MINISTRY FOR
INNOVATION AND TECHNOLOGY
TRANSPORTATION SAFETY BUREAU

FINAL REPORT

2015-229-4P

SERIOUS INCIDENT

Váckisújfalu area

25 July 2015

DHC-8-400 / Schleicher Ka-8B
SP-EQG / HA-4007

General information

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

- Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC,
- Act XCVII of 1995 on aviation,
- Annex 13 identified in the Appendix of Act XLVI. of 2007 on the declaration of the annexes to the Convention on International Civil Aviation signed in Chicago on 7th December 1944,
- Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents (hereinafter referred to as Kbvt.),
- GKM Regulation 123/2005. (XII. 29.) of the Ministry of Economy and Transport on the rules of technical investigation of aviation accidents and incidents and other occurrences
- NFM Regulation 70/2015 (XII.1) on technical investigation of aviation accidents and incidents, as well as on detailed investigation for operators,
- In absence of other relevant regulation in the Kbvt., in accordance with Act CXL of 2004 on the general rules of administrative authority procedure and service, and, as of 1 January 2018, in accordance with Act CL on General Public Administration Procedures.

The competence of the Transportation Safety Bureau of Hungary is based on Government Regulation 278/2006 (XII. 23.), and, as from 01 September 2016, 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 laws,

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

The persons participating in the technical investigation did not act as experts in other procedures concerning the same case and shall not do so in the future.

The IC shall safe keep the data having come to their knowledge in the course of the technical investigation. Furthermore, the IC shall not be obliged to make the data – regarding which the owner of the data could have refused its disclosure pursuant to the relevant act – available for other authorities.

This Final Report

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

Copyright Notice

Translation

This document is the translation of the Hungarian version of the Final Report. Although efforts have been made to translate it as accurately as possible, discrepancies may occur. In this case, the Hungarian is the authentic, official version.

Table of Contents

Definitions and abbreviations

Aerodrome	*means a defined area (including any buildings, installations and equipment) on land or water or on a fixed, fixed off-shore or floating structure intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft*
AGL	*Above Ground Level*
AMSL	*Above Mean Sea Level*
ARP	*Airport Reference Point*
EASA	*European Aviation Safety Agency*
GPL	*Glider Pilot Licence*
IC	*Investigating Committee*
ICAO	*International Civil Aviation Organization*
Kbvt.	*Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents and other transportation occurrences*
logger	*satellite-based location and recording system*
LOT	*ICAO code of LOT Polish Airlines*
LT	*Local Time*
MET	*Ministry of Economy and Transport (Hungary)*
MIT	*Ministry for Innovation and Technology*
MND	*Ministry of National Development*
NTA AA	*National Transport Authority Aviation Authority, Hungary (till 31 December 2016)*
SGPL	*Student Glider Pilot Licence*
TMA	*Terminal Control Area*
TSB	*Transportation Safety Bureau*
UTC	*Coordinated Universal Time*
VFR	*Visual Flight Rules*

Summary of the occurrence

Occurrence class		serious incident
Aircraft 1	manufacturer	de Havilland Canada
	type	DHC-8-400
	registration	SP-EQG
	operator	LOT Polish Airlines S.A.
Aircraft 2	manufacturer	Alexander Schleicher GmbH & Co. Segelflugzeugbau
	type	Ka-8B
	registration	HA-4007
	operator	Malév Repülő Klub (Malév Aero Club)
Occurrence	Date and time	25 July 2015, 16:05LT
	Location	Dunakeszi airspace (Figure Figure 1)
Fatalities / severe injuries related to the occurrence:		0 / 0
Extent of damage to the aircraft involved:		Undamaged

Each time indicated in this Report is local time (LT). At the time of the occurrence: LT= UTC+ 2 hours.

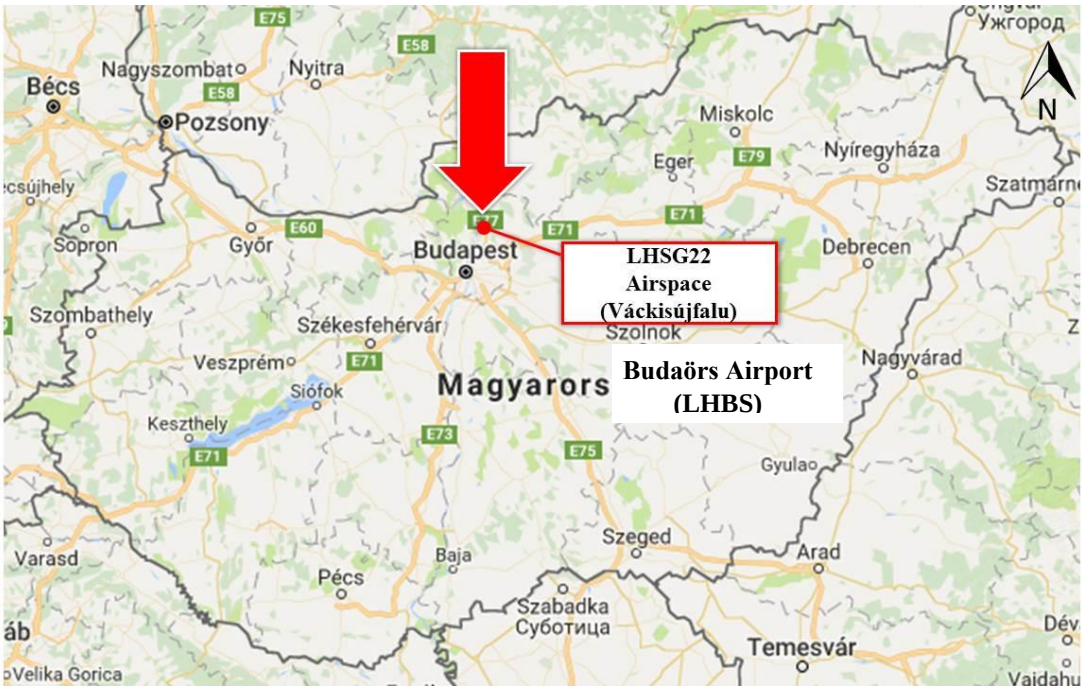


Figure 1: Location of the occurrence in Hungary

Reports and notifications

The occurrence was reported to the duty service of TSB on 25 July 2015, at 16:20, by the duty service of HungaroControl Zrt.

