MINISTRY FOR
INNOVATION AND TECHNOLOGY
TRANSPORTATION SAFETY BUREAU

FINAL REPORT

2018-169-4

Accident

Farkashegy Airport (LHFH)

8 April 2018

PW-5 ”Smyk”

HA-4070

The sole objective of the safety investigation is to reveal the causes and circumstances of aviation accidents or incidents and to initiate the necessary safety measures, as well as make recommendations in order to prevent similar events in the future. Safety investigations shall not be conducted to apportion blame or liability by any means.

General information

This investigation is being carried out by Transportation Safety Bureau on the basis of

- Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC,
- Act XCVII of 1995 on aviation,
- Annex 13 identified in the Appendix of Act XLVI. of 2007 on the declaration of the annexes to the Convention on International Civil Aviation signed in Chicago on 7th December 1944,
- Act CLXXXIV of 2005 on the safety investigation of aviation, railway and marine accidents and incidents (hereinafter referred to as Kbvt.),
- NFM Regulation 70/2015 (XII.1) on safety investigation of aviation accidents and incidents, as well as on detailed investigation for operators,
- In absence of other relevant regulation in the Kbvt., in accordance with Act CL of 2016 on the general rules of administrative authority procedure and service.

The competence of the Transportation Safety Bureau of Hungary is based on Government Regulation № 230/2016. (VII.29.) on the assignment of a transportation safety body and on the dissolution of Transportation Safety Bureau with legal succession.

Pursuant to the aforesaid legislation,

- Transportation Safety Bureau Hungary shall investigate aviation accidents and serious incidents.
- Transportation Safety Bureau Hungary may investigate aviation and incidents which – in its judgement – could have led to more accidents with more serious consequences in other circumstances.
- Transportation Safety Bureau Hungary is independent of any person or entity which may have interests conflicting with the tasks of the investigating body.
- In addition to the aforementioned laws, the ICAO Doc 9756 and the ICAO DOC 6920 Manual of Aircraft Accident Investigation are also applicable.
- This Report shall not be binding, nor shall an appeal be lodged against it.

Members of the IC are in no conflict of interest. Persons participating in the safety investigation do not act as experts in other procedures concerning the same case and shall not do so in the future.

The IC shall retain the data and information obtained in the course of safety investigations. Furthermore, the IC shall not disclose for other authorities such data and information, whose holder would have been legally entitled to withhold them.

This Final Report

was based on the draft report prepared by the IC and sent to all affected parties (as specified by the relevant regulation) for comments.

Copyright Notice

Translation

The present document is a translation from Hungarian. Although efforts have been made to provide a translation as accurate as possible, discrepancies may occur. In such eventuality, the Hungarian version is considered overriding.

Table of Contents

Definitions and abbreviations

AGL	*Above Ground Level*
ARP	*Airport Reference Point*
CG	*Center of Gravity*
EASA	*European Union Aviation Safety Agency*
IC	*Investigating Committee*
ICAO	*International Civil Aviation Organization*
ITM	*Ministry for Innovation and Technology*
Kbvt.	*Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents*
LT	*Local Time*
MND	*Ministry for National Development (Legal Predecessor of ITM)*
Organisation	*The organisation involved in the occurrence*
PKBWL	*Państwowa Komisja Badania Wypadków Lotniczych (the investigating body of Poland)*
Student Pilot	*The student pilot involved in the occurrence*
TCDS	*Type Certificate Data Sheet*
Safety link	*A detachable extension of the winch line, which includes a piece of rope, a weak link, and a tow ring.*
TSB	*Transportation Safety Bureau (Hungary)*
UTC	*Coordinated Universal Time*
VFR	*Visual Flight Rules*
WGS-84	*A standard used in geodesy and satellite geopositioning*

Introduction

Occurrence category		Accident
Aircraft	Manufacturer	Wytwórnia Sprzetu Komunikacyjnego „PZL – Swidnik” S.A. Poland
	Model	PW-5 „Smyk”
	Registration sign	HA-4070
	Operator	MÁV Sportrepülő Egyesület
Occurrence	Date and time	8 April 2018, 17:31LT
	Location	Farkashegy airfield (Figure 1)
Number of people deceased / seriously injured in the accident:		0 person / 0 person
Extent of damage to the aircraft involved in the occurrence:		Destroyed

Any clock-time indicated in this report is given in local time (LT). Time of the occurrence: LT= UTC+ 2 hours.

All geographical coordinates indicated in this report is given according to the WGS-84 survey.

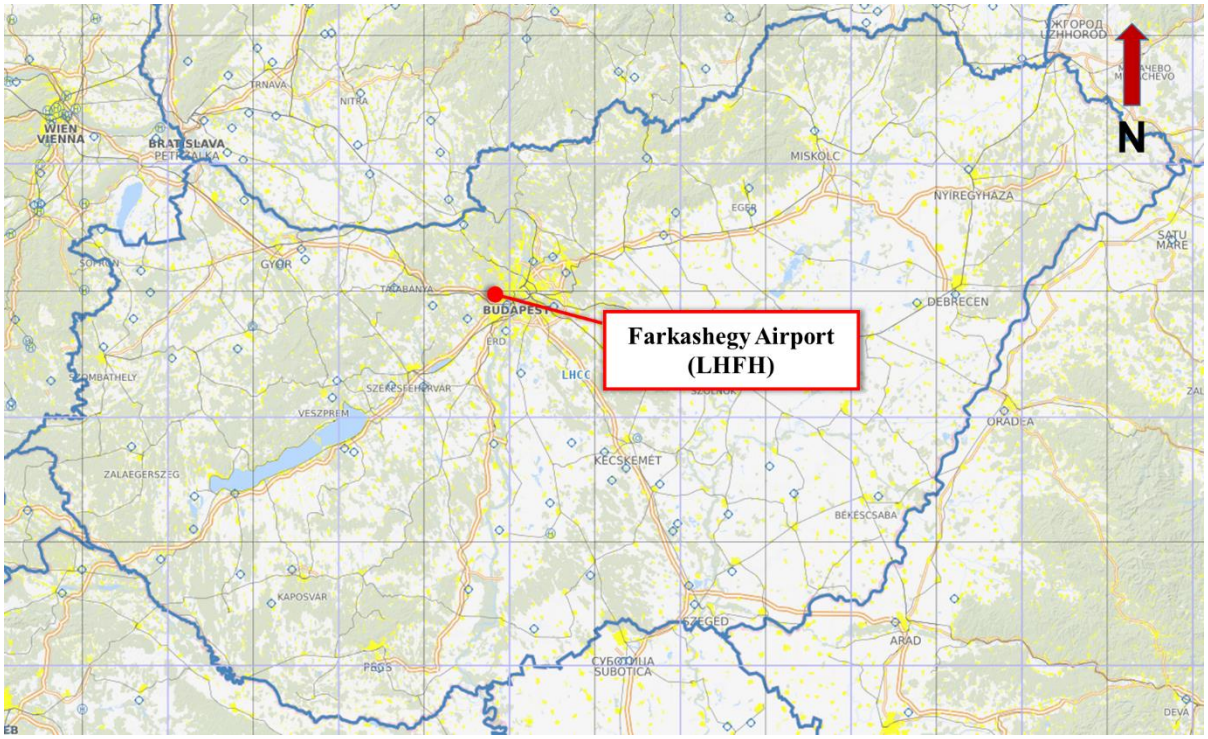

Figure 1: Location of the occurrence in Hungary

Reports and notifications

The occurrence was reported to the dispatcher of TSB on 8 April 2018, at about 17:50.

Dispatcher service of TSB Hungary notified:

- State Commission on Aircraft Accident Investigation, Poland (PKBWL), the investigating body of the state of the manufacturer, on 09 April 2018, at 16:09, as well as EASA.

After the notification, the following foreign organisation assigned a representative for the investigation:

- The state of the manufacturer of the aircraft assigned PKBWL.

