

# **FINAL REPORT**

## **on safety investigation of air accident**

Aircraft type **SZD-48-3 „JANTAR STANDARD“**  
Registration mark **SP-3688 and LY-GBI**  
dated **26 April 2022**



*The original of the Final Report was issued in the Slovak language.  
In case of inconsistency original version in Slovak language is applicable*

The safety investigation of the aviation incident was performed in accordance with § 18 of Act No. 143/1998 on Civil Aviation (the Aviation Act) and on amendments and supplements of certain acts, in accordance with Regulation (EU) No. 996/2010 of the European Parliament and of the Council on the investigation and prevention of accidents and incidents in civil aviation governing the investigation of civil aviation accidents and incidents.

The Final Report has been issued in accordance with L 13 which is the application of provisions of the ANNEX 13, Investigation of Air Accidents and Incidents, to the Convention on International Civil Aviation.

The sole purpose of safety investigation is to identify the underlying causes of the incident and to prevent such incidents from occurring and not to apportion any blame or liability of any persons.

This Final Report, its individual parts or other documents related to safety investigation of the incident in question are only informative and cannot be used otherwise than as recommendation for implementation of measures aimed at preventing other aviation incidents with similar causes from occurring.

## Abbreviations used

°	Degree - geometric quantity
°C	The Degree Celsius
ALT	Altitude
ATE	AIR - TRANSPORT EUROPE, spol. s r.o.
BVK	Specialised commission for investigation of causes of a particular incident from members of the Commission
FAI	International Aeronautical Federation (sets the rules for air sport events) – FEDERATION AERONAUTIQUE INTERNATIONALE
FCC 2022	International Gliding Competition Flight Challenge Cup Gliding 2022 in Prievidza
FLARM	Flight alarm
HaZZ	Fire and Rescue Corps
IGC	Flight data file/flight record
km/h	Derived unit of the International System of Units for the speed of rectilinear motion
LZPE	ICAO code for Prievidza airport
LZPW	ICAO code for Prešov airport
m	Basic unit of length in the International System of Units
m/s	Unit of the international system of units determining the speed of rectilinear motion
MIL	Helicopter of the ARMED FORCES OF SLOVAK REPUBLIC
PZ SR	Police Corps of the Slovak Republic
RCC	Rescue Co-ordination Centre
SAR	Search and Rescue Services
STD ALT	The International Standard Atmosphere 1013.25 hPA (hectopascal)
SZD	Production plant in Bielsko-Biała (design and research centre) - Szybowcowy Zakład Doświadczalny
UTC	Universal Coordinated Time
VFR	Rules of visual flight
VZZS	HELICOPTER EMERGENCY MEDICAL SERVICE

## A. INTRODUCTION

Aircraft type: SZD-48-3 „JANTAR STANDARD“  
Manufacturer: PZL-Bielsko  
Registration mark: **LY-GBI**  
Start mark: **B**  
Owner: Kūno kultūros ir sporto departamentas  
Provider: Viliniaus aeroklubas 193077337

Aircraft type: SZD-48-3 „JANTAR STANDARD“  
Manufacturer: PZL-Bielsko  
Registration mark: **SP-3688**  
Start mark: **LK**  
Owner: Rafał Elżanowski  
Provider: private person

Type of traffic: General aviation / sports and recreational flying  
Take-off location: LZPE  
Flight phase: En route / maneuvering in thermal lift  
Accident location: Končiar hill above the village of Trebostovo  
N 49°02'25,60", E 018°49'28,90"

Accident date and time: 26 April 2022, 12:11:13

Note: All time data in this report are stated in UTC time, all heights are stated in STD ALT

## B. INFORMATION SUMMARY

On 26 April 2022, during the FCC 2022 flight day, the aircraft crews took off for the competition task in Club Class, 15 m class and Combi class.

During the manoeuvring phase in a common updraft, a collision of aircraft of the type occurred in a right-hand turn:

SZD-48-3 „JANTAR STANDARD 3“, registration mark LY-GBI, start mark „B“ (hereinafter referred to as the „**B/LY-GBI**“)

SZD-48-3 „JANTAR STANDARD 3“, registration mark SP-3688, start mark „LK“ (hereinafter referred to as the „**LK/SP-3688**“).

Both pilots died.

Uncontrollable aircrafts hit the mountain terrain in Malá Fatra.

The BVK was appointed to investigate the causes of the air accident in question

Ing. Igor BENEK	Chairman of the BVK
Ing. Juraj GYENES	Member of the BVK
Ing. Igor KREJČA	Member of the BVK
Miroslav GÁBOR	Member of the BVK

The Report has been issued by:

Aeronautical and Naval Investigation Unit  
Ministry of Transport and Construction of the Slovak Republic

## C. MAIN PART OF THE REPORT

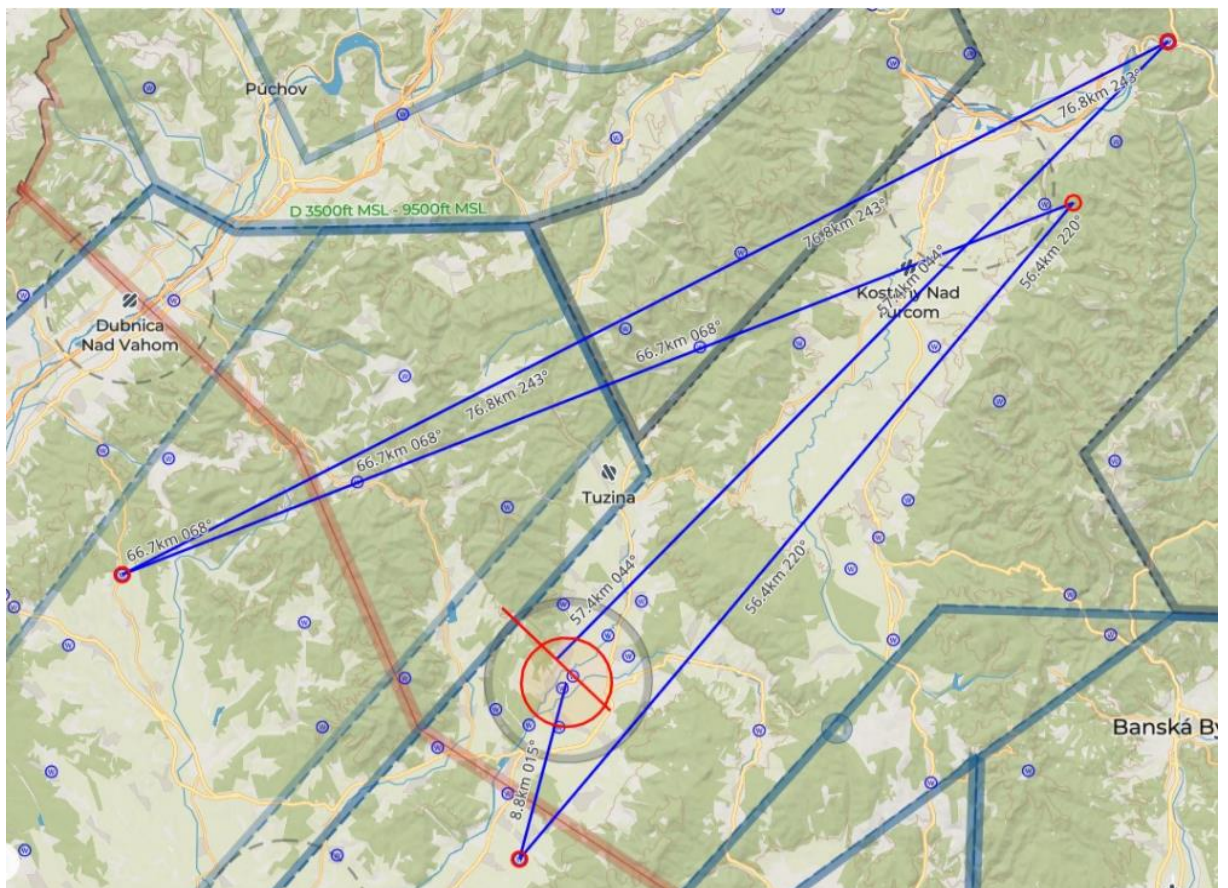
1. FACTUAL INFORMATION
2. ANALYSIS
3. CONCLUSIONS
4. SAFETY RECOMMENDATIONS

### 1. Factual information

#### 1.1 History of the flight

On 26 April 2022 the crews took off for the Club Class competition on the route Bojnice - Kraľovany - Motešice - Katova skala (a hill in the Veľká Fatra Mountains/located directly above the village of Sklabinský Podzámok) - Bystričany – Prievidza.

Length of the track 266.3 km.



