Air Accident Investigation Unit (Belgium)
Federal Public Service Mobility and Transport
info.aaiu@mobilit.fgov.be
www.aaiu.belgium.be

Safety Investigation Report

Ref. AAIU-2019-09-08-01
Issue date: 01 July 2025
Status: Final

Scope: Limited

As per ICAO Annex 13 and EU regulation EU 996/2010, decisions regarding whether to conduct a civil aviation safety investigation, and the extent of an investigation, are based on many factors, including the level of safety benefit expected to be drawn from such an investigation.
For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.

SYNOPSYS

Occurrence class	Accident
Occurrence category	Abnormal runway contact (ARC)
Date and time[1]	Sunday 08 September 2019 17:45 UTC
Location	Tielrode
Aircraft	Kubicek BB30Z
Aircraft category	Lighter-than-air - Hot Air Balloon
Location of departure	Grote Markt (Market place) of the city of Sint-Niklaas
Planned destination	South of Sint-Niklaas, region of Temse
Type of operation	Non-commercial - Cross-country
Phase of flight	Landing
Injuries	1 serious, 2 minor
Aircraft damage	Minor

What happened

During a hard landing with a hot air balloon, the pilot got seriously injured in the face.

[1] All time data in this report are indicated in UTC, unless otherwise specified

1. THE OCCURRENCE

Every year during the first weekend of September, numerous hot-air balloons in all manner of shapes and sizes rise into the air from the market place in the city centre of Sint-Niklaas during an event called 'Vredefeesten'.

The pilot wanted to participate to the event in a private capacity. He got permission of the owner to use his balloon for a flight out of Sint-Niklaas together with his wife and sister-in-law.

The 'Vredefeesten' involved take-offs of balloons from the market place at Sint-Niklaas and another field in the vicinity for the whole week-end. However, no flights were made on the Friday and Saturday evening, because of the meteorological conditions.

On the Sunday, the pilot enquired about the weather on various websites. There was still instability, but on the evening, around 18:00, the forecast seemed favorable for ballooning.

A briefing was held by the organizers of the ballooning event, indicating that meteorological conditions were expected to improve in the evening as the clouds would clear.

All balloons were prepared on the market square, ready for take-off. Another group of 8 balloons were to take-off from another field 800 m away. The signal for the take-off was given at 17:00. The pilot raised his balloon for a departure with the second wave. He had some difficulties because of the wind. Finally, he got the balloon straight and took off from the market place.
The flight occurred at 1200 ft on a true track of 150-155 degrees.

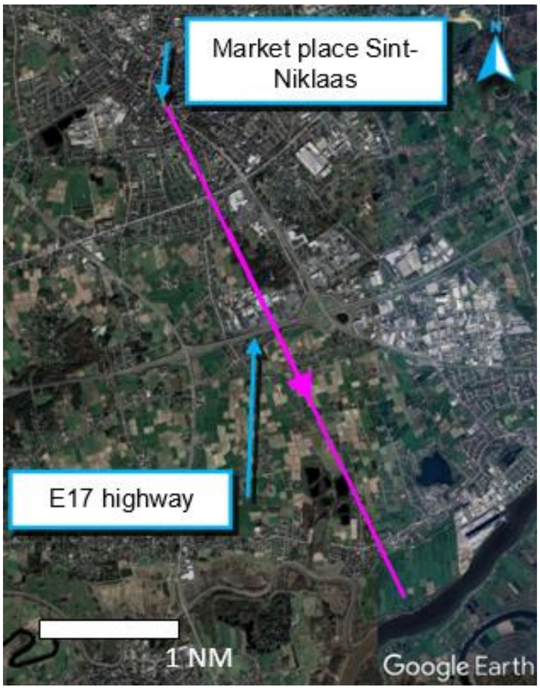

Figure 1: Flight path

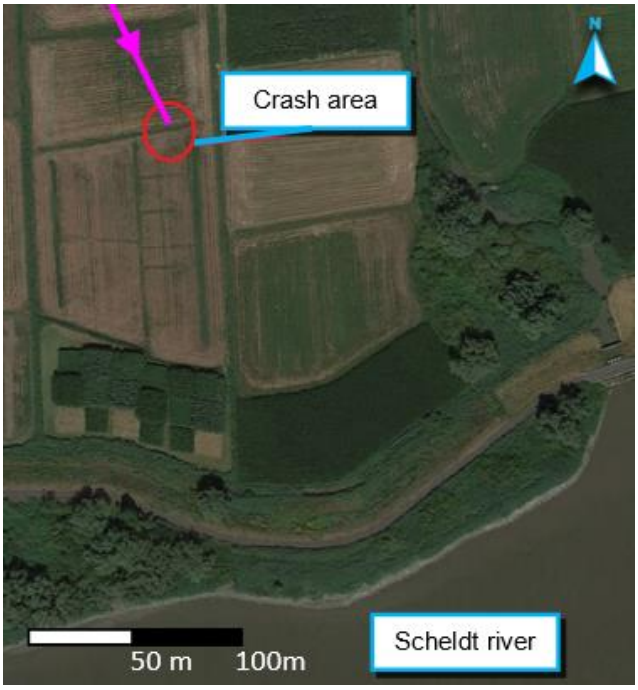

Figure 2: Landing area

The pilot noticed that, on second take-off zone, only one balloon took-off out of the 8 balloons that were supposed to. The pilot further noticed that there were still clouds present, some of them showing rain activity.

After the balloon crossed the E17 highway, at 1000 ft AMSL and a speed around 10 knots, the pilot started to descend at 1 m/s, in order to make a controlled descend towards the expected landing zone.

