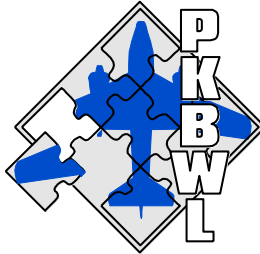




**MINISTRY OF TRANSPORT, CONSTRUCTION AND MARITIME ECONOMY
STATE COMMISSION ON AIRCRAFT ACCIDENT INVESTIGATION**

Warsaw, 6 March, 2013



Occurrence reference No:

860/12

FINAL REPORT

**on investigation into air occurrence
to aircraft of a maximum mass equal to or below 2250 kg ***

This report is a document presenting the position of the State Commission on Aircraft Accident Investigation concerning circumstances of the air occurrence, its causes and safety recommendations. The report is the result of the investigation carried out in accordance with the applicable domestic and international legal provisions for prevention purposes only. The investigation was conducted without the need of application of the legal evidential procedure. In connection with the provisions of the 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 and repealing Directive 94/56/EC (EU Journal of Laws L 2010.295.35), the wording used in this report may not be considered as an indication of the person guilty or responsible for the occurrence. The Commission does not apportion blame or liability.

In connection with the above, any form of use of this report for any purpose other than air accidents and serious incidents prevention, can lead to wrong conclusions and interpretations. This report was drawn up in the Polish language. Other language versions may be drawn up for information purposes only.

- 1. Type of occurrence:** ACCIDENT
- 2. Investigation conducted by:** SCAAI
- 3. Date and the local time of the occurrence:** 23 July, 2012, 13:24hrs LMT
- 4. Point of departure and point of intended landing:** Kruszyn – EPWK aerodrome
- 5. Place of the occurrence:** Kruszyn – approximately 200m South of EPWK aerodrome
- 6. Type, model, owner and operator of the aircraft, damage description:** parachute system: main canopy – Diablo 150; reserve canopy –Micro Raven 150; harness/container – Javelin Odyssey JI model; AAD – Cypres, Expert model. Owner and user – private. The container harness was bisected during the rescue operation following the accident.
- 7. Type of operation:** parachute jumps
- 8. Phase of flight:** reserve canopy opening
- 9. Flight conditions:** not applicable
- 10. Weather factors:** no impact on the occurrence
- 11. Flights/jumps organizer:** Skydive.pl, limited liability company

* Form and scope of this Report are not in full accordance with the guidance contained in Appendix „Format of the Final Report” to Annex 13 to the Convention on International Civil Aviation

- 12. Aircraft Commander data:** male, aged 41, holder of the parachute jumper license issued by the Danish Parachute Union (Dansk Faldskærms Union), valid at the accident time. He performed over 1300 parachute jumps during 22 years.
- 13. Injuries to the crew and passengers:** as a result of the high speed collision with the ground the jumper suffered serious injury.
- 14. Course and analysis of the occurrence:** The jumper performed a Relative Work jump – attempt of building the 100-person formation during free fall. According to the statement of the jumper, after completing the task at a height of about 1000 - 800 m he proceeded to opening the main canopy Diablo 150 type. The canopy opened incorrectly which resulted in a quick spin. During the spin the jumper was in the back to earth position. He cut away the main canopy and opened the Micro Raven 150 reserve canopy. The reserve canopy inflated but it was flying in a very deep spiral descending at high speed. One of the witnesses, an experienced instructor, saw the jumper just after cutting away the main canopy. He noticed that during opening of the reserve canopy the risers on one side appeared to have been shorter, and the canopy immediately after the opening went into the spiral flight. The jumper collided with the ground in a rotating motion, falling at a fairly soft ground. Having been provided with first aid the jumper was taken to the hospital where he received a specialist medical treatment.

Analysis:

Based on the available photos and video recordings of the final phase of the jump it was determined that the reserve canopy was inflated and the lines were twisted. The slider was located approximately at 1/3 - 1/4 of the length of the lines measured from the risers. The control lines were not released.

The data stored in the memory of Altitrack altimeter allowed for an objective determination of the basic parameters of the jump. The data was read out by the altimeter manufacturer - Larsen & Brusgaard Company and along with the respective charts forwarded to the Commission.

- Jump height: approximately 5450 m;
- Canopy opening: approximately 570 m[†];
- Free fall time: 89 s;
- At a height of about 270 m (101s after the jumper exited from the aircraft and 12s after opening the main canopy) the vertical speed increased to 142 km/h;
- At a height of about 160 m (108s after the jumper exited from the aircraft and 19s after opening the main canopy) the vertical speed decreased to 58 km/h and was maintained in the range of 50 - 60 km / h;
- Approximately 118 - 119s after the jumper exit from the aircraft, at the vertical speed of about 50 km/h a collision with the ground occurred.