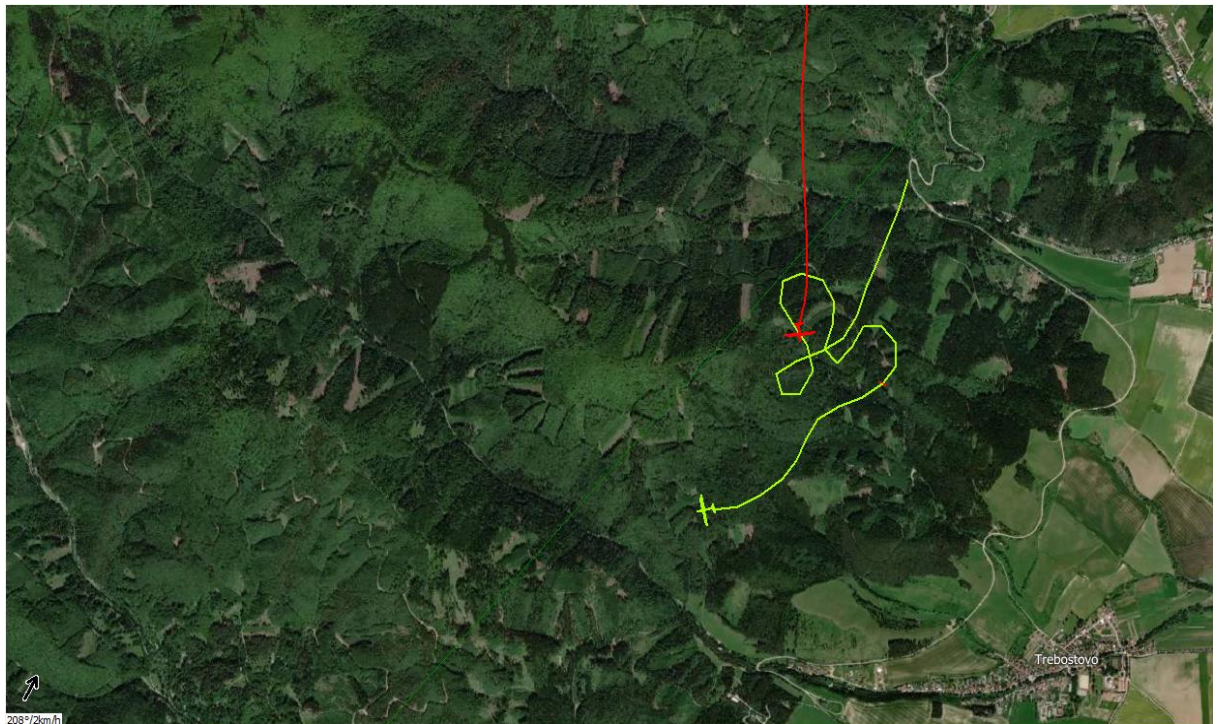
At 09:31:52 **B/LY-GBI** took off on the competition task.

At 10:03:25 **LK/SP-3688** took off on the competition task.

At the time of the event there were also aircrafts flying the Combi Class and 15m Class competition task over the Malá Fatra mountains.

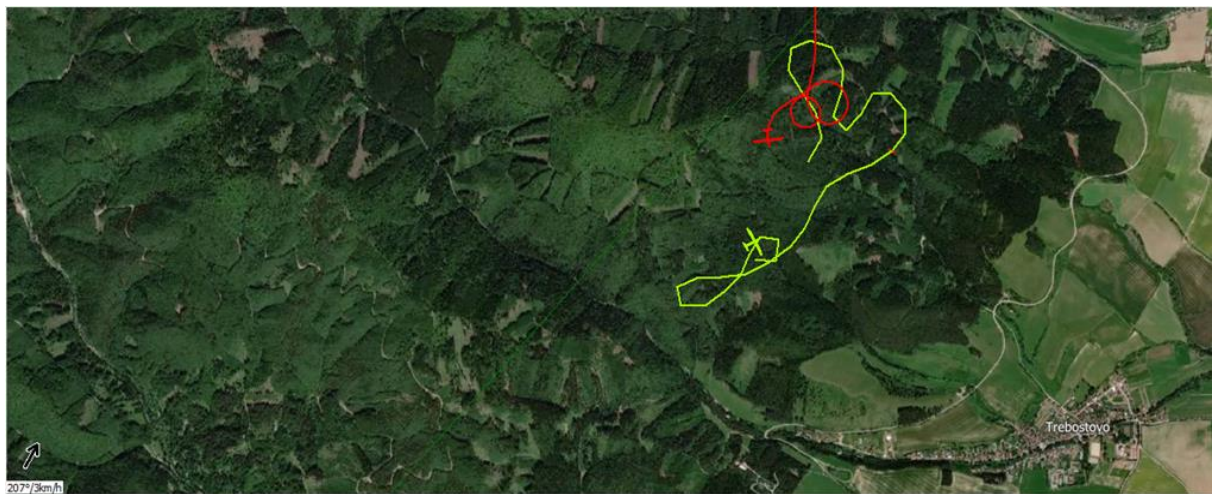
According to the pilots' experience, there are good thermal conditions in the area to gain the necessary altitude to continue the flight.

At 12:06:51 **B/LY-GBI** arrived in the area north of the village of Trebostovo, altitude 1,070 m, where it started to search for updrafts. At this time, **CU/SP-3332** was 959 m high in the updraft



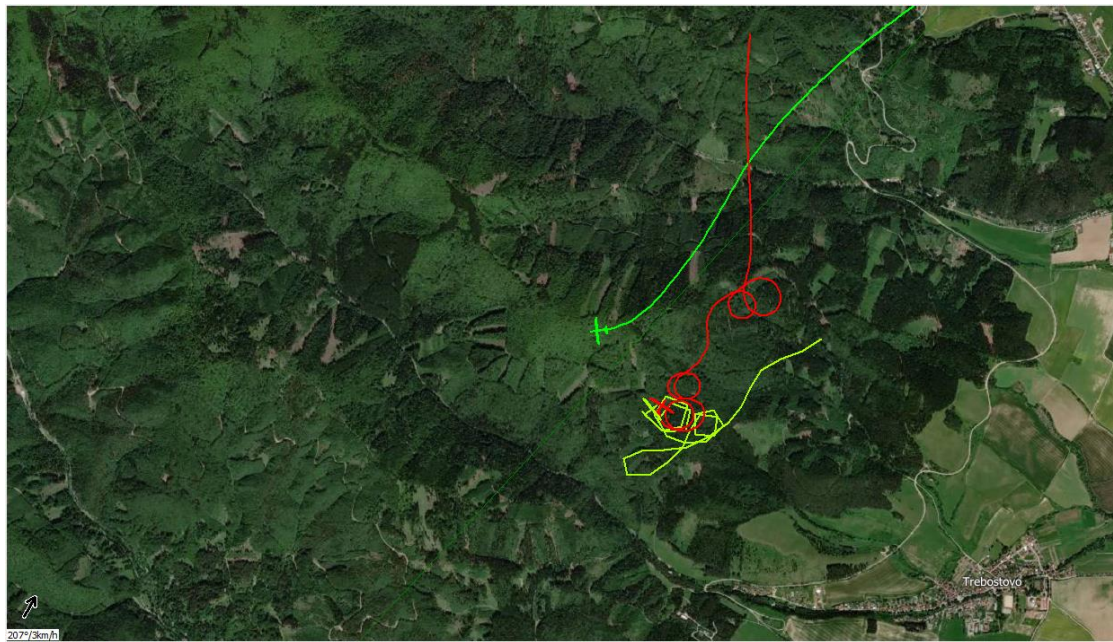
Time	CN	Std. Alt.	GPS Alt.	Alt.	AGL	Trk	Vario	IAS	TAS	Gsp.	Wind
14:06:51	●B	1070m	1118m	1070m	309m	174°	4,5m/s	116,3km/h	122,6km/h	120km/h	208°/2km/h
14:06:51	●K	1505m	1560m	1505m	747m	233°	-1,6m/s	126,2km/h	135,8km/h	117km/h	157°/3km/h
14:06:51	●U	959m	971m	939m	182m	259°	0,5m/s	102,5km/h	107,3km/h	106km/h	207°/3km/h
14:06:51	●Z	1376m	1417m	1365m	728m	218°	-1,0m/s	146,8km/h	156,9km/h	164km/h	355°/11km/h
14:06:51	●R	1438m	1452m	1445m	724m	225°	-1,0m/s	103,1km/h	110,7km/h	117km/h	357°/10km/h
14:06:51	●AT	1402m	1446m	1392m	732m	296°	1,3m/s	0,0km/h	0,0km/h	111km/h	356°/12km/h
14:06:51	●F	1561m	1596m	1549m	813m	42°	0,3m/s	118,6km/h	127,9km/h	116km/h	353°/10km/h
14:06:51	●O	1491m	1537m	1481m	810m	212°	-0,8m/s	105,8km/h	113,8km/h	111km/h	357°/9km/h
14:06:51	●I	1491m	1533m	1478m	744m	232°	-0,9m/s	128,8km/h	138,4km/h	121km/h	14°/3km/h

At 12:07:48 **B/LY-GBI** decided to join **CU/SP-3332** in the common updraft.