On the chosen field, there were already 2 balloons on the ground. They were stationary and were deflated quite quickly. This gave the pilot the assurance that the wind conditions on the field were favorable for the landing. He saw another balloon with a correct, normal landing, without indication that there was a problem.

During the approach, suddenly, when the balloon was 40 m above ground, the variometer warned about the rate of descend exceeding 1 m/s and actually indicated a value of 2.5 m/s; the ground speed was 13.2 knots. The pilot was surprised. He said to the passengers to prepare for a hard landing.

Due to the presence of the river nearby and the horizontal speed, his options were limited and he decided not to go for a go-around. The basket hit the ground hard and was dragged on the ground. Before touchdown, the pilot noticed a ditch behind the expected landing area.

The ditch happened to be larger than expected, being an irrigation ditch partially covered with vegetation.

During the slip, the basket went across the ditch. The basket hit the banks of the ditch and the pilot lost balance and got seriously injured in the face. He momentarily lost conscience. The basket continued its ground travel over 60 m, until the balloon completely deflated.

The occupants climbed out the basket. The pilot saw another balloon landing in the vicinity, being also dragged on the ground for a long distance.

2. CONTEXTUAL INFORMATION

2.1 Injuries to persons

The two passengers suffered light injuries; one had a broken rib, the other a sprained wrist. The pilot had an broken nasal bone and skull fracture.

Table 1: List of injuries

Injuries	Crew	Passenger	Others	Total
Fatal				
Serious	1			1
Minor		2		2
None				
Total	1	2		3

2.2 Damage to aircraft

There was minor damage to the basket and balloon envelope.

2.3 Personnel information

Table 2 : General pilot data

Nationality	Belgian	Age	60
License	Hot-Air Balloon Group B Pilot licence first issued by BCAA in 2005		
Ratings	Commercial Operations permitted (First issued 2006).		

Table 3 : Flying experience pilot

Total time:	293:30
Total number of flights:	290

The pilot regularly participated in the Vredefeesten event, with a total of 19 take-offs from the Sint-Niklaas market square in the past.

The pilot experienced 3 landings during which the surface wind speed was above 13 kt. In each of these occasions, the landing was fast, but uneventful; the landing area was free of obstacles and the approach happened at low height. The pilot stated that these occasions were exceptional and due to unexpected meteorological changes.

2.4 Aircraft information

2.4.1 General

The Balloon is a BB-Type Kubicek SPOL s.r.o. hot air balloon, featuring a BB30Z envelope and a basket.
The balloon is defined by the EASA Type Certificate Data Sheet BA.003. The certification base is US FAR Part 31 Amdt 31-7.
The flight manual was initially approved by EASA under major change approval number 10061892, dated 15 May 2017.

A double burner is the heat source for the envelope. The basket is made of cane-work connected to the envelope by means of stainless steel or Kevlar wires and carabiners with a screw gate.

The basket used for this flight was a Kubicek K17 with door.

4 gas cylinders were disposed on the corners of the basket. For this flight there were 2 larger cylinders Thunder & Colt V30 and 2 smaller Worthington CB250.

The larger cylinders V30 were provided with a top ring cover, while the top ring of the smaller ones did not feature such cover.

Figure 3 : CB250 cylinder (left) and V30 cylinder with padded top ring (right)

The use of the gas cylinders was done in compliance to the Flight Manual (FM) 3102 for Kubicek BB Balloons Edition 3 - Rev 5, 15 August 2019, - 8.4 Table of Fuel Cylinders. See also Figure 4. V30 are also available without a ring cover.

In section 6.6.1 of the FM, it is stated that all cylinders must be fitted with a padded cylinder cover to protect both the cylinder from damage in transit and the persons in the basket from injury on landing. But this about the jacket around the body of the bottle, not on the top ring.

8.4 Table of Fuel Cylinders

Manufacturer	Material	Type	Weight			
			Empty		Full	
			[kg]	[lb]	[kg]	[lb]
Balóny Kubíček	Duplex stainless steel	KB72L	20	44	50 (propane)	110 (propane)
					54 (LPG)	119 (LPG)
		KB85L	22	48,5	58 (propane)	128 (propane)
					62 (LPG)	137 (LPG)
		KB97L	24	53	65 (propane)	143 (propane)
					70 (LPG)	154 (LPG)
Schroeder Fire Balloons	Stainless steel	VA 50	15	33	36	80
		VA 70	18	40	48	107
Cameron Balloons	Aluminium	Worthington (CB250)	14	31	34	75
		CB2990	13	26	34	71
	Stainless steel	CB497	16	35	34	75
		CB599	20	44	41	90
		CB2088	22	48	50	110
		CB426	22	48	51	112
		CB 959	25	55	61	135
		AO/V30	20	44	48	106
		AO/V40	25	55	60	133
	Titanium	CB2385	11	24	34	75
		CB2387	14	31	41	90
		CB2380	13	29	42	93
		CB2383	15	33	52	114
	Duplex stainless steel	CB2900	21	46	44	96
		CB2901	23	51	53	117
		CB2902	24	53	51	113
		CB2903	27	60	63	139
Lindstrand Balloons	Stainless steel	V20	14	31	34	75
		V30	18	40	48	106
		V40	20	44	60	132
	Titanium	T30	10	22	40	88
Thunder & Colt	Stainless steel	V20	14	31	34	75
		V30	18	40	48	106
		V40	20	44	60	132

Figure 4: Extract from table in FM showing the type of fuel cylinders that may be installed

2.4.2 Flight Manual

2.2 Weather Limitations

Maximum allowed surface wind speed during take-off and landing for:

