



MINISTRY OF
TECHNOLOGY AND INDUSTRY
TRANSPORTATION SAFETY BUREAU

FINAL REPORT

DG-202-17, PH-699
Mátranovák, Hungary
14 May 2022

Accident
2022-0569-4

The sole objective of a safety investigation is to find the causes and circumstances of aviation accidents or incidents and to initiate the necessary safety measures; furthermore, to make recommendations in order to prevent similar cases in the future. It is not the objective of an investigation to apportion blame or liability.

Introduction

Synopsis

Occurrence class	Accident	
Aircraft	manufacturer	DG Flugzeugbau GmbH (Glaser-Dirks)
	model	DG-202-17
	registration	PH-699
	operator	Private
Occurrence	Date and time	14 May, 2022, 15:28 LT
	Location	Mátranovák, Hungary (48°02'35.7"N 19°58'31.4"E)
Fatalities / severe injuries		None
Damage to the aircraft		Substantial

The pilot took off from Dunakeszi Airfield in a 300-kilometer gliding competition event. About three hours later, running out of thermals, he crashed his glider in an attempt to land out in a crop field NE outside Mátranovák. He made his final approach over descending terrain ending in steeply rising ground, which he was not able to negotiate in the flare. In the ensuing hard landing the laminated fiberglass-composite empennage separated. A detailed description of the landing is presented in chapter '*Wreckage and Impact Information*'.

The IC concluded that the causes of the accident were the pilot's misreading of terrain features and his imprecise aircraft control during flare and touchdown.

Safety Recommendations have not been issued.



Definitions and Abbreviations

Aerodrome	<i>A defined area (including any buildings, installations and equipment) on land or water or on a fixed offshore or floating structure intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft</i>
AGL	<i>Above Ground Level</i>
AMSL	<i>Above Mean Sea Level</i>
EASA	<i>European Union Aviation Safety Agency</i>
IC	<i>Investigating Committee</i>
ICAO	<i>International Civil Aviation Organization</i>
Kbvt.	<i>Act CLXXXIV of 2005 on the safety investigation of aviation, railway and marine accidents and incidents and other transportation occurrences</i>
LT	<i>Local Time</i>
MTI	<i>Ministry of Technology and Industry</i>
NFM	<i>Ministry of National Development</i>
NKH LH	<i>National Transport Authority Aviation Authority, Hungary (till 31 December 2016)</i>
UTC	<i>Coordinated Universal Time</i>

General information

All times indicated in this report are in local time (LT). LT at the time of the occurrence: UTC +2 hours.

Geographic locations throughout this document are provided in WGS-84 standard.

The content of this report is in accordance with the requirements set out in ICAO Appendix 13, Chapter 6 and ICAO Doc 9756, Chapter IV.

Reports and Notifications

The occurrence was reported to TSB's call center at 15:45 on 14 May 2022 by the Airfield Manager of Dunakeszi Airfield.

TSB of Hungary notified the following organizations.

- EASA on 16 May 2022 at 12:23
- Accident Investigation Authority of the State of Design and Manufacture (Germany) on 16 May 2022 at 12:24
- Accident Investigation Authority of the State of Registry and Competent Authority of Airworthiness Review (Netherlands) on 16 May 2022 at 12:24
- Accident Investigation Authority of the Pilot License Issuing State (Belgium) on 16 May 2022 at 12:24

Of the above, the Belgian Accident Investigation Authority appointed an accredited representative for the investigation.

Investigation Committee

The Head of TSB appointed the following persons in the investigating committee (hereinafter IC).

Investigator-in-Charge	Mr. Akos Hanczar	investigator
Member	Ms. Zsuzsanna Nacsá JD	investigator

Overview of the Investigation Process

In response to the event notification, the on-duty manager of the TSB ordered an immediate dispatch to the site.

Pursuant to Article 5 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/ECA the TSB is required to initiate an investigation in the following circumstances.