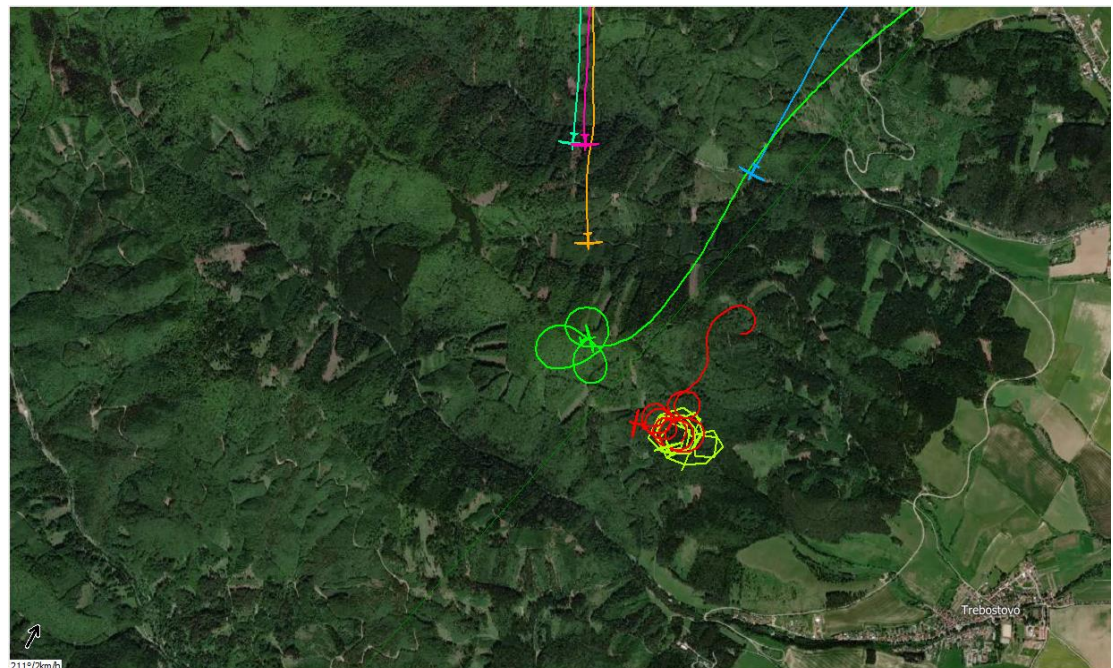
Time	CN	Std. Alt.	GPS Alt.	Alt.	AGL	Trk	Vario	IAS	TAS	Gsp.	Wind
14:07:48	●B	1097m	1149m	1097m	291m	173°	-1,0m/s	106,0km/h	111,9km/h	110km/h	207°/3km/h
14:07:48	●K	1437m	1494m	1437m	459m	214°	-1,3m/s	125,7km/h	134,9km/h	126km/h	348°/4km/h
14:07:48	●U	981m	972m	962m	210m	60°	0,4m/s	88,1km/h	92,4km/h	94km/h	207°/3km/h
14:07:48	●Z	1306m	1355m	1295m	674m	217°	-0,5m/s	161,1km/h	171,6km/h	171km/h	281°/1km/h
14:07:48	●R	1402m	1418m	1409m	449m	219°	-1,0m/s	104,7km/h	112,2km/h	118km/h	353°/8km/h
14:07:48	●AT	1401m	1450m	1391m	758m	199°	-0,2m/s	0,0km/h	0,0km/h	155km/h	356°/12km/h
14:07:48	●F	1382m	1426m	1370m	802m	221°	-4,0m/s	189,5km/h	202,6km/h	217km/h	360°/10km/h
14:07:48	●O	1481m	1526m	1471m	667m	230°	-0,9m/s	124,6km/h	133,9km/h	124km/h	356°/11km/h
14:07:48	●I	1421m	1466m	1408m	470m	224°	-2,5m/s	130,8km/h	140,1km/h	131km/h	352°/6km/h

At 12:09:11, **QZ/OK-2977**, altitude 1,264 m, arrived in the area and began to execute a rising right-hand turn.



Time	CN	Std. Alt.	GPS Alt.	Alt.	AGL	Trk	Vario	IAS	TAS	Gsp.	Wind
14:09:11	●8	1204m	1257m	1204m	371m	33°	0,0m/s	108,2km/h	114,8km/h	117km/h	207°/3km/h
14:09:11	LK	1419m	1479m	1419m	254m	182°	-1,5m/s	119,8km/h	128,3km/h	121km/h	303°/2km/h
14:09:11	CU	1044m	1058m	1025m	195m	51°	-1,3m/s	100,5km/h	105,7km/h	108km/h	207°/3km/h
14:09:11	QZ	1264m	1333m	1253m	328m	265°	4,0m/s	139,1km/h	147,8km/h	146km/h	209°/2km/h
14:09:11	MR	1403m	1417m	1410m	221m	226°	0,6m/s	90,9km/h	97,4km/h	97km/h	313°/2km/h
14:09:11	CAT	1360m	1412m	1350m	713m	206°	-1,7m/s	0,0km/h	0,0km/h	155km/h	341°/4km/h
14:09:11	ZF	1289m	1332m	1277m	622m	174°	-2,9m/s	159,6km/h	169,9km/h	186km/h	18°/11km/h
14:09:11	GO	1362m	1406m	1352m	250m	197°	-1,4m/s	120,1km/h	128,2km/h	122km/h	349°/6km/h
14:09:11	G1	1459m	1506m	1446m	169m	228°	-0,9m/s	97,4km/h	104,6km/h	89km/h	308°/2km/h

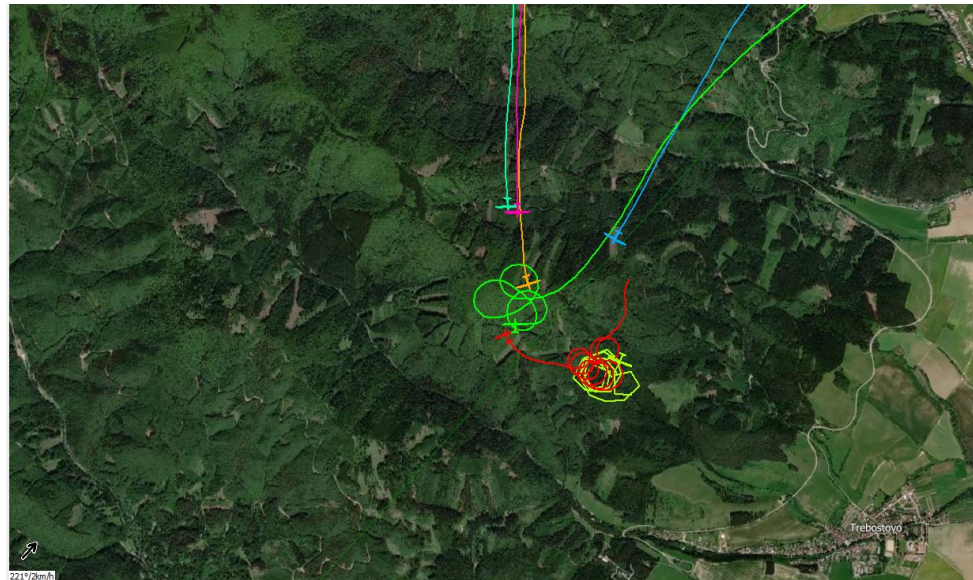
At 12:10:26 **B/LY-GBI** spotted **QZ/OK-2977** circling 700 m away at 1,405 m in a stronger climb and decided to follow it to take advantage of better conditions to gain the necessary altitude. Meanwhile, **LK/SP-3688** was approaching the area of the incident on a heading of 177°, altitude 1,375 m.



Time	CN	Std. Alt.	GPS Alt.	Alt.	AGL	Trk	Vario	IAS	TAS	Gsp.	Wind
14:10:26	●8	1365m	1418m	1365m	504m	284°	4,0m/s	104,2km/h	111,4km/h	111km/h	211°/2km/h
14:10:26	LK	1375m	1431m	1375m	435m	177°	0,7m/s	116,8km/h	124,9km/h	119km/h	287°/2km/h
14:10:26	CU	1142m	1120m	1123m	345m	345°	-0,1m/s	90,7km/h	95,8km/h	98km/h	207°/3km/h
14:10:26	QZ	1405m	1440m	1394m	461m	76°	1,5m/s	113,8km/h	121,9km/h	123km/h	268°/1km/h
14:10:26	MR	1343m	1357m	1350m	472m	185°	-1,5m/s	117,2km/h	125,2km/h	126km/h	298°/1km/h
14:10:26	CAT	1263m	1312m	1253m	493m	208°	-2,4m/s	0,0km/h	0,0km/h	154km/h	219°/2km/h
14:10:26	ZF	1303m	1346m	1291m	526m	215°	-2,1m/s	140,8km/h	150,0km/h	142km/h	48°/4km/h
14:10:26	GO	1311m	1354m	1301m	210m	198°	-0,3m/s	111,3km/h	118,6km/h	112km/h	220°/2km/h
14:10:26	G1	1363m	1405m	1350m	483m	179°	-1,5m/s	130,9km/h	139,8km/h	139km/h	293°/1km/h