	XR models	BB64Z and BB70Z with K32T or K32Y basket	BB92Z with K40Y, K40T, K40TTA, K50, K50TT and K50TTA basket	BB 150P, BB184P	All other BB models
Free flight take-off (with quick release)	7.5 m/s (14.6 kts)	5.5 m/s (10.7 kts)	5.5 m/s (10.7 kts)	5.5 m/s (10.7 kts)	7.5 m/s (14.6 kts)
Free flight take-off (with quick release) at the reduced fabric strength *	5.0 m/s (10 kts)	5.5 m/s (10.7 kts)	5.5 m/s (10.7 kts)	5.5 m/s (10.7 kts)	7.5 m/s (14.6 kts)
Tethered operation	7.5 m/s (14.6 kts)	4.0 m/s (7.8 kts)	3.5 m/s (6.8 kts)	3.5 m/s (6.8 kts)	4.0 m/s (7.8 kts)

*Reduced fabric strength means that the grab test was carried out according to the Maintenance Manual and has proven that the fabric strength is in the 10 - 13 kg range.

WARNING	*Additional limitations apply when baskets K32T or K40Y fitted with burner frames without the symbol "S/N" before its serial number are used. See Appendix 6.*

Balloons must not be flown or tethered if there is a thunderstorm, turbulence or another meteorological conditions (e.g. wind shear) that give raise to erratic or gusty wind in the vicinity of flight path.

WARNING	*Flights near cumulonimbus clouds must be rigorously avoided. These clouds often form thunderstorms. There may be dangerous turbulence and a risk of either the envelope being deflated or the balloon being carried up to altitudes where oxygen and temperatures are low.*

The following issues related to weather need be considered, when planning a flight and choosing a launch site:

Turbulence / gusty wind — Any wind gust make the balloon much more difficult to inflate. Wind gusts should be avoided on launch site especially when operating balloons of volume higher than 7000 m³.

Maximum wind speed — The values in the table above indicate maximum, not the mean wind speed. The gusts must be within the limits given by the table e.g. for mean speed 5 m/s (10 kts). A gust up to 2,5 m/s (5kts) is allowed, for mean speed 7.5 m/s (15 kts) no gust is allowed). Moreover, gusts above 5.1 m/s (10 kts) above mean speed are to be avoided.

Figure 5 : chapter on weather limitations

3.1.1 Passenger Emergency Positions for Landing or Collision

WARNING	*The correct positioning of persons in the basket is important for minimising the risk of injury!*

Fast landing or collision

- Stay low in the basket and bend knees. Heads always below the upper rim of the basket.
- Stow all objects (cameras etc.), hold on the rope handles with both hands.
- Place as many passengers as possible to the rear side of the basket
- In open baskets heavier persons need to be placed first in the direction of flight. Sideways position is the most favorable but difficult to achieve due to limited space. If the sideways position is not possible, the persons placed first should also be oriented backwards to the direction of flight.
- In case of a passenger travelling inside of the pilot's compartment - use the rope handle for securing. It is allowed to use rope handle with one hand and the rim of the fuel tank with the other hand, if this would offer more stable position (considering the number and distribution of the fuel tanks and other factors).

Figure 6 : Passenger position for landing (left one for the K17 basket)

3.6.1 Fast Landing

Landing in a relatively high surface wind
Priorities: Primarily avoid persons from falling out of the basket or their injury from loose objects. Make a **tangential contact to the ground** with little vertical speed.

1. Select a suitable landing field, maintain desired landing trajectory.
2. If a RV is fitted, rotate the balloon, so the balloon lands on the longer side of the basket.
3. Passengers to adopt correct emergency position for fast landing. Prepare them for being dragged on the ground after landing.
4. Descend gently.
5. Consider possibility to stop the envelope with a convenient obstacle (tree, bushes...)
6. Switch off the pilot flames on all burner units.
7. Red line - open the deflation system completely.
8. Prevent people from leaving basket until so instructed.

WARNING	***Combination of fast horizontal motion and vertical descend is extremely dangerous and must be avoided. The touchdown is to be performed with as low a rate of descend as possible.***

Figure 7 : Instructions to execute a fast landing

4.3.2 Decision on the Flight

Weather	Weather conditions within limits, no thermals, no thunderstorm or any other weather phenomena possibly dangerous in the vicinity of the intended flight
Launch site	No downwind obstacles
Weight	The balloon is within weight limits and capable of staying that way during the entire flight
Fuel	At least the minimum quantity of fuel is present and is enough to complete the intended flight

WARNING	***NO FLIGHT IS PERMITTED*** *if there is a chance that the surface wind speed during the flight will exceed limitations for safe landing (see 2.2). Never attempt to fly when there is thunderstorm activity in the area, ahead of approaching frontal systems, or near severe weather of any kind (turbulence, thermals, or wave currents etc).*

Figure 8 : Decision on the flight including considerations on the weather

2.5 Meteorological conditions

The meteorological situation was followed by weather specialists, providing not only a briefing for the pilot before the flight at 15:00 that day, but also advising the organization about the evolution of the weather. The analysis was based on the continuous monitoring of the weather radar data.

The meteorological situation on that day was conditioned by Northerly polar maritime air stream and a high pressure zone over the Atlantic ocean. This provided an unstable situation with the development of TCU (Towering Cumulus) and rain showers.

On the Geopotential height chart (500hPa), a cold pool (blue encircled on Figure 9) was visible over the Netherlands-Belgium-Northeast France-Switzerland-Northwest Italy. This is generally also an indication of unstable weather condition.