Investigating Committee

The Head of TSB assigned the following investigating committee (hereinafter referred to as IC) to the investigation of the case:

Investigator-in-charge	**Miklós Ferenci**	Investigator
Member	**Gábor Erdősi**	Investigator

Overview of the investigation process

During the investigation, the IC:

- performed a site survey: took photos of the site, the wreck of the aircraft, and the documents available, and investigated the wreck of the aircraft involved;
- interviewed witnesses;
- interviewed the pilot of the aircraft with reg. marks HA-4070, on 10 April 2018;
- interviewed the pilot of the aircraft with reg. marks HA-7004 on 18 April 2018;
- obtained the records of radio communication (recorded at Farkashegy airfield) relating to the period of the occurrence;
- obtained the training manual, the pilot's training syllabus, and the document relating to the pilot's training and his training flights performed prior to the occurrence, from the Training Organisation;
- contacted and asked the investigating body of Poland / the manufacturer of the sailplane what changes they had made to the CG hook of the type PW-5 aircraft, and why;
- requested the type certificate of the aircraft involved, from the aviation authority of the manufacturer's state (through the investigating body of the manufacturer's state), but did not receive it;
- sought similar cases involving the same aircraft type;
- cited an expert of aviation meteorology for an opinion relating to the weather;
- obtained the documentations needed for the operation of the Training Organisation, from the competent authority;
- analysed available data and information, and drafted an investigation report of the occurrence.
- The IC modified the Draft Report based on the received comments from EASA (see Appendices), and withdrew the proposed Safety Recommendation № BA2018-169-4-1.
- The Organisation sent comments to the modified Draft Report. The IC evaluated such comments, nonetheless, the IC maintained its position, and the Final Report has been made without changes.

Synopsis

On 08 April 2018, at 17:31, with the Student Pilot took off in the type PW-5 ”Smyk” glider aircraft with reg. marks HA-4070 (Figure 2) from Farkashegy airfield to perform training flight tasks. In the initial phase of winch launch, the aircraft climbed in a steep angle, and then, at a height of ca. 20 to 25 m, it entered a left bank, lost altitude. Then its left wing collided with a tree, and the aircraft fell on an area thickly covered by trees and bushes near the runway. The Student Pilot was not injured and the aircraft was destroyed in the accident.

The immediate cause of the accident was that the Student Pilot lost control over the aircraft in the initial phase of the winch launch, and there were some contributing factors as well:

- low level of skill and experience of the pilot;
- a characteristic feature of the aircraft;
- adverse weather condition.
- judgment of the above factors by the flight instructors.

The IC proposes that a safety recommendation be issued relating to the accident, on completion of the investigation.

Figure 2: An earlier photo of the aircraft involved in the occurrence (source: the Internet)

1. Factual information

1.1. History of the flight

In the morning of the day of the accident, the Student Pilot took part in a briefing as part of flight operations, where participants discussed the plans and tasks related to the flights of the day, and reviewed the weather forecast together which indicated strong winds for that day. According to his report, the Student Pilot did not want to fly solo in the morning due to the strong wind, so, on his request he flew two traffic circuits with his flight instructor in a PW-6 two-seater sailplane. During the training flight, the Student Pilot needed some help with the first take-off and landing, while he performed the second take-off and landing independently (and correctly).

According to the launch coordinator, the briefing that morning included discussing the training records (kept in an electronic format by the training organisation) relating to the student pilots' training. No cross-country flights were performed; the tasks only included training flight and practice flights in strong winds. The weather forecast included strong winds for the whole day; in the morning hours, wind speeds were 6 to 8 m/s, while after 12:00 wind speeds picked up to 10-12 m/s, with gusts of 14 m/s. As the launch coordinator noted, he did not measure higher values that day. At about 12:00, when the wind gusts reached 10-12m/s and the wind direction was from 150~170 degrees (the direction of the runway), the beginners' training flights were stopped. At about 14:00, the wind became weaker and more steady, resulting in mean winds of 6-8 m/s, with no stronger gusts, so they restarted beginners' training and demonstration flight tasks.

According to the launch coordinator, the opinion of the Student Pilot's Flight Instructor was that the Student Pilot performed his training flights perfectly in the morning even in the given weather conditions, so the Flight Instructor deemed the Student Pilot apt to fly solo.

According to the launch coordinator, he cautioned the student pilots that the wind direction had changed from 150-160 degrees to 170-200 degrees, and that the upper wind had turned even more westerly. He also cautioned them to compensate for the wind as early as possible in the initial phase of the winch launch, and to avoid sudden climb because gusty wind may pose serious hazards. According to the launch coordinator, there was no wind gust or stronger wind at the time of the occurrence.

According to the launch coordinator, the safety link had to be replaced before the flight accident, because the Tost rings of the rope had been lost during the previous flight. After replacement, the launch coordinator checked the weak link, the trace and the Tost rings, and found them all right.

The Student Pilot involved in the accident, a "Badge C" pilot, took off for a solo training flight in a type PW-5 „Smyk" sailplane with reg. marks HA-4070 at 17:31. In the initial phase of the winch launch at a height of about 20 metres, the aircraft entered a very steep climb and started a left bank. With the bank increasing, the aircraft deviated to the left of the winch direction. The winch cable was still attached to the aircraft – i.e. the winch engine was still towing the aircraft. Soon after, the rope detached, the aircraft further increased its bank and deviation from the winching direction, and began to descend. The Student Pilot attempted to control the situation, but the left wing got caught in a branch of a tree and then the aircraft crashed to ground in the thick bushes.

According to the Student Pilot, he started the take-off by winch launch in a wind direction corresponding to the runway direction (Figure 3, [1]). After the lift-off, he perceived that his speed is higher than normal so, as he said, "*I pulled on the stick as well*", but then he found that the aircraft was getting close to an *"excessive angle of attack"* (Figure 3, [2]–[3]), and then, at the height of about 20-25 metres, the aircraft started a bank to the left.

He then attempted to recovery, but despite his efforts, the aircraft hit the vegetation, and finally crashed into the ground (Figure 3, [5]–[6]).

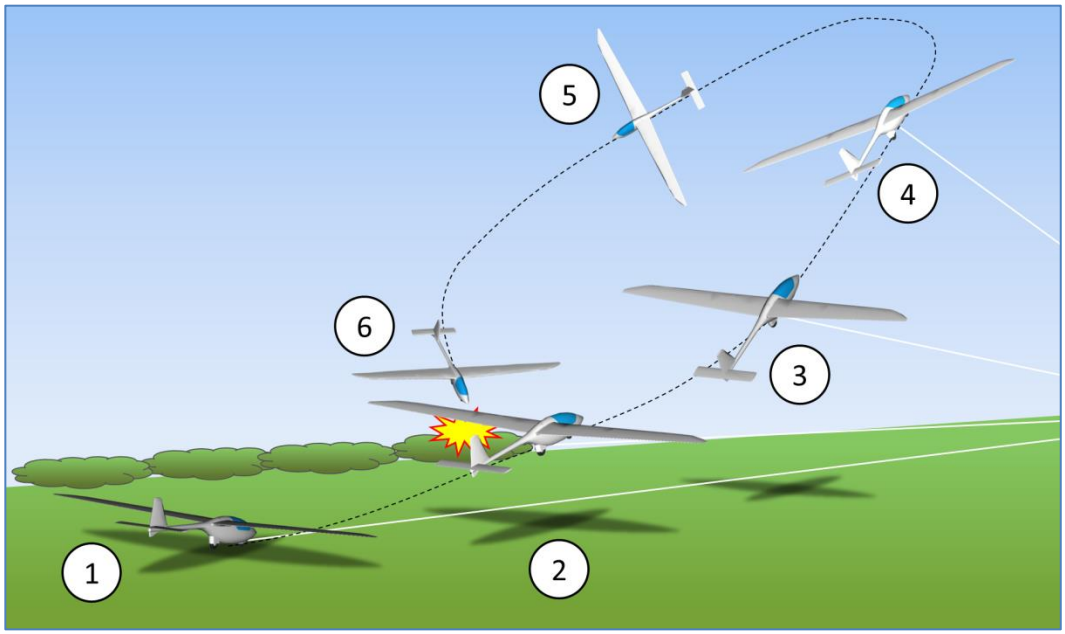

Figure 3: Flight path of the HA-4070 (drawing not to scale)

According to the winch operator, he had to operate the winch very carefully because of the strong wind, but nothing special had happened during the winch launches until the accident; not even a rope-break simulation had been planned, so he had to perform normal launches. In the morning, he checked the machine before use, and found everything all right. He had winched the PW-5 several times on that day, and, as it is a light aircraft, he started the launch very carefully, accelerating the aircraft gradually. Due to a hump on the strip, he did not see the aircraft at the beginning of the launch, only after it appeared above the horizon (Figure 4). Then he saw that the aircraft suddenly *"broke"* to the right (from the winch operator's perspective). The winch operator immediately applied the brake and stopped the drum.