- 1. Every accident or serious incident involving aircraft other than specified in Annex II to Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency (6) shall be the subject of a safety investigation in the Member State in the territory of which the accident or serious incident occurred.*
- 2. When an aircraft, other than specified in Annex II to Regulation (EC) No 216/2008, registered in a Member State is involved in an accident or serious incident the location of which cannot be definitely established as being in the territory of any State, a safety investigation shall be conducted by the safety investigation authority of the Member State of registration.*
- 3. The extent of safety investigations referred to in paragraphs 1, 2 and 4 and the procedure to be followed in conducting such safety investigations shall be determined by the safety investigation authority, taking into account the lessons it expects to draw from such investigations for the improvement of aviation safety, including for those aircraft with a maximum take-off mass less than or equal to 2 250 kg.*
- 4. Safety investigation authorities may decide to investigate incidents other than those referred to in paragraphs 1 and 2, as well as accidents or serious incidents to other types of aircraft, in accordance with the national legislation of the Member States, when they expect to draw safety lessons from them.*

Based on the findings of the site inspection and with regard to Article 5 (1) of Regulation (EU) No 996/2010 of the European Parliament and of the Council, the head of the TSB decided that an investigation is required and will be launched.

In the course of the investigation the IC has taken the following steps.

- The crash site was surveyed and available evidence was secured.
- The pilot's personal and flight documentation, as well as aircraft documentation was photo documented.
- The pilot was interviewed.
- Electronic flight logging was obtained in IGC format.
- Relevant met reports were obtained.
- Facts and data were studied and analyzed.
- Minor textual modifications were effected in the document in response to the remarks submitted by the Dutch Safety Board.

Investigation Principles

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

- 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 (referred to as Kbvt. throughout the document),
- NFM (Ministry for National Development) Regulation 70/2015 (XII.1) on safety investigation of aviation accidents and incidents, as well as on detailed investigation for operators,
- In matters not covered by Kbvt., Act CL of 2016 on General Public Administration Procedures

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 of Hungary shall investigate aviation accidents and serious incidents.
- Transportation Safety Bureau of Hungary may investigate aviation and incidents which – in its judgment – could have led to accidents of more severe consequences in different circumstances.
- Transportation Safety Bureau of Hungary is independent of any person or entity that may have interests in conflict with the objectives of the investigating body.
- In addition to the aforementioned legislation, TSB of Hungary shall conduct safety investigations in line with ICAO Docs 9756 and 6920 Manual of Aircraft Accident Investigation.
- This Report shall not be binding, nor shall an appeal be lodged against it.
- The original of this report was written in Hungarian.

No conflict of interest has been identified between safety investigators appointed to the IC. No investigator assigned with a safety investigation has been involved as an expert in any other procedure pertaining to the same case and shall not do so in the future.

The IC shall retain all data and information having come to their knowledge in the course of the safety investigation. Furthermore, the IC shall not be obliged to make such data and information available to other authorities, whose disclosure could have been legally refused by their original owner.

This Final Report is based on the Draft Report prepared by the IC and shall be sent to all involved parties for comments, as set forth by the relevant regulations.

Within legal deadline in response to the Draft Report, DSB has submitted comments, which have been reviewed and incorporated in a revised Final Report.

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With the exceptions stipulated by law, this report or any part thereof may be used in any form, provided that context is maintained and clear references are made to the cited source.

Translation

This document has been translated from Hungarian. Although efforts have been made to provide a translation as accurate as possible, discrepancies between the versions might occur. In such eventuality, the Hungarian version shall prevail.

Factual information

Flight History

The pilot was aerotowed for a 300-kilometer gliding competition flight from Dunakeszi Airfield, taking off at 12:26 LT, with 110 liters of ballast water in the wing tanks. He reached Veresegyház, his first turn point, at 13:37 and Felsőtárkány, his second one, at 14:42. Setting course to Salgótarján, his third turn point, he shortly ran out of thermals, and at 600 meters AMSL, in the vicinity of Mátranovák, he scanned the area for a suitable landing spot. In a fortuitous last thermal, he managed to climb to 800 meters while dumping his ballast water. With no more thermals, he decided to go for a landing and made a final assessment of the topography, eventually opting for the same field he initially picked. In his final approach he realized that the terrain beneath was sloping steeper than he thought and the acclivity ahead of him across the dirt road at the far end of the field was also rising much steeper than expected. This terrain feature caught him off-guard in the flare and, despite his firm pull on the stick, the aircraft came down hard and crashed into the ground. A detailed analysis of the impact is provided in chapter '*Wreckage and Impact Information*'.

Aircraft Damage

As a result of the series of forces acting on the fuselage during the impact, the laminated fiberglass empennage broke clean off the hull at about 30 centimeters behind the wings' trailing edge, with only the elevator rods and rudder cables linking the separating parts. The carbon-fiber reinforced left side flap succumbed to the left wing's dynamic fore-and-aft oscillation forces and buckled on impact near the left wing root. The removable add-on wingtip got stuck in place on the left side, effectively resisting all removal efforts on the spot.