[†] Altimeter manufacturer note: real deployment height is properly higher, because the Altitrack detects deployment when canopy is fully inflated, not when the pilot chute is thrown. If main canopy was not fully inflated after deployment, the Altitrack deployment detection is lower than real deployment.

Some marks of molten material were found on the risers and one canopy control handle which indicated a friction, probably during the reserve opening process.



Photo 1. View of the back part of the right riser with a visible mark of melting on the back of the control handle. (Photo SCAA)



Photo 2. View of the back part of the left riser. Visible mark of melting. (Photo SCAA)



Photo 3. View of the front part of the left riser. Visible mark of melting. (Photo SCAA)

The parachute owner informed the Commission that the reserve canopy had never been used before. It follows that the molten material marks on the risers and handle were created during the investigated jump.

In addition, an asymmetry of the pairs of the reserve canopy suspension lines was found.

Table 1 - Layout of the suspension lines, the view from the top.

LEADING EDGE									
		Line number							
Lines row	A	1	2	3	4	5	6	7	8
	B	1	2	3	4	5	6	7	8
	C	1	2	3	4	5	6	7	8
	D	1	2	3	4	5	6	7	8
TRAILING EDGE									

The results of measurement of the suspension lines symmetry:

Row A:

A1 > A8 2 cm difference;
 A2 > A7 2 cm difference;
 A3 > A6 1,5 cm difference;
 A4 < A5 1 cm difference;

Row C:

C1 > C8 1,5 cm difference;
 C2 > C7 2 cm difference;
 C3 > C6 1,5 cm difference;
 C4 = C5

Row B:

B1 > B8 1,5 cm difference;
 B2 > B7 2 cm difference;
 B3 > B6 0,5 cm difference;
 B4 = B5

Row D:

D1 > D8 2 cm difference;
 D2 > D7 2 cm difference;
 D3 > D6 2 cm difference;
 D4 = D5

According to the Commission, the differences in length of pairs of the suspension lines are quite large. However, it is doubtful that these differences resulted in malfunction of the canopy opening process.

Visual inspection of the main canopy did not show any damage. It was only found that the tips of the soft links connecting the lines with the right risers were not secured by stitching. The cause of incorrect opening of the main canopy was not determined.

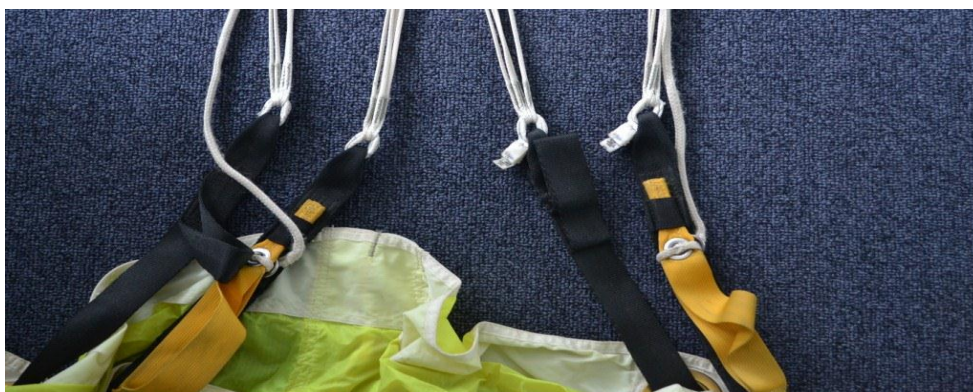


Photo 4. View of the main canopy risers. Visible tips of the soft lines which are not stitched to the right risers. (Photo SCAA)

Visual inspection of the container did not reveal damage or unusual traces that might indicate a cause of the accident.

Based on the collected information, the Commission determined the most likely course of events. Between 1600 m and 900 m the vertical speed of the jumper was 155-180 km/h, which indicated the flight in the track position. At 850 m the vertical speed increased which was consistent with stopping the track and throwing the main canopy pilot chute. According to the jumper statement over the past 7 years the main canopy has normally travelled 250 m from throwing the pilot chute until fully inflated. At a height of about 500 m the vertical speed of the jumper decreased to 35-40 km/h, which in the Commission opinion should be regarded as inappropriate and indicated incorrect opening of the main canopy. Then, the speed increased to 142 km/h at the height of 286 m, which indicated that earlier, likely at about 350 m the jumper had cut away the main canopy and re-transited to free fall. Then, the vertical speed began to decrease and stabilized in the range of 50 - 60 km/h at a height of about 160 m. According to the Commission, at that time the reserve canopy had already been inflated, but the parachute did not operate correctly (which was recorded in the video and photographic documentation as a flight in a deep spiral). Automatic Activation Device was activated during the reserve canopy opening.

