DUTCH
SAFETY BOARD

Loss of control after interrupted winch launch, Gilze-Rijen Air Base

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The Hague, May 2021

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The Dutch Safety Board

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Dutch Safety Board

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NB: This report is published in English, a summary is available in the Dutch language. If there is a difference in interpretation between the Dutch and English version, the English text will previal.

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SUMMARY

On Sunday 12 July 2020, the Rolladen-Schneider LS8-18, with registration PH-1150, a single seater glider, took off from Gilze-Rijen Air Base by making use of the winch launch method. At an altitude of approximately 200 metres, the cable disconnected prematurely. Witnesses saw the glider lower its nose and a transition to a right hand turn with a steep angle of bank. The glider then attained a nose-down attitude and started to rotate. After approximately two full rotations in the nose-down attitude, the glider crashed into the ground and came to rest upside down. The pilot died due to fatal injuries.

The Dutch Safety Board conducted an investigation into the cause of the accident. This investigation answers the following three questions: (1) What was the cause of the crash? (2) Which factors enabled the participation of PH-1150 in flight operations on the day of the accident, while there was a possible malfunction of the release mechanism? (3) Which circumstances led to the fact that the pilot involved, with no recent experience on single seaters, took off with PH-1150?

Cause of crash
The accident was caused by the pilot not being able to recover from the spin, which was the result of a low airspeed situation, close to the stall speed, which had quickly developed into an asymmetric stall. The low airspeed situation arose after the premature cable release during the winch start. After a premature cable release, the pilot has to carry out the cable release procedure, which, in practice, implies forward moving of the control stick to achieve a normal flying attitude and the corresponding safe speed. The pilot of PH-1150 made a right turn, before the glider had reached a safe speed, causing the right wing to stall. There were no technical defects in the flight controls that have played a role in the accident.

During maintenance of PH-1150, a temporary repair of the molded sleeve of the yellow release handle was made and the routing of the cable of the centre of gravity release hook was adjusted. On the first day of flying with PH-1150 after this work on the cable release mechanism, this was the day before the accident, three premature cable releases took place during winch launches. After the last flight before the accident flight, a breakdown of the temporary repair was observed. A technician who was informed about one premature cable release that day and the breakdown of the repair, checked the release mechanism at the end of that day and found no particularities. It is concluded that the premature cable release during the accident flight was caused by a malfunction of the release mechanism. The exact cause of this malfunction has not been established.

Release of PH-1150

No one realised that PH-1150 had three premature cable releases in one day after a temporary repair was done. The information about the three premature cable releases was scattered. People who witnessed or were aware of one or two premature cable releases, made assumptions about the cause. Premature cable releases were not specifically mentioned in the club's rules as occurrences that should be reported. The club's safety management system did therefore not ensure that it was detected that the same malfunction occurred three times with PH-1150 and did not ensure subsequent communication about it within the club.

All people involved either assumed an accidental flaw and those concerned did not consider it a reason to ground PH-1150. However, no peculiarities were found during the inspections of the cable release mechanism. The consequence of that was that the cause of the premature cable releases was unknown, so the risk could not be fully assessed. In such situations, precaution is preferred.

By not grounding PH-1150 immediately after the initial premature cable release without clear cause, the malfunction of the cable release mechanism continued to exist and premature cable releases continued to occur.

Allocation of gliders

The pilot's lack of recent flying experience, and especially on single seater gliders may have contributed to not being able to obtain a safe airspeed after the unexpected situation of a premature cable release. The club set up rules for the allocation of its gliders, including experience requirements. The pilot met the club's requirements. The club's safety management system did not ensure that it was prevented that the pilot, with no recent flying experience on single seater gliders, took off with PH-1150. Furthermore, the club did not have a member tracking system that can help to inform instructors about specifics of members, for instance regarding their currency on type.

Concluding, a temporary repair had been carried out on PH-1150 and then three times a premature cable release took place. PH-1150 was subsequently not grounded, but made available for flight operations with a malfunction of the cable release mechanism, without the cause of the cable releases being thoroughly analysed. This in combination with the allocating of PH-1150 to a pilot with a lack of recent experience on single seater gliders, created a situation in which the accident could occur. The club's safety management system did not ensure that such a situation was prevented from happening.

RECOMMENDATIONS

This report entails some important lessons for gliding clubs.

This accident emphasises that it is important that everyone participating in glider flight operations realises that small defects on a glider can have an adverse effect on flight safety. It is therefore important that every malfunction should be viewed and assessed, without making any assumptions, with flight safety in a broad sense in mind. If there is any doubt pertaining to issues concerning critical functions, such as related to the takeoff, the glider should be taken out of flight operations for further inspection and should not be flown until it is determined that the glider can be safely operated. However, malfunctions can be hard to recognise as such. Therefore, it is important that occurrences that possibly imply critical malfunctions are recognised and reported. The club's safety management system can guide club members with examples of occurrences that possibly imply critical malfunctions. Furthermore, it is important that clubs stimulate the structural and continuously reporting of occurrences that possibly imply critical malfunctions, that might affect flight safety, and record them. Everyone who participates in flight operations has a responsibility in this. In addition, clubs must ensure that the people who have to make decisions about the airworthiness of a glider (technicians, instructors and pilots) are aware of potential malfunctions and associated risks.

The investigation shows that the way in which the club had organised the allocation of its gliders, made it possible that the pilot, not current on single seater gliders, took off with the LS8. The pilot met the club's requirements to fly locally on the LS8. However, the club's requirements did not account for the lack of currency on single seaters. Although this situation is not relevant for many glider pilots, gliding clubs should be aware that club members may pause flying temporarily or may pause flying on a specific type of glider. Therefore, gliding clubs should incorporate recent experience in the way they allocate gliders to their club members and include this in the safety management system.

The Dutch Safety Board therefore issues the following recommendation:

To the Royal Netherlands Aeronautical Association:

Bring the lessons from this accident to the attention of the Dutch gliding clubs and point out to them that:

1. A club's safety management system must be organised in such a way that occurrences that possibly imply critical malfunctions are recognised, reported, and immediate action is taken on it. A club must stimulate everyone who participates in flight operations to report these type of occurrences.

2. A club's safety management system must be organised in such a way that the members' recent flying experience is taken into account when allocating a glider to a club member.

J.R.V.A. Dijsselbloem
Chairman Dutch Safety Board

C.A.J.F. Verheij
Secretary Director

LIST OF ABBREVIATIONS

AMSL	Above mean sea level
ARC	Airworthiness Review Certificate
ASI	Airspeed indicator
BFU	German Federal Bureau of Aircraft Accident Investigation
CG	Centre of gravity
EASA	European Union Aviation Safety Agency
EHGR	Gilze-Rijen Air Base
GPL	Glider Pilot Licence
IAS	Indicated airspeed
ICAO	International Civil Aviation Organization
KNMI	Royal Netherlands Meteorological Institute
KNVvL	Royal Netherlands Aeronautical Association
LAPL(S)	Light Aircraft Pilot Licence (Sailplane)
LOC-I	Loss of control in-flight
METAR	Meteorological Aerodrome Report
SMS	Safety management system
SPL	Sailplane Pilot Licence

Identification number:	2020047
Classification:	Accident
Date, time of occurrence:	12 July 2020, 12.47 hours[1]
Location of occurrence:	Gilze-Rijen Air Base
Registration:	PH-1150
Aircraft type:	Rolladen-Schneider LS8-18
Aircraft category:	Glider
Type of flight:	Pleasure
Phase of operation:	Winch launch
Damage to aircraft:	Nose destroyed, fuselage and cockpit severely damaged, tail broken
Flight crew:	One
Passengers:	None
Injuries:	Pilot fatally injured
Other damage:	Fence
Light conditions:	Daylight

1 All times in this report are local times.

1 INTRODUCTION

On 12 July 2020, the Rolladen-Schneider LS8-18 (hereafter LS8), with registration PH-1150, a single seater glider, took off from Gilze-Rijen Air Base by using the winch launch method. At an altitude of approximately 200 metres, the cable disconnected prematurely. Witnesses saw the glider lower its nose and a transition to a right hand turn with a steep angle of bank. The right turn continued with an increasingly higher bank angle and lower nose attitude. The glider gained a nose-down attitude and started to rotate. After approximately two full rotations the glider crashed into the ground and came to rest upside down. The pilot, who had no recent experience on single seaters, died due to fatal injuries.

On behalf of the state of occurrence, the Dutch Safety Board was responsible for conducting the investigation and instituted an investigation into the circumstances of the accident. The German Federal Bureau of Aircraft Accident Investigation (BFU) appointed an accredited representative, as Germany is the state of design and the state of manufacture of the LS8 glider. European Union Aviation Safety Agency (EASA) appointed a technical adviser. The manufacturer DG Flugzeugbau and the Gliding Safety Committee of the Royal Netherlands Aeronautical Association provided assistance during the investigation.

The investigation into the accident revealed that three premature cable releases occurred with PH-1150 the day before the fatal crash. It answers the following three questions:

1. What was the cause of the crash?
2. Which factors enabled the participation of PH-1150 in flight operations on the day of the accident, while there was a possible malfunction of the release mechanism?
3. Which circumstances led to the fact that the pilot involved, with no recent experience on single seaters, took off with PH-1150?

This investigation followed the ICAO Annex 13, Standards and Recommended Practices, for aircraft accident investigation. Air safety investigators of the Dutch Safety Board visited the scene of the accident and carried out the first investigation of the glider wreckage. They spoke with witnesses to the accident. The wreckage was stored at Gilze-Rijen Air Base, where the Dutch Safety Board further examined it, with assistance provided by two gliding technicians. Investigators spoke with various instructors, technicians and members of the gliding club. They reviewed, among other things, the glider's flight documents and maintenance documents and data provided by the gliding club. The Dutch Aviation Police provided the Dutch Safety Board with additional witness statements and pictures of the accident site.