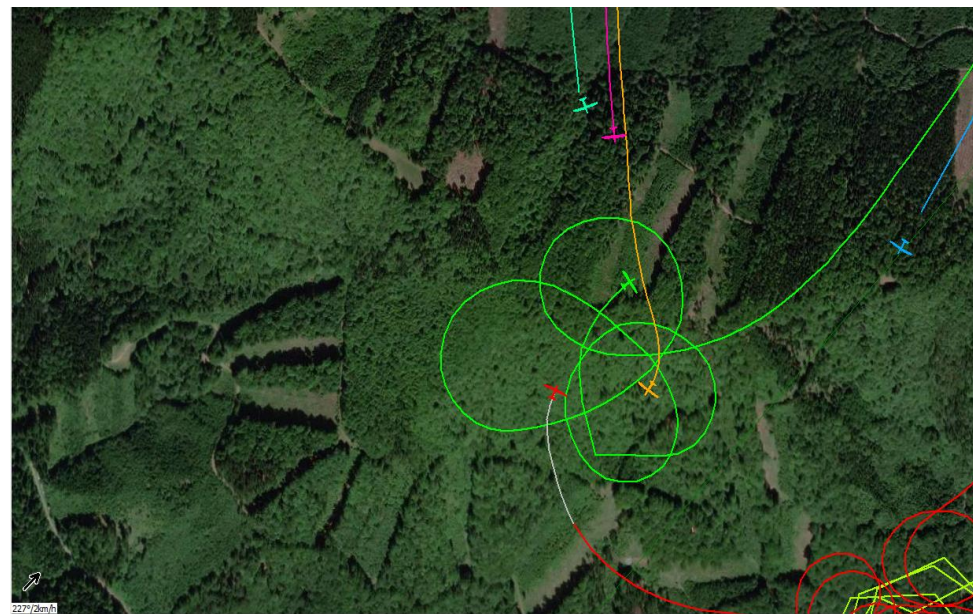
At 12:10:44 **B/LY-GBI**, altitude 1,383 m, reached below **QZ/OK-2977**, altitude 1,444 m, which was circling to the right. **B/LY-GBI** joined the circle by a right-hand turn. **LK/SP-3688** reached a flight altitude of 1,395 m at this time.

At 12:10:44 other competing aircraft were arriving in the area of the aircraft collision, **CAT/OM-7773** heading 209°, altitude 1,258 m, **G1/SP-4013** heading 179°, altitude 1,352 m, **MR/SP-3854** heading 176°, altitude 1,328 m.



Time	CN	Std. Alt.	GPS Alt.	Alt.	AGL	Trk	Vario	IAS	TAS	Gsp.	Wind
14:10:44	GB	1383m	1440m	1383m	453m	340°	1,0m/s	96,5km/h	103,3km/h	104km/h	221°/2km/h
14:10:44	LK	1395m	1447m	1395m	467m	163°	1,9m/s	109,6km/h	117,3km/h	103km/h	291°/1km/h
14:10:44	CU	1160m	1134m	1141m	350m	201°	1,3m/s	93,4km/h	98,7km/h	96km/h	207°/3km/h
14:10:44	QZ	1444m	0m	1433m	504m	0°	1,0m/s	104,0km/h	111,5km/h	111km/h	282°/1km/h
14:10:44	MR	1328m	1343m	1335m	387m	176°	-0,1m/s	119,8km/h	127,9km/h	129km/h	298°/1km/h
14:10:44	CAT	1258m	1301m	1248m	431m	209°	-0,4m/s	0,0km/h	0,0km/h	153km/h	213°/2km/h
14:10:44	ZF	1272m	1315m	1260m	378m	223°	-2,5m/s	144,0km/h	153,2km/h	146km/h	127°/1km/h
14:10:44	GO	1296m	1339m	1286m	240m	203°	0,0m/s	118,0km/h	125,6km/h	125km/h	213°/2km/h
14:10:44	G1	1352m	1391m	1339m	391m	179°	0,0m/s	128,0km/h	136,6km/h	129km/h	294°/1km/h

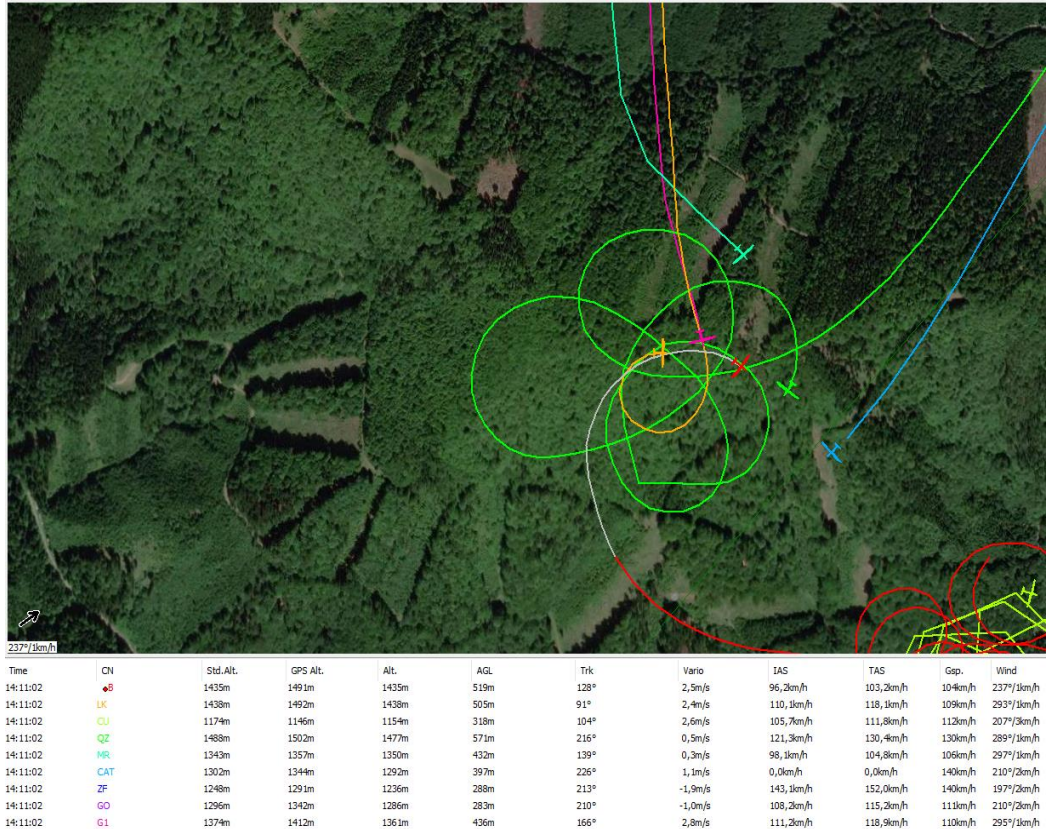
At 12:10:51 **LK/SP-3688**, altitude 1,423 m had **B/LY-GBI**, altitude 1,402 m, on its right side (it was in a 3 m/s climb, airspeed relative to the ground 105 km/h). **LK/SP-3688** joined the tangent to the circle of circling aircrafts to a position on the opposite side of the circle to **B/LY-GBI**. Its actual rate of climb was 2.1 m/s, its airspeed relative to the ground was 97 km/h.



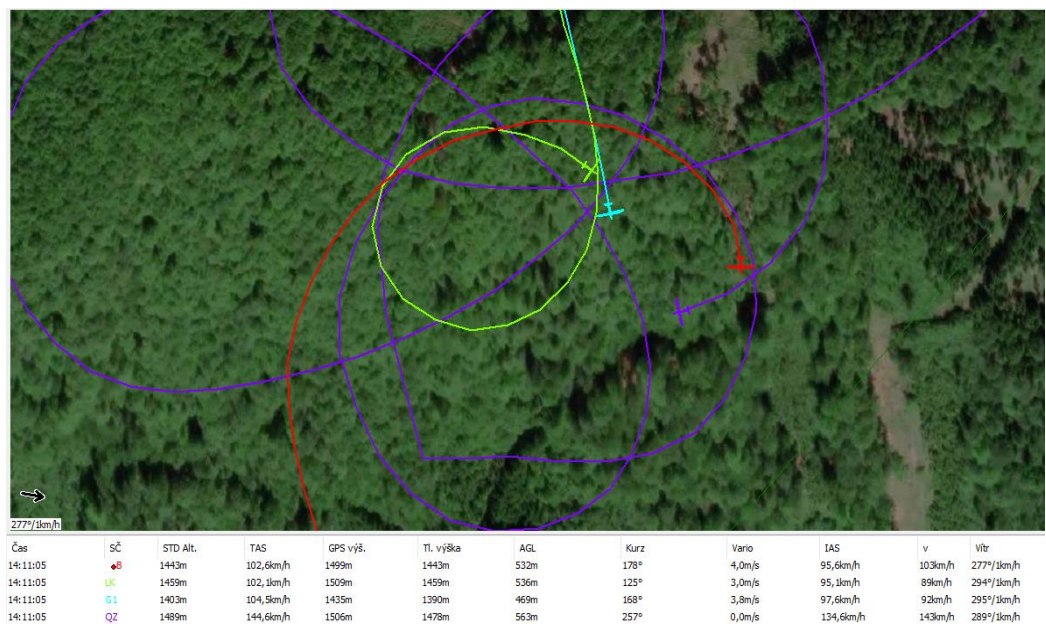
Time	CN	Std. Alt.	GPS Alt.	Alt.	AGL	Trk	Vario	IAS	TAS	Gsp.	Wind
14:10:51	GB	1402m	1457m	1402m	460m	25°	3,0m/s	97,0km/h	103,9km/h	105km/h	227°/2km/h
14:10:51	LK	1423m	1478m	1423m	500m	216°	2,1m/s	96,6km/h	103,5km/h	97km/h	292°/1km/h
14:10:51	CU	1163m	1136m	1144m	367m	317°	0,4m/s	91,8km/h	97,1km/h	98km/h	207°/3km/h
14:10:51	QZ	1452m	1403m	1441m	508m	57°	2,0m/s	122,9km/h	131,5km/h	132km/h	285°/1km/h
14:10:51	MR	1333m	1346m	1340m	377m	161°	1,1m/s	105,1km/h	112,2km/h	113km/h	297°/1km/h
14:10:51	CAT	1282m	1319m	1273m	431m	211°	1,6m/s	0,0km/h	0,0km/h	143km/h	212°/2km/h
14:10:51	ZF	1269m	1312m	1257m	318m	215°	0,5m/s	148,7km/h	158,2km/h	139km/h	168°/1km/h
14:10:51	GO	1296m	1340m	1286m	256m	210°	0,1m/s	118,3km/h	125,9km/h	120km/h	212°/2km/h
14:10:51	G1	1357m	1398m	1344m	397m	174°	-0,7m/s	116,3km/h	124,1km/h	123km/h	295°/1km/h