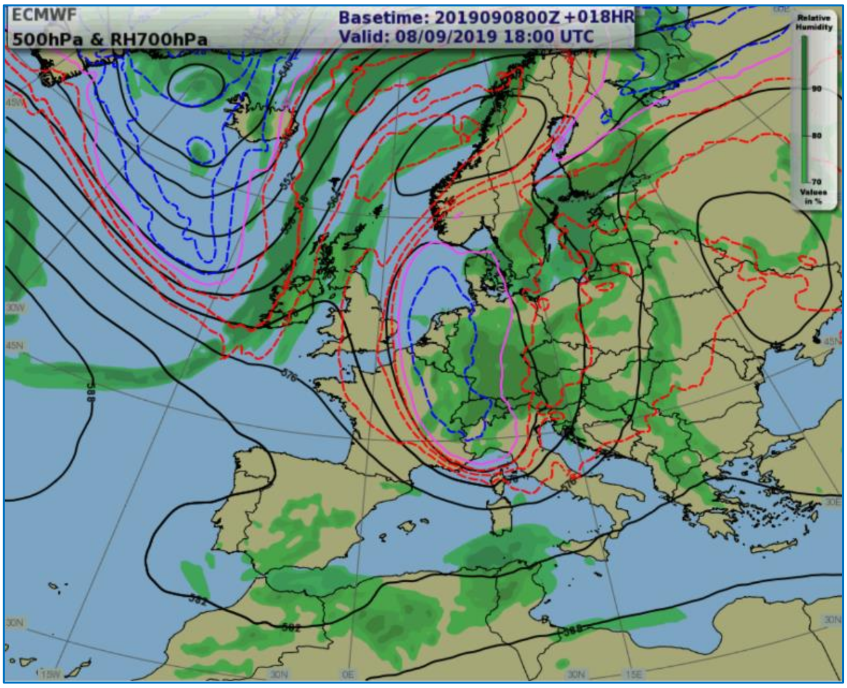

Figure 9 : Geopotential heights (GPDM) 500hPa and Relative Humidity 700hPa

For the time period before the pilot briefing, the unstable weather situation was still clearly present.

On the satellite image from 14:30 UTC (Figure 10 left), we see convective clouds interspersed with wide clearings. On the radar image from 14:40 UTC (Figure 10 left), two facts can be deduced:

- In the vicinity of Sint-Niklaas, small rain showers are still present.
- North of Sint-Niklaas, large cells are still active. Given the northern wind direction, it was assumed that these cells could reach Sint-Niklaas in the coming hours

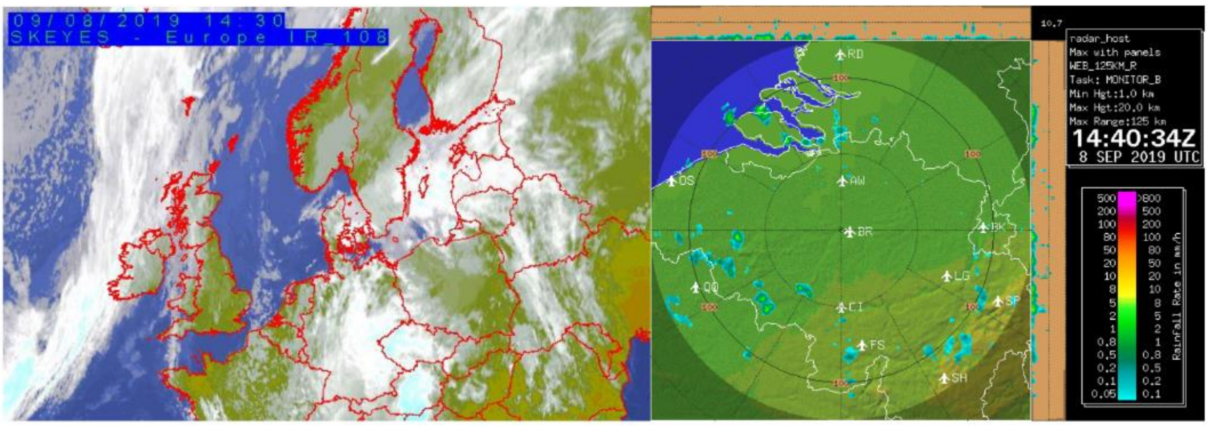

Figure 10: Satellite-image IR_10.8 1430 UTC (left), Radar Image 1440 UTC (right)

On the other hand, the prediction model (Figure 11) showed that the rain activity would be lower during the evening.

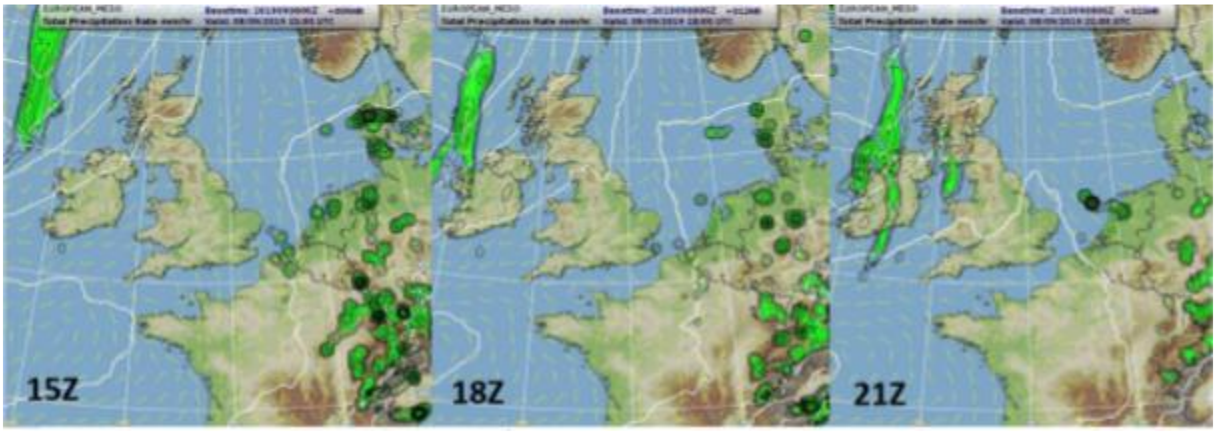

Figure 11: Total Precipitation Rate (mm/hr) (model UKMO) 15Z-18Z-21Z

For the specialists, there were two scenarios possible;

- Scenario 1; The instability continues to weaken and would result in a dry weather with partial nebulosity. The Northern wind would blow at an average speed of 5 to 7 kt, with possible peaks of 10-15 kt
- Scenario 2; The weakening of the instability takes more time than predicted, causing residual rain showers to occur for several hours. Consequently, the average windspeed would be higher; 7 to 10 kt with peaks up to 15-18 kt

This situation was explained to the pilots during the briefing.