In Chapter 2, the factual information, gathered and considered relevant, is provided according to the ICAO Annex 13 standard. In Chapter 3 the accident is analysed and in Chapter 4 the findings and conclusions from the previous chapter are combined and listed.

2 FACTUAL INFORMATION

2.1 History of the flight

2.1.1 Flight preparation

In the morning of Sunday 12 July 2020, the instructor in charge performed the daily inspection of PH-1150, an LS8 glider which was owned by a club, together with an aspiring glider pilot licence holder. The glider was assembled the day before. The instructor noticed a repair, which had been made at the molded sleeve of the yellow T-shaped cable release handle in the cockpit. As part of the inspection, he pulled the release handle and put a finger in the center of gravity hook to check if the mechanism was functioning. Everything felt normal; the cable had some slack, which is necessary for the over-center mechanism of the release hook to function. The instructor approved the glider and made it available for flying that day.

Later that day, the pilot of the fatal flight was asked by another club member why she did not fly in the LS8, which was standing idle and available. She told him that she did not like the semi-reclining sitting position in the LS8. The club member offered to help her in arranging a comfortable sitting position. The Deputy Head of Training, who was present as tow pilot, overheard this conversation. The pilot said that it had been at least 10 years ago since she flew in the LS8 and she had to familiarize herself with the flight manual again and then re-apply for authorization to fly the LS8. The Deputy Head of Training stated that he subsequently suggested to help the pilot to adjust the seat of the glider in such a way that she would sit conveniently in it.[2] The pilot took a seat in the glider. The Deputy Head of Training then adjusted the seat. Directly afterwards, the club member the pilot had previously talked with about the LS8, asked her whether she now was comfortable in the LS8. The pilot complained that the shoes she was wearing that day touched the suspension of the canopy, and that her feet were turned inward[3] in the LS8. Nevertheless, he pilot told the club member that she wanted to fly the LS8 that day.

Later, the pilot brought PH-1150 to the strip and asked the instructor in charge for a briefing on the LS8. The instructor in charge asked her why she wanted a briefing from him, as he had seen that the Deputy Head of Training had given her an extensive briefing only some 30 minutes earlier. The pilot replied that she wished to have another briefing, directly before taking off. The instructor in charge asked her also why she did not fly the LS4, which was available.

2 The instructor in charge stated that the Deputy Head of Training had granted the pilot authorisation to fly the LS8 and gave her a briefing, while she sat in the LS8. However, the Deputy Head of Training stated that he only adjusted the seat in the LS8 for the pilot and did not give her a briefing nor the authorisation.

3 Due to the position of the foot pedals.

The pilot answered that she did not like the sitting position of the LS4. The instructor in charge then gave her a briefing. He inserted two pieces of lead in the cockpit, each weighing 2.5 kg, to compensate for the pilot's relatively low weight. The glider was not provided with water ballast. Next, the pilot, who was carrying an emergency parachute, seated herself in the glider and closed the canopy. When she noticed that her head touched the canopy, she opened the canopy and got out again. The instructor then assisted her in moving the backrest in a more backward position. Thereafter the pilot got back in the glider and tightened the safety belts. The instructor checked that the backrest had been secured properly.

Then the pilot checked if she could still move the stick all the way forward and could touch the instruments. When this turned out to be the case, she started the pre-flight checklist. The instructor connected the winch cable to the centre of gravity hook of the glider and performed the usual pull check by hand on the cable, until the glider showed some movement. A red coloured weak link was used. Then the pilot put her thumb up to indicate she was ready for takeoff. Thereafter, at 12.46 hours, the glider took off from glider strip 02 by making use of the winch launch method.

2.1.2 The takeoff

The instructor in charge stated that the rotation of the glider and the climb attitude looked normal. He noticed that at one point in the beginning of the start, the nose of the glider was lowered a bit, after which the glider continued with the normal climb attitude.[4] The instructor followed the whole winch launch. At an altitude of approximately 200 metres, the cable released prematurely. Witnesses saw the glider lower its nose and a transition to a right hand turn with a steep angle of bank. The right turn continued with an increasingly higher bank angle and lower nose attitude. The glider attained a nose-down attitude and started to rotate. The instructor did not see the glider behave in a way that suggests a recovery attempt was made. Another instructor stated that the rotation of the glider stopped after two full rotations. After approximately two full rotations, the glider crashed into the ground. The pilot was fatally injured. The glider came to rest upside down with the right wing on a fence of the air base. The nose of the glider was destroyed and the tail broken. See Figures 1 and 2.

4 This correction was not necessary, according to the instructor, as the glider had a normal climbing attitude.

Figure 1: Accident location. (Source: Dutch Aviation Police)

2.2 Injuries to persons

The pilot died due to fatal injuries as a result of the crash.

2.3 Damage to aircraft

The nose was destroyed and the tail had broken off as a result of the crash. The fuselage was almost broken in half at the level of the wings. The wheel bay and the cockpit were severely damaged (see Figure 2). The right wing was damaged at the point where it hit the fence. The underside of the trailing edge of the left wing was damaged. The glider was beyond repair.

Figure 2: Wreckage of the glider. (Source: Dutch Safety Board)

2.4 Other damage

The right wing of the glider ended up on a fence. The fence was damaged as a result (see Figure 1).

2.5 Personnel information

2.5.1 Pilot's licencing

The pilot held a valid European Union Flight Crew Licence (LAPL(S)[5]) with privileges winch launch and aero tow launch. She also held a valid medical certificate for class LAPL. The weight of the pilot was approximately 65 kg.

2.5.2 Pilot's flying experience

Flying proficiency

The pilot started gliding within the club in November 1998. In May 2004 she obtained her glider pilot licence. The pilot's total flying experience was approximately 190 hours; she had made 1,150 flights.

Her last flight before the accident flight (on 12 July 2020) was made on 28 June 2020. During this flight with an instructor in an ASK-21[6], she made, as an exercise, twice an asymmetrical stall; the first one was followed by a half rotation and the second one by a

5 LAPL(S) stands for Light Aircraft Pilot Licence (Sailplane).
6 The ASK-21 was not equipped with a spin kit.

full rotation. In 2020 the pilot had made six flights[7] (four times winch launch and two times aerotow), five of which were on an ASK-21, a two-seat glider, of which one solo flight and one flight with a passenger. On 26 January 2020, she also made a flight with an instructor in a Schempp-Hirth Duo Discus. In 2019, she had made 23 flights (17 times winch launch), 19 of which were on the ASK-21, including two solo flights on an ASK-21.[8] On 17 February 2019, she did her last cable break exercise with an instructor in an ASK-21.

She had made a total of seven flights on PH-1150 (excluding the accident flight). The table below provides additional information about the pilot's experience.

Last flight	Date
In a single seater (Grob 102)	26 March 2016
On the LS4 (single seater)	4 May 2014
On the LS8 (PH-1150)	26 August 2007

Flying skills

Instructor pilots who had flown with the pilot in the past, made comments about the pilot's flyings skills. A note in her logbook, that related to her last cable break exercise, indicated that she needed to watch her airspeed.[9] Another instructor commented that she was rather easily confused during an abnormal situation. On an aerotow check flight[10] in an ASK-21, the tow pilot flew into a thermal in order to climb faster. As a result, the glider came too high in position behind the tow plane. The pilot was startled and wanted to release the cable, but accidentally opened the air brakes. Then she released the cable after all. The instructor mentioned that this showed that she could become overloaded in unexpected situations. He mentioned that the pilot normally only flew the ASK-21 and it had been 4 years since she had last flown on a single seater, an LS4.[11] The LS4 is a comparable, but slightly easier to fly glider compared with the LS8, according to the instructor.

2.6 Aircraft information

2.6.1 General

The Rolladen-Schneider LS8-18 is a high performance glider. It is a single seater glider with carbon fibre wing shells, winglets, a T-tail, wing and vertical tail fin water ballast

7 According to the administration of the gliding the club the pilot had made six instead of five flights (as stated in the pilot's logbook) in 2020. This missing flight in the logbook was made with an instructor in a Schempp-Hirth Duo Discus on 26 January 2020.

8 The remaining four flights were made on a Slingsby Sedbergh TX1, a Diamond HK 36 TTC and (twice) a Schempp-Hirth Duo Discus. She did not act as pilot in command during these flights.

9 As part of the cable release procedure (see Paragraph 2.14.2), which has to be performed in case of a cable break exercise, the control stick has to be forwarded to obtain a safe airspeed.

10 On 21 June 2020.

11 The instructor stated this after the accident had happened. The logbook indicates that it had been more than six years ago, she had last flown on the LS4.

systems, a retractable landing gear and upper wing surface air brakes. It can be operated in 15 metre or 18 metre wingspan.

On the day of the accident, PH-1150 was operated in the 18 metre wingspan. It was owned by the gliding club at the air base.

2.6.2 Registration and airworthiness review

PH-1150, with serial number 8233, was manufactured by Rolladen-Schneider Flugzeugbau GmbH[12] in Germany in 1999. The date of issue of the certificate of registration is 15 May 2007.

On 28 December 2019, the Royal Netherlands Aeronautical Association[13], Gliding Department, performed the last airworthiness review on PH-1150. The date of expiry of the airworthiness review certificate then issued, is 8 January 2021.