Taking into account unusual marks on the handle and risers of the reserve canopy, the Commission did not exclude that the incorrect opening of the reserve canopy could have been related to the configuration of the jumper. If the opening took place when the jumper was falling in the side position and rotated quickly, at a certain moment the risers and lines would have been unequal.

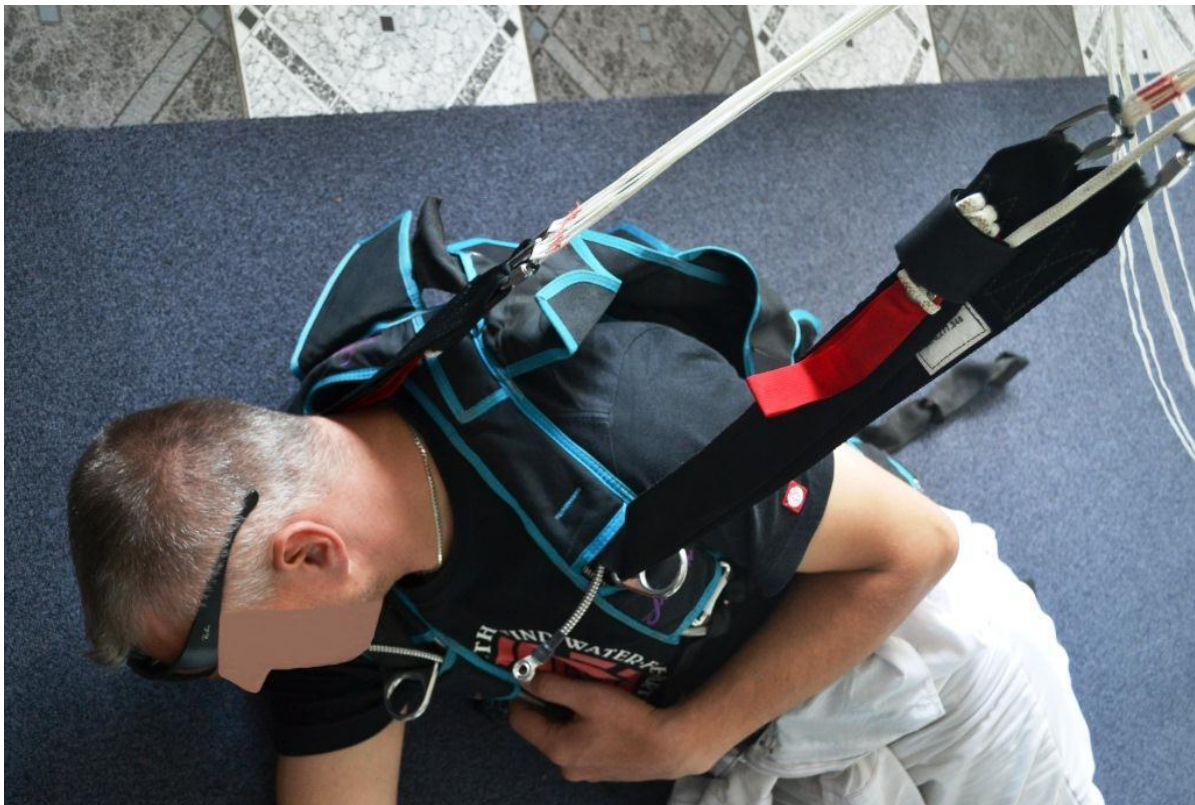


Photo 5. Likely configuration of the jumper, which could have occurred during opening of the reserve canopy.

Quick rotation could have resulted in tight twisting of the lines improperly positioned over the jumper head, which in turn would lead to the parachute flight in a deep spiral. The flight in a deep spiral could have prevented untwisting of the lines.

Incorrect opening of the reserve canopy due to unstable configuration of a jumper is a very rare occurrence.

15. Causes of the accident:

- 1) Incorrect opening of the main canopy due to unknown reasons;
- 2) Incorrect opening of the reserve canopy, probably due to initiation of the opening in a side position and during high speed rotation.

16. Safety recommendations: The State Commission on Aircraft Accident Investigation, taking into account the evidence gathered during the investigation, has not proposed any safety recommendation.

Investigator-in-Charge

signature

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