Both wingtips and the nose underside ahead of the wheel-well show superficial scrape marks. For further structural damage out of plain sight an in-depth shop test will be necessary.

Other Damage

Minor crop trample damage occurred in the wheat during landing and aircraft recovery.

Pilot Information

The pilot concerned is relatively experienced in flying gliders. Following a lengthy hiatus in flying, he picked up soaring again and got back into active flying a few years ago. He has regularly flown in gliding competitions in the recent years, and has a total of 850 gliding flight hours. In the preceding 30 days he logged 65:01 hours, and 4:59 hours in the last 3 days before the accident. Both his license and flight medical were valid. In this particular aircraft model he was considered experienced.

Aircraft Information

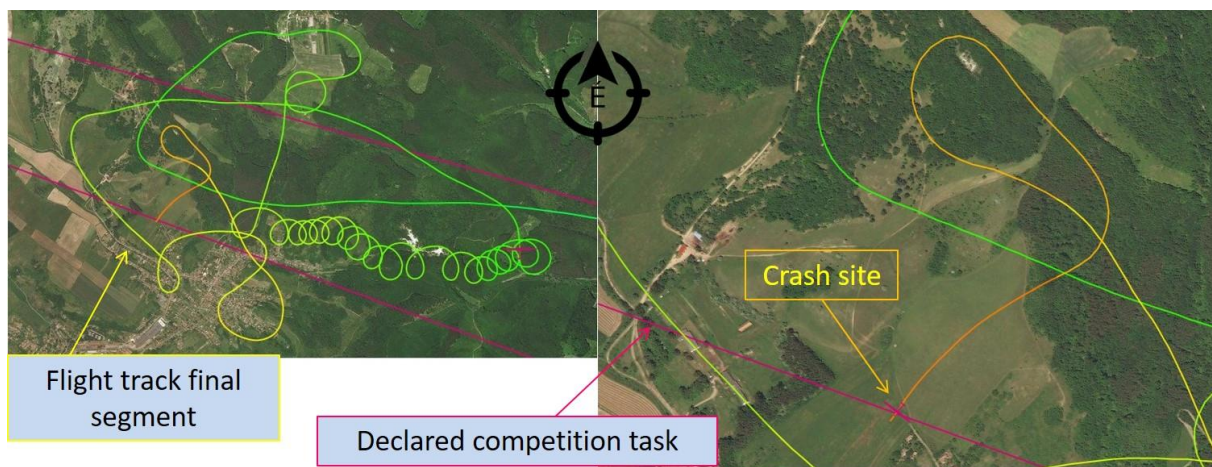
The mishap aircraft, a DG202 17C, was manufactured in 1981. It has been maintained according to maintenance requirements and it was in good overall shape, with a total logged flight time of 3,446:33 hours and an aggregate number of movements of 3,396. On-board and other documents were valid in the event, load and balance figures were within limits. Take-off was performed with add-on wingtips, yielding a 17-meter wingspan, and with 110 liters of ballast water on board that was jettisoned prior to landing.

Weather and Flight Information

The occurrence took place at daytime in good visibility. Dry and sunny post frontal cold front conditions prevailed on the day with high altitude cirrus coverage and a cumulus base at 1,500 to 2,500 meters AGL. In the accident area wind was moderate, west-southwesterly with occasional gusts. Zabar station, 12 km NE of the site registered 5,4 m SW. Further details in the chart below.

Time	Zabar Station (52523) (12 km, NE)			Gyöngyössolymos Nyírjes Station (43416) (17 km, S)		
	Wind speed (m/s)	Wind Direction (deg.)	Gusts (m/s)	Wind speed (m/s)	Wind Direction (deg.)	Gusts (m/s)
15:00	2,4	273	5,6	1,2	276	4,7
15:10	3,3	277	6,3	1,8	323	6,1
15:20	2,9	231	5,6	1,8	274	4,5
15:30	2,4	223	5,4	1,7	234	4,1
15:40	3,1	230	5,6	1,8	274	4,6
15:50	4,0	218	8,9	1,6	224	3,3
16:00	4,7	232	8,0	1,9	354	4,6