2.6.3 Weight and balance

The weight and balance report of PH-1150, dated 19 November 2016, indicates that for the 18 metre configuration with an empty tail tank and a tail fin battery the minimum weight of the pilot is 80 kg. The maximum weight of the pilot is 105 kg.

The extract of the weight and balance report of PH-1150 (for the 18 metre configuration), dated 5 December 2016, which is dominant over the weight and balance report[14], indicates that the minimum weight of the pilot, including a possible emergency parachute, is 80 kg when a battery is present in the vertical tail of the glider. In the vertical tail of PH-1150 no battery was present, but a fixed compensation weight equal to the weight of a battery was installed. The center of gravity weighing was performed with this configuration.

The Flight Manual[15] states the following:

> Ensuring the correct weight and balance for pilots with insufficient weight can be done by fitting trim weights to a threaded rod in front of the rudder pedals and secured by a knurled nut. A maximum of three trim weights can be installed. One trim weight of 2.5 kg compensates 5 kg of pilot weight.

The instructor inserted two pieces of lead in the cockpit, each weighing 2.5 kg, to compensate for the pilot's relatively low weight.[16]

12 Rolladen-Schneider Flugzeugbau (LS) was taken over by DG Flugzeugbau in 2003.
13 KNVvL, Koninklijke Nederlandse Vereniging voor Luchtvaart.
14 As stated on the extract.
15 DG Flugzeugbau GmbH, Flight manual for the sailplane LS8, June 2016.
16 The glider was not provided with water ballast.

2.6.4 Operation of cable release hook

The winch cable is connected to the glider via the centre of gravity release hook (see Figure 3), which is attached to the bottom of the fuselage near the landing gear (see Figure 5). The pilot can release the cable during the winch launch, by pulling the yellow T-shaped handle in the cockpit. The cable release handle in the LS8 is normally guided a little further into the cockpit, via a molded sleeve[17], to enable the pilot to acces it better during flight (see Figure 4).

The hook has automatic safety release features, governed by a special solid-steel ring. It operates on kinematic principles. The solid, high-grade steel ring takes the lateral load of the cable and governs the automatic release. After 2,000 starts, the release hook must be sent to manufacturer for an overhaul. According to the records, PH-1150 had made a total of 1,737 flights with this hook up to and including 11 July 2020.

Figure 3: The centre of gravity release hook of PH-1150. (Source: Dutch Safety Board)

Figure 4: Molded sleeve and yellow release T-shaped handle in another LS8's cockpit. (Source: Dutch Safety Board)

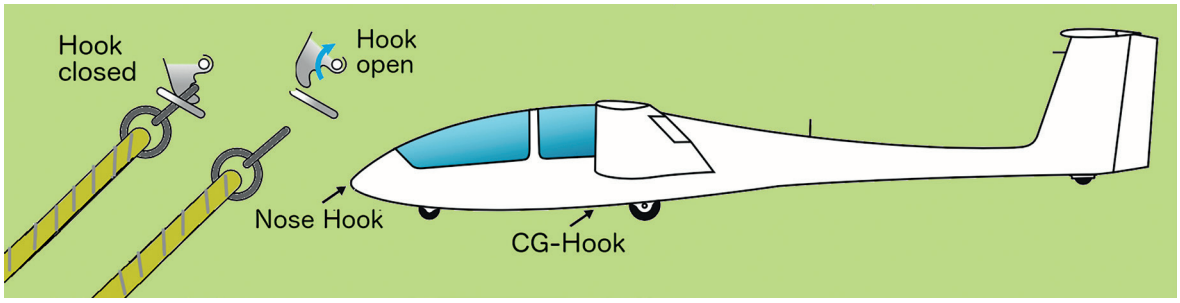

Figure 5: The location of the centre of gravity (CG) release hook. (Source: Gliding, The basics in 35 lessons, D. and R. Corporaal)

17 The molded sleeve is a plastic carrier (resin with a mat) with a pipe in it, through which the release cable runs.

2.6.5 Maintenance history

The table below provides an overview of PH-1150's flights, maintenance, reported defects and repairs done in 2020.[18] The ARC[19] inspection in 2019 is also mentioned.

Date	Number of flights	Report/action performed
28 December 2019		ARC inspection
5 January 2020	11	
11 January 2020	8	
7 March 2020	6	
8 March 2020 – 9 May 2020		Regular annual maintenance
9 May 2020		Issue of 'Release for use and maintenance statement'
31 May 2020	2	
1, 6, 7 June 2020	10	
13 June 2020		Broken molded sleeve of yellow release handle[20]
14 June 2020	11	
15 June 2020		PH-1150 brought to workshop (because of broken molded sleeve)
20 June 2020	1	PH-1150 made a cross-country flight, after which it was brought back to the workshop
20 June 2020		Damaged pitot tube
20 June 2020		Too spacious secure ring of the elevator connection
21 June 2020		Secure ring of the elevator connection replaced
24 June 2020		Pitot tube repaired
Period before 8 July 2020 (when PH-1150 was in workshop)		Temporary repair of broken molded sleeve of yellow release handle
8 July 2020[21]		Incorrect routing of cable of centre of gravity hook observed during inspection of release mechanism
8 July 2020[22]		Routing of cable of centre of gravity hook adjusted
8 July 2020		PH-1150 released
11 July 2020	5	Premature cable release during three flights

18 Source: Complaints and Defects form, update: 20 July 2020 and Excel sheet with overview of starts of PH-1150 in 2020.
19 ARC stands for Airworthiness Review Certificate.
20 It was reported on this date that the molded sleeve had broken.
21 The incorrect routing of the cable was observed during the inspection of the cable release mechanism and subsequently adjusted on 8 July 2020. On the Complaints and Defects form is stated that both occurred on 1 July 2020.
22 One technician declared that the routing of the cable was adjusted in the period before 8 July 2020.

PH-1150 went into regular annual maintenance on 8 March 2020[23]; this was finished on 9 May 2020 when the last annual inspection took place. The nose and centre of gravity hook were both tested and found to be functional and within applicable specifications. On 9 May 2020 a certificate of 'Release for use and maintenance statement'[24] was issued, which indicates that all mandatory maintenance in accordance with the maintenance program that applies to PH-1150 and any other necessary maintenance has been carried out.[25] [26]

The club's technicians use a Complaints and Defects form for the administration of defects of gliders. On the form, which was updated up to the day of the accident, four complaints are listed that apply to PH-1150. Two of them were related to the cable release mechanism:

- 13 June 2020[27]: It was reported that the molded sleeve of the yellow release handle in the cockpit had broken.[28] Subsequently, a repair was made in the period before 8 July 2020. A technician stated that the Maintenance Manual for the LS8 had been consulted for the required amount of slack in the release cable.[29,30]
- 8 July 2020: The cable of the centre of gravity release, which travels across the bottom of the cockpit through the nose of the glider to the yellow handle in the cockpit, was found to be incorrectly routed past the landing gear. The routing was adjusted, conform the Maintenance Manual for the LS8, and released on 8 July 2020.

The other two complaints were related to a damaged pitot tube and a too spacious secure ring of the elevator connection. The pitot tube was repaired and the secure ring was replaced. PH-1150 was released on 8 July 2020, after technicians had determined that the slack on the release mechanism cable was sufficient for both release hooks to function properly.

Repair of molded sleeve

As a result of the broken molded sleeve, the yellow release handle in the cockpit, which is connected to the release cable, hung loosely. Because of this, it was possible that the release handle was hanging outside the cockpit when the canopy was closed. This is undesirable, because then the canopy cannot be closed properly and the handle is also not accessible to the pilot. Hence a repair was carried out. The purpose of the repair was to bring the molded sleeve (and also the yellow handle) more in the pulling direction towards the pilot. In the workshop it was found that the repair of the broken molded

23 The glider had made 1,698 takeoffs and flown 2,815 hours on 8 March 2020.
24 Serial number 1150RC-785-200509-1.
25 The glider thus meets the requirements as referred to in Article 3.22 of the Aviation Act (Wet Luchtvaart).
26 The maintenance was performed by qualified glider technicians.
27 On this date the defect was reported to the technicians of the club.
28 The break may have been caused by disproportionate loads, which occurred when the release handle was pulled by someone outside the glider through the sliding window in the canopy
29 One technician stated that the lack of cable routing, due to the broken molded sleeve, did not make PH-1150 unservicable, but that it should be corrected to avoid consequential damage.
30 A technician stated that nothing had changed in the length of the release cable or of the guide pipe, nor in the (already existing) slack.

sleeve would take longer than hoped for and it was therefore decided to make a temporary repair.[31,32] See Figure 6.

Adjusted routing of release cable

Figure 7 shows the routing of the metal release cable after it had been adjusted on 8 July 2020. As visual, the metal cable runs behind a crossbar of the landing gear. It was found, when the glider was in the workshop, that this routing ran incorrectly along the landing gear on this side of the crossbar, as shown in Figure 7. There was a visible wear spot on the crossbar of the landing gear along which the cable had run.

Figure 6: The temporary repair of the molded sleeve, as found at the accident site. (Source: Dutch Safety Board)

Figure 7: The metal cable of the release mechanisme after the routing adjustment. (Source: Dutch Safety Board)

31 The final repair shoud take place later that season and had not yet been carried out during the accident flight on 12 July 2020.

32 The plan was to fly with PH-1150 in France for two weeks from 11 July 2020.

2.6.6 Flight Manual information

The following information is derived from the Flight Manual.[33]

For a winch launch, the maximum of the weak link is 8,250 Newton (825 kg). A Tost weak link number 3, colour code red, with a rated break away load of 7,500 Newton (750 kg) is recommended.

During a winch launch, the trim should be set slightly nose heavy. The trim position indicator shoud be in front of the neutral mark.

