

# Safety Investigation Report

Ref. AAIU-2012-14  
Issue date: 01 September 2016  
Status: Final

## SYNOPSIS

<b>Classification:</b>	Incident
<b>Level of investigation:</b>	Standard
<b>Date and time:</b>	30 June 2012 – 20:45 UT
<b>Aircraft:</b>	Hot Air Balloon - Ultramagic N-300. The aircraft was registered in Belgium and held a Certificate of Airworthiness and a valid Airworthiness Review Certificate (ARC)
<b>Owner:</b>	Private
<b>Accident location:</b>	N 51° 01.862' E 005° 29.926' Corn field in Houthalen - Helchteren
<b>Type of flight:</b>	Aerial Works; First flight
<b>Phase:</b>	Landing
<b>Persons on board:</b>	One pilot, twelve passengers
<b>Injuries:</b>	Minor concussions

## Abstract

During a flight, a hot air balloon carrying 12 passengers experienced a sudden change in wind direction and speed. During the hard landing, the basket bounced and the occupants suffered minor concussions

## Occurrence type:

Abnormal runway contact/ hard landing (ARC)

## Cause

The incident was caused by an unexpected change in the wind direction caused by a meteorological phenomenon – a gust front – in the region of Antwerp that led to a hard landing of the hot air balloon due to a high ground speed

## FACTUAL INFORMATION

### History of the flight

The pilot and the ground crew prepared the balloon for the flight on a field located near the Schulesmeer in Lummen.

The pilot stated he contacted the meteorological services because the wind speed was increasing. The answer was that, indeed there was a slight increase, but only temporary. The pilot waited until the wind conditions were optimum, then decided to take-off at 19:57 UTC.

There were 12 passengers on board for a first flight. The passengers received a safety briefing before the flight. The intention of the pilot was to fly for 1.5 hours, maybe less, because of the late departure. The landing would occur before sun down (20:00 UTC)

After 30 minutes of flight, the pilot experienced abnormal wind gusts, and the balloon flight path started to deviate to the East.

The pilot decided an early landing, as a precaution.

The pilot looked for a suitable landing field. When flying (50 m elevation) over Kelchterhoef, they saw tents on the ground being violently shaken by the wind, and people shouting.

The pilot briefed the passengers for a hard landing, and told them to hold on tight to the ropes.

Upon landing, when reaching a corn field, the pilot operated the rapid deflation system; the basket landed heavily on the ground, and was dragged on the ground for a few meters by the deflating envelope. The basket came to a stop.

The wind rose rapidly, and the envelope was blown away. The balloon took off and travelled a further 100 to 150 meters at a height of 5 to 10 meters. When the basket touched ground for the second time, it was further dragged for 40 m.

The basket nearly capsized, and one passenger was ejected.

The pilot notified the emergency services, and the passengers were dispatched to the nearest hospital for observation. They mostly suffered concussions.