Investigating Committee

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

Investigator-in-Charge	**István Belső**	Investigator
Member	**György Háy**	Investigator

Overview of the investigation process

During the investigation the IC:

- the IC obtained and evaluated the audio and radar records documenting the air traffic control activity in the area at the time of the occurrence;
- gathered information on glider activity in the area at the time of the occurrence.
- requested information (through the Polish investigating body) from the crew of the airliner involved in the event on the course of the occurrence and on the characteristics of the glider involved in the event.
- As a result of evaluation of the logger file received and other data, the IC identified both the glider and its pilot involved in the conflict.
- The IC interviewed the affected glider pilot and copied his documents. The IC also arranged for checking the altitude metering system of the affected glider.
- The IC reviewed the cooperation agreement signed between Dunakeszi Airport and HungaroControl, and analysed the standard Eurocontrol RAT.

Short summary of the occurrence

On 25 July 2015, at an altitude of 1500 metres (5000 ft) AMSL above the Dunakeszi LHSG22 area, while approaching the runway 13R in Budapest, the crew of the aircraft type DHC-8-400, with registration number SP-EQG, performing the Warszawa - Budapest flight № LOT537 reported that they had detected a glider flying opposite them at a lateral distance of 100-150 metres and at an altitude exceeding their own level by 90-150 metres (300-500 ft). The IC identified the said glider as the single-seated glider type Schleicher Ka-8B, with registration number HA-4007, operated by Malév Aero Club. According to the IC, the event occurred very probably in such manner that pilot of the glider performing endurance flight near the upper limit of the airspace permitted for the flight may not have realised flying through an intensive upstream which lifted the glider a couple of hundred metres higher, and the aircraft thus entered an airspace used by airline flights.

The IC does not find it necessary to issue a safety recommendation.

Figure 2: The aircraft types involved in the occurrence (illustration; source of photos: internet)

1.1. History of the flight

Flight of the airliner (SP-EQG)

The crew of the aircraft with the call signal LOT537 signed in to the frequency used by the Hungarian Air Management service at 15:54:05 and said they would descend to flight level 190, keeping a course of 200 degrees, in order to avoid a cumulonimbus. The air traffic controller authorised them to descend further to flight level 110, and soon after to fly to the BP113 point of the approach procedure. At 15:59:49, the crew again requested and received permission to change direction due to storm, and they changed their heading to 250. Later on, the LOT537 flight received further permits to descend, first at 16:01:05 to 8000 ft, and then at 16:02:30 to 5000 ft. At 16:03:44, the flight crew indicated that they had finished their storm-evading activity and are able to head to any point or approach Budapest Liszt Ferenc Airport even by VFR flight. The ATC authorised them again to head to BP113, and told them they might expect further descend within ca. 1 minute. At 16:05:19, the LOT537 flight was authorised to descend to an altitude of 4000 ft. A 16:05:45, the flight crew reported to the ATC that, about one minute before, when flying at an altitude of 5000 ft (**Figure 2**), they saw a glider which was flying at a higher altitude than their plane. The ATC acknowledged the message and authorised the LOT537 flight to descend further and apply VFR-based approach, which the flight crew performed, and they had a smooth landing at Runway 13R at 16:11:52.