The backrest should be adjusted properly and the seat belt harness tightened to avoid sliding backwards during acceleration and steep climb.

In free flight, the stalling speed (IAS) for straight and level flight and air brakes retracted for the 18 metre wing span configuration without water ballast is 65-67 km/h.

2.6.7 Emergency procedures

The Flight Manual provides in Chapter 3, Emergency Procedures, information on how to react when confronted with typical flight hazards, like a winch launch cable failure, a stall and a spin.

Cable failure during winch launch

a. Immediately push stick forward until airspeed indication is within ASI[34] green range
b. Release cable
c. According to altitude:
d. Use short traffic pattern and make safety landing on airfield or
e. Extend airbrakes immediately and land in front of winch

Stall Recovery

Stall warning	• slight tail shudder prior to entry
Aileron	• effectiveness reduced by about 50%
Sink rate	• increases considerably
Termination	• stick forward to neutral

33 DG Flugzeugbau GmbH, Flight manual for the sailplane LS8, June 2016.
34 ASI stands for airspeed indicator, a flight instrument indicating the airspeed of an aircraft.

When during stalled flight the angle of attack[35] is increased considerably by further "pulling" (the stick), then –depending on the centre of gravity position- spinning may result from asymmetric stall.

Spin Recovery
Simultaneously:
Elevator push forward
Rudder full rudder deflection opposite to spin rotation until rotation stops
Aileron opposite to spin rotation for quicker termination
Until rotation stops, then: elevator, smooth pull-out
Altitude loss during recovery about 100 m (300 ft)

2.7 Meteorological information

On the day of the accident, the center of a high-pressure area moved north along the west coast of the Netherlands. On its eastern flank, a weak northerly current carried maritime polar air that was unstable in build up to 5,000 feet. At the height where the cable was released prematurely, the wind came from the direction 010 degrees with a speed of 5 knots. Visbility was more than 10 kilometres. There were few cumulus clouds at 3,200 feet, scattered stratocumulus at 3,700 feet and broken stratocumulus at 4,500 feet.[36]

2.8 Aerodrome information

Gilze-Rijen Air Base is an operational air base of the Royal Netherlands Air Force with two runways (10-28 and 02-20). The gliding club normally flies from a grass strip along Runway 02-20. The strip is about 1,000 metres long and 100 metres wide.

2.9 Flight recorders

PH-1150 was equipped with FLARM, a traffic awareness and collision avoidance system, which constantly transmits a signal. This signal had been received by a receiver at the clubhouse of the gliding club next to the air base and was forwarded to the Open Glider Network.[37] The operator of this network had made this data available to the gliding club, which then passed it on to the Dutch Safety Board for the purpose of the investigation.

35 The angle of attack is the angle at which relative wind meets an aerofoil. It is the angle formed by the chord of the aerofoil and the direction of the relative wind or the vector representing the relative motion between the aircraft and the atmosphere.
36 Royal Netherlands Meteorological Institute (KNMI), Weather report 12 July 2020 Gilze-Rijen, KNMI-2020/2495.
37 The objective of the Open Glider Network is to create and maintain a unified tracking platform for gliders, drones and other aircraft.

PH-1150 was equipped with an LX8000 navigation computer. The data from the LX8000 were made available to the Dutch Safety Board. The flight data indicate that during the winch launch the glider reached a maximum height of approximately 200 metres.

2.10 Wreckage and impact information

No detached parts of the glider were found at the accident site.

The examination of the wreckage showed the following conditions. The left air brake was found open and the right one closed and locked. The connections of the air brake system showed no abnormalities. The air brake handle in the cockpit was found in an unlocked position. The tube to which the handle is mounted, was found broken in the cockpit.

The nose section of the glider was destroyed and the cockpit was severely damaged. The green trim position indicator was found near the neutral position, just a bit forward of it: see Figure 8. The slot in which the indicator moves, was bent. No marking to indicate the neutral position of the indicator was visible along the slot. The lever to operate the retractable landing gear was found in the 'extended' position. Two orange coloured pieces of lead, of which the text 'LS8' was visible on one, were found in the nose of the cockpit.

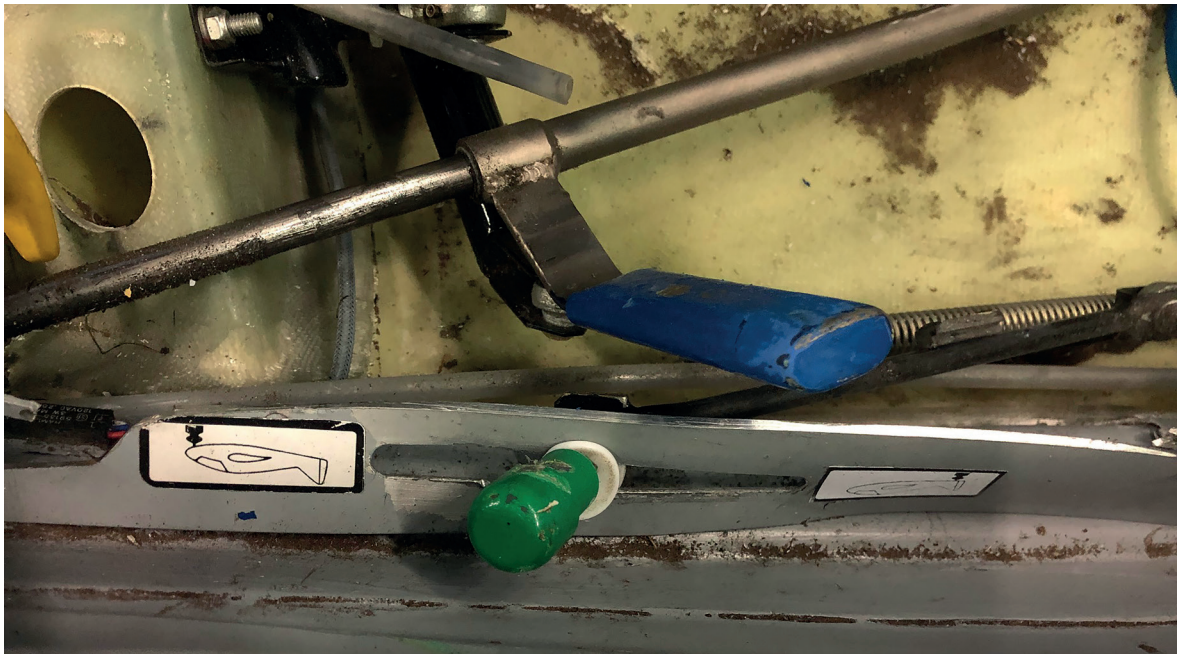

Figure 8: Green trim position indicator and the blue air brake handle. (Source: Dutch Safety Board)

On the inside of the cockpit, under the seat, there is a pulley, made of a synthetic resin[38], around which a cable runs towards the nose hook.[39] This cable and the pulley are part of the cable release mechanism. The pulley is also connected to a cable that runs backwards and is connected to the centre of gravity hook.[40] See Figure 9. The cable that runs through the pulley to the nose appeared to have come loose from the pulley. See Figure 10. The edge of the pulley was found damaged in some places. A technician stated that no peculiarities of the pulley and cable were found during the last maintenance in the winter.

Figure 9: Pulley and release cable at the bottom of the cockpit. (Source: Dutch Safety Board)

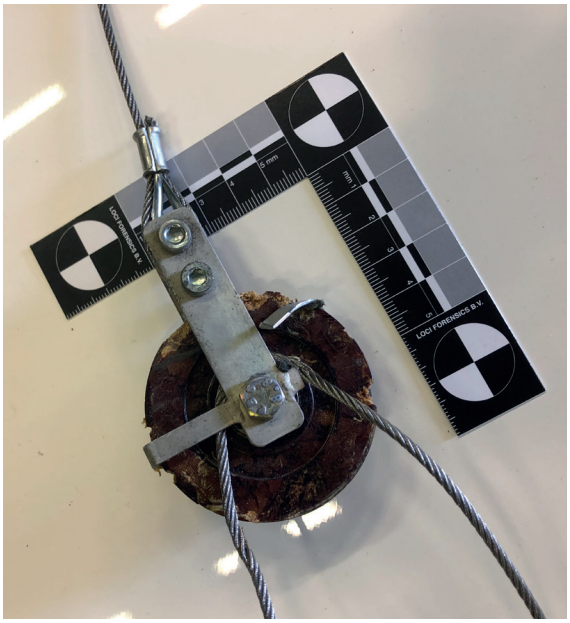

Figure 10: Loose cable around pulley. (Source: Dutch Safety Board)

2.11 Medical and pathological information

On request of the Dutch Safety Board, the Netherlands Forensic Institute performed a toxicology screening of the pilot's blood. No abnormalities were found. No forensic autopsy was performed on the pilot's body.

2.12 Additional investigation

The inspection and testing of the centry of gravity release hook by the manufacturer Tost in Germany, as part of this investigation, has not yet taken place due to travel restrictions due to COVID-19. Since the results of this do not significantly influence the expected learning effect of this investigation, the Board has chosen not to delay the publication of this report until the restrictions are lifted. On first inspection, the hook assembly seemed to work properly; no abnormalities were found.

38 Bakelite or Pertinax.
39 In the current design, the pulley is made of aluminum.
40 When the yellow release handle in the cockpit is pulled, the pulley moves forward.

2.13 Organizational and management information

The gliding club concerned, which is a jointly Declared Training Organisation and part of the Royal Netherlands Aeronautical Association, has a safety management system and a safety committee, consisting of five members. The committee, headed by the safety manager, has an advisory role to the board of the club. The committee publishes safety letters for the members of the club. There is an obligation within the club for members to receive a yearly comprehensive safety briefing.