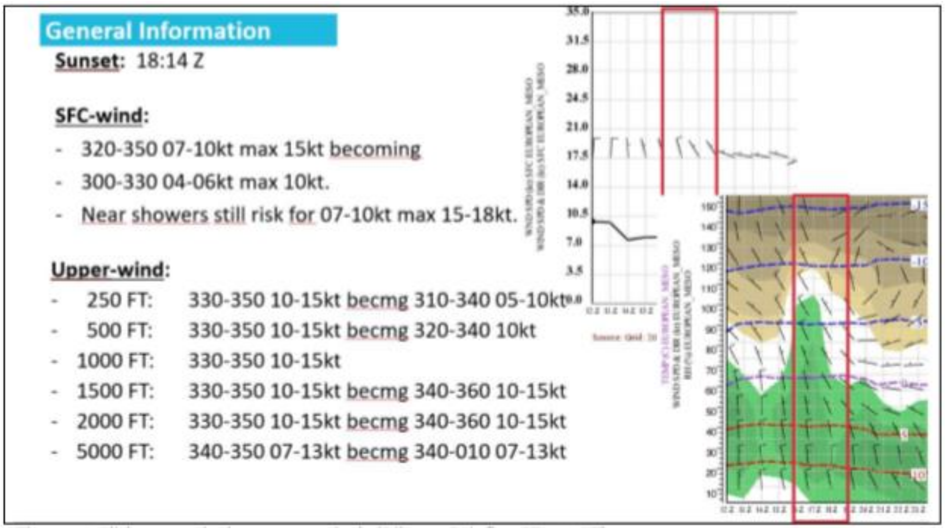

Figure 12: Pilot briefing extract

After the pilot briefing, the organization of the flights decided to wait for the weather to improve before giving the 'green light'. Rain activity to the West of Sint-Niklaas was observed from the market square of the city.

The green light for the flights to begin was given around 16:35; the meteorological observations made immediately after gave, for Antwerp airport, a windspeed below 10 kt and meteo balloons were launched to assess the actual situation in Sint-Niklaas itself.

At that time, the weather radar gave the following information:

- The rain activity that occurred West of Sint-Niklaas moved to the South and gave a wind condition similar to the value given during the briefing
  METAR EBAW 16:20 UTC & 16:50 UTC: 330°-360° 07-09 kt.
- On the other end, the rain that occurred to the North of Sint-Niklaas showed no Southwards movement on the weather radar during the same period. It was concluded that the image on the radar was most probably influenced by the cooling towers of the nuclear powerplant of Doel.

The balloons took off around 17:00.

Around 18:00 (about 15 minutes after the balloon had landed) a new active cell in the neighborhood of Sint-Niklaas became visible on the weather radar and could be observed from the Sint-Niklaas market square. This instability most probably influenced the weather condition encountered by the balloon during the landing.

2.6 Organisation and management information

A briefing is given by the organisation before the flights. The attendance is mandatory.

On a given day, three briefings are given, one for the flights in the morning, another around noon for the gas balloons and the last one at 15:00 for the evening flights.

The briefing covers all the aspects of the event;

- A rollcall. Only those pilots being registered would be allowed to fly.
- General information regarding the organisation of the event,
- Specific information regarding the flights, take-off area, departure sequence. Specialists give an ATC briefing according to the expected flight directions and provide coordination with the active ATC units. A particular attention was given to the presence of high voltage lines.
- Meteo briefing.

The pilot recalls having received the main message given; there was weather instability up to 18:00. However, it would be flyable after the clouds would move away.
The green light (start of operations) was given by the organization.

2.7 Regulation

2.7.1 Certification

US 14 CFR Part 31 Sec.59(b) (certification basis of the balloon involved) as well as EASA certification specifications for hot air balloons rule CS-31.HB.59 (b) state that “each projecting object on the basket, that could cause injury to the occupants, must be padded”.

With reference to rule CS-31HB.59(b) Issue 1, EASA's current interpretation is that cylinders are considered installed in the basket and therefore need to be addressed by this requirement as well. The gas cylinder when installed would be classed as a projecting object on the basket, and therefore needs to be padded to protect occupants from injury.

EASA clarified that it should be noted that this interpretation only applies to new type certificates. and changes concerning a fuel cylinder and its installation. This however will not lead to a retrospective retrofit of padding on cylinders in service. This could only be achieved through demonstrating an unsafe condition leading to an AD or rulemaking of Part-26 or OPS requiring a retrofit.

2.7.2 Operational

It is EASA’s opinion that existing flexibility should be exercised in the balloon OPS regulation and to consider events like Sint-Niklaas in accordance with GM1 BOP.BAS.190(a)(3) as special event flights under balloon specialised operations subject to a risk assessment.

BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist

(a) Before commencing a balloon specialised operation, the pilot-in-command shall conduct a risk assessment, assessing the complexity of the activity in order to determine the hazards and associated risks of the intended operation and establish mitigating measures where necessary.