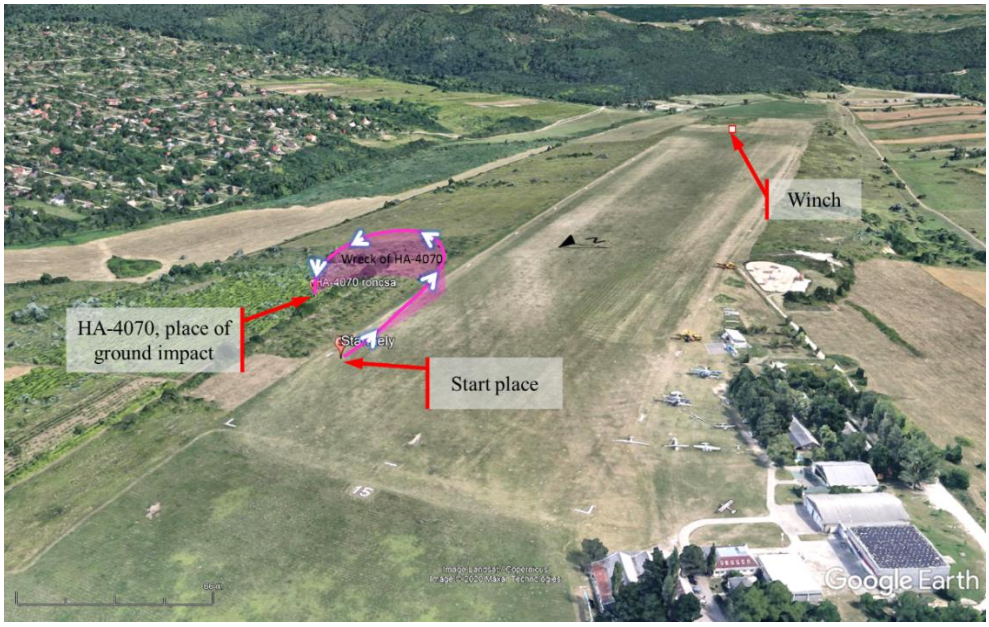

Figure 4: The path of the flight ending up in accident

1.2. Injuries to persons

No one was injured in the accident.

1.3. Damage to aircraft

The aircraft was damaged beyond repair. The nose of the sailplane was destroyed, but the pilot's seat and cabin remained in one piece (Figure 5). The canopy separated from the fuselage and was found left of it. The left wing separated from the fuselage at the wing root, and the mid-section of the leading and the trailing edges were damaged. The tail fractured but did not separate from the fuselage. The fuselage fractured at the numerical characters of the reg. marks, but the two parts did not separate. As a result of the impact, the horizontal stabilizers (together with the attach fittings) broke out of the tail, and the push rod moving the elevator broke at the stabilizer. The right wing remained in its place, showing no signs of damage.

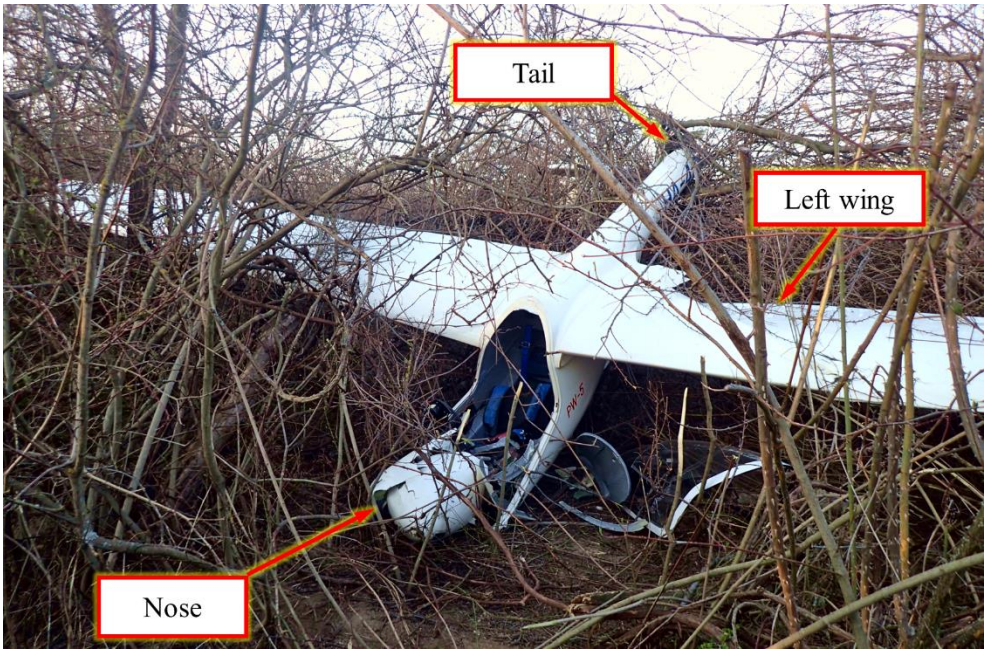

Figure 5: The wreckage at the accident site

1.4. Other damage

The IC had got no information on other damage by the completion of the investigation.

1.5. Crew data

1.5.1. Pilot flying (Pilot-in-Command)

Age, nationality, gender		18 years old, Hungarian, male
Licence data	Type	None
	Professional valid until	None
	Ratings	None
Certificates		Student Pilot
Medical class and valid until		Class 2 /LAPL, 26/01/2021
Flying hours/take-offs	In the previous 24 hours	12 minutes / 2 take-offs (in a type PW-6)
	In the previous 7 days	49 minutes / 6 take-offs

	In the previous 14 days	1 hour 3 minutes / 7 take-offs
	Total:	24 hours 01 minute / 173 take-offs
	On the affected type, total:	1 hour 51 minutes / 7 take-offs
Aircraft types flown:		K-7, PW-5
Date and result of latest test		Theory test, on 12/03/2018; result: 83%

The Student Pilot started his sailplane pilot training course at the beginning of 2016. He got his "Badge C" qualification in October 2017.

From the beginning of his training to the date of the accident, he flew 24 hours and 1 minute, with 173 take-offs (aerotow or winch launch combined) in aircraft types K-7, PW-6 and PW-5.

Prior to the flight ending in accident, the Student Pilot flew 10 hours and 42 minutes solo from 67 take-offs, of which 1 hour and 51 minutes in a PW-5 (7 take-offs, of which 3 by winch launch). He performed a flight of 1 hour and one minute in this type in November 2017.

The Student Pilot obtained his aerotow endorsement in August 2017. He did not fly between 11 November 2017 and 15 March 2018. From 15 March 2018 to the flight ending in accident on 08 April, he performed 6 take-offs with a flight instructor and one solo in a type K-7 aircraft.

He had his first five take-offs in the type PW-5 in October 2017. The flight ending up in accident was his eighth flight. He did not fly in the type PW-5 for 148 days between November 2017 and April 2018.