A part of the safety management system is occurrence reporting. In 2019 the safety committee received fifteen safety reports and in 2020 it had received 27 reports until the day of the accident. After the accident had taken place, the committee received a report of an instructor on the premature cable releases of PH-1150 that took place on 11 July 2020.

The way in which the club had organised the allocation of its gliders is also a part of its safety management system. The regulations of the club stated that every member makes a check flight with an instructor at least once a year. In addition, it was stated that a certified glider pilot, who wants to act as pilot in command, and wants to use a specific take-off method (winch launch, aerotow) and who has not made a take-off with that particular method in the previous three months, must report first to the instructor in charge before flying.

If a pilot meets the requirements to fly a particular type, s/he will receive a briefing for that type from an instructor, after which s/he is allowed to fly it. The club's minimum requirement for pilots to fly locally on the LS8, was to have performed ten flights on the LS4 after obtaining the Glider Pilot Licence (GPL). There was no additional currency requirement within the club for local flights on a single seater, or the LS8 in particular.[41] Those requirements only existed for cross-country flights.

It was a custom at the club for members to report to the instructor in charge, if they wanted to fly again on a certain type of glider after a longer period of time

2.14 Additional information

2.14.1 PH-1150's previous flights

On Saturday 11 July 2020, PH-1150 was assembled in the morning, after it had been in the workshop for maintenance.[42] During the daily inspection, no peculiarities were found. The glider was released for flight operations. That Saturday, PH-1150 made five flights. The first takeoff, by aerotow launch, was uneventful. During the three following winch launches, the cable disconnected prematurely at different heights. The fifth flight, by winch launch, was also uneventful.

41 Gilzer Luchtvaart Club Illustrious, Veldreglement (Field regulations), version 2017-03, January 2020.
42 See Paragraph 2.6.5 for mainenance that had been carried out on PH-1150.

The first time, the cable disconnected at a height of approximately 350 metres. The pilot, who was the instructor in charge that afternoon, estimated the normal relase height that day at 380 meters, and flew for seven minutes. He saw no reason to report the premature cable disconnection after the flight, because he assumed the hook might not have worked properly. The pilot observed the third winch launch of PH-1150 that day where it happened again, but did not connect it to his own experience with his winch launch.

The pilot who experienced the second case (during the third flight of PH-1150 that day), at a height of approximately 200 metres, assumed that the weak link (see Figure 11) had broken and did not report it. He made a flight of 37 minutes. In the evening, when he heard from his wife that the weak link had not broken, he could hardly believe it. His wife, who is also a glider pilot, had contacted the winch operator after the second premature cable release, who told her the weak link was still intact.

The third time, during the fourth flight of PH-1150 that day, the cable disconnected at a height of approximately 70 metres. The pilot flew straight ahead and made a safe landing. She contacted the winch operator[43] to ask if the cable or weak link had broken. Both turned out not to be the case. The pilot then checked the safety cage of the hook and the tension on the hook; everything felt normal. She then made the fourth and last winch launch of PH-1150 that day, which was uneventful. After landing, the glider was towed back to the shelter for overnight storage.

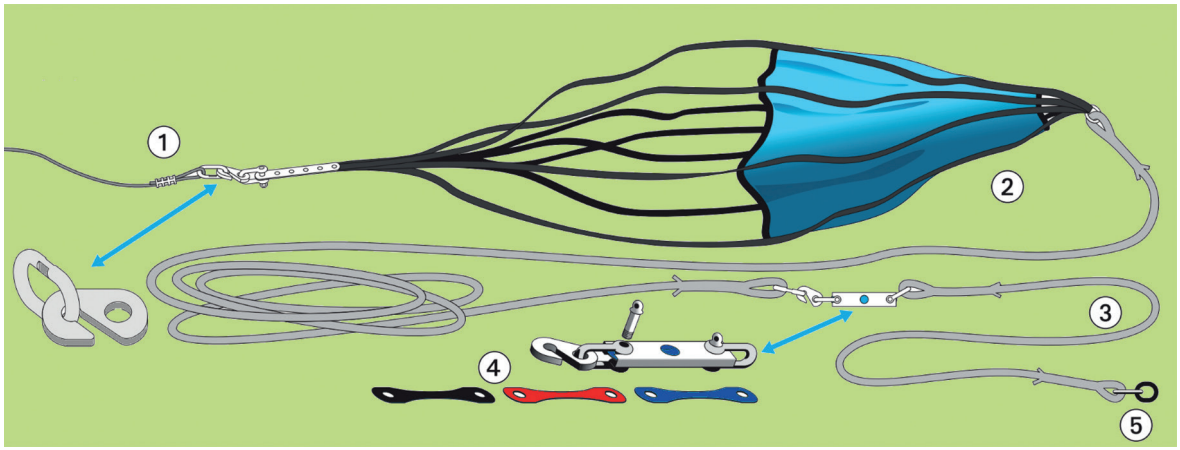

Figure 11: Winch cable (1), the cable parachute (2), the shock absorber rope (3), the weak link (4) and the release rings (5). (Source: Gliding, The basics in 35 lessons, D. and R. Corporaal)

It then occurred to the pilot (who experienced the third premature cable release) that the repair, which had been made at the molded sleeve of the yellow cable release handle in the cockpit, had broken and came loose again. The pilot reported this and the premature cable release, she had encountered, to a technician who was present at the shelter.

The technician felt whether there was still enough slack on the cable, to which the release handle is attached, and whether the release hook was functioning. Everything felt normal, according to the technician. He stated that initially he wanted to ground PH-1150, but

43 Between the second and third premature cable release, someone else took over the winching.

then decided that the glider could fly one more day, after the pilot (who is an instructor) had pointed out to him that the weather conditions would be good for gliding the following day. The technician decided the issue could be resolved later. Winch launch interuptions usually do not indicate a malfunction of the release mechanism. He also stated that he told the pilot, who had informed him about the premature cable release, that one had to be careful with the operation of the release hook[44] and that he asked the pilot to report to the instructor in charge the following morning that there might be an issue with the cable release mechanism. The latter was confirmed by the pilot, who also reported that tomorrow only certified pilots would fly the LS8, the technician stated.

The pilot spoke with another club member as well; they assumed that the over-center mechanism of the centre of gravity hook might not function properly and that the glider should be brought to the workshop for inspection if the cable would release by itself again the next day. The pilot heard about the second case in the club house after flight operations had stopped that day. It was only after the accident, that this pilot heard that the cable released prematurely three times the previous day.
The instructor in charge on 12 July 2020 was not informed about the premature cable release issue of PH-1150 that had occurred three times the day before his shift, nor about concerns about a possible malfunction of the cable release mechanism that needed to be investigated later.

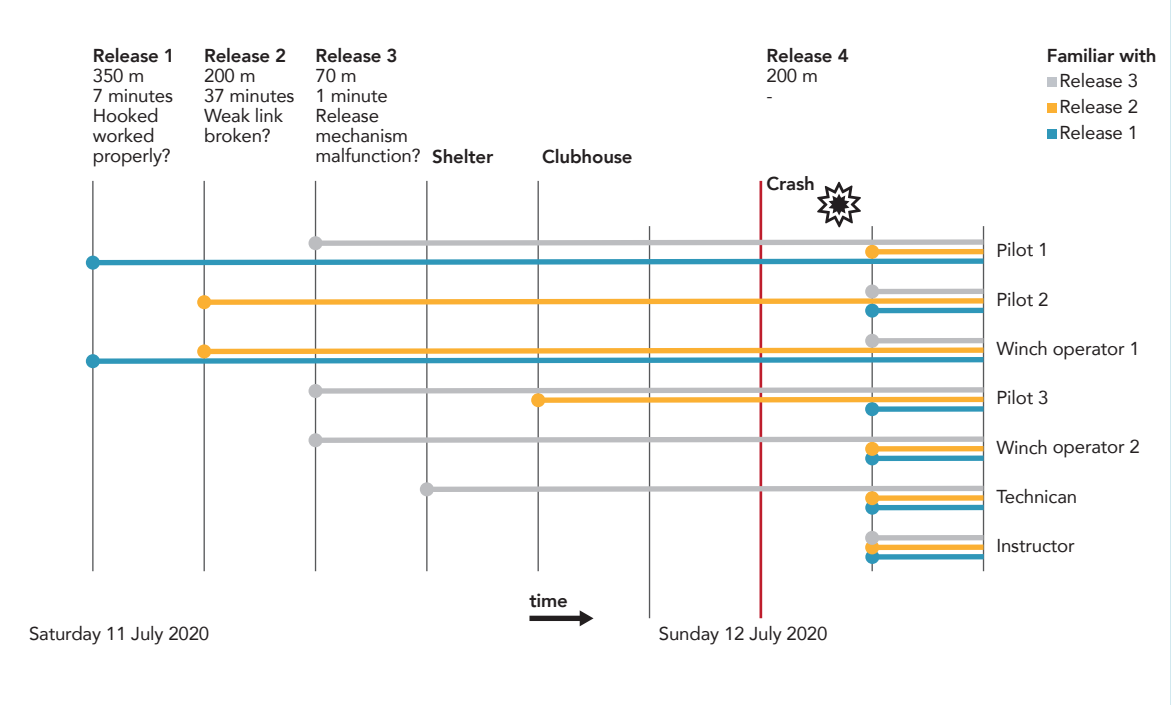

Figure 12: Schematic representation of the times when the main persons involved became aware of the three separate premature cable releases. Pilot 1, 2 and 3 are the pilots involved in respectively the first, second and third premature cable release. Technician is the technician who received the verbal report about one premature cable release. Instructor is the instructor in charge during the accident flight.