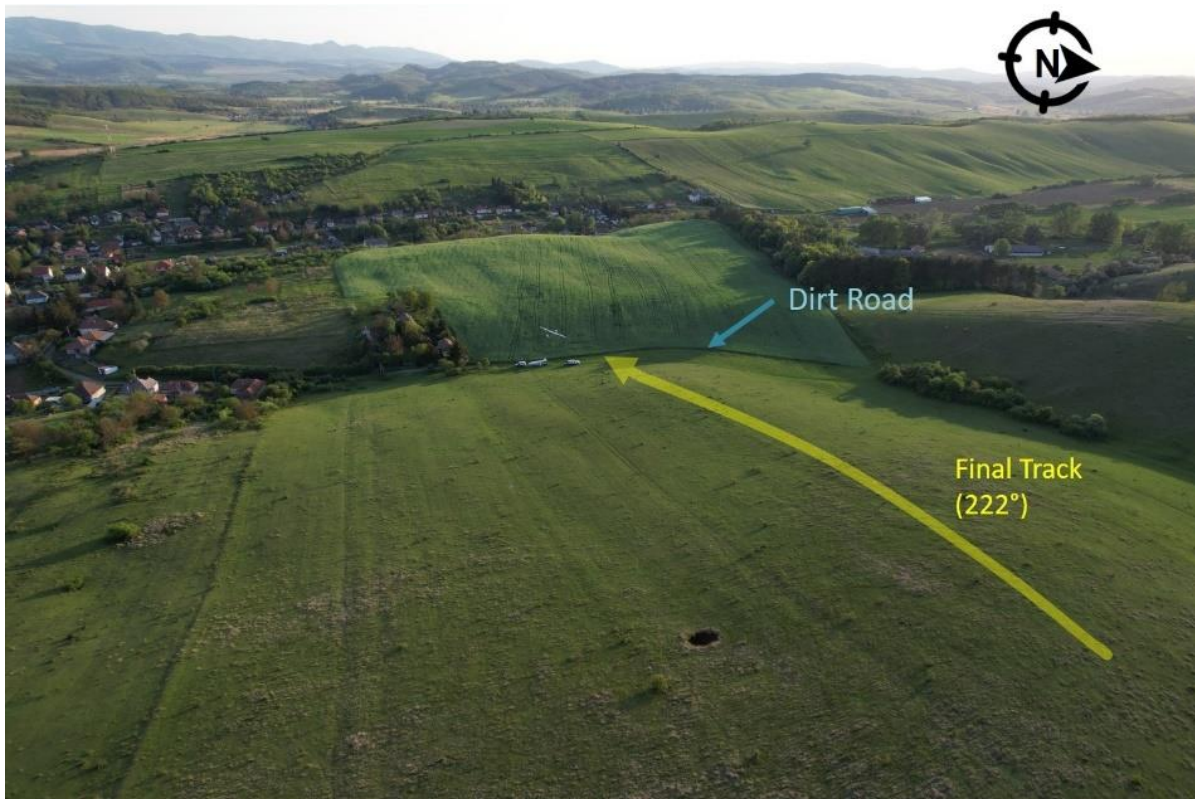
The recorded flight IGC-data show a 3 to 6 m/s wind, varying between 270 and 278 degrees in the last few minutes of the flight, as displayed in the pictures below.



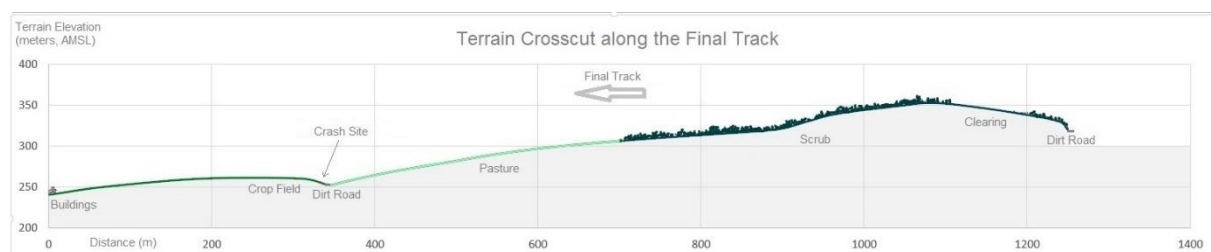
The sun was 60 degrees high and 25 degrees to the left of the final track.