1.6. Aircraft data

1.6.1. General

Class	Fixed-wing unpowered sailplane
Manufacturer	Wytwórnia Sprzetu Komunikacyjnego „PZL – Swidnik" S.A. Poland
Model	PW-5 "Smyk"
Year of manufacture	1996
Serial number	17.04.021
Registration marks	HA-4070
State of registry	Hungary
Date of registry	26/04/2010
Name of the owner	MÁV Sportrepülő Egyesület
Name of the operator	MÁV Sportrepülő Egyesület

	Hours flown	Number of take-offs
Since manufacturing	~1380	~2050
Since last overhaul	~380	~710

Regarding its design, the type PW-5 is a single-seat, shoulder-wing sailplane with its airframe fully made of fiberglass reinforced plastic.

This type is characterised by a relatively short wing span (13.44 m) and low empty mass (180 – 190 kg), and accordingly, low surface load. This model is popular with students because of its gliding performance and good maneuverability.

The aircraft was equipped with two tow hooks, one located near the main landing gear (CG hook), which can be used for winch launch. This is a device that provides automatic release from the winch cable before the angle (between the winch tow line and the longitudinal axis of the aircraft) exceed a certain limit.

This model has EASA type certificate[1]. According to this certificate, the aviation authority of the state of the manufacturer of the aircraft issued the first type certificate for the type on 10 March 1994.

The manufacturer of the aircraft modified the location of the CG hook of the aircraft in 2000 (see details in Section 1.18.1). The aircraft involved in the accident was produced prior to the said modification.

1.6.2. Notes relating to airworthiness of the aircraft

Airworthiness Certificate	Number	PM/A/NS/1517/2/2010
	Date of issue	12/05/2010
	Valid until	Until withdrawal
	Restrictions	None

Airworthiness Review Certificate	Number	HU.MG.0139
	Date of issue	22/04/2016
	Valid until	22/04/2018
	Date of last review	20/04/2017

1.6.3. Aircraft loading data

Empty mass	186.6 kg
Payload (maximum)	113.4 kg
Maximum take-off mass	300 kg
Mass at the time of the occurrence	Approx. 290kg

The trim ballast weights supplied by the manufacturer were not mounted at the time of the accident. According to information known to the IC, those trim ballast weights were never used during training.

1.6.4. Description of malfunctioning equipment; equipment data

No information emerged during the investigation on malfunction of the structure or any system of the aircraft prior to the occurrence, thus contributing to the occurrence or influencing the course of events.

1.6.5. On-board warning systems

No warning system was installed in the aircraft; none is required for the aircraft type involved.

[1] EASA TCDS No. A.087; Issue 02, 30 April 2008

1.7. Meteorological information

The IC cited an expert meteorologist to obtain and analyse relevant weather data; this chapter is based on his expert opinion.

On the day of the occurrence, the weather in Western Europe was characterized by a multicentric low pressure weather system and an associated front fluctuating along a north to south axis, while the weather of the Carpathian Basin was determined by a high pressure weather system situated above the East European Plain. The south-southeast low level wind was lively (3 to 5 m/s) with intense gusts (>10 m/s) in Hungary. The upper wind was basically southern, with speeds around 15 m/s.

According to the METAR published at Budapest Liszt Ferenc International Airport, the wind blew from 160° at 14 to 15 knots (7.5 m/s) between 16 and 18 o'clock.

On the basis of the Weather Research and Forecasting Model drawn from 8-hour data on 08 April 2018, the forecast for the Farkashegy area for 17 pm reported a mean wind of 6.3 m/s from 162°, with gusts of 10.8 m/s.

According to the launch coordinator, at the time of the occurrence the wind blew from 160° with a speed of about 7 m/s, without intense gusts.

1.8. Navigation aids

The navigation equipment did not influence the course of events, so it needs no detailed discussion.

1.9. Communications

The communication equipment did not influence the course of events, so it needs no detailed discussion.

1.10. Aerodrome information

The take-off was performed from Farkashegy (Class IV) airfield on 08 April 2018, at 17:31, and the destination also was Farkashegy airfiled. Actual touchdown took place outside the working area of Farkashegy Airport, at the spot determined by the coordinates 47,48971°North and 018,91446°East, at 17:33.

The airport involved in the occurrence had a valid operation certificate.

Name of aerodrome	Farkashegy
ICAO code of aerodrome	LHFH
Airport operator	MÁV Repülő Sportegyesület
Airport coordinates (ARP)	47°29'22.32"N 18°54'35.53"E
Elevation above sea level	215 metres
Runway orientation	15-33
Runway dimensions	1000x200 metres
Runway surface	grass

The parameters of the airfield did not influence the course of events, so they need no detailed discussion.

1.11. Flight data recorders

No flight data recorder was installed in the aircraft; none is required for the aircraft type involved.

1.12. Wreckage and impact information

The sailplane involved in the occurrence touched down near the northeastern part of Farkashegy airfiled, at the coordinates 47,48971°N, 018,91446°E, near the grass strip, but outside its working area, in a spot densely covered by trees and bushes of 1,5 to 3 m (Figure 5). Prior to the touch-down, the aircraft hit the vegetation in a turn, predominantly around its vertical axis, then it crashed into ground nose down. As a result, the aircraft was destroyed.

According to the launch coordinator, the sailplanes launched from the estimated coordinates of 47.490004°N, 018.913033°E. The wreck of the aircraft was found ca. 82 metres from the start point towards the winch, and ca. 65 metres NE of the runway edge markings (Figure 6).

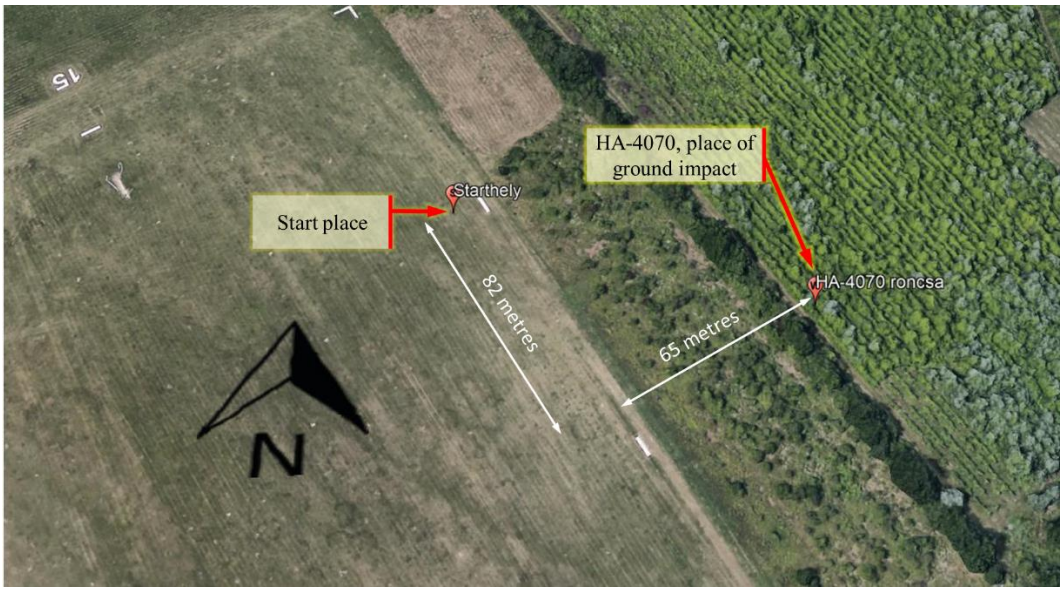

Figure 6: Situation of the wreck relative to the start place

The inspection team of TSB arrived at the accident site at 18:40. The winch cable and its accessories were inspected on the site. The winch cable system included a weak link which was as required for the aircraft involved in the accident. Neither the winch cable nor its accessories had any effect on the occurrence therefore they will need no discussion in detail.

1.13. Medical and pathological information

There was no evidence that physiological factors or other impediments had affected the legal capacity of the Student Pilot.

1.14. Fire

There was no fire in connection with the occurrence.