44 Pilots had to be careful with the release handle, because it was possible that it was hanging outside the cockpit, after the canopy had been closed.

2.14.2 Cable release procedure

The cable release procedure, which is the same for both single and two seaters, reads:[45]

- Slowly move the control stick forward so that the tension on the winch cable is released and the glider obtains its normal flying attitude with the nose slightly below the horizon.
- Pull the yellow release handle twice.
- Feel the airbrakes handle, to check if the airbrakes are still locked.
- Check if you are flying at normal airspeed and say aloud: 'Speed (e.g.) 85 km/h'.

2.14.3 Identified risks with winch launching

The British Gliding Association (BGA) published the booklet Safe Winch Launching.[46] Amongst others, the booklet highlights the key risk areas in winch launching and offers simple but effective guidance on how to minimise these risks.[47]

Power loss in mid launch followed by a stall and spin led to the overwhelming majority of winch accidents. The BGA booklet contains the following practical consideration for hazards during the main climb of the winch launch, which relates to the risk of starting a turn too quickly, with insufficient airspeed, after a winch launch interruption (as occurred with PH-1150).

> After a power failure and a push over to a recovery dive, it can typically take 5 seconds to restore the approach speed. That can seem a long time. When you have achieved the approach speed land ahead if it is safe to do. If not, turn in the direction you decided before take-off. Release the cable when time permits.[48]

2.14.4 Similar occurrences

The Dutch Safety Board investigated another accident with a premature cable release, which occurred during an instruction flight with a SZD-50-3 Puchacz glider at Lemelerveld airfield on 10 July 2005. During a winch launch, the weak link broke at a height of approximately 80 metres, after which the glider made a right turn at a low speed, during which it stalled. The height was insufficient to recover from the situation. The instructor suffered fatal injuries as a result of the crash. The accident was initiated by the use of a weak link with a break load which was too low. The report is available on the Safety Board's website.[49]

45 Dirk Corporaal, Zweefvliegen, *Elementaire vliegopleiding,* 5th Edition, 2018
46 Britisch Gliding Association, *Safety Briefing, Safe Winch Launching,* 6th Edition, October 2017.
47 The BGA safe winch launch initiative began in October 2005; 12 years before the publication of the booklet. In those 12 years in the UK there have been 7 fatal or serious injuries from winch launches compared with the previous 2-year average of 40. The number of fatal or serious injuries that involved a stall or a spin declined from a 12-year average of 34 to 3.
48 Britisch Gliding Association, *Safety Briefing, Safe Winch Launching,* 6th Edition, October 2017.
49 Dutch Safety Board, *Crashed after broken weak link, SZD-50-3 Puchacz, glider airfield Lemelerveld,* December 2006.

On 1 May 2019 at Achmer Airport in Germany, an LS4-b experienced a premature cable release during an aerotow at a height of approximately 150 metres, after the pilot had retracted the landing gear. The pilot was able to make a safe landing at the airport. Investigation by a technician had shown that there was sufficient slack on the release cable and the release button, when the landing gear was extended. The LS4-b's center of gravity hook is coupled to the landing gear and folds in or out together with it. When the gear was retracted, tension was applied to the release cable and the nose hook opened slightly, which is undesirable, enabling the tow cable to release. The manufacturer DG Flugzeugbau stated that when the release cable is adjusted correctly, there must be approximately 5 mm of slack on the cable when the landing gear is retracted. The nose hook then remains closed and a premature cable release is not possible.[50]

2.14.5 Data for modifications and repairs

Part M.A.304 of Regulation (EU) 2019/1383[51] reports the following on data for modifications and repairs:

> A person or organisation repairing an aircraft or a component, shall assess any damage. Modifications and repairs shall be carried out using, as appropriate, the following data:
>
> a. approved by the Agency;
> b. approved by a design organisation complying with Annex I (Part-21) to Regulation (EU) No 748/2012;
> c. contained in the requirements referred to in point 21.A.90B or 21.A.431B of Annex I (Part-21) to Regulation (EU) No 748/2012.

50 The Technical Affairs Committee of the Royal Netherlands Aeronautical Association had been informed of this occurrence and subsequently shared it with the gliding clubs in the Netherlands.

51 Amending and correcting Regulation (EU) No 1321/2014 as regards safety management systems in continuing airworthiness management organisations and alleviations for general aviation aircraft concerning maintenance and continuing airworthiness management (8 July 2019).

3 INVESTIGATION AND ANALYSIS

The Dutch Safety Board analysed the cause of the accident. It was analysed what caused PH-1150, with a possible malfunction of the release mechanism, to be released to participate in flight operations on the day of the accident. It was further analysed how it was possible that the pilot involved, with no recent experience on single seaters, took off with PH-1150. The first three sections correspond to the three investigation questions. The last section contains an overview of the findings of the investigation.

3.1 Cause of the accident

3.1.1 Low airspeed and spin

The winch launch was interrupted because the cable disconnected prematurely at a height of approximately 200 metres. In case of a premature cable release, the standard cable release procedure has to be executed, as at the end of every uninterrupted winch launch. In practice, this implies forward moving of the control stick to achieve a normal flying attitude and the corresponding safe speed to prevent a loss of control situation. Thereafter, enough height would have remained to turn right and fly a short traffic pattern, followed by a landing on the air base.

After the release of the winch cable, several witnesses observed that the right wing started to drop, which appeared to be a steep turn and was not arrested, indicating an asymmetric stall. That was the result of a low airspeed situation, close to the stall speed. The nose of the glider lowered. These characteristics together point to the glider entering an incipient spin. The spin developed and the glider made approximately two full rotations around its longitudinal axis, like a corkscrew, from which it did not recover.

As the British Gliding Association published in its booklet Safe Winch Launching, it can typically take 5 seconds to restore a safe speed when the cable release procedure is being performed, which can seem a long time. Nevertheless, a safe speed must be obtained before making a turn. The pilot of PH-1150 made a right turn, before the glider had reached a safe speed, causing the right wing to stall.

The accident with PH-1150 can be classified as a loss of control in-flight (LOC-I) accident. Loss of control can happen because the aircraft enters a flight regime that is outside its normal flight envelope and may quickly develop into a stall or spin. Loss of control in-flight is the most frequent and most deadly type of accident in general aviation. There are approximatively 37 fatal loss of control in-flight accidents per year in Europe leading

to 67 persons on average losing their lives every year due to loss of control in-flight (for fixed-wing aircraft only). The take-off and landing phase are particularly risky.[52]

The accident was caused by the pilot not being able to recover from the spin, which was the result of a low airspeed situation, close to the stall speed, which had quickly developed into an asymmetric stall. The low airspeed situation arose after the premature cable release during the winch start. The pilot of PH-1150 made a right turn, before the glider had reached a safe speed, causing the right wing to stall.

Although stalling in itself is a benign flight condition, it is a major contributory factor in gliding accidents. The reason for this is usually not that the pilots do not know the correct recovery action, but that they do not realise what happens.[53] Therefore, it is important to exercise the recognition of the symptoms of the stall and to become familiar with it. Furthermore, sufficient practice and familiarity with the spin manoeuvre and the recovery techniques contribute to taking the correct recovery actions. It helps to prevent pilots from becoming incapable by fear of disorientation when they inadvertedly spin.

3.1.2 Contributing factors leading to the stall and spin

Wreckage examination
The damage pattern of the glider indicates that the nose of the glider was the first to hit the ground, which is confirmed by witness' statements. It could not be determined in which position the backrest was set prior to the flight, because it had come loose due to the impact forces. The air brake handle in the cockpit was found in an unlocked position. The tube to which the handle is mounted, was found broken in the cockpit. It is concluded that both were the result of the impact. This is substantiated by witnesses, who followed the entire flight and did not observe any extended airbrakes. Both airbrakes functioned properly. The investigation of the flight controls (ailerons, elevator and rudder) revealed no defects.

There were no technical defects in the flight controls that have played a role in the accident.

Effect of centre of gravity position
The weight of the pilot was approximately 65 kg. With the two plates of lead, compensating 10 kg of pilot weight, and the emergency parachute, the weight of the pilot (to be used for the weight and balance calculation) became approximately 80 kg. This is the required minimum weight of the pilot, including a possible emergency parachute. The centre of gravity was near the aft limit.

52 EASA website, Domains, General Aviation, Flying safely, Loss of Control (LOC-I).
53 British Gliding Association, *INSTRUCTORS' MANUAL, 18 – STALLING,* Fourth Edition, 2017.

An aft centre of gravity causes the glider to become less stable, due to reduced longitudinal stability.[54,55] It acts against the natural tendency of a glider to recover from a stall by lowering the nose. Therefore, with an aft centre of gravity, it is more likely to enter a stall and more difficult to recover from it and the subsequent spin.

> The center of gravity was near the aft limit. This made the glider more susceptible to enter a stall; it further made it more difficult to recover from the subsequent spin or resulted in a slower recovery.

Effect of trim position
The green trim position indicator was found near the neutral position, just a bit forward of it. As the slot, in which the indicator moves, was bent, it is possible the indicator had moved as a result of the impact forces. This could not be determined. According to the Flight Manual, the trim should have been set to slightly nose heavy. As the manual is not clear about the exact position the trim should be set to during takeoff, it could not be established if the trim position may have contributed to inadequately lowering of the nose, after the cable disconnected. However, it is unlikely that the trim position had a significant influence on this.

The pilot
The pilot did not manage to carry out the cable release procedure in such way that the glider achieved a normal flying attitude and a safe speed. Her lack of recent experience on single seaters may have contributed to this, see Paragraph 3.3. What exactly the pilot did or did not do after the premature cable release, could not be determined.