(b) A balloon specialised operation shall be performed in accordance with a checklist. The pilot-in-command shall establish that checklist and ensure that it is appropriate to the specialised activity and balloon used, based on the risk assessment and taking account of all requirements set out in this Subpart. The checklist shall be readily accessible on each flight to the pilot-in-command and other crew members, where it is relevant for the performance of their duties.

(c) The pilot-in-command shall regularly review and update the checklist where necessary in order to adequately take account of the risk assessment.

GM1 BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist

LIST OF OPERATIONS

(a) Balloon specialised operations include the following activities:

(1) parachute operations;

(2) hang-gliding dropping; and

(3) special events flights, including flying displays and competition flights.

(b) The following operations are not considered balloon specialised operations, but normal operations:

(1) aerial advertising flights; and

(2) news media flights, television and movie flights.

2.8 Survival aspects

2.8.1 Pilot restraints

The pilot wore a safety belt attached to the bottom of the basket. The purpose of the belt is to prevent the pilot to be ejected.

2.8.2 Nature of injury

Some time after the accident, the pilot stated;

"After analysis of the wound, the place I stood in the basket (rear right) during the landing and the fact that I was wearing the safety belt, anchored at the bottom of the basket, I come to the conclusion that my head hit one of the gas bottles. There were 4 gas bottles in the basket; two of them were large bottles, well protected by a rubber foam layer. The two others were Worthington aluminum bottles, without protection and my face crashed most probably on one of those."

"Twelve stitches were placed on the left side of my nasal bridge. I had a small crack in the skull above the left side of my nose and a small skull fracture on the right. Both sinuses were broken. In other words, the injuries were very localized/concentrated."

3. ANALYSIS

3.1 Meteorological conditions

The conditions encountered during the landing of the balloon were indeed identified as probable in the meteorological reports and briefing. The decision to fly was made following the forecast, based on weather models, that the instability would disappear. The factual indications of windspeed and the weather radar seemed to confirm the forecast at the time the decision was made. However, as stated by meteorologists during the investigation; a meteorologist gives the best possible advice, based upon the available information, but there is no 100% certainty in meteorology.

3.2 Decision to fly and organizational influences

The support given by the event organisation with the safety briefing, the security on the market square, etc.. gave the pilot an impression of adequate preparedness. He only had to follow the advises and concentrate on his balloon. Indeed, all the pilots the investigators contacted during the investigation stated that the support given during the Vredefeesten is rather unique and very much appreciated.

The organization's decision to give the 'green light' was based on scientific advice. However, the weather briefing included some reservations. Despite this, they chose to proceed rather than taking a conservative approach. This decision might have been influenced by a certain pressure, as all previous flights had been cancelled, and it was the last opportunity to satisfy both the public and the participants.

Nevertheless, the pilot is the ultimate responsible for a safe flight. Each pilot has his own limitations and analysis and may decide to fly or not to fly, according to his skills, the information available and ultimately his appreciation of the whole situation. Being part of a big event, with many balloons and provided with information and support he would not normally have, he would have a kind of peer pressure to fly. The pilot did not feel a particular pressure to fly against his better judgment, but more a positive feeling to go with the stream.

After the event, the pilot said, in normal conditions, out of the 35 balloons that took off that day, there would be at least 25 that would not have taken their own decision to fly. From the field outside the market place, he said that out of the 8 balloons that were there, only one took off.

The latter may be due to the fact that the launch site at market place in Sint-Niklaas is surrounded by tall buildings, which obstruct the view of the meteorological conditions in the area. In an open field next to the city centre, there is a better view, allowing for a more accurate assessment. This latter situation also more closely resembles the conditions of a launch site during a normal balloon flight, outside the context of a balloon event.

3.3 The landing

During the landing, according to the pilot, the ground speed was 13.2 kt, while the flight manual defines an emergency landing from the limit of 14 kt. The landing may not therefore to be considered as normal, but rather as unusual fast landing, seldom encountered by the pilot.
Other balloons landed in the same area, in the same conditions, but not the same consequences.
The perturbating element was the presence of the ditch, somewhat hidden by vegetation, that caused the basket to tip over.

In hindsight, the pilot could have interrupted the landing when realising the conditions were not as expected. However, he decided to continue with the landing, due to;

- The presence of the river Schelde beyond the intended landing area;
- The vertical speed indicating a downdraft, making a go-around difficult;
- The landing zone seemed to be adequate.

This made him conclude that a go-around may more hazardous than continue with the landing.

As pointed out by the balloon manufacturer, the flight manual contains warnings advising the pilot to perform a touchdown with a rate of descent as low as possible, because the combination of fast horizontal motion and vertical descend is extremely dangerous.

It should also be kept in mind that the maximum wind velocities published in the flight manual are the extreme limits and that, depending on the local geography and availability of landing sites, these landing limits can be even smaller in reality.

The choice of the landing site is also limited by the landing of other balloons in the nearby area. Here too, one can say that the context of a balloon event has had an indirect influence on the landing.

3.4 Survival aspects

The pilot was positioned at the right, facing the direction of flight. Both passengers adopted the brace position as prescribed for an open basket by the manufacturer, with one facing forward and the other facing backward. The gas cylinders were positioned as shown in Figure 13.