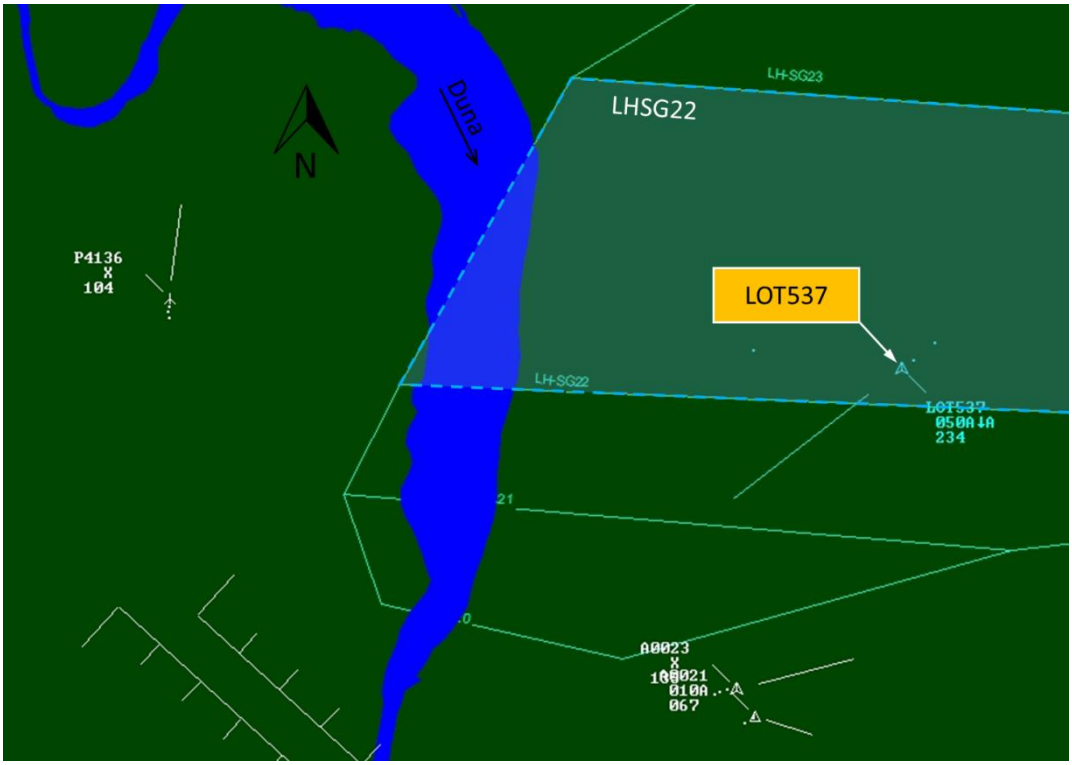


Figure 3: Approximate position of the LOT537 flight at the time of the occurrence

The flight of the glider (HA-4007)

The type Schleicher Ka-8B single-seated glider (registration number: HA-4007; operator: Malév Aero Club) was flown by a student pilot with C Licence who had just started to perform a 3-hour endurance task as the next step of his training. He took off by winch launching at 13:23 p.m. The purpose of the task was to keep the aircraft in the air for at least 3 hours, relying on rising air, especially thermals found and used by the pilot. The

pilot performed the task in the interconnected airspaces LHSG20, LHSG21, LHSG22, and LHSG23 which are adjacent to Dunakeszi Airport as well. In the period prior to the investigated event, he mainly was staying in the airspace number LHSG22, in the Őrbottyán area. As on that day the runway direction used at Budapest Liszt Ferenc International Airport was 13, the highest flight level in the airspace number LHSG22 was 1350 m AMSL, i.e. 4500 ft. According to the pilot's statement, he was flying somewhat below that altitude; he stopped rising prior to reaching the limit of the airspace and was in gliding when he flew through a thermal updraft which he did not perceive. A few minutes after the report from the crew of the LOT537 flight on the encounter to the air traffic control service available, the start place working at Dunakeszi Airport ordered (by radio) the pilots of the gliders in air to return. The pilot of the glider involved in the event returned to the vicinity of Dunakeszi Airport in gliding, entered the traffic pattern, and landed at 16:26 p.m. According to his statement, the pilot of the glider did not perceive his encounter with the airliner, he only heard of it after landing.

According to his report, the pilot experienced thermal updrafts of 3-4 m/s in the affected area on several occasions previously during his endurance flight.

1.2. Injuries to persons

No person was injured.

1.3. Damage to aircraft

The aircraft was not damaged related to the occurrence.

1.4. Other damage

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

1.5. Personnel information

The data of the airliner crew need not be discussed as it played no role in the occurrence or course of the event.

1.5.1. Data of the glider pilot

Age, nationality, gender		31, Hungarian, male
Licence data	type	SGPL
	professional valid until	22/05/2017
	ratings	--
Certificates		Student pilot
Medical class and valid until		Class 2, 13/01/2019
Flying hours/take-offs	in the previous 24 hours	3 h 03 min / 1 takeoff
	in the previous 7 days	5 h 19 min / 9 takeoffs
	in the previous 90 days	10 h 44 min / 26 takeoffs
	total:	19 h 15 min / 131 takeoffs
	on the affected type:	3 h 23 min / 5 takeoffs
Person flying / providing ground service for the aircraft at the time of the occurrence		

1.6. Aircraft information

1.6.1. General information

Class	Sailplane
Manufacturer	Schleicher GmbH & Co
Model	Ka-8B
Nationality and registration marks	HA-4007
State of registry	Hungary
Name of the owner	Malév Repülő Klub (Malév Aero Club)
Name of the operator	Malév Repülő Klub (Malév Aero Club)

1.6.2. Airworthiness Certificate

The airworthiness of the affected aircraft is irrelevant to the event.

1.6.3. Engines

The glider had no engine.

1.6.4. Data of propellers installed on the engine

The glider had no engine.

1.6.5. Aircraft loading data

The loading data of the glider is irrelevant to the event.

1.6.6. Description and data of malfunctioned system or equipment

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

1.6.7. On-board warning systems

The airliner was equipped with a transponder and airborne collision avoidance system, but the glider had no transponder (actually it is not required to have one), so its proximity could not activate the warning system of the airliner.

1.7. Meteorological information

During the flight of the airliner, there was a squall line, in a multiple linear array, reaching from the Western Beskids (Southern Poland) to the ore mountains of Felvidék ("Uplands"), Slovakia, right on the straight route between Warszawa and Budapest; its south-western extension even reached through the border of the airspace of Hungary between the reporting points AMRAX and DEMOP – all these justified a digression by the airliner to the east and south.

Based on the wind reports from Budapest Liszt Ferenc International Airport, the landing direction "13" was justified at the time of the event, although the wind direction was turning to southwest, but at that time it was still quite changeable, blowing occasionally to south-southwest directions.

At the same time, at the time of the event or in the preceding hour, the radar picture showed was no sign of such intensive cumulus formation in the airspace used by the

glider which could present a negative pressure (‘suction effect’) the aircraft type cannot resist. (In the first hour of the task flight, there were minor rain bearing clouds in the neighbourhood, but they shifted from the Szentendre side of the river Danube to the northeast an hour before the event, and in this kind of clouds the upstream terminates when the rain begins to fall.) In this period, the records of the web camera showing the airspace only indicate the formation and flow of medium-developed cumulus mediocrises with minor, short-lived towers (‘castellanus’). As regards quantity and array, the were scattered [SCT], their base above ground level was about 2000 m [AGL] (+/–200 m), while the top of the airspace used is 1350 m [AMSL] (while the top of the neighbouring airspace is 1.050 m only), i.e. someone should flow (should have flown) at 500 m below the clouds where the development stages and the formation of the clouds can be observed well. Gathering cumulus clouds, significant tower formation, cumulonimbuses and their anvils appeared in the records an hour later only.