1.15. Survival aspects

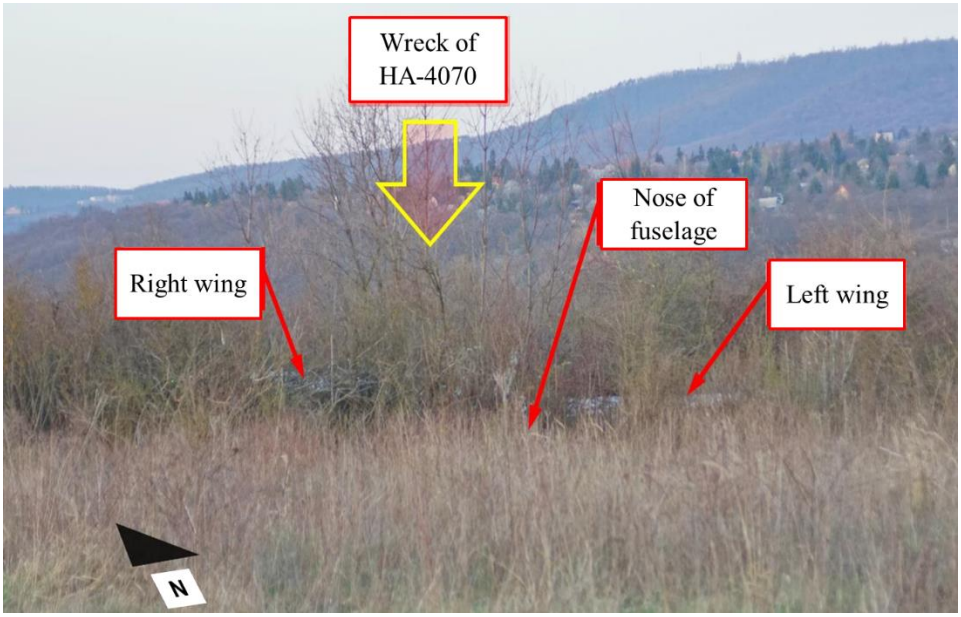

Figure 7: The spot of ground impact of the HA-4070

The touch-down spot was an uncultivated land next to the airfield, covered with trees and bushes. This thick and relatively tall vegetation (Figure 7) and the damage of the airframe absorbed a substantial portion of the kinetic energy. The damage of the cockpit was not so severe as to cause serious injuries to the Student Pilot.

1.16. Tests and research

The IC did not perform or order tests or special inspections.

1.17. Organisational and management information

1.17.1. Management manual for the organisation

The training organisation (hereinafter: the "Organisation") had the required and competent authority approved manuals as well as certificates. The list of the training aircraft in the Management System Manual[2] (hereinafter: "MSM") obtained by the IC includes the type PW-5 sailplane with Reg. marks HA-4070.

The IC identified errors (including but not limited to those listed below) in the MSM manual of the Organisation which may present cause of contradictions or ambiguity:

- the date of issue of the MSM with the Version № 1 is different from the date indicated in the decision of the authority in which the Training Organisation is approved;
- The meaning of the term 'employee') as used in the MSM is not clearly defined;
- Certain terms and procedures used in the MSM are not clearly defined (e.g.: MSM Chapter 6 gives no sufficient reference as to the operation of the flight safety system);
- MSM Chapter 6 Flight Safety System refers to a government organisation which conceded with a legal successor in 2006;

[2] MSM / 4.2 [List of aircraft used for training] (2nd Edition, 25 01 2018)

1.17.2. Flight safety system of the Organisation

Pursuant to Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and Regulation (EU) No 376/2014 of the European Parliament and of the Council repealing Commission Regulation (EC) No 1321/2007 and Commission Regulation (EC) No 1330/2007 (hereinafter: "376/2014/EU"), each organisation shall develop a process to analyse occurrences collected in order to identify the safety hazards associated with identified occurrences or groups of occurrences. According to the analysis, each organisation has to define the appropriate correction or preventive actions necessary for improving the safety of aviation.

The Organisation reported only those occurrences to TSB, which involved personal injuries or damage to aircraft.

The Organisation states in Chapter 3.9.1 of its MSM that it has no *'outsourced activities'*. The Organisation gives the name of the person responsible for flight safety in Chapter 3.3 of its MSM.

Despite those above, the periodical reports were sent to TSB by another organisation providing flight safety services. This flight safety organisation in the periodical reports indicate the Organisation involved in the occurrence as a contracted partner, but the sailplanes used for training are not listed, and the occurrences involving such sailplanes are not mentioned either. In addition, TSB has not received any investigation material produced by the Organisation (or any agent) relating to occurrences involving the aforesaid aircraft or any action taken relating to such occurrences, despite several requests from TSB.

1.17.3. Documents according to the Organisation's MSM

Chapter 6 of the Organisation's MSM deals with the Safety Management System. In that chapter, the Organisation specifies tasks for itself based on relevant legislation, and the outcomes of such tasks are documents. Some of those documents are to be submitted to TSB upon completion.

The IC asked the Organisation to submit all documents mentioned in Chapter 6 of the Organisation's MSM, but the Organisation has not handed over any of the requested documents.

1.17.4. Weather limits in training

Section AMC1 ORA.ATO.230(b) of Regulation (EU) No 1178/2011 requires that the Operation Manual (hereinafter: the "OM") of the training organisation (approved by the competent authority) should include defined weather minima. According to the IC, such weather minima should include visibility limits, cloud base and clearance from clouds.

The weather limits as specified in the OM of the Organisation apply for flight instructors only, and these limits do not include wind speeds.

OM 3.5[3] of the Organisation says:

> *"Minima relevant to student pilots shall be judged by the flight instructor, depending on the given student's experience, skills and the flight task at hand."*

[3] 3.5. Weather minima (student pilots)

1.18. Additional information

1.18.1. Modification of the aircraft by the manufacturer

The PW-5 sailplane has two versions, as far as the CG hook is concerned. The accessory is mounted 60 mm closer to the front in the version manufactured after the year 2000 compared to the earlier version. The IC asked the manufacturer the reason for such modification, and received the following answer:

Excerpt from the manufacturer's answer:

> *"The towing hook was moved to the front (about 60 mm) which resulted in decreasing the nose up pitching moment (in the first version – the location of belly-mounted hook underneath the glider's CG – the line of pull was very low and imparted a strong pitch-up moment so the glider had a strong tendency to pitch-up on its own under the influence of winch acceleration, which may result in steep climbing at the very low altitude)."*

According to the flight manual of the sailplane, the force acting on the control stick during steep climb is not significant, the ideal winch launching speed is 90 to 100 km/h, the maximum crosswind during take-off/landing is 6 m/s, and the aircraft is not sensitive to the crosswind while rolling on both wheels.

1.18.2. Similar cases

1) Poland, 15 November 2008

Transition training for the PW-5 sailplane was planned for two student pilots on the day concerned. The organisation involved in the training sent a PW-5 and a Bocian sailpalnes to the start place. The two student pilots assigned for transition training for the PW-5 sailplane performed two check flights each in the Bocian. Based on the student pilots' performance, the duty flight instructors checked them out for solo flights. The first student pilot took off in the PW-5 sailplane in order to perform the next task according to the plan of transition training for the new type. During the climb, the student pilot failed to maintain the constant and correct angle of climb, and over accelerated the sailplane to ca. 150 km/h. Judging that the situation was dangerous, the flight instructor ordered the winch operator to interrupt the launch. The student pilot released the rope somewhat below 200 m AGL, and landed uneventfully at the landing area. The flight instructor and his student pilots discussed the mistakes made during the winch launch, and he gave them a break so that they can think over how to perform the subsequent flights. About 2 hours later, the flight instructor told the second student pilot to get into the PW-5 and prepare for the flight. In the first phase of the take-off run the tail skid of the sailplane hit the ground intensely two or three times, and then the plane suddenly started a very steep climb. The Flight Instructor told the student pilot on the radio to push on the control stick, but the student pilot did not seem to react. The student pilot also ignored the next order to release the rope. The sailplane stalled at about 20-30 metres, began to yaw to the left along its vertical axis, and crashed to the ground. The student pilot lost his life in the impact.