**B/LY-GBI**, altitude 1,435 m, continued to spin the right-hand climbing turn at 3.1 m/s and probably turned its attention to **QZ/OK-2977**, altitude 1,488 m, which increased the radius of the right-hand turn. Arriving **G1/SP-4013**, altitude 1,374 m and joined the circle below the other aircrafts.

The aircraft crews continued circling about 144 m apart until 12:11:02 when **B/LY-GBI**, altitude 1,435 m slightly extended 50 m above the circling **QZ/OK-2977**. At this time B/LY-GBI did not have, altitude 1,435 m, LK/SP-3688 in sight, altitude 1,438 m, it was behind its back. **LK/SP-3688** had **B/LY-GBI** in its natural field of view and decided **not to follow its route** but to stay in its original circle.



At 12:11:05, **G1/SP-4013**, altitude 1,403 m, which had **QZ/OK-2977**, altitude 1,489 m, in front of it in the line of sight, and **B/LY-GBI**, altitude 1,443 m, to its left, ranked below the other aircrafts. Followed by **LK/SP-3688**, altitude 1,459 m.



At 12:11:07 **LK/SP-3688**, altitude 1,470 m, had **G1/SP-4013**, altitude 1,408 m, and **B/LY-GBI**, altitude 1,451 m, in the forward hemisphere and had **QZ/OK-2977**, altitude 1,489 m, in the line of sight. **LK/SP-3688** with a high probability bordering on certainty continued to fly behind **QZ/OK-2977**.

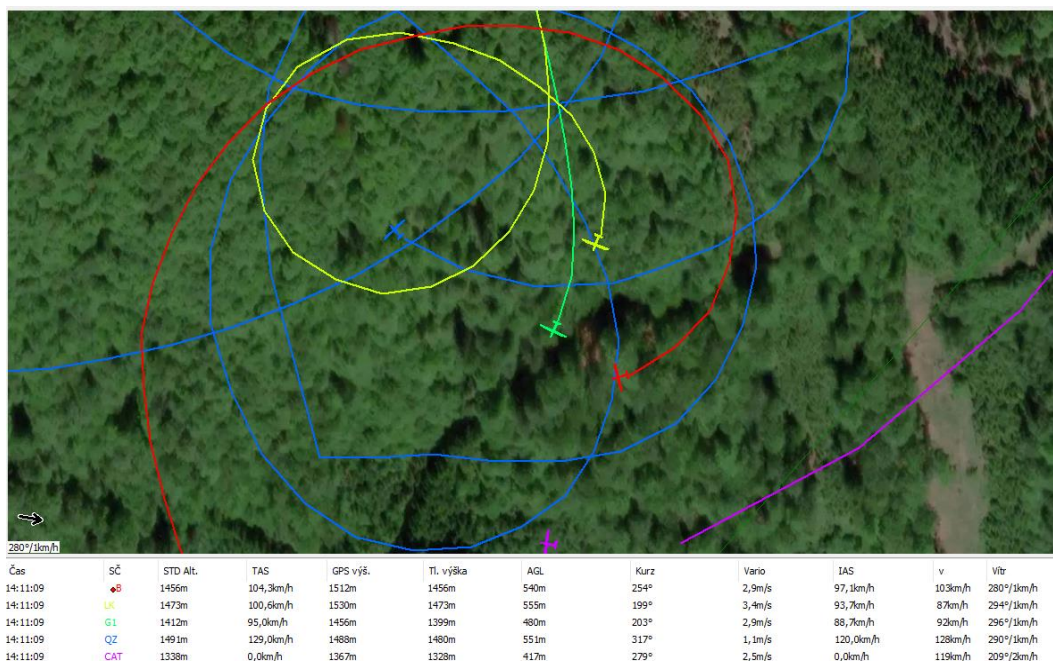


At 12:11:09 **B/LY-GBI**, altitude 1,456 m, climbing at 2.9 m/s, airspeed relative to the ground 104.3 km/h, it returns to its original circle. In the upper right part of the field of view it should see the aircraft **LK/SP-3688**, altitude 1,473 m, climb 3.4 m/s, airspeed 100.6 km/h).

**G1/SP-4013**, after entering the circle, began a right-hand climbing turn below the other aircrafts, altitude **1,412 m**, climb rate 2.9 m/s, airspeed relative to the ground 95.0 km/h).

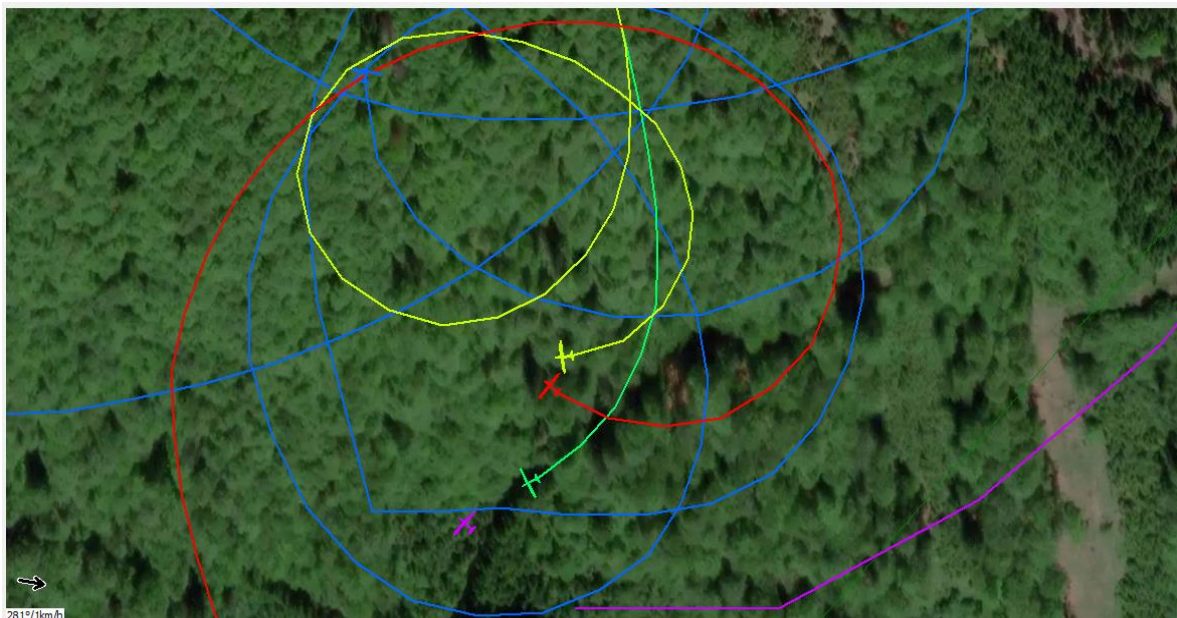
**LK/SP-3688** should have a **B/LY-GBI** aircraft in the lower left of the field of view as well as a **CAT/OM-7773** arriving lower, tangent to the circle, altitude 1,338 m, climbing at 2.5 m/s). **LK/SP-3688** continues in a right-hand turn, altitude **1,473 m** and does not realize that **B/LY-GBI**, altitude **1,456 m** begins to cross its direction of flight, which was in climb. **B/LY-GBI** did not have **LK/SP-3688** in its field of view at this time.