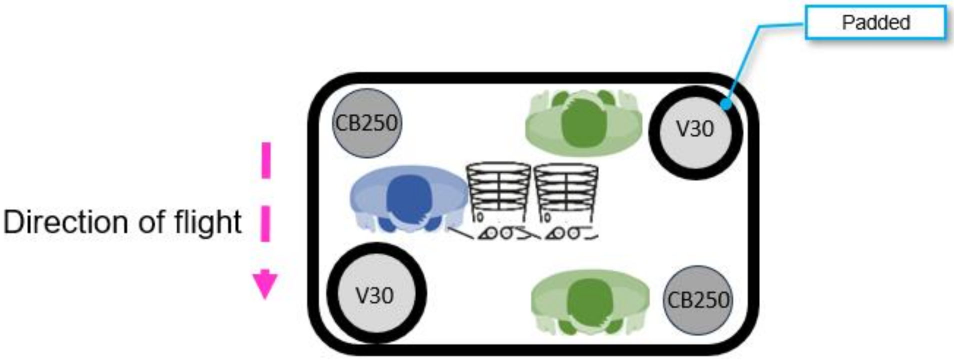

Figure 13 : Reported configuration and positions (pilot blue, passengers green) during the landing

The pilot confirmed that he was wearing the prescribed restraint, and stated some time after the accident that he might have collided with a CB250 cylinder with his face, due to the very local injury (at the nasal bridge). It is a fact that the edge of such a cylinder (see Figure 3) has a much smaller rounding than a V30 bottle, even if the latter is unpadded.

However, given the reported layout of the cylinders and position of the occupants during the landing (Figure 13), the investigation was not able to reconstruct the exact kinematics of the accident. As due to the inertia of motion, the pilot will always be thrown forward in the event of a sudden frontal impact.

Hitting the burner is not completely ruled out, as it could not be reconstructed how well the restraint was fastened. This restraint is only intended to prevent the pilot from being thrown out of the basket, but it still allows some freedom of movement within the basket, especially if the basket tips forward.
Hitting an object on the ground (such as a stone) is also considered a possibility by the investigators.
Due to the lack of irrefutable evidence, the investigation could not definitively determine the cause of the facial injuries.

3.5 Padding of the fuel cylinders

The selection of the fuel cylinders was conform the flight manual, based on FAR Part 31 Amdt 31-7 and approved by EASA.
Although it could not be determined during the investigation what caused the pilot's injury, and therefore whether the unpadded top ring played any role, the AAIU considers the use of this unpadded top ring as a potential risk for the pilot and/or passengers even though no certification standard currently exists that specifies any level of energy absorption.

With reference to CS-31HB.59(b) Issue 1 EASA's current interpretation is that cylinders are considered installed in the basket and therefore need to be addressed by this requirement as well but that his only applies to new type certificates and changes concerning a fuel cylinder and its installation. This doesn't apply on cylinders yet in service and certified by other authorities in the past before the initial issue of CS--31HB, back in 2009.

It was also noted that the flight manual states that all cylinders must have padded covers to protect people in the basket during landing. However, it doesn't mention the top ring, even though there's no scientific evidence suggesting the risk of injury would be any lower there.

4. FINDINGS

4.1 Findings as to causes and contributing factors

- The meteorological forecasts identified the probability of surface winds of the intensity encountered during the landing of the balloon but it was decided to continue the flight.
- The nature and circumstances of the mission, as part of a public ballooning event, may have created social pressure that influenced the decision to proceed with the flight instead of cancelling it.
- The surface wind speed during landing (13 kt) was slightly under the limit for a fast landing, as determined in the Flight Manual “Emergency conditions”.
- During landing, the basket hit the banks of a ditch and tipped over causing the pilot to lose balance and hit is face.
- Due to the lack of irrefutable evidence, the investigation could not definitively determine the cause of the facial injuries.

4.2 Findings as to risks

- The authorization to start the flights were given by the organization of the ballooning event in conjunction with a weather improvement, confirmed by the analysis of meteorological data by specialists, although the probability of surface winds of the intensity encountered during the landing of the balloon still existed.
- Meteorological predictions do not provide a 100% certainty.
- The top ring of 2 of the 4 fuel cylinders in the basket were not all fitted with a protection against the fall of persons on the cylinder.
- In addition to the contributing factor of social pressure mentioned above, the circumstances of such a balloon event also entail other risks:
  - Specifically for Sint-Niklaas: the tall buildings around the launch area obstruct the view of the weather in the distance, which increases reliance solely on forecasts;
  - The choice of a suitable landing site is compromised by the presence of other balloons participating in such a 'mass’ take-off.

4.3 Other findings

- The pilot reportedly wore the prescribed restraint system.

5. SAFETY ACTIONS AND RECOMMENDATIONS

*A **safety issue** is a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organization or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.*

*A **safety action:** the steps taken or proposed to be taken by an organization or agency on its own initiative in response to a safety issue.*

*A **safety recommendation** is a proposal by the safety investigation authority in response to a safety issue and based on information derived from an investigation and/or study. It's aimed to improve the safety of an organisation and/or system and therefor always addressed to an organisation and/or agency, never to a specific individual. The sole purpose of a safety recommendation is the prevention of accidents or incidents and the reduction of the consequences of such occurrences. It, in no case has the purpose of creating a presumption of blame or liability for an accident or incident. Neither does it reflect the level of contribution to a specific accident or incident.*

*A **safety message:** An awareness which brings to attention the existence of a safety factor and the lessons learned. AAIU can distribute a safety message to a community (of pilots, instructors, examiners, ATC officers), an organization or an industry sector for it to consider a safety factor and take action where it believes it appropriate. There is no requirement for a formal response to a safety message.*

5.1 Safety factor: Specific risks related to a balloon event

Safety message to all hot air balloon pilots participating in a ballon event:

Balloon pilots participating in a balloon event are reminded that it is important to conduct a thorough risk analysis as Pilot In Command taking into account a.o. the complexity of the activity and the operational environment and geographical area.