3.1.3 Winch launch interruption

Investigation of the release mechanism
The interruption of the winch launch at approximately 200 metres was caused by a premature winch cable release of the centry of gravity hook.

The cable, which is part of the release mechanism and runs through a pulley to the nose of the glider, appeared to have come loose from the pulley. The edge of the pulley was found damaged in some places. The synthetic resin, from which the pulley is made, becomes brittle over time. This may cause the edges to break. The cause of the damage to the pulley has not been investigated. No peculiarities of the pulley and cable were found during the last maintenance. It is unlikely that the cable came loose while making the repair to the molded sleeve or the adjustment of the routing of the release cable. It is therefore likely that the cable came loose as a result of impact forces during the crash.

54 An aft centre of gravity also results in a more vigorous stall and spin behavior.
55 The longitudinal stability of an aircraft, also called pitch stability, refers to the aircraft's stability in its plane of symmetry, about the lateral axis (the axis along the wingspan).

Since the winch cable had disconnected spontaneously three times the day before the accident occurred, it is likely that this happened again during the accident flight.

Maintanance and other occurences
The certificate of 'Release for use and maintenance statement' had been issued on 9 May 2020. Thereafter, when PH-1150 was brought to the workshop on 15 June 2020, twice work was carried out on the cable release mechanism in the period up to and including 8 July 2020. First, the repair to the molded sleeve of the yellow release handle was done. The Maintenance Manual for the LS8 had been consulted for the required amount of slack in the release cable The repair had not been carried out on the basis of approved data, conform Regulation (EU) 2019/1383. Second, the routing of the cable of the mechanism near the centre of gravity release hook was adjusted, conform the Maintenance Manual for the LS8. PH-1150 was released on 8 July 2020. The first flights that took place after that release were made on 11 July 2020, with premature cable releases during three out of four winch launches. No reports were received regarding the operation of the release mechanism prior to 8 July 2020.

The pilot, who experienced the third premature cable release, observed after the next (and last) flight of PH-1150 that day, that the repair to the molded sleeve had broken and detached.

No premature cable releases had been reported prior to 8 July 2020. Neither during the daily inspections of PH-1150 on both 11 and 12 July 2020, nor during the cockpitchecks, peculiarities were found regarding the technical status of the glider. The functioning of the release handle in the cockpit and the centre of gravity hook were evaluated to be in working order. The technician who was informed about a premature cable release on 11 July 2020, checked the release mechanism at the end of that day and found no particularities. Nevertheless, he wanted to investigate the issue further at a later moment.

Based on the maintenance history of PH-1150 and the history of premature cable releases, it is concluded that the premature winch cable releases were caused by a malfunction of the release mechanism.

The premature cable release during the accident flight was caused by a malfunction of the cable release mechanism, the exact cause of which has not been established. The possible influence of the operation of the centry of gravity release hook, which is part of the cable release mechanism, on the premature cable release has yet to be determined.

3.2 Released for flight operations with technical defect

PH-1150 experienced three premature cable releases during winch launches on Saturday. The pilots involved were able to complete the flights safely. However, this accident shows that a winch interruption, in combination with a pilot who does not succeed carrying out the cable release procedure as needed, can pose a major risk to flight safety. The three premature cable releases were an indication that PH-1150 was released for flight operations with a possible malfunction of the cable release mechanism. Nevertheless, PH-1150 was not grounded, but released to participate in flight operations on the day of the accident. How was that possible?

- The defect concerned was not traceable with regular inspection methods. The premature cable releases were the only signals that something might be wrong.
- Not one of the club members present on the strip that day perceived or realised that the cable had come loose three times on the same glider, despite only one LS8 was flying from the strip that day.
- Two out of three pilots made assumptions about the premature cable release that were not tested and turned out to be wrong. The first pilot assumed that the hook might not have worked properly. The pilot of the second case assumed that the weak link had broken.
- Winch launch interuptions usually do not indicate a malfunction of the release mechanism. The breaking of a weak link or winch cable takes place regulary and so do cable break exercises with an instructor. However, premature cable releases where the cable disconnects by itself are rare.
- The third pilot assumed that the cable may not have been hooked properly to the glider when she heard from the winch operator that the weak link and cable had not broken. Furthermore, the tension on the release handle felt normal and the release hook seemed to function well. Also, the next winch start which was uneventfull. Nevertheless, she reported to the technician, who was present, that one premature cable release had taken place and that the temporary repair was broken. The technician stated that this breaking did not cause PH-1150 to be no longer airworthy.
- The technician, who knew about only one premature cable release, checked the release mechanism and found no particularities. Therefore he assumed the issue could be further inspected and resolved later. He did not consider the events too risky and released PH-1150 for flight operations the next day, under the condition that the instructor in charge in the morning would be informed about a possible issue with the cable release mechanism.
- Two winch operators were on duty on Saturday. A winch operator has to follow each winch launch. Therefore, the winch operator has the possibility to notice that a cable disconnected prematurely several times on the same glider, without a cable break or a weak link break. Between the second and third premature cable release, someone else took over the winching. As a result, the winch operator who winched PH-1150 during the first and second premature cable releases was not aware of the third case. In addition, the winch operator who performed the third winch launch was not aware of the first two cases. The winch operators did not contact the instructor in charge to find out what had caused the premature cable releases.

- The technician did not make a registration about the issues with PH-1150 that could be read by the instructor in charge on Sunday morning. Therefore, this instructor in charge had no reason to doubt the airworthiness of PH-1150, as it had been released to flight operations and no peculiarities were found during the daily inspection. He was unaware of the flight history and the doubts of the technician, so the risk of a premature cable release was not known, let alone that he could take decisions to mitigate this risk he was not aware of.

Each premature cable release by itself was indicating that the cable release mechanism was not functioning properly, because there was no clear cause such as a broken winch cable or weak link. However, the information about the premature cable releases was scattered and two of the three pilots and the winch operators involved did not track down the cause of the premature cable release, they experienced. The club's proces of registrating and sharing operational issues did not ensure that information about the three premature cable releases was coming together. Premature cable release were not specifically mentioned in the club's rules as issues that should be reported, nor was there any instruction for instructors in charge or technicians to ground a glider after such an occurrence.

No one realised that PH-1150 had three premature cable releases in one day after a temporary repair was done. The information about the three premature cable releases was scattered. The people who witnessed or were aware of one or two cable premature cable releases, made either reassuring assumptions about the cause or to those who were concerned about the premature cable releases, the cause was unknown. Premature cable releases were not specifically mentioned in the club's rules as occurrences that should be reported. The club's safety management system did therefore not ensure that it was detected that the same malfunction occurred three times with PH-1150 and did not ensure subsequent communication about it within the club.

The cause of the premature cable releases was not established. In fact, the defect could not be reproduced when the technician checked the release mechanism. Instead of considering an unknown cause for a critical deviation of the normal procedure as a risk and a reason to ground the glider until the defect was found and repaired, the glider was released for flight operations, assuming that there was no risk to flight safety. However, in cases of unknown causes of malfunctioning, precaution is preferred taking into account the vulnerability of gliders and hence their pilots.

All people involved either assumed an accidental flaw and those concerned did not consider it a reason to ground PH-1150. However, no peculiarities were found during the inspections of the cable release mechanism. The consequence of that was that the cause of the premature cable releases was unknown, so the risk could not be fully assessed. In such situations, precaution is preferred.

By not grounding PH-1150 immediately, after the initial premature cable release without clear cause, the malfunction of the cable release mechanism continued to exist and premature cable releases continued to occur.

This accident emphasises that it is important that everyone participating in glider flight operations realises that small defects on a glider can have an adverse effect on flight safety. In this case, if there is any doubt pertaining to issues concerning critical functions, the glider shoud be taken out of flight operations for further inspection and should not be flown until it is determined that the glider can be safely operated. Grounding the glider in the present case, can be seen as a barrier, preventing an early cable release from occurring again with all possible consequences. This does not only apply to premature cable releases, but also to other situations that may adversely affect flight safety.

However, malfunctions can be hard to recognise as such. So, it is important that clubs promote the structural and continueously reporting of all deviations of normal functioning, that might affect flight safety, and record them. Everyone who participates in flight operations has a responsibility in this. In addition, clubs must ensure that the people who have to make decisions about the airworthiness of a glider (technicians, instructors and pilots) are aware of potential malfunctions and associated risks.

A club's safety management system must be organised in such a way that critical malfunctions are recognised, action is taken on it and communication about it takes place. Premature cable releases should be identified as such a situation that needs to be reported and examined before the glider is used for other flights.

3.3 Flying the LS8 without recent experience on single seaters

The pilot was an experienced glider pilot with a total number of starts of 1,150. Nevertheless, her total flying time of approximately 190 hours during a period of approximately 20 years is limited. Her recent experience was also limited; in 2020 she made six flights, of which one solo flight in an ASK-21. The last four years, she mainly flew on the ASK-21 and was known as a cautious pilot. The pilot's last flight on the LS8 on 26 August 2007 was almost thirteen years ago. Her last flight on a single seater glider was over four years ago.

The pilot's lack of recent flying experience, and especially on single seater gliders, like the LS8, may have contributed to the crash.

In the glider club, club members can build up flying experience on various types of gliders. They have to start their training with an instructor on an ASK-21, followed by solo flying the ASK-21. Subsequently, they can build up expericience in more types by flying types that demand more and more flying experience and skills. In this glider club, the successive order was LS4, LS8 and finaly LS6. Most members who use gliders of the club then remained current on the types they were allowed to fly on. The pilot involved in the accident had followed the abovementioned path up to and including the LS8. However, she preferred to fly the ASK-21 in recent years, so she was no longer current on the LS4 and LS8.