However, it should be noted that, prior to the task flying, the pilot of the glider performed 4 shorter flights (a total duration of 20 minutes) within a period of an hour and a half, and at that time the temperature near ground level was over 32°C which is the limit value of ‘Extreme Caution’ heat stress (‘Stage 2’); according to relevant advise, one who performs physical activity in the sun at that temperature should expect exhaustion (actually pilots also take part in the repeated aircraft moving activities on the ground around the start place).

When the glider took off the air temperature was 33-34°C already.

The event took place at daytime, in good visibility conditions.

1.8. Aids to navigation

The airliner had the equipment specified in its type certificate in place; no reflection was received by the IC relating to the operation of such equipment. The IC received no reflection relating to the operation of ground based equipment either.

The glider pilot oriented by navigation based on his visual perception.

Navigation had no effect on the course of events so it needs no further discussion.

1.9. Communications

According to the Type Certificate the aircraft was equipped with the relevant installations, operational dysfunctions were not observed by the IC.

The glider had a two-way radio set and the pilot actually used it to maintain two-way contact with the start place located in Dunakeszi Airport.

The IC did not find noticeable malfunction and did not receive any contrary information about the ground navigational aid equipment they were suitable for the task.

The communication equipment had no effect to the occurrence therefore detailing them is not relevant.

1.10. Aerodrome information

The airliner with registration number SP-EQG took off from Warsaw Frederic Chopin Airport (EPWA) and landed at Runway 13R, Budapest Liszt Ferenc International Airport (LHBP).

The glider with registration number HA-4007 took off from Dunakeszi (LHDK) Airport, and landed there, too.

Other parameters of the airports had no effect on the occurrence, and thus require no further discussion.

1.11. Flight recorders

The required data recorders at the air traffic control service were in operation and produced evaluable records. No data recorder was installed in the glider, but it is not a requirement for the aircraft type affected.

1.12. Wreckage and impact information

There was no wreckage in connection with the occurrence.

1.13. Medical and pathological information

Fatigue of the pilot of the glider very probably played a role in his infringing a mandatory altitude limit known by him.

1.14. Fire

There was no fire in connection with the occurrence.

1.15. Survival aspects

No one was injured.

1.16. Tests and research

Upon request from the IC, the operator's maintenance organisation inspected the state and operation of the altitude measurement system of the glider affected, and documented such inspection by a video record. The investigation found no disorder in the state or operation of the altitude measurement system of the glider.

1.17. Organizational and management information

The features of the organizations involved did not affect the occurrence, so their detailing is not required.

See Appendix 4 for relevant sections of the Co-operation Agreement.

1.18. Additional information

Designation of the Budapest TMA airspaces and the LHSG airspaces

The primary function of the Budapest TMA airspaces is to provide flight in an airspace continuously supervised from the airport, with regard to flight levels, for the aircraft departing from and arriving at Budapest Liszt Ferenc International Airport. The layout of the structure and corner points of the TMA were determined with regard to the takeoff and descend profiles of commercial aircraft. Accordingly, the corner points were not assigned to favour VFR flight (i.e. not based on visually perceivable terrain objects that make navigation easy.

The details of the structure and the lateral and upper limits of the airspace are part of the pilot training, and the pilot of the affected glider was aware of such details.

The IC does not find any other factual data or circumstances than those above important for the drawing of its conclusions or for proposing safety recommendations, and thus, the IC does not intend to present further data.

1.19. Useful or effective investigation techniques

The IC used the Eurocontrol RAT (Risk Analysis Tool)[1] method in order to categorise the air traffic occurrences. See Appendix 2 for the Eurocontrol RAT method applied.

[1] https://www.skybrary.aero/index.php/Risk_Analysis_Tool_(RAT)

2. Analysis

As Dunakeszi Airport is situated below the controlled airspace of Budapest TMA, its use presupposes a relatively complicated, cascaded airspace, the height of which changes in function of the alternative runway direction at Budapest Liszt Ferenc International Airport, in order to provide safe landing to the aircraft which arrive at Budapest.

The pilot of the glider with registration number HA-4007 was performing a 3-hour flight task, before which he had performed four takeoffs within a short period of time. The total duration of the earlier flights was 20 minutes between 12:13 p.m. and 13:10 p.m., at temperatures of 32 to 33 centigrade. The pilot stated he had also helped others move the glider on the ground between the flights. After the fourth landing, he took off for the 3-hour flight at 13:23 p.m., and took with him the map which shows the lateral and height limits of the gliding airspaces well (*Figure 3*). During the last takeoff and the flight, the temperature rose further, to 34 centigrade, which is already a value equivalent to 'Extreme Caution' heat stress ('Stage 2'); as indicated in the heat index table (*see Annex 3*); at the same time, there were several thermals with uplifts reaching four metres per second, which lifted the glider a few hundred metres higher within a short time. The event took place in the last thirty minutes of the three-hour flight. The IC holds the opinion that the strong and extended thermal updraft developed gradually, which the relatively inexperienced student pilot did not perceive.

Figure 4: The map used by the pilot of the glider as assistance.