In addition to the more tangible, operational risks, they should also guard against potential social pressure by setting personal criteria in a checklist, being the ultimate responsible for a safe flight.

5.2 Safety issue: The use of non-padded top rings of gas cylinders

As stated in chapter 2.7 of this report, EASA's current interpretation is that cylinders are considered installed in the basket and therefore need to be addressed by rule CS-31HB.59(b as well. The gas cylinder when installed would be classed as a projecting object on the basket, and therefore needs to be padded to protect occupants from injury.

EASA further clarified that it should be noted that this interpretation only applies to new type certificates and changes concerning a fuel cylinder and its installation. This however will not lead to a retrospective retrofit of padding on cylinders in service. This could only be achieved through demonstrating an unsafe condition leading to an airworthiness directive (AD) or rulemaking of Part-26 or OPS requiring a retrofit.

Although it is considered that the use of non-padded top rings does not meet the criteria for an AD, AAIU Belgium is of the opinion that it does hold a risk and that EASA has other means to sensitize the pilot community and to promote non-mandatory safety information, such as a Safety Information Bulletin (SIB).

Therefore:

Safety recommendation BE-2025-04:

It is recommended that EASA issues a Safety Information Bulletin (SIB) or an equivalent publication to raise awareness and advise the balloon pilot community on the use of padded fuel cylinders, included the top rings.

The publication referred to in the safety recommendation could also encourage conducting a risk assessment to determine if additional padding or covers for other on-board equipment are necessary.

ABOUT THIS REPORT

General	
What?	Safety investigation reports are a technical document that reflects the views of the investigation team on the circumstances that led to the accident or serious incident and is conducted in accordance with Annex 13 to the Convention on International Civil Aviation and Regulation (EU) No 996/2010.
Objective	**The sole objective of safety investigations is the determination of the causes, and to define safety recommendations in order to prevent future accidents and incidents. It is not the purpose of this investigation to apportion blame or liability.** In particular, Article 17-3 of Regulation (EU) 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility.
Investigation authority	The Air Accident Investigation Unit of Belgium (AAIU for the rest of this publication). It is the Belgian permanent national civil aviation safety investigation authority as defined in Article 4 of Regulation (EU) No 996/2010 and established in accordance with the Royal Decree of 26 December 2022. This unit is part of the Federal Public Service Mobility and Transport and is functionally independent from the Belgian Civil Aviation Authority and other interested parties.
This investigation	
Investigation initiation	AAIU was notified of the occurrence by Skeyes ACC the same day at 18:40 UTC. The investigator on duty did not deploy but took contact with the pilot and the organizer of the event in the days that followed.
Scope	**Limited** For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.
Other parties involved	None
	AAIU would like to thank the mentioned parties above and all other entities and individuals that have contributed to this safety investigation.

Ballooning Bulletin issued by Skeyes on 08 September 2019 at 14:30 UTC

FABX58 EBBR 081414
ISSUED: 08/09/19 AT 14:30 UTC
PLEASE REFER TO THE GENERAL FORECAST ISSUED ON 08/09/19 AT 0530 UTC

PERIOD: 2 HOURS BEFORE AND 1 HOUR AFTER SUNSET

NEXT SUNRISE AT EBBR: 090507 UTC
NEXT SUNSET AT EBBR: 081812 UTC

1. WINDS:

SURFACE: 320-020 06-10KT MAX 14KT BECMG
300-350 03-07KT MAX 11KT E OF LINE CHIEVRES-GENT AND
280-350 06-09KT MAX 13KT W OF LINE CHIEVRES-GENT
TO TEMPO VRB 02-04KT IN POLDERS
250 FT: 330-010 05-10KT BUT 330-360 10-15KT W OF
LINE BRUSSELS-CHARLEROI BECMG
320-010 05-10KT EVERYWHERE
500 FT: 320-360 10-15KT BECMG 320-360 05-10KT
1000 FT: 320-010 10-15KT BECMG 330-360 10KT
1500 FT: 320-360 10-15KT
2000 FT: 330-010 10-15KT
3000 FT: 330-360 10-15KT

2. WEATHER:

PARTLY CLOUDY BY CU AND SC DURING DRY SPELLS TO VERY CLOUDY IN ISOLATED SHOWERS ORIGINATING FROM THE N-NNW THAT BECOME LESS FREQUENT DURING THE PERIOD. A LOCAL THUNDERY OUTBREAK IS HEREBY STILL NOT TOTALLY EXCLUDED IN THE E OF THE TERRITORY.

3. INVERSIONS: HEIGHT IN FEET [+ WIND SPEED ABOVE INVERSION]:

NIL

4. OUTLOOK FOR NEXT BALLOONING FORECAST PERIOD:

DRY IN GENERAL AND PARTLY CLOUDY TO CLOUDY BY SC AND CU.
SOME PATCHES OF MIST AND SHALLOW FOG ARE VERY PROBABLE TO HAVE FORMED OVER THE WHOLE COUNTRY.

RISK AS WELL FOR LOCAL FOG AND FRAGMENTS OF STRATUS, ESPECIALLY IN VALLEYS S OF SAMBRE AND MEUSE.
SURFACE INVERSION S OF SAMBRE AND MEUSE WITH 10-15KT ABOVE (AROUND 1000-1500FT).
WIND : 210-280 03-08KT MAX 13KT IN COASTAL AREA BECMG
200 04-07KT MAX 12KT ;
190-250 03-04KT MAX 07KT INLAND BECMG
190-230 02-05KT MAX 08KT ;
VRB TO 190-220 02-05KT MAX 08KT S OF SAMBRE + MEUSE
NEXT UPDATE OF BALLOONING BULLETIN: 02:30 UTC

****************** *********************** ******************