The student pilot involved in the accident had finished his basic training in a type Bocian sailplane on 4 August 2008. Before the accident, he only had licence for the types Bocian and Junior, and had little flight experience.

As a result of the investigation the PKBWL issued two safety recommendations (see 1.18.3).

2) Tauranga Airport, New Zealand, 01 May 2016

A student pilot was performing his first solo flight in a type PW-5 sailplane (PZL-Swidnik PW-5, with reg. marks ZK-GPE) at Tauranga Airport, New Zealand. The aircraft stalled in a low level turn before landing, and crashed to the ground. The aircraft was badly damaged, and the pilot died on the day after, due to his injuries. The investigation found that the pilot had lost control over his aircraft during the turn, and crashed to the ground. The investigation also found that the student pilot had had insufficient experience in the type PW-5. Since starting his training in June 2015, the pilot had 49 minutes of solo flight from 3 take-offs, and 19 hours and 6 minutes flight experience (40 take-offs) altogether.

In their report, the authority of New Zealand highlighted that a few hours flying solo is not sufficient for flying a new aircraft type.

3) Farkashegy Airport, Hungary, 15 April 2018

During the investigation of the current event, the IC got information on a similar event which had involved the another PW-5 sailplane with reg. marks HA-7004 at Farkashegy airfield on 15 April 2008, at 14:00. The pilot had an SPL licence and had ca. 31 hours flight time in the sailplane model involved, and 61 hours flight time altogether in the sailplane types K-7, PW-5, Astir CS77 and Club Astir. According to the pilot's report, there was little variable wind on the day of the occurrence. At the time of the flight, the wind was about 5 to 6 m/s crosswind and headwind, with no sunshine or thermals. The pilot performed the necessary pre-flight checks, and started his first take-off of the day with the purpose of practice. Take-off was by winch-launch from Runway 15 of the airfield. The pilot said she did not start a steep climb during the winch launch because she was familiar with the story of the HA-4070. However, at a height of ca. 150 metres, the speed of the aircraft suddenly increased. According to the pilot, she did not move the control stick, but the pitch of the sailplane still increased suddenly (almost to vertical), while its speed began to drop. The sailplane did not react to the pilot's subsequent pushing the control stick forward, and soon after, the aircraft dropped off to the left. At that point, the pilot released the cable and pitched down to increase speed and continued her flight opposite to the winch direction. Finally, she entered the traffic pattern according to the runway direction, and landed. The winch system was the same as in the case of the accident of the sailplane with reg. marks HA-4070, but the winch operator was different.

1.18.3. Safety recommendations and measures taken by authorities relating to accidents involving the sailplane type PW-5

PKBWL issued safety recommendations relating to the accident which took place in Poland (see in Section 1.18.2 (1) above), recommending that the flight manual of the PW-5 should include, in the form of a warning, that the forces acting on the control stick during take-off are very small, and disregarding this factor may lead to stalling of the aircraft, and that it is not recommended to apply winch launch for transition training student pilots for this sailplane type. PKBWL issued such safety recommendations for both PW-5 versions (see differences between the two versions in Sections 1.6.1 and 1.18.1).

The safety recommendations issued by the Polish investigating body are not integrated into the flight manual of the sailplane type concerned. According to information available to the IC, the manufacturer has never since issued limitations and/or information to the users relating to such different characteristics of this type compared to the usual sailplanes designed for beginner pilots.

The IC has no information that the Hungarian gliding community would have become aware of such recommendations or such unfavourable winch-launch characteristics of the sailplane type concerned.

In connection with the accident in New Zealand (mentioned in Section 1.18.2), the competent authority recommended the New Zealand gliding association to compile a guide for flight instructors which guide should assist, among others, with the student pilots transition training with single-seated aircraft. The association integrated it in their modified Manual issued on 13 January 2018.[4]

1.18.4. Audit by the competent authority

On 03 December 2019, the competent authority carried out a full audit of the Organisation; the records taken of such audit does not mention any non-compliance relating to the Organisation's safety management system.

1.19. Useful or effective investigation techniques

The investigation did not require techniques differing from the conventional approach.

[4] http://gliding.co.nz/wp-content/uploads/2018/01/Instructor%20Manual%20Part%202-Jan18%20amdt.pdf

2. Analysis

2.1. Aircraft

2.1.1. Flight characteristics

Both sailplanes involved in this investigation and the one described in Section 1.18.2 (and involved in a similar event) were manufactured before the modification introduced by the manufacturer (1.6.1). The manufacturer's position is that, due to the location of the CG hook, the aircraft is prone to pitch up in the initial phase of winching. The force acting on the control stick is very small during winching (1.18.1). Consequently, the IC thinks that the control stick forces do not help the pilot while flying the sailplane. That may easily result in rough and jerky control inputs among of less experienced pilots.

The Sailplane Flight Manual published by the manufacturer only mentions small values of stick forces but not the prance of the aircraft during winch launch. The IC identified this as a serious flight safety problem.

It is known from the report of the pilot involved in the occurrence of 18 April 2018 (1.18.2) that, despite unchanged control stick position, the pitch angle of the aircraft increased suddenly, and her pushing the control stick fully forward had no effect. According to the IC's experience, this situation may occur when the horizontal stabiliser has stalled.

Flying clubs often allow beginner pilots (pilots with little experience) to fly the sailplane, owing to its favourable flight performance (1.6.1). According to the IC, the winch launch implies high risk for pilots of little experience. A more detailed analysis of this accident and the occurrences described in Section 1.18.2 also support this opinion:

- after winch launch, two student pilots of little experience, participating in aircraft type transition training, stalled in the same way; each aircraft is destroyed, and one of the student pilots died;
- an inexperienced student pilot with few hours flight time spun at low altitude after aerotow; the student pilot died;
- an aircraft flown by a licensed pilot stalled during winch launch.

According to the IC, the flight characteristics of the aircraft contributed to the occurrence.

The IC proposes that safety recommendations be issued in order to reduce the risk described above.

2.1.2. Stalling of the aircraft

According to the IC, the Student Pilot increased the pitch angle[5] of the sailplane (by pulling back the control stick) to such an extent in the initial phase of the winch launch (Figure 8/ (1)), that the wings' angle of attack[6] increased close to the stalling attitude.

[5] pitch angle: the angle between the longitudinal axis of the aircraft and the surface of the ground.
[6] angle of attack: the angle between the chord line of the airfoil and the relative wind.

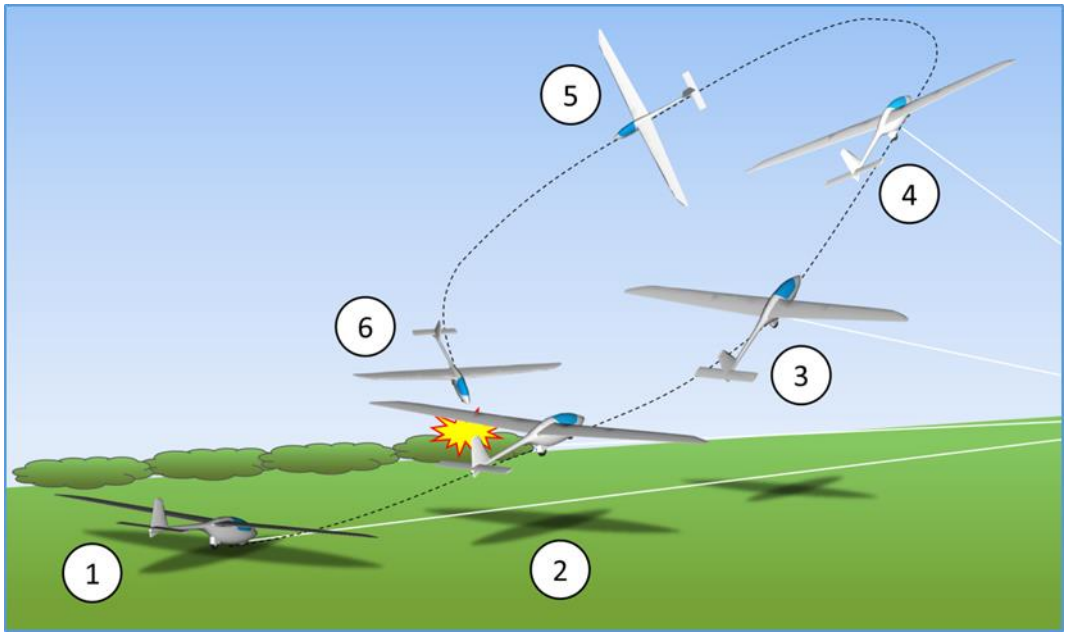

Figure 8: Flight path of the HA-4070 (drawing not to scale)

