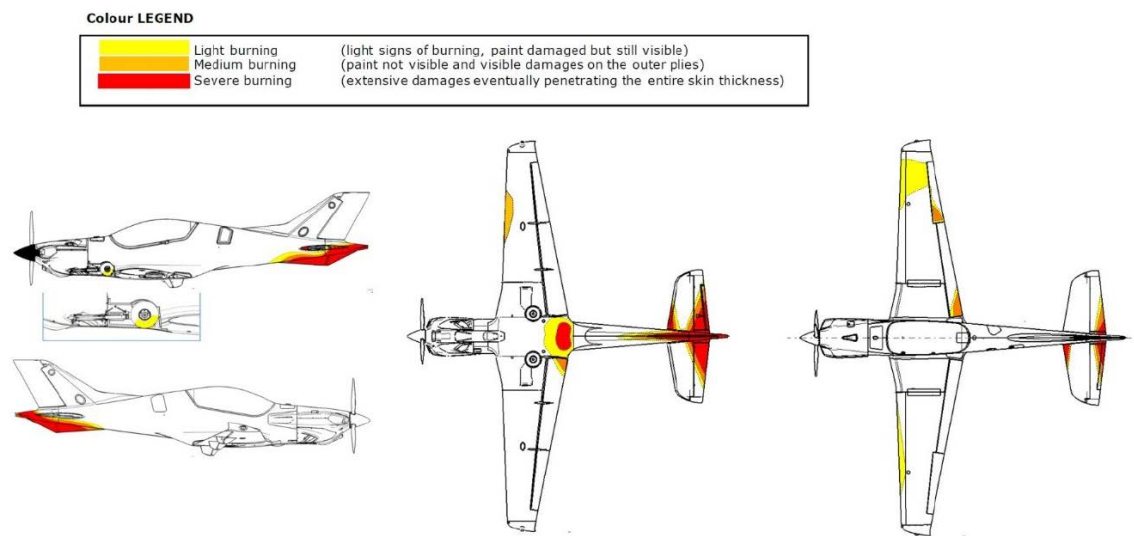
Wreckage and impact information

The aircraft wreckage was recovered from the lake Zwarte Meer, which is estimated to be around 1.5 metres deep at the impact location. Despite comprehensive search efforts, including the use of sonar equipment, several smaller parts remain unrecovered (undetected) in the lake.

Examination of the wreckage by Dutch Safety Board investigators revealed burn marks, predominantly on the exterior surfaces, see Figure 3.⁶ Notable areas affected include the nose wheel, the upper side of the right wing flap and aileron, and the lower side of the left wing's leading edge. The tail cone, horizontal tail plane (stabilizer), elevator, and the central panel of the lower fuselage section show significant burn damage. The composite material was completely dry, i.e. no visual traces of resin remained, and the fibres in the composite material were splintered.

⁶ The Italian Civil Aviation Safety Investigation Authority (ANSV) and the aircraft manufacturer participated in the initial examination of the wreckage.

Only fragments of the Plexiglas canopy were found, with the canopy closing system remaining intact and devoid of burn signs.



▲ Figure 3: General overview of the burn marks on the aircraft wreckage. (Source: Blackshape)

Further inspection revealed that the right and left aileron control rods showed signs of impact-induced failure and plastic deformation. The vertical tail and rudder remained intact, without signs of burning, maintaining structural connection through the upper hinge. The elevator welded assembly, linking the right hand and left elevators, displayed only superficial burn marks. Both elevators remained attached to the assembly, although the right-hand elevator completely burned at the inboard rib, disconnecting it mechanically from the control, due to the complete destruction of the carbon fibre plies at the attachment location. The elevator control push-pull rod, most likely deformed by the impact, partly showed superficial burning.

Tests and Research

Flight tests

In the aftermath of the wreckage recovery from the lake, the left-hand filler cap has not been found. In an effort to determine the origin of the burn marks on the wreckage – whether from an in-flight or post-impact fire - a series of flight tests were undertaken in Italy 15 May 2023. These tests, performed by the aircraft manufacturer under the supervision of EASA and the Dutch Safety Board, aimed to investigate potential fuel siphoning and measure spillage levels with the filler cap removed. For these experiments, the aircraft's left-hand tank was filled with dyed water to simulate fuel, allowing for a clear assessment of any leakage.

The flight tests were witnessed by representatives of the Dutch Safety Board, EASA and the Italian Civil Aviation Safety Investigation Authority (ANSV). These tests showed that removal of the fuel filler cap does not lead to significant fuel siphoning or the collapse of bladder fuel cells. The findings indicated only minor spillage from a full fuel tank, insufficient to deplete it. The conclusion drawn from these tests is that the absence of the left-hand filler cap during flight is highly unlikely to cause fuel leakage that could result in an in-flight fire.

Engine examination

Following the recovery of the wreckage, the engine – with the propeller hub still attached, but missing its carter and fuel control unit – was submerged in fresh water to ensure its preservation. On 11 July 2023, the engine and its components were examined at an EASA approved Part 145 overhaul facility in Belgium, specialized in Lycoming engines. This process was conducted under supervision of the Dutch Safety Board’s investigators. During the disassembly of engine accessories and components, damage consistent with impact forces was observed.

The engine components showed no signs of wear, discoloration from heat, or lack of lubrication. The presence of oil and fuel within the engine system led to the determination that the engine was functioning normally at the time of the accident.

Ongoing investigation

The Dutch Safety Board’s technical investigation continues in order to ascertain the source of the fire damage, determining whether it occurred in-flight or was the result of post-impact events. This involves ongoing efforts to identify potential sources of fuel leakage, a task complicated by the extensive damage sustained by the aircraft. Furthermore, in light of a fatal accident in Malaysia on 13 February 2024 with the same aircraft type, the preliminary findings shared by the Air Accident Investigation Bureau (AAIB) of the Ministry of Transport Malaysia⁷, and an Airworthiness Directive issued by EASA⁸, a thorough re-examination of certain aircraft parts will be conducted. This re-examination aims to uncover possible signs of structural failures that could contribute to the understanding of the accident.

7 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.

8 On 18 March 2024, EASA issued an Airworthiness Directive suspending flight operations of Blackshape BS 115, BK 160, BK 160-200 and BK 160 TR aircraft (AD No. 2024-0074-E).



The Dutch Safety Board

When accidents or disasters happen, the Dutch Safety Board investigates how it was possible for these to occur, with the aim of learning lessons for the future and, ultimately, improving safety in the Netherlands. The Safety Board is independent and is free to decide which incidents to investigate. In particular, it focuses on situations in which people's personal safety is dependent on third parties, such as the government or companies. In certain cases the Board is under an obligation to carry out an investigation. Its investigations do not address issues of blame or liability.

Dutch Safety Board

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