Landing Area

The final segment of the flight preceding the landing was over a sloping pasture of about 11 degrees of decline, bordered by a dirt road at its far end on the southwest. Across the road there was a crop field of 40 to 50 cm tall green wheat. This field started in a rampant acclivity of a significant, 22-degree gradient that further on renounced into a milder upslope, as shown in the picture. The impact site was on the initial, steep section of the wheat field, about 20 meters from the dirt road, at coordinates N48°02'35.7", E19°58'31.4".



Note: At the time this photo was taken, the sun was already setting, so the shadows cast on the ground enhance the terrain features and the sharp changes of the topography. At the time of the accident the sun was at 60 degrees high, much higher than in the photo, and these terrain features were much less conspicuous for the pilot.



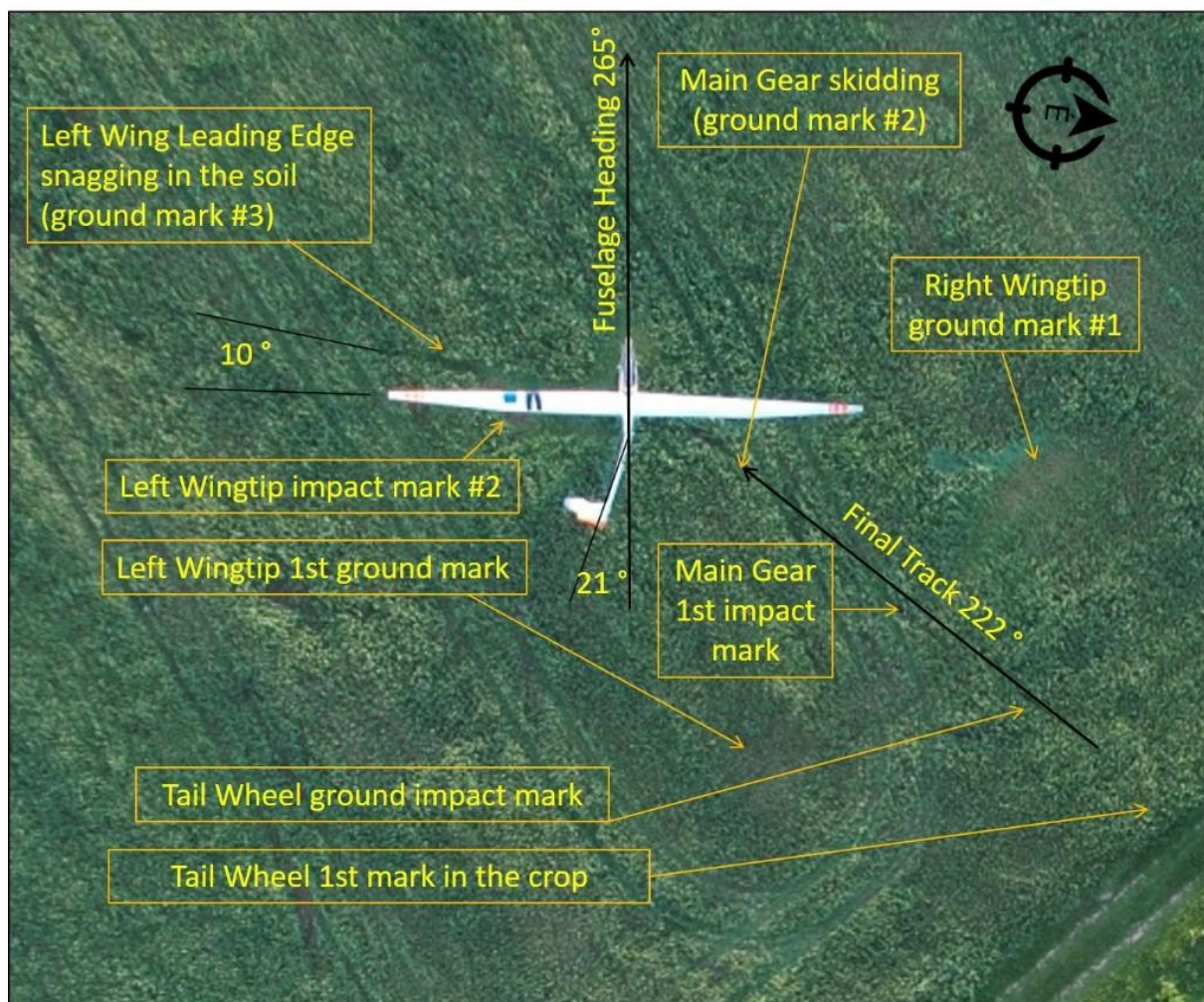
Data Recorders

The aircraft was carrying an LX 9050, GPS-based data logger, which provided serviceable IGC format data for the investigation.