**B/LY-GBI** and **LK/SP-3688** were 4 seconds away from the collision.

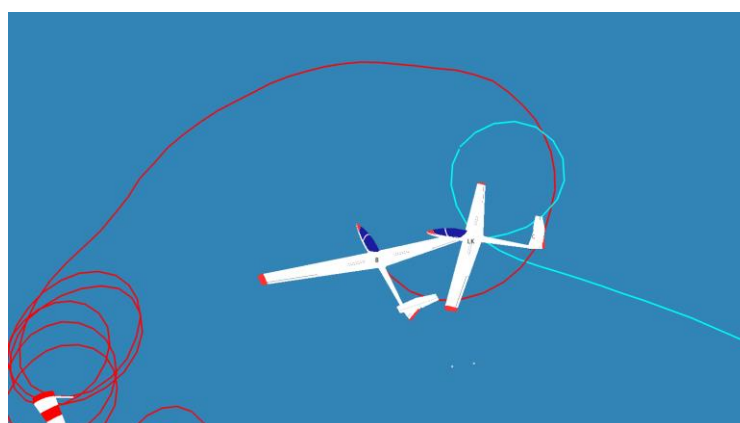


At 12:11:12 **LK/SP-3688** had reached an altitude of 1,466 m and was continuing in a right-hand climbing turn at a rate of climb of 1.3 m/s at a ground speed of 104.0 km/h and, with a high probability bordering on certainty, did not see (obscured by its aircraft fuselage) **B/LY-GBI**, which had an altitude of 1,462 m, was in a rate of climb of 5.1 m/s, and was approaching from below at a ground speed of 104.3 km/h.

**LK/SP-3688** was at a slight elevation relative to aircraft **B/LY-GBI**, which was in its blind angle.



Čas	SČ	STD Alt.	TAS	GPS výš.	TL. výška	AGL	Kurz	Vario	IAS	v	Vitr
14:11:12	●B	1462m	104,3km/h	1519m	1462m	540m	310°	5,1m/s	97,1km/h	103km/h	2815/1km/h
14:11:12	●K	1466m	104,0km/h	1526m	1466m	543m	262°	1,3m/s	96,9km/h	103km/h	2947/1km/h
14:11:12	●L	1413m	107,3km/h	1458m	1400m	478m	241°	2,4m/s	100,2km/h	99km/h	2967/1km/h
14:11:12	●Z	1497m	125,7km/h	1485m	1486m	549m	9°	2,5m/s	116,9km/h	125km/h	2917/1km/h
14:11:12	●AT	1345m	0,0km/h	1387m	1336m	416m	314°	1,6m/s	0,0km/h	117km/h	2137/2km/h



At 12:11:13 an aircraft collision occurs. **LK/SP-3688** crashed into **B/LY-GBI** from above and after the collision they hit the mountain terrain.

The pilots of the aircrafts died after hitting a forest cover.

The aircrafts were destroyed after hitting the forest cover.

The accident was reported by local residents to the emergency services and to the competition organiser, who reported the incident to the Aeronautical and Maritime Investigation Unit of the Ministry of Transport and Construction of the Slovak Republic.

Time of day: Day

Flight Rules: VFR

## 1.2 Injuries to persons

Injury	Crew	Passengers	Others
Fatal	2	-	-
Serious	-	-	-
Minor	-	-	-
No injuries	-	-	-

## 1.3 Damage to aircraft

Aircrafts **B/LY-GBI** and **LK/SP-3688** were transported from the accident site to the premises of AEROSPOOL, spol. s.r.o., which carried out an expert technical inspection with photo documentation.

### **LK/SP-3688**

**Left wing** - damaged as follows:

- Destroyed and broken off end arch on about 25 cm span (destroyed pieces not found).  
- leading edge of about 2.5 m from the butt rib and 2 tears in the coating at the point of the split of the leading edge, about 0.5 m of the profile depth towards the beam
- steering in the wing:
  - water ballast outlet valve control movable and functional,
  - aileron control - pull rod in the butt rib movable and functional,
  - aileron control inside the wing functional, no signs of blockage - all parts movable and functional, connections tight (rods, levers, bolted joints). Aileron minimally damaged, functional,
  - air brakes movable in the wing skin cut-outs and functional, connections fixed (rods, levers, bolted joints).

**Right wing** - damaged as follows:

- peeled-off end-arch on approx. 30 cm of the leading edge circumference, hole in the leading edge approx. 0.8 m from the end-arch approx. 30x30 cm, unglued and wavy leading edge of the aileron along the entire span, deeply scratched cover (upper side along the entire span).
- steering in the wing:
  - water ballast outlet valve control movable and functional,
  - aileron control - pull rod in the butt rib movable and functional,
  - aileron control inside the wing functional, no signs of blockage - all parts movable and functional, connections tight (rods, levers, bolted joints)
  - air brakes movable in the wing skin cut-outs and functional, connections fixed (rods, levers, bolted joints).

**Stabiliser and elevators** – damaged as follows:

- stabiliser only slightly damaged, fittings attached to hull keel (front and rear on stabiliser) undamaged and functional.
- left elevator broken several times but movable and functional.
- right elevator intact, movable and functional.
- steering:
  - control drive and thrust end - quick coupler and elevator connections - both movable and functional.

**Hull** - damaged as follows:

- nose of fuselage destroyed, cockpit cover broken several times (right side), fuselage about 1,5 m behind the centre section - main fuselage bulkhead broken (fuselage tube separated), cockpit cover (also plexiglass) broken several times, emergency cover throwing functional,
- bulkhead - foot steering floor peeled off and broken several times, foot steering functional, steering cables in place of pedals intact - functional.
- dashboard without significant damage.
- manual steering bulkhead torn from fuselage covering and damaged, manual steering functional, all parts firmly connected (rods, levers, bolted joints).
- centre section - fibreglass structure intact, all steering control elements functional and firmly connected (rods, levers, bolted joints).
- main chassis undamaged - functional.
- fuselage tube about 1.5m behind centre section - main fuselage bulkhead broken off - keel surface completely separated. Horizontal elevator control rod 2x broken at fuselage tube fracture point, part of rod in centre section direction movable in guides and functional. Rudder control cables, RDST antenna wiring and pitot static system hoses - all separated - cut while removing the aircraft from the terrain.
- keel surface - vertical part broken off - laminate structure only slightly damaged. Horizontal elevator control rod in aft broken off section of fuselage tube movable in guides and functional. Direction rudder torn out of the upper hinge, it is hanging on the lower hinge - drive - rudder control intact - rudder ropes firmly connected to the drive, control functional. Vertical elevator control rod undamaged, firmly connected to lower elevator lever and upper elevator actuator - control functional. Handles - front and main hinge of horizontal stabilizer - upper keel part - undamaged, functional.
- on-board batteries, voltage 12.2V and 0.12 V.
- clamping straps undamaged, firmly attached in hinges to the hull covering.

**Aircraft B/LY-GBI**

**Left wing** damaged as follows:

- wing completely broken about 3m from the butt rib. Wing spar stump broken away from butt rib, spars of spar torn at point of stump break. Broken several times - sandwich wing covering destroyed about 0.6m behind the butt rib and peeled away from the ridge. Leading and trailing edge of wing repeatedly chipped and damaged. The broken off outer section was also completely broken along the span at the beam location. Aileron torn from hinges, broken at about 1/3 span, aileron hinges on wing intact.
- Steering in the wing:
  - water ballast outlet valve control movable and functional.
  - aileron control - rod in the butt rib just in front of the ridge and at the wing fracture point broken off completely but movable and functional in the rib and in the wing, no signs of blocking - all parts movable and functional, connections tight (rods, levers, screw connections)
  - aileron actuator (on aileron) movable, functional,
  - air brakes due to damage - brake lever bending difficult to move in wing cover cut-outs but functional, connections tight (levers, bolted joints),
  - control rod at the point of motion transfer behind the wing butt rib broken off from the tie rod end. The rest of the controls on the butt rib and in the wing are functional. Wing mounting bearings in butt rib undamaged.

**Right wing** damaged as follows:

- taped and damaged trailing edge at about 30cm of leading edge circumference, hole in leading edge and broken wing covering about 3m from butt rib to wing spar. Wing cover punctured by a branch -about 0.3m from the butt rib.
- Steering in the wing:
  - water ballast outlet valve control movable and functional,
  - aileron control - pull rod in the butt rib movable and functional,
  - aileron control inside the wing functional, no signs of blockage - all parts movable and functional, connections tight (rods, levers, bolted joints),
  - air brakes due to damage - brake lever bending difficult to move in the wing covering cut-outs but functional, connections tight (rod, levers, bolted connections). Articulated wing mounting bearings in the butt rib undamaged.

**Stabiliser and elevators** - damaged as follows:

- stabilizer broken completely about 0.3 m to the left of the middle rib (attachment to the keel of the trunk),
- leading edge of the stabilizer taped to 90% of the stabilizer span,
- left elevator broken completely about 0,3m from the butt,
- right elevator broken about 0.8m from the butt,
- both elevators with drive torn out of stabilizer hinges,
- stabilizer torn from the keel surface with fittings.
- steering:
  - rod end - quick coupling for elevator connection - broken off from the vertical elevator rod but firmly connected (secured) to the elevator drive.