The aircraft with call signal LOT537 did not fly the usual route. There was a squall line on its route, with its southern extensions even reaching into the airspace of the Budapest TMA, so the crew had to intervene several times to avoid the storm. The crew of the aircraft reported the event one minute after they saw a glider near them above their altitude. That one-minute difference made it more difficult to determine the positions of the two aircraft at the time of the event. On the basis of the report obtained from them subsequently *(See Annex 1 hereto)*, the lateral distance between the two aircraft was 100 to 150 m, and the vertical distance was about 300 to 500 ft (90 to 150 m) *(Figure 4).*

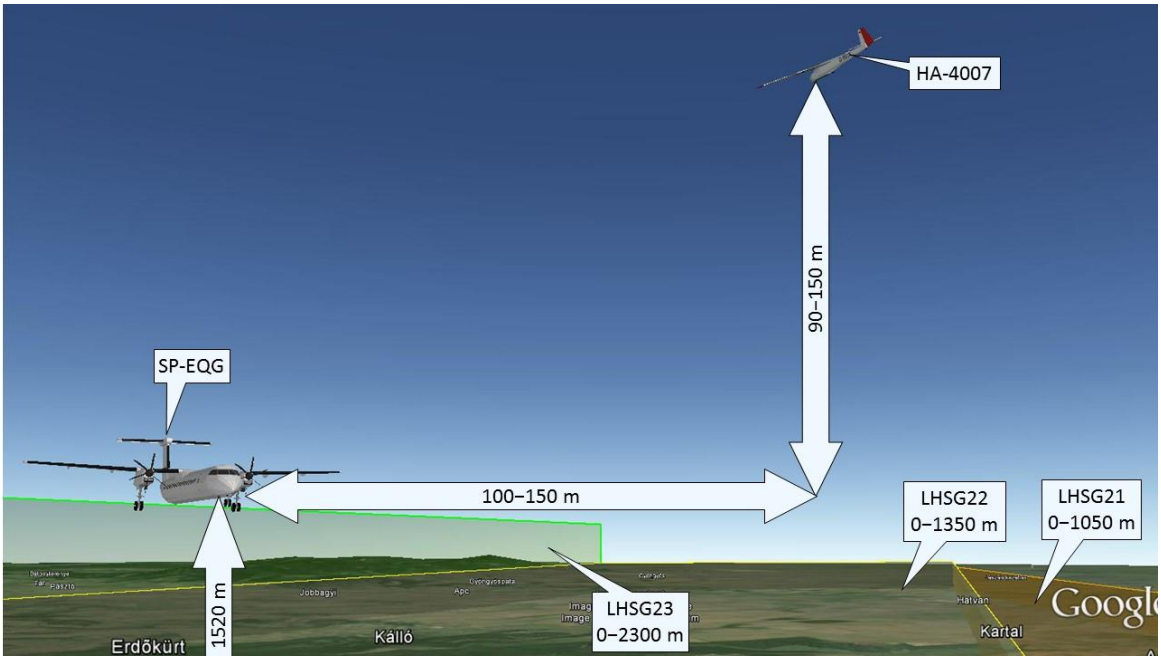


Figure 5: The positions of the two aircraft relative to each other as depicted according to the report of the crew of the LOT537

The ATC was notified of the infringement of separation minima from the crew of the LOT537 only because the glider had no responder, so its position was only detected but its altitude was not *(Figure 5).*

Figure 6: A primary radar signal can be seen in the vicinity of the LOT537 aircraft around the time of the event

The glider pilot's ground-based and flight activities exceeding three hours prior to the event, the complexity of the airspace, his relatively low level of experience, and the weather conditions

made him fairly tired both mentally and physically. The pilot also admitted that he had been tired.

The combined effect of the weather conditions (uplift of four metres per second) and the fatigue of the glider pilot led to the unintended airspace infringement and the infringement of the separation minima between the two aircraft.

According to calculations by the IC, the altitude of rising into the TMA, which was ca. 1000 ft (300 m) can be done in 1.5 to 2 minutes in a thermal updraft of 4 m/s.

On the basis of the standard Eurocontrol RAT analysis performed, the event was classified as A4, i.e. 'rare, serious incident'. This means that similar events had occurred in a very little number in the airspace system investigated, but the affected aircraft were not safe during the event, and the situation could have led to a collision in the air. The required separation minima were infringed, and the resulting distance was shorter than half of the required minimum.

The IC inspected the design of the corner points of the TMA airspaces in Budapest TMA. Very low percentage of such corner points were appointed in the vicinity of terrain objects which help visual navigation (VFR flight) despite the fact that, in many cases, such corner points are actually located close to such terrain objects.

Based on the pilot's statement and the meteorological data analysed, the IC supposes that the glider got into a continuously strengthening upstream while in gliding. Characteristically, when entering this kind of thermal updrafts, the glider does not encounter the intense turbulence typical of normal thermals. In the opinion of the IC, a pilot with low experience level may only take notice of rising instead of gliding in this kind of upstream when checking the on-board instruments, due to lack of the usual turbulence characteristic of thermals. The IC attributes the decrease of continuous instruments checks and situation awareness to the pilot's fatigue.

3. Conclusions

3.1. Findings

The glider pilot had appropriate licence and rating but low level of experience for the given flight task.

The technical investigation revealed no information relating to any malfunction of any of the aircraft occurring prior to the event and would have contributed to the event or influenced the course of the event.

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

No such information was emerged in connection with the activity of the air traffic control which would be relevant to the occurrence of the event.

The commercial aircraft did not fly its usual route due to the storm activity detected in the area.

The glider pilot performed a 3-hour flight task during which he got fairly tired.

At the time of the event investigated, the affected glider left the LHSG22 glider airspace.