According to reports from witnesses and the fact that the aircraft crashed to ground left of the line of winching (Figure 8/ (2)), it may be stated that, during the stall, the airflow separated from the left wing first, thus creating an asymmetric lift distribution (Figure 8/ (3) and Figure 9). As a result, the sailplane deviated from the intended flight path in a left rolling movement (Figure 8/ (4), (5)), and finally it crashed to the vegetation and the ground.

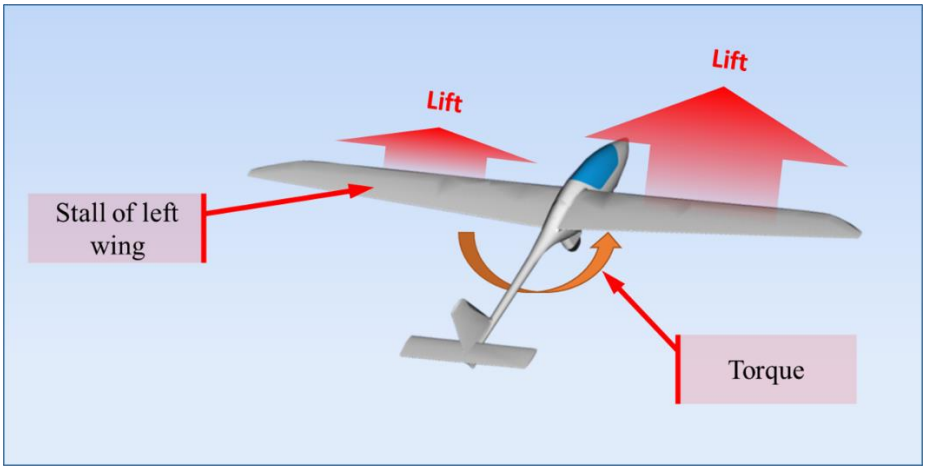

Figure 9: asymmetric stalling of an aircraft

According to the IC, it cannot be stated with certainty that the Student Pilot caused the stalling of the aircraft solely by control stick handling. It cannot be verified either that excessive pitch angle was caused by possible stalling of the stabilizer in the initial phase of winch launch.

According to the IC, steep winching in itself may lead to stalling of a sailplane, but the joint effect of the winching characteristics of the sailplane and the wind gusts contributed to the loss of control over the aircraft.

2.1.3. Safety recommendations issued earlier

The purpose of the earlier Polish safety recommendation (1.18.3) was to raise awareness, but the manufacturer did not implement the recommended modification. The IC's position is that it is essential to make all aircraft owners and users aware of any major identi-

fied risk factor (e.g.: proneness to prance, etc.) on time. Accordingly, acceptance of the earlier safety recommendation relating to the aircraft type involved would largely have decreased the possibility of the occurrence under investigation.

The purpose of the safety recommendation issued by New Zealand earlier was to give help to the flight instructors and student pilots to decide the experience level required of student pilots to be selected for transition training for single-seat aircraft types.

2.2. Weather

According to witness reports, the expert meteorologist and the forecasting models, it may be stated clearly that the mean wind in the region was 7 m/s, with gusts of 9-11 m/s (1.7).

The instructors at the site decided that it was possible to continue the training under the given weather conditions.

According to the IC, the intensity of the mean wind and the gusts at the time of the occurrence was higher than the reasonable limit for transition training for the Student Pilot with little experience.

2.3. The Student Pilot

The Student Pilot had 7 take-offs in the year concerned, all in a two-seater aircraft. He had not flown the type PW-5 for 5 months prior to the date of the accident (1.5.1).

Before flying the type PW-5, the Student Pilot only flew a type (K-7) which is much more forgiving of controlling/control stick handling errors. According to the IC, it was a contributing factor that the Student Pilot began to fly too soon (compared to his level of experience) in an aircraft type having flight characteristics which were new to him.

According to the IC, the weather conditions discussed in Section 1.7 implied a risk for the inexperienced Student Pilot who had not flown the given type for 148 days, which contributed to the accident.

The accident proves that the task received was too difficult for the Student Pilot under the given weather circumstances.

2.4. The Organisation

2.4.1. Allowing student pilots to fly solo

It is difficult to judge in glider training when a student pilot has reached a level commensurate to flying safely in a single-seat type, i.e. when they should start transition training. In addition to technical aspects, other factors (e.g.: weather, flight characteristics of the aircraft) are also to be taken into account before such a decision. The occurrence in New Zealand (described in Section 1.18.2) also points toward a transition training started too soon, and inappropriate circumstances can have tragic consequences.

In the morning, the Student Pilot did not want to fly alone because of the intensive wind, so, upon his request, he performed two practice flights with a flight instructor, in a two-seat type PW-6 sailplane. Subsequently, the flight instructor found the Student Pilot suitably qualified for solo flying.

As the facts show, the Student Pilot's knowledge and experience (taking the winch launch characteristics of the sailplane into account) proved to be insufficient for safe solo flying under the given weather conditions.

According to the IC, the practice flights preceding the flight ending up in accident were not sufficient to prepare the Student Pilot for flying any type of sailplane safely on his own after missing 5 months of flying.

2.4.2. Aviation safety aspects

The IC found significant administrative shortcomings in the MSM of the Organisation (1.17.1). The MSM Chapter 6 Flight Safety System contains certain terms and parts which are not defined in the Manual or are too general to give useful help to the user of the Manual (1.17.1 and 1.17.2). According to the IC, the aforesaid administrative shortcomings did not contribute to the occurrence directly, but call into question the efficacy of the supervision of the compliance of the Organisation.

Experience shows that more serious occurrences are often preceded by such safety-related events and errors which call attention to safety hazards. Therefore safety-related information significantly contributes to the identification of existing or potential safety hazards. Since the application of the Regulation (EU) No 376/2014, TSB has not received (unless requested) any notification from the Organisation which was not about an occurrence involving a personal injury or serious damage to an aircraft. According to the ICAO Accident Prevention Programme[7], the 1:600 rule can roughly be applied to aviation accidents and incidents. According to that rule, 1 major or fatal accident is preceded by 600 minor incidents, the timely management of which can prevent a more serious accident with high probability.

The Organisation did not perform any internal investigation, and did not have any investigation performed, into the accident concerned. According to the IC, the problems mentioned above demonstrate the necessity to improve the safety management system and the safety culture of the Organisation.

The fact that the Organisation did not deliver any of the documents requested by the IC allows the IC to conclude that the Organisation did not perform proper documenting, analysing or preventive activity relating to flight safety, nor did they have any such activity performed.

According to the IC, an aviation organisation should constantly scan for and manage safety hazards proactively that arise during its operation. In the case of an accident which has already taken place, it is expected as a minimum that the organisation should do its best to prevent an event from occurring again due to the same or similar cause(s). Seven days after the accident of the aircraft with reg. marks HA-4070, a similar incident with the same causes occurred within the same Organisation, with another PW-5 aircraft, but with no bodily injury or damage to the aircraft (1.18.2).

The IC took into account EASA's comments to the Draft Report on the occurrence which included the requirements set for the operation of training organisations. In the absence of documented operation, the IC could not identify such way of operation.