**Hull** - damaged as follows:

- fuselage nose destroyed, fuselage about 1.2m behind the centre section up to the transition to the keel area - glue seam of the covering broken and fuselage tube broken about 1.5m behind the centre section, cockpit cover (also plexiglass) broken several times, front mounting bracket of the cockpit cover broken off, emergency drop of the cover but functional.
- foot steering at the front torn out of the hull floor, foot steering functional, steering cables at the pedals intact - functional,
- dashboard without significant damage,
- manual steering bulkhead intact, manual steering functional, all parts firmly connected (rods, levers, bolted joints),
- centre section - fibreglass structure intact, all steering control elements functional and firmly connected (rods, levers, bolted joints),
- main chassis undamaged - functional,
- horizontal elevator control rod in fuselage intact, firmly connected to drive lever in keel below, functional,
- rudder deflection cables in the hull without damage, firmly connected to the rudder drive at the bottom of the keel, functional,
- keel surface - laminate structure about 0.3m from bottom to top fully destroyed - panels of covering left and right torn off (left part of keel covering not found). The upper part of the main keel beam and the rear keel stand about 0.25m from the top torn out. Rudder torn from upper and lower hinge, rudder control intact - rudder cables firmly connected to drive at bottom of keel, control functional. Vertical elevator control rod bent-destroyed, broken tie rod end from VHF drive at top, at bottom but firmly connected to lower lever of VHF drive - control functional,
- on-board batteries, voltage 13.39V and 13.13V.
- clamping straps undamaged, firmly attached in hinges to the hull covering.

**1.4 Other damage**

The Aeronautical and Naval Investigation Service has not been notified of circumstances involving the possible claim for other damages against a third party.

## 1.5 Personnel information

### Pilot B/LY-GBI:

citizen of the Republic of Latvia, aged 36,

SPL licence holder, issued by Transporto kompetenciju agentura on 03 September 2018, without marked validity.

#### Flight experience:

total time flown:	730:12
total time flown on type:	512:35
total time flown in the last 90 days:	31:23
on type in the last 90 days:	31:23
total in the last 30 days:	31:23
on type in the last 30 days:	31:23

Certificate of medical fitness 2nd class with marked validity until 13 March 2023.

### Pilot LK/SP-3688:

citizen of the Republic of Poland, aged 56 years,

holder of an SPL licence, issued by the Civil Aviation Authority on 21 October 2015, without marked validity,

SEPL licence holder, issued by the Civil Aviation Authority on 12 December 2018, valid until 31 November 2023.

#### Flight experience:

total time flown:	1517:51
total time flown on type:	733:20
total time flown in the last 90 days:	27:24
on type in the last 90 days:	0:00
total in the last 30 days:	10:12
on type in the last 30 days:	0:00

Certificate of medical fitness 2nd class with marked validity until 29 June 2023.

## 1.6 Aircraft information

Type:	SZD-48-3 „JANTAR STANDARD“
Registration mark:	<b>LY-GBI</b>
Serial number:	B-1423
Year of manufacture:	unidentified
Manufacturer:	PDPS PZL BIELSKO

Since production has flown a total of: 2348:35 as of 29 November 2021

Aircraft Registration Certificate No. 00192, issued by Lietuvos Respublika Civilinės aviacijos administracija on 13 April 2011.

Certificate of Airworthiness No. 00192, issued by the Civil Aviation Administration of the Republic of Lithuania on 12 March 2013.

Verification of airworthiness was performed by Lietuvos Respublika Transporto Kompetencijų Agentūra on 29 November 2021, valid until 28 November 2022.

Type:	SZD-48-3 „JANTAR STANDARD“
Registration mark:	<b>SP-3688</b>
Serial number:	B-1522
Year of manufacture:	1985
Manufacturer:	PDPS PZL BIELSKO

Since production has flown a total of: 887:56 as of 05 March 2021

Aircraft Registration Certificate No B-1522, issued by the Republic of Poland Civil Aviation Office on 12 February 2004.

Certificate of Airworthiness No B-1522, issued by the Republic of Poland Civil Aviation Authority on 18 February 2014.

The airworthiness review was conducted by Zakładów i Naprawów Statków Powietrznych - Maciej Malarczyk dated 05 March 2021, with marked validity until 04 March 2022.

The maximum permissible take-off weight of the aircrafts 540 kg was not exceeded during take-off.

### 1.7 Meteorological information

On 26 April 2022 in the cadastre of the village of Trebostovo there was an insignificant pressure field. At the same time, a frontal boundary associated with a high pressure low was advancing from southwest to northeast across Germany and the Alpine region.

On 26 April 2022 from 10:00 to 12:12 in the area of Trebostovo was mostly cloudy (cloud cover was from 6/10 to 8/10) and without precipitation or other hazardous phenomena. The predominant cloud type was Cumulus and Stratocumulus, with the lower cloud base at 1,200 to 2,000 m above sea level. The air temperature was between 12 and 14°C. Horizontal visibility was 40-50 km. In the Turčianska basin, at an altitude of 500 m above sea level, a variable mainly northerly wind was blowing at a height of 10 m above the surface with a speed of 1 to 4 m/s.

On 26 April 2022 at 12:12 it was cloudy in the area of Trebostovo (cloud cover 8/10) and without precipitation or other dangerous phenomena. The predominant cloud type was Cumulus and Stratocumulus, with the lower cloud base at 1,500 to 2,000 m above sea level. The air temperature was 13°C and the horizontal visibility was 40 km. In the Turčianska basin, at an altitude of 500 m above sea level, a north to northeast wind was blowing at a height of 10 m above the surface at a speed of 1 to 3 m/s.

Weather conditions in the free atmosphere on 26 April 2022 at 12:12 were as follows: At an altitude of 2,500 m above sea level, the air temperature was approximately -5°C and at this altitude the wind was blowing from west to southwest at a speed of about 7 m/s. At an altitude of 2,000 m above sea level, the air temperature was approximately -2°C and at this altitude the wind was still blowing from the west to the south-west at an average speed of 6 m/s. From 2,000 m above sea level towards lower altitudes, the wind direction changed from south-westerly to north-easterly. At an altitude of 1,500 m above sea level, the air temperature was +2°C and the wind direction was already northeast and the wind speed was 3 to 4 m/s. At altitudes of 1,500 to 1,000 m, the wind direction and wind speed were already influenced by the local orography, but the prevailing wind was north-easterly, with a maximum speed of 4 m/s.

### 1.8 Aids to navigation

N/A

### 1.9 Communication

The aircrafts were equipped with an on-board radio station for the possibility of two-way radio communication at any moment of the flight with all air stations.

### 1.10 Aerodrome information

N/A

### 1.11 Flight recorders and other recording devices

Both aircrafts were equipped with a calibrated electronic flight recorder (GNSS-FR/Global navigation satellite system flight recorder), a type approved by the IGC FAI for validation of gliding performance.

IGCs were evaluated by BVK.

SOFTWARE Naviter SeeYou was used for calculation and visual representation of the flight

**LK/SP-3688** - Flight recorder LXNAV, LX9050F, serial number 1973.

**B/LY-GBI** - Flight recorder LXNAV, NANO4, serial number 7052.

The aircrafts were also mandatorily equipped with FLARM-type equipment for imaging of nearby traffic. FLARM determines its position and altitude using a GPS receiver and a barometric sensor, which is updated every second.

FLARM estimates its future trajectory in the next few moments, taking into account mainly speed, acceleration, turning radius. Its radio receiver picks up other FLARMS within a radius of about 3-5 km and processes the received information.

The FLARM unit will alert you to the greatest current danger with an audible warning and by illuminating the LED indicator. The display will show the threat level (lateral and vertical direction of this threat).

**LK/SP-3688** had a FLARM built into the LX9050F flight recorder. The FLARM's identification number was DDEEFF, which stored records of its activity in an IGC file.

The work of FLARM has been evaluated by the BVK. FLARM RANGE ANALYZER was used for the evaluation (<https://flarm.com/support/tools-software/flarm-range-analyzer>).

Based on analysis of FLARM LK/SP-3688's record, at the time of the accident and for nearly two hours prior to the accident, there was no contact with another FLARM.

**B/LY-GBI** had a FLARM with identification number 259F2A that was not linked from the IGC file record. It was not possible to evaluate the FLARM work from the IGC file.

### 1.12 Wreckage and impact information

The collision of the aircrafts occurred over the mountains of Malá Fatra (N49°02'22,44", E018°49'27,84") in the vicinity of the highest hill Končiar (1,164 m) near the village of Trebstovo, at the time of 12:13.



The horizontal distance between the aircraft impact sites was 204 m.



Both aircrafts landed in difficult to reach mountainous terrain with forest cover.

The impact of aircraft **B/LY-GBI** was determined at N49°02'23,28", E018°49'26,22".





The impact of aircraft **LK/SP-3688** was determined to be at N49°02'28.50", E018°49'20.82".





An air ambulance with a doctor was immediately dispatched to the scene of the accident.

At the site of the air accident BVK carried out an orientation inspection of the accident site and the aircraft.

BVK, in cooperation with PZ SR, marked significant parts of the wreckage and took orientation and overview shots of the entire incident site.

During the search, BVK secured and marked the impact traces of the impact of the aircraft into the forest cover, documented the condition of the aircraft/debris, the terrain features at the accident site, the impact traces and movement of debris and persons, and located the parts that had separated from the aircraft prior to its impact. They evaluated the condition of the airframe structure of the aircraft.

Subsequently, BVK tried to find documents and documentation at the scene of the incident, which is obligatory on board the aircraft during the flight. After completing a detailed inspection of the scene and securing all necessary documentation, BVK decided to take the remains of the victims for autopsy and to store the wreckage of the aircraft for further examination.