The Board determines that another way to prepare someone without recent experience on single seaters for a glider like the LS8, could be to fly with an instructor in the two-seat Duo Discus. Its flight characteristics are more similar to those of the LS8, compared to those of the ASK-21. By doing this a pilot can get used as well to using the retractable landing gear that both the Duo Discus and LS8 have. In 2020, the pilot made a flight with an instructor in a Duo Discus, but that was more than five months before the accident happened. Another possibility to prepare for the LS8 could be a flight on the single seater LS4 first, which can be seen as slightly easier to fly than the LS8. However, the pilot made her last flight on the LS4 more than 6 years ago.

The way in which the club had organised the allocation of its gliders, made it possible that the pilot, not current on single seater gliders, took off with the LS8. The pilot met the club's requirements (ten flights on the LS4) to fly locally on the LS8. However, the club's requirements did not account for the lack of currency on single seaters. The club did not have a member tracking system that can help to inform instructors about specifics of members. However, instructors can see in a pilot's logbook what the pilot's currency is on a particular type.

The pilot's lack of recent flying experience, and especially on single seater gliders, may have contributed to not being able to obtain a safe airspeed after the unexpected situation of a premature cable release.

The pilot met the clubs requirements for local flights on PH-1150. The club's safety management system did not ensure that it was prevented that the pilot, with no recent flying experience on single seater gliders, took off off with PH-1150.

3.4 Overview of the findings

Concluding, a temporary repair had been carried out on PH-1150 and then three times a premature cable release took place. PH-1150 was subsequently not grounded, but made available for flight operations with a malfunction of the cable release mechanism, without

the cause of the cable releases being thoroughly analysed. This in combination with the allocating of PH-1150 to a pilot, with a lack of recent experience on single seater gliders, created a situation in which the accident could occur. The club's safety management system did not ensure that such a situation was prevented from happening.

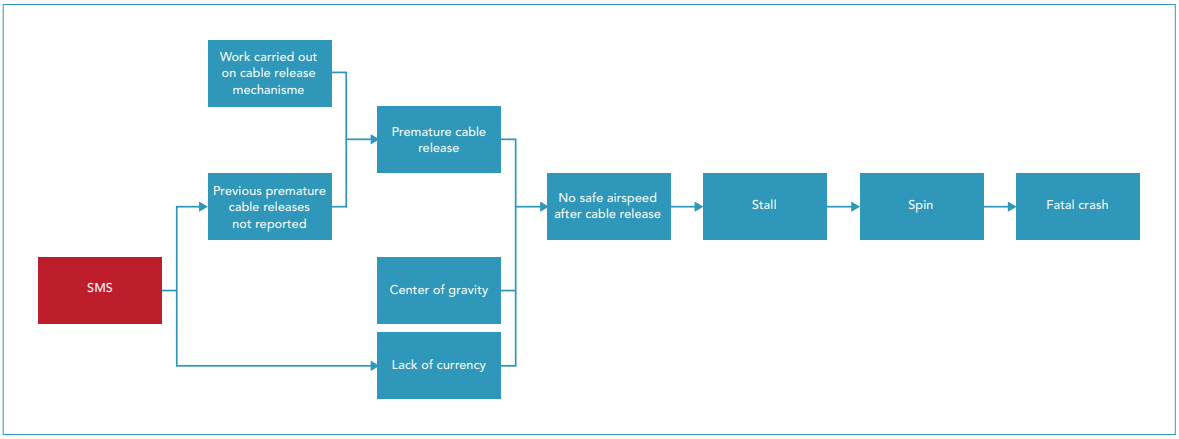

Figure 14: Schematic representation of the findings. SMS stands for the club's safety management system.

4 CONCLUSIONS

Cause of crash
The accident was caused by the pilot not being able to recover from the spin, which was the result of a low airspeed situation, close to the stall speed, which had quickly developed into an asymmetric stall. The low airspeed situation arose after the premature cable release during the winch start. In such a circumstance, the pilot has to carry out the cable release procedure, which, in practice, implies the forward moving of the control stick to achieve a normal flying attitude and the corresponding safe speed. The pilot of PH-1150 made a right turn, before the glider had reached a safe speed, causing the right wing to stall. There were no technical defects in the flight controls that have played a role in the accident.

The pilot's lack of recent flying experience, and especially on single seater gliders, may have contributed to not being able to obtain a safe airspeed after the unexpected situation of a premature cable release. The center of gravity was near the aft limit, which made the glider more susceptible to enter a stall; it further made it more difficult to recover from the subsequent spin or resulted in a slower recovery.

Since the winch cable had disconnected spontaneously three times the day before the accident occurred, it is likely that this happened again during the accident flight. The premature cable release during the accident flight was caused by a malfunction of the cable release mechanism, the exact cause of which has not been established. The possible influence of the operation of the centry of gravity release hook, which is part of the cable release mechanism, on the premature cable release has yet to be determined.

Precaution preferred
No one realised that PH-1150 had three premature cable releases in one day after a temporary repair was done. The information about the three premature cable releases was scattered. The people who witnessed or were aware of one or two cable premature cable releases, made either reassuring assumptions about the cause or to those who were concerned about the premature cable releases, the cause was unknown. Premature cable releases were not specifically mentioned in the club's rules as occurrences that should be reported. The club's safety management system did therefore not ensure that it was detected that the same malfunction occurred three times with PH-1150 and did not ensure subsequent communication about it within the club.

All people involved either assumed an accidental flaw and those concerned did not consider it a reason to ground PH-1150. However, no peculiarities were found during the inspections of the cable release mechanism. The consequence of that was that the cause of the premature cable releases was unknown, so the risk could not be assessed. In such situations, precaution is preferred.

By not grounding PH-1150 immediately, after the initial premature cable release without clear cause, the malfunction of the cable release mechanism continued to exist and premature cable releases continued to occur.

Allocation of gliders
The pilot met the club's requirements for local flights on PH-1150, which did not account for the lack of currency on single seaters. The club's safety management system did not ensure that it was prevented that the pilot, with no recent flying experience on single seater gliders, took off from with PH-1150.

Main conclusion
Concluding, a temporary repair had been carried out on PH-1150 and then three times a premature cable release took place. PH-1150 was subsequently not grounded, but made available for flight operations with a malfunction of the cable release mechanism, without the cause of the cable releases being thoroughly analysed. This in combination with the allocating of PH-1150 to a pilot, with a lack of recent experience on single seater gliders, created a situation in which the accident could occur. The club's safety management system did not prevent such a situation from happening.

5 RECOMMENDATIONS

This report entails some important lessons for gliding clubs.

This accident emphasises that it is important that everyone participating in glider flight operations realises that small defects on a glider can have an adverse effect on flight safety. It is therefore important that every malfunction should be viewed and assessed, without making any assumptions, with flight safety in a broad sense in mind. If there is any doubt pertaining to issues concerning critical functions, such as related to the takeoff, the glider should be taken out of flight operations for further inspection and should not be flown until it is determined that the glider can be safely operated. However, malfunctions can be hard to recognise as such. Therefore, it is important that occurrences that possibly imply critical malfunctions are recognised and reported. The club's safety management system can guide club members with examples of occurrences that possibly imply critical malfunctions. Furthermore, it is important that clubs stimulate the structural and continuously reporting of occurrences that possibly imply critical malfunctions, that might affect flight safety, and record them. Everyone who participates in flight operations has a responsibility in this. In addition, clubs must ensure that the people who have to make decisions about the airworthiness of a glider (technicians, instructors and pilots) are aware of potential malfunctions and associated risks.

The investigation shows that the way in which the club had organised the allocation of its gliders, made it possible that the pilot, not current on single seater gliders, took off with the LS8. The pilot met the club's requirements to fly locally on the LS8. However, the club's requirements did not account for the lack of currency on single seaters. Although this situation is not relevant for many glider pilots, gliding clubs should be aware that club members may pause flying temporarily or may pause flying on a specific type of glider. Therefore, gliding clubs should incorporate recent experience in the way they allocate gliders to their club members and include this in the safety management system.

The Dutch Safety Board therefore issues the following recommendation:

To the Royal Netherlands Aeronautical Association:

Bring the lessons from this accident to the attention of the Dutch gliding clubs and point out to them that:

1. A club's safety management system must be organised in such a way that occurrences that possibly imply critical malfunctions are recognised, reported, and immediate action is taken on it. A club must stimulate everyone who participates in flight operations to report these type of occurrences.

2. A club's safety management system must be organised in such a way that the members' recent flying experience is taken into account when allocating a glider to a club member.

APPENDIX A

Responses to the draft report

In accordance with the Dutch Safety Board Act, a draft version (without recommendations) of this report was submitted to the parties involved for review. The following parties have been requested to check the report for any factual inaccuracies and ambiguities:

- DG Flugzeugbau
- European Union Aviation Safety Agency
- German Federal Bureau of Aircraft Accident Investigation
- Gilzer Luchtvaart Club Illustrious
- Human Environment and Transport Inspectorate
- Ministry of Infrastructure and Water Management
- Relatives

The responses received, as well as the way in which they were processed, are set out in a table that can be found on the Dutch Safety Board's website (www.safetyboard.nl).

The responses received can be divided into the following categories:

- Corrections and factual inaccuracies, additional details and editorial comments that were taken over by the Dutch Safety Board (insofar as correct and relevant). The relevant passages were amended in the final report.
- Not adopted responses; the reason for this decision is explained in the table.
- Adopted responses; they are also listed in the table.

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