Wreckage and Impact Information

By the marks recorded on the ground, the tail wheel touched down first, followed by the main wheel, while both wingtips flapped all the way down against the ground. The left wing only mowed the wheat stems at ground level, while the right wing left a hard ground impact mark in addition, revealing that the wings were not quite level on touchdown. The resulting increased drag on the right side gave the fuselage a right turning momentum as it was bouncing off in a left rolling and down pitching attitude. On the next ground impact the left wingtip slammed into the ground, together with the main wheel skidding left, while the nose also came down hard, scraping on the ground.

The left wing bounced off yet again, only to come down once more with its leading edge cutting into the soil. The left wing now, flexing backwards, arrested the last of the aircraft's forward motion. The left wing then sprung back forward and threw the fuselage aft, while twisting it about 10 degrees back left at the same time. As a result of the rapidly changing, excessive torsional forces, the empennage separated and came to a rest, tilting left.



Survival Aspects

Impact forces acting on the pilot were not in the magnitude of endangering human life. No injury ensued.

Analysis

When the pilot made the decision to make an off-field landing, he first scanned the terrain from around 400 meters AGL to choose a suitable landing spot. From this altitude, especially at high sun that was characteristic of the time of the event, it is rather difficult for a pilot to recognize slope angles and differences of elevation in rolling terrain. Prior to commencing landing, the pilot flew around his intended landing area and measured up the terrain features once more. His review reinforced him to stick with his initial decision and he lined up for the same spot he initially picked. According to his account, at that point he did not recognize either the relatively steep, approximately 11-degree (and steepening) slope along his final, or the sharp, 22-degree, rampant acclivity across the dirt road at the end of the sloping pasture. These features caught him off-guard at landing, when he also realized that his approach was longer than expected over the sinking terrain. With the steep upslope across the road coming on rapidly, he tried to correct his flare by an intensive pull on the stick, but his action was delayed on the one hand and too abrupt on the other, resulting in a hard landing.

It needs to be emphasized that the steeper the upslope, the more difficult it is to perform a proper flare, even for experienced pilots. Flawless timing, along with a precise and spot-on pull rate on the stick are both paramount for a successful flare on rising terrain, which requires specific training for pilots who intend to operate in such an environment. The slightest tardiness in the flare, which would be insignificant over a level surface, will bring in serious consequences, including aircraft damage. Flare initiation that is just a little bit delayed, cannot be corrected by a positive pull on the stick, because by the time aircraft attitude catches up with pitch change, it is too late on rising terrain, and the aircraft will impact the ground at a high vertical speed in a nose-up attitude.

As a viable alternative, the pilot, with a more timely assessment of the situation, could have opted for reducing airbrakes and aim for a landing spot further up in the wheat field, where the terrain gradient was milder. In this case, he would still have ample stop distance of 300 meters, even with the crop field turning into a gentle slope beyond the top of the hill. The IC, however, deems that the best and safest option would have been picking a different landing spot, of which there were several in the close vicinity.

Conclusions

The IC has concluded that the immediate cause of the accident was the pilot's judgment error when making the following decisions.

- Terrain features were not properly assessed when choosing a landing spot.
- Later on at lower altitudes, the terrain's steep slopes in the intended landing area were still not spotted, therefore, the necessary corrective actions were not performed.
- Flare was late, abrupt and not properly adjusted to the steeply rising terrain.

In addition to the causes established above, the IC identified the following contributing factors.

- Looking straight down from an altitude (especially at high sun with short shadows) it is difficult for a pilot to accurately evaluate topographic features of an undulating terrain.
- Flaring upslope is no easy job: the steeper the gradient, the more difficult flaring gets. Attempting it without prior training and experience will significantly compromise safety.
- When choosing his landing area, the pilot did not give appropriate consideration to spot and identify several other optional landing fields in the close vicinity, with more favorable terrain features.

The Investigating Committee of TSB Hungary has issued no Safety Recommendation.

Dated in Budapest, on 3 June 2022.



.....
Mr. Akos Hanczar
Investigator-in-Charge



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Ms. Zsuzsanna Nacsá JD
Investigator