Somewhat before of the event investigated, the affected glider was flying below the upper limit of 1350 m of the LHSG22 glider airspace.

The glider got into a lifting upstream which raised it to undesirable altitudes.

3.2. Causes

On the basis of the investigation, the IC concluded that the causes of the event were as follows:

- the affected glider climbed above the altitude limit specified for the given airspace,
- the cause of infringing of the altitude limit was the pilot's lapse of attention originating in his fatigue.

During the investigation, the IC encountered the following phenomenon which is not directly related to the event, but deserves attention from the aspect of flight safety:

- Some of the border lines of the airspaces limiting those flying VFR below the TMA are difficult to identify when navigation is based on visual perception.

4. Safety recommendation

4.1. Actions taken by the operator/authority during the investigation

4.2. Safety recommendation(s) issued during the investigation

During the technical investigation, the IC issued no recommendation.

4.3. Safety recommendation(s) issued on completion of the investigation

The Investigating Committee of TSB identified no circumstance which would warrant issuance of a safety recommendation

Budapest, 12 February 2019

István Belső
Investigator-in-Charge

György Háy
Member

APPENDICES

Appendix 1:

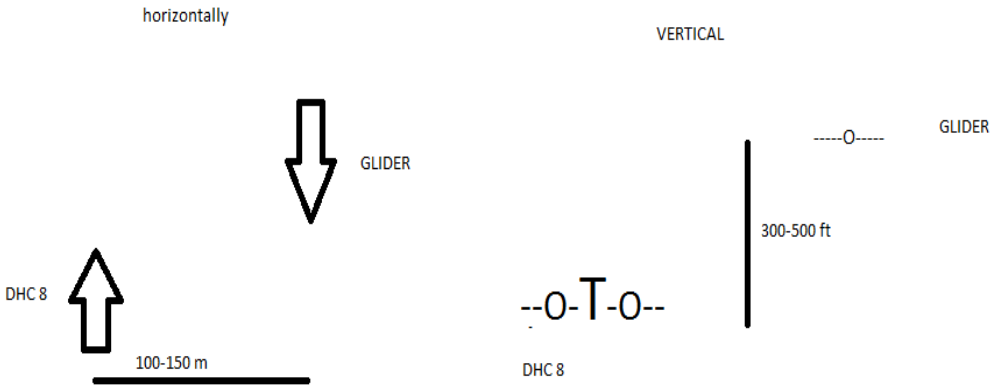
Report of the LOT537 crew on the positions of the two aircraft relative to each other

PILOT'S STATEMENT OBTAINED DURING INTERVIEV AT FLIGHT SAFETY DEPARTMENT OF LOT POLISH AIRLINES

1. Polish version:"*Szybowiec szkolno-treningowy, koloru białego z czerwonym przodem kadłuba aż do skrzydeł. Wyglądał trochę old school-owo. Prawdopodobnie dwumiejscowy, ale było widać tylko jednego pilota."*

2. English version*:"There was a white glider. Forward part of its fuselage, until wings, was red. It was probably a two-seater, but only one seat was occupied.*

3. Plan view:



Appendix 2: Eurocontrol RAT

2015-229-4P

RISK ATM: A4

RISK ATM GROUND: A4 — **ATM Ground Contribution:** No contribution

RI = 76%; RI sev= 100%; RI rep = 52%

double click here to reset the marksheet!!

A1	B1	C1	E1	D1
A2	B2	C2	E2	D2
A3	B3	C3	E3	D3
A4	B4	C4	E4	D4
A5	B5	C5	E5	D5

A. SEVERITY

1. Risk of collision	
Minimum separation achieved	0
Separation + 75% minimum	1
Separation >50%, <=75% minimum	3
Separation >25%, <=50% minimum	7
Separation <=25% minimum	10
Total separation (a)	**10**
Rate of closure NONE	0
Rate of closure LOW (<=60knots, <=1000ft/mn)	1
Rate of closure MEDIUM (>60 and <=250 knots, >1000 and <=2000 ft/mn)	3
Rate of closure HIGH (>250 and <=600 knots, >2000 and <=4000 ft/mn)	4
Rate of closure VERY HIGH (>600knots, >4000ft/mn)	5
Total rate of closure (b)	**3**
TOTAL (1) Risk of Collision (a)+(b)	**13**

2. Controllability	ATM		ATM Ground	
Conflict detected	0		0	
Conflict detected INADEQUATE	3		3	
Conflict NOT detected	5	5	5	5
Plan CORRECT	0		0	
Plan INADEQUATE	3		3	
NO plan	5	5	5	5
Execution CORRECT	0		0	
Execution INADEQUATE	3		3	
NO execution	5	5	5	5
STCA triggered	0		3	
NO STCA warning	5	0	5	3
Recovery CORRECT	0		0	
Recovery INADEQUATE	5		5	
NO recovery or the ATM ground actions for recovery have worsen the situation	10	10	10	10
TCAS triggered (useful RAs only to be considered) or see and avoid pilot decision (in the absence of TCAS)	0		10	
NO TCAS RA	10	10	0	0
Pilot(s) followed RA (or, in absence of RA, took other effective action, as a result of see and avoid decision)	0		0	
Pilot(s) INSUFFICIENTLY followed RA or ATC instructions	10		0	
Pilot(s) INCORRECTLY followed RA (or, in the absence of RA, took other inadequate action) or ATC Instructions or NO pilot action at ATC instructions with no further ATM ground controlability margin	25		0	0
	TOTAL (2-ATM)	35	TOTAL (2-ATM Ground)	28