On inspection of the wreckage of the aircraft and the pilots, the following was found:

- the cockpit overlays on both aircraft have been emergency jettisoned,
- the seat belts that restrained the pilots to their seats were unbuckled in both aircraft,
- both pilots were found outside the cockpit,
- the wrapper of the rescue parachute of the pilot of aircraft **b** was open and the canopy of the parachute with the laced cords was next to the pilot's body. The release to open the rescue chute was pulled out,
- the rescue parachute of the aircraft pilot **B/LY-GBI** was not activated.

### 1.13 Medical and pathological information

#### **Pilot B/LY-GBI:**

Forensically, it was a violent death of a pilot - contusion and crushing of the brain, with laceration of the brain stem, with comminuted fractures of the cranial vault and base, and with polytrauma. Based on the circumstances investigated, it can be established that the pilot

was engaged in the control of the aircraft during the flight, and after the collision with **LK/LK/SP-3688**, the aircraft crashed, striking trees, falling out of the cockpit, and his body hitting the ground.

All of the injuries found at autopsy, namely blood supply to tissues surrounding the fractures, organs and tissues, showed signs of vitality and were sustained in an aerial incident, prior to death.

On the basis of the toxicological examination, it could be established that the pilot was not under the influence of ethanol or other toxic substances or drugs during the flight, and there were no such traces of mechanical violence that would be indicative of the intervention of another person. Autopsy and histological examination did not reveal any morbid changes that could lead to impairment of the pilot's ability to fly the aforementioned aircraft.

**Pilot LK / SP-3688:**

Forensically, it was a violent death of a pilot - traumatic hemorrhagic shock in polytrauma. Based on the circumstances investigated, it can be established that the pilot was engaged in the control of the aircraft during the flight and left the cockpit of his aircraft after the collision with the **B/B/LY-GBI**.

All of the injuries found at autopsy, namely blood supply to tissues surrounding the fractures, organs and tissues, showed signs of vitality and were sustained in an aerial incident, prior to death.

On the basis of the toxicological examination, it could be established that the pilot was not under the influence of ethanol or other toxic substances or drugs during the flight, and there were no such traces of mechanical violence that would be indicative of the intervention of another person. Autopsy and histological examination did not reveal any morbid changes that could lead to impairment of the pilot's ability to fly the aforementioned aircraft.

**1.14 Fire**

N/A

**1.15 Survival aspects**

At 12:44 it was reported from the emergency number 112/Žilina (used to summon the rescue services of the integrated rescue system in case of danger to human life, health, property or the environment) that at 12:29 two aircraft collided in flight, location KONČIAR hill northwest of the village of Trebostovo, Martin district.

PZ SR, HaZZ was dispatched to the scene of the air accident. HaZZ officers handed over the geographical coordinates of the RCC, which were later handed over to the SAR/MIL helicopter from LZPW. The RCC reported the aircraft accident by telephone to the Aeronautical and Maritime Investigation Unit of the Ministry of Transport and Communications.

At 12:55, the SAR/MIL helicopter at LZPW Airport was activated to standby and at 13:07 flew to the scene of the aircraft accident.

The aircraft **LK/SP-3688** was located at the top of KONČIAR hill and the aircraft B/LY-GBI 204 m southeast of the top of KONČIAR hill, a rescuer/doctor from the VZZS helicopter descended to this aircraft and stated death.

A member from the SAR/MIL helicopter descended to **B/LY-GBI** at 14:19 and observed the death of the pilot. The crew of the SAR/MIL helicopter could not be contacted by HaZZ via frequency 123,350, 121,500, 132,250, 123,100 / the helicopter crew did not have a mobile phone.

Two teams were formed at the scene of the air crash to continue activities.

At 14:33 the SAR/MIL helicopter was recalled.

### 1.16 Tests and research

No aircraft tests were necessary.

An expert examination of parts of the aircraft wreckage was carried out by AEROSPOOL, spol. s.r.o.

### 1.17 Organizational and management information

The flight activity was conducted in accordance with the aviation regulations in force in the territory of the Slovak Republic and local rules.

FCC 2022 was organized in accordance with FAI Sporting Regulations, General Part, Chapter 3, Gliding.

### 1.18 Additional information

At the time of the incident, a rescue parachute was being used in the **B/B/LY-GBI** aircraft

Manufacturer: Parachute De France

Type/Model: unidentified

Serial number: HE0088

Date of manufacture: unidentified

Parachute was repacked 13 March 2022

At the time of the incident a rescue parachute was used in aircraft LK/LK/SP-3688

Manufacturer: SPEKON

Type/Model: RE-5 L Serie 5

Serial number: 72213

Date of manufacture: 04/08

Validity of parachute packing until 02 February 2023.

### 1.19 Useful or effective investigation techniques

The usual methods of investigation were used.

## 2. ANALYSIS

### 2.1. Activity of pilots

Flying aircraft in a common updraft requires pilots to pay constant attention and constant checking of each other's position relative to other aircraft, not to underestimate the safe distance between them and not to rely on the fact that the pilot of the other aircraft can see them.

The pilots of the aircraft in the area of collision were circling fairly closely in the same circle side by side in a common updraft to the right. Prior to the collision they were circling in a position above each other so that they could not all see each other.

During the flight, they used the FLARM in-flight warning device to keep an eye out for the risk of collision with another aircraft or an obstacle. In a common climbing stream FLARMS may emit frequent visual audible warnings/alarms that can be annoying and confusing to pilots in a common updraft.

From the evaluated FLARM data, the pilot of **LK/SP-3688** did not make any contact with another FLARM prior to the accident, and BVK did not determine whether the pilot of **B/LY-GBI** had a visual and audible warning/alarm from other aircraft in the common updraft.

The pilots of aircraft **LK/SP-3688** and **B/LY-GBI** were on a collision course at almost the same altitude, when the aircraft had the smallest profile and were less visible in the shadows of the clouds and in low sunlight, and probably did not see each other before the collision.

## 2.2. Inspection of aircraft wreckage and pilots:

- It is highly probable that the pilot of aircraft **LK/SP-3688** managed to make an emergency drop of the cockpit canopy and the seat belts were unfastened. The pilot managed to jump out/leave the cockpit area of the cabin and subsequently opened the rescue chute. Probably due to the opening of the rescue parachute at a low altitude above the terrain, the canopy was not filled with air and the pilot's body fall was not slowed down. From the facts observed, BVK did not establish at what height above the terrain the pilot managed to leave the cockpit in an emergency and at what height above the terrain he opened his rescue parachute.
- It is highly probable that the pilot of aircraft **B/LY-GBI** managed to make an emergency drop of the cockpit canopy and the seat belts were unfastened.  
As the pilot's body was outside the wreckage cabin, it can be assumed that:
  - pilot managed to make an emergency jump/leave the cockpit area before the aircraft hit the tree canopy but did not deploy the rescue parachute, probably due to the low altitude above the terrain, or,
  - he did not have time to make an emergency jump/leave the cockpit area and was ejected from the cockpit after the aircraft crashed into the treetops.

Based on the obtained data and observed facts, it can be concluded that both pilots, after the collision of the aircraft, evaluated the damage - or the uncontrollability of the aircraft as a condition in which it was not possible to perform an emergency landing with the aircraft in the terrain. They therefore proceeded to make an emergency exit from the cockpit with the intention of using the rescue parachute.

## 2.3. Expert inspection of aircraft wreckage in the company Aerospool spol. s.r.o.:

Considering the result of the investigation and examination of the wreckage of aircraft **LK/SP-3688** and **B/LY-GBI**, it is unlikely or completely excluded that a technical failure of both aircraft would have caused the accident in question..

All aircraft controls were unaffected by the accident and performed their function during the flight.

## 3. CONCLUSIONS / Cause of the air accident

### 3.1 Findings

#### Pilots

- had, according to the documentation obtained and submitted, valid qualifications for the operation of that category of aircraft,
- had sufficient flight experience to conduct competitive flights,
- both pilots were performing life-saving activities, which excludes the suspicion of medical indisposition of both pilots at the time before the collision.

#### Aircraft

- had valid documentation,
- did not exhibit any malfunction prior to the accident,
- were equipped with FLARM devices,
- on the basis of the facts resulting from the expert technical inspection of the wreckage (identified main components of the aircraft that came into contact during the collision, on the basis of abrasion marks, residues of the top coat of the airframes, on the basis of the typical signs of mutual impact of the individual parts of the aircraft) and the flight recorder records show, that **LK/SP-3688** crashed into the tail section of **B/LY-GBI** from above, causing serious damage to both aircraft and loss of control.

**Meteorological situation**

- had no influence on the occurrence of the accident.

**Causes of air accident**

- incorrect relative position of the aircraft in circling with respect to the pilots' field of view,
- the immediate cause of the accident was the collision of the aircraft.

## 4. SAFETY RECOMMENDATIONS

Following an investigation into the causes of the aircraft accident

Aircraft Type: **SZD-48-3 „JANTAR STANDARD“**  
Registration mark: **SP-3688 and LY-GBI**  
dated: **26 April 2022**

**Slovak National Aero Club has adopted a measure:**

Conduct a debriefing of the subject accident with flight personnel during winter periodic training, emphasizing compliance with the procedures and rules of precedence for taxiing, circling, exiting rising currents, and in-flight avoidance. Invite also pilots who are not members of SNA but are interested in participating in competitions organized by SNA.

In Bratislava, 27.01.2023