2.5. Requirements

As far as training restrictions are concerned, the applicable rules of the EU[8] only stipulate certain weather minima to be applied by training organisations. The IC's position is that the concept of 'weather minima' does not comprise wind speed and wind gust values. However, such values have a lot higher practical importance in glider training than weather minima generally associated with VFR flying. Regardless of that, no legislation prohibits a training organisation from introducing more restrictive limits for themselves in their Manual.

[7] ICAO Accident Prevention Programme, 2005
[8] Regulation (EU) No 1178/2011, AMC1 ORA.ATO.230(b).

2.6. Activity of the flight instructors

The Organisation's manuals contained no specification for wind speed limits relating to student pilots; it was the flight instructor's responsibility to decide on a case-by-case basis, whether the weather conditions allowed a student pilot to fly (1.17.4), or whether a flight activity was to be cancelled or continued.

In the IC's opinion, the instructors' decision put the Student Pilot into a situation he could not manage.

2.7. Survival aspects

The IC's opinion is that the accident was survivable only owing to extraordinarily fortunate circumstances. The reason for the lucky outcome of the accident was that the kinetic energy of the aircraft was largely absorbed by dense vegetation and the serious damage of the airframe (1.15).

2.8. Comparison to similar occurrences

The relatively low experience of the Hungarian and the Polish student pilots were very similar in regard of total flight hours and long periods without flying. The pilot from New Zealand had little experience as well. The pilot, who managed to prevent the accident in the occurrence at Farkashegy Airport on 15 April 2018 (1.18.2) had an SPL licence and adequate experience.

Regarding the controllability/handling of the aircraft the following may be established based on similar occurrences.

- A student pilot with little experience in the given aircraft fell into unintended spin at low altitude. .
- Three of the four occurrences investigated involved student pilots with little experience.
- Three of the four occurrences investigated took place during winch launch, and one of those three involved a pilot with adequate level of experience.

The IC's opinion is that winch launching inexperienced student pilots in this glider involves multiple hazards.

3. Conclusions

3.1. Findings

3.1.1. The Aircraft

The aircraft had a valid airworthiness certificate. (1.6.2)

According to its documents, it was equipped and maintained in compliance with the requirements in effect and with the accepted procedures. (1.6.)

No information came to light during the investigation on malfunction of the structure or any system of the aircraft prior to the occurrence, thus contributing to the occurrence or influencing the course of events. (1.6.4)

The equipment specified in the type certificate was installed in the aircraft, and the IC had made no notice and received no notice relating to its operation. (1.6.4)

3.1.2. The Student Pilot

At the time of the occurrence, the Student Pilot had the appropriate certificate, but inadequate experience for the given flight task. (1.5.1)

3.1.3. Air operations

The mass of the aircraft and the distribution of its mass were within the specified limits. (1.6.3)

The flight took place at daytime, in good visibility conditions. (1.7.)

At the time of the occurrence, the direction of the mean wind was almost identical with the runway direction, with a wind speed of 7 m/s, with gusts of 9-11 m/s.

3.1.4. The Organisation

The Management System Manual used by the Organisation contains several contradictions as well as errors causing ambiguity. (1.17.1), (2.4.2)

The Organisation has only notified TSB of occurrences involving injury to a person and/or damage to aircraft. (1.17.2)

According to the Organisation's MSM it has no *'outsourced activities'*. (1.17.2)

Neither the Organisation nor any agent performed investigation relating to the accident. (1.17.2), (2.4.2)

The Organisation failed to provide the documents requested by the IC. (1.17.2), (2.4.2)

The Organisation's manuals contain no limits for wind speeds relating to student pilots. (1.17.4), (2.6)

It was the flight instructor's responsibility to decide, on a case-by-case basis, whether the weather conditions allowed a student pilot to fly. (1.17.4), (2.6)

3.1.5. The airport

No information emerged on the characteristics of the airport which could be associated with the occurrence. (1.10)

The airport involved in the accident had valid certificate. (1.10)

3.1.6. Medical and pathological information

There was no evidence that any physiological factors affected the legal capacity of the Student Pilot. (1.13)

3.1.7. Chances of survival

No one was injured. (1.2)

The accident was survivable owing to the energy-absorbing capability of the vegetation and the damage to the aircraft. (1.15, 2.7)

3.1.8. Supervision of flight safety

The full audit of the Organisation performed by the competent authority in 2019 found no non-compliance relating to the Organisation's safety management system. (1.18.4)

3.2. Causes

During the investigation, the IC came to the conclusion that the direct cause of the accident was the Student Pilot's loss of control in the initial phase of the winch launch. The following were also contributing factors:

- low level of skill and experience of the Student Pilot (2.3);
- characteristics of the aircraft model (2.1);
- adverse weather conditions (2.2);
- judgment of the above-mentioned factors by the flight instructors (2.4.1), (2.6).

In addition to those above, the IC identified the following indirect cause and contributing factor:

- Neither before nor after the occurrence did the Organisation run its safety management system.

4. Safety recommendations

4.1. Actions taken by the Organisation during the investigation

On 25 August 2020, the Organisation informed the IC via email that:

"During the theoretical and practical training, being aware of the characteristics of the aircraft type, we have always paid due attention during winch launching the PW-5 type.

After that occurrence, we will place even greater emphasis on preparing the pilots flying this type of aircraft for these characteristic features. Herein we present the measures taken by those interested in connection with the occurrence during the investigation."

The Organisation could not present any document of the above action or of the completion thereof.

4.2. Safety recommendation issued on completion of the investigation

The Investigating Committee of TSB has withdrawn the Safety Recommendation № **BA2018-169-4-1** proposed to EASA in the Draft Report.

The Investigating Committee of TSB proposes that the following safety recommendation be issued on completion of the investigation:

BA2018-169-4-2: *The Investigating Committee of Transportation Safety Bureau found during its investigation that, in some circumstances, the PW-5 sailplane is prone to stalling during winch launch. Therefore*

> **Transportation Safety Bureau recommends Zakład Szybowcowy „Jeżów", the manufacturer, to include in the Flight Manual of the PW-5 sailplane that winch launch is not recommended during student pilots' transition training for that type.**

According to the IC, by acceptance and expected implementation of the safety recommendation, the probability of accidents involving student pilots flying this type of aircraft will decrease.

Budapest, 21 December 2021

Miklós Ferenci
Investigator-in-Charge

Gábor Erdősi
Member

Appendices

Appendix 1: Extract of EASA comment

" The Approved Training Organisations should always have in place a solid risk assessments as part of their certification process and operational structure, as specified respectively by ORA.GEN.115 and ORA.GEN.120, and by ORA.GEN.200(a)(2)(3), also to inform its staff and students of applicable procedures and limitations (ORA.ATO.130(a)(b)). Furthermore it is the role of the Chief Flight Instructor to standardise the Flight Instructors, who in turn will evaluate and judge on a daily basis if a student is able to execute a solo flight within the applicable safety limits established by the Approved Training Organisation in its training/operations manuals as specified by ORA.ATO.210(b).

In addition the Pilot In Command should determine if a flight can be executed safely and within the safety margins according to the Approved Training Organisation' training and operations manuals (ORA.ATO.230).

The management of the risks connected to the specific operations of any given Approved Training Organisation (e.g. environment, fleet, type of flight training provided etc.), should be part of the internal risk management programme (ORA.GEN.200 applicable AMCs), and of the internal standardisation activities as required by ORA.ATO.210(b) for which the appointed Chief Flight Instructor is responsible under the supervision of the Head of Training.

Based on the arguments detailed above, the European Union Aviation Safety Agency has already clearly established the responsibilities of the individual Flight Instructors and the of the designated Pilots in Command, and that the Safety Recommendation HUNG-2020-XX1 is already addressed by the applicable Approved Training Organisations certification and operational requirements. As such there is no need for further amendments to the present regulation in order to introduce additional obligations for Approved Training Organisations to specify in their manuals each individual maximum wind speed values up to which their student pilots may take-off during their training."