TOTAL SEVERITY :	
SEVERITY ATM =(1) + (2-ATM)	**48**
SEVERITY ATM Ground = (1) + (2-ATM Ground)	**41**

B. REPEATABILITY

3. Historical data (own or other)	
Numbers NONE	0
Numbers FEW	3
Numbers SIGNIFICANT	5
Numbers VERY HIGH	10
Total (3)	5

4. Systemic issues	ATM airborne		ATM ground	
Procedures DESIGN	10		10	
Procedures IMPLEMENTATION	5		5	
Procedures LACK OF	5		5	
Equipment DESIGN	10		10	
Equipment IMPLEMENTATION	5		5	
Equipment LACK OF	5		5	
Human resources management (staff planning, staff assignment, training) DESIGN	10		10	
Human resources management IMPLEMENTATION	5		5	
Human resources management LACK OF	5		5	
	TOTAL 4a	0	TOTAL 4b	0
Total (4-ATM) = (4a)+(4b)	**0**			
Total (4-ATM Ground) = (4b)	**0**			

5. Window of Opportunity			
	Situation		
Methods	Daily routine	Workload peak	Emergency
normal	4	3	2
exceptional	3	2	1
Total (5)	4		

6. Complexity			
	Timing		
Causes/events	Irrelevant	Role playing	Indispen-sable
Many (>5)	3	2	1
Average (3 , 5)	4	3	2
Few (1, 2)	5	4	3
Total (6)	4		

TOTAL REPEATABILITY :	
ATM =(3) +(4-ATM)+(5)+(6)	**13**
ATS =(3) +(4-ATM GROUND)+(5)=(6)	**13**

Appendix 3:

Heat Index *(Source: Internet, http://www.katasztrofavedelem.hu/)*

Heat index (HI) is the temperature the body perceives when temperature and humidity are taken into consideration. The human body achieves heat loss by regulating the speed of circulation of blood and the distance of it from the surface of the body, and through water loss. In order to cool the organism, the heart begins to pump more blood, the blood vessels dilate to receive the increased blood flow, and the bunches of thin blood flows in the outer layers of the skin are activated. The blood begins to circulate closer to the skin surface, thus conducting heat to the cooler atmosphere. At the same time, water diffuses through the skin as perspiration. Sweating in itself does not cool the body until the water begins to evaporate; high relative humidity slows evaporation down.

When the ambient temperature and relative humidity are high, the heart works to keep the inner temperature of the body at 37°C. The heart pumps the blood through the dilated blood vessels, the sweat glands excrete liquid to the skin surface, with such necessary dissolved substances in it as sodium and chlorine. If the quantity of heat exceeds the level which the body is able to compensate, or if the body cannot replace the liquid and salt lost through sweating, then the temperature inside the body begins to increase, and high inner temperature may lead to illness.

Illnesses (heatstroke, heat-induced fatigue, etc.) may occur in healthy people who are exposed to extreme heat or perform too hard physical work. However, in heat related fatalities death is caused primarily by other diseases, and extreme heat only accelerates the process. Children, elderly people and patients with severe illnesses, especially those with circulation problems are exposed to increased risk in hot weather.

Explanation to the Colour Codes

Colour Code	Danger Category	Risk of Harm
	Basic level	Not dangerous in normal circumstances.
	Caution (Stage 1)	Fatigue possible with prolonged exposure and physical activity.
	Extreme caution (Stage 2)	Heat cramps and heat exhaustion possible in the case of prolonged exposure and physical activity.
	DANGER (Stage 3)	Heat cramps or heat exhaustion likely; heatstroke or even death is possible within a short time in the case of long exposure to the sun and physical

		activity.
	EXTREME DANGER (DANGER TO LIFE)	Death may occur within a short time. **LIFE-THREATENING TEMPERATURE!**

Heat Index Chart

°C	Relative Humidity (%)																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
57°	49	52																			
54°	47	50	55																		
52°	44	47	51	55	61																
49°	42	44	47	51	54	59	64														
46°	41	42	44	46	49	53	57	62	66												
43°	37	39	41	42	44	47	51	54	58	62	66										
41°	35	36	38	39	41	43	45	48	51	54	57	61	65								
38°	33	34	35	36	37	38	40	42	43	46	49	52	56	59	62	66					
35°	31	31	32	33	34	34	36	37	38	40	42	43	46	48	51	54	58	60	66		
32°	28	29	29	30	31	31	32	33	34	35	36	37	38	39	41	43	45	47	50	52	55
29°	26	26	27	27	28	28	29	29	30	31	31	32	32	33	34	35	36	37	39	41	42
27°	23	23	24	24	25	25	26	26	26	27	27	27	28	28	29	29	30	31	31	32	32
24°	21	21	21	22	22	22	23	23	23	23	24	24	24	24	25	25	26	26	26	26	27
21°	18	18	18	18	19	19	19	19	20	20	21	21	21	21	21	21	22	22	22	22	22

Appendix 4:

3. Upper and lateral limits of the co-ordinated airspaces

3.1 Airspace LHSG20/A

LHSG20/A

Lateral limits of the co-ordinated airspace

Circle with a radius of 2 km; location of central point: 473704N 0190836E

Upper limits of the co-ordinated airspace

4000’ (1200 m) AMSL

2000’ (600 m) AMSL

3.2. Airspaces LHSG20, LHS21, LHSG22, and LHSG23

Lateral limits of the co-ordinated airspace LHSG20	
Szentendre W	473900N 0190300E
Gödöllő N	473800N 0192100E
Fót SW	473600N 0191030E
Lake Omszk W	473700N 0190400E
Szentendre W	473900N 0190300E

Lateral limits of the co-ordinated airspace LHSG21	
Szentendre N	474100N 0190430E
Hatvan E	473948N 0194515E
Gödöllő N	473800N 0192100E
Szentendre W	473900N 0190300E
Szentendre N	474100N 0190430E

Lateral limits of the co-ordinated airspace LHSG22	
Vác SE	474636N 0190905E
Lőrinci	474503N 0194053E
Hatvan E	473948N 019E
Szentendre N	474100N 019E
Vác SE	474636N 0190905E

Lateral limits of the co-ordinated airspace LHSG23	
Bokor W	475547N 0193148E
Lőrinci	474503N 0194053E
Vác SE	474636N 0190905E
Bokor W	475547N 0193148E

PERMISSIBLE UPPER LIMITS OF CO-ORDINATED AIRSPACES LHSG20, LHSG21, LHSG22, LHSG23	Upper limit of co-ordinated airspace Lower limit of co-ordinated airspace			
	LHSG20	**LHSG21**	**LHSG22**	**LHSG23**
“13”	2500’ (750 m) AMSL 2000’ (600 m) AMSL	3500’ (1050 m) AMSL 2500’ (7500 m) AMSL	4500’ (1350 m) AMSL 3000’ (900 m) AMSL	7500’ (2300 m) AMSL 6500’ (2000 m) AMSL
“31”	2500’ (750 m) AMSL 2000’ (600 m) AMSL	5000’ (1500 m) AMSL 2500’ (7500 m) AMSL	6500’ (2000 m) AMSL 3000’ (900 m) AMSL	7500’ (2300 m) AMSL 6500’ (2000 m) AMSL

4. Requesting and permitting of co-ordinated airspaces

4.1. Submission of claims for the use of co-ordinated airspaces

At least 30 minutes before the planned usage of a coordinated airspace, the airspace co-ordinator at Dunakeszi reports the claim by telephone to the duty service of Airspace

Management Group, Budapest ATS Centre (hereinafter: AMC) through the direct line or using the following telephone number:

06 1 2969258

Such report should include the following:

a) airspace ID (LHSG…)

b) the requested duration (from/to, in UTC time),

c) name and licence number of the airspace co-ordinator (who requests the c-ordinated airspace or airspaces),

d) contact of the airspace co-ordinator (telephone number)

4.2. Issuing permits to one or more co-ordinated airspaces

4.2.1. Upon receipt of a request and taking into account the weather conditions, the runway direction in use or expected for the period claimed, and whether any of the cases specified in Subclause 4.2.1.3. subsists Budapest ATS Centre will decide to permit or prohibit the use of the co-ordinated airspace depending on whether the LHBP runway is in use or not.

Within 15 minutes of receipt of a claim, Budapest ATS Centre AMC will inform the airspace co-ordinator in Dunakeszi by telephone on the permission or prohibition to of the requested co-ordinated airspace(s).

4.2.1.1. Budapest ATS Centre AMC will give the conditions of use of the co-ordinated airspace(s) as follows:

a) the permitted altitude limits of the co-ordinated airspaces by giving the altitudes specified in Subclause 3.1 and 3.3 or the indication 13/31 specified in Subclause 3.2.

b) the requested (in Subclause 4.1. b)) and the available duration of use of the co-ordinated airspace (from/to, in UTC time), and

c) the name of the person issuing the permit.

If Budapest ATS Centre AMC gives the altitude limits of the co-ordinated airspace(s) with the indication 13/31 according to Subclause a) then the permitted altitudes must be interpreted according to the relevant line in the table specified in Subclause 3.2.

Regardless of the runway direction in use at LHBP, the co-ordinated airspace LHSG20/A may be requested several times a day, but Budapest ATS Centre AMC may issue a permit for a maximum of 30 minutes on each occasion, in function of the traffic at LHBP.

4.2.1.2. Budapest ATS Centre AMC may modify the altitude limits of the co-ordinated airspace(s) already permitted on the given day, with regard to the weather conditions and to change of the runway directions in use or expected at LHBP airport relevant to the requested period of time. The airspace co-ordinator at Dunakeszi must be notified of such modification by telephone by giving the data specified in Subsections 4.2.1.1. a) - c).

4.2.1.3. Budapest ATS Centre AMC will not permit the use of the co-ordinated airspaces or will withdraw a permit issued earlier, regardless of the weather conditions or the runway directions in use or expected at LHBP airport, in the following cases:

a) if no terminal approach radar (TAR) information is available,

b) in the case of possible emergency,

c) in the case of any meteorological phenomena which influence the paths of departure or arrival procedure around LHBP, or

d) in the case of military training activities which affect the airspace of Budapest TMA.

4.3. Further responsibilities of the airspace co-ordinator at Dunakeszi in addition to the tasks specified in the Decree:

a) collects information on the operation of the dangerous airspaces affecting the airspaces for gliders,
b) keeps in touch with Budapest ATS Centre AMC by telephone, and shall pass on (by radio) any information received relevant to the operation of the co-ordinated airspaces to the pilots of aircraft staying in LHSG… airspaces.
c) if, pursuant to Subsections 4.2.1.2 and 4.2.1.3, Budapest ATS Centre AMC informed the airspace co-ordinator at Dunakeszi on a modification of the co-ordinated airspace(s) then the co-ordinator at Dunakeszi is obliged to take action to get the affected gliders to descend appropriately, within 15 minutes,

ca) to or below the altitudes permitted according to the indication”13” in the table,
cb) in the case of withdrawal of the co-ordinated airspace(s): to or below the lowest altitudes of the co-ordinated airspaces, or […]

When the airspace co-ordinator at Dunakeszi has made sure that all known traffic in the co-ordinated airspace(s) has descended to the required altitudes she/he shall report it to Budapest ATS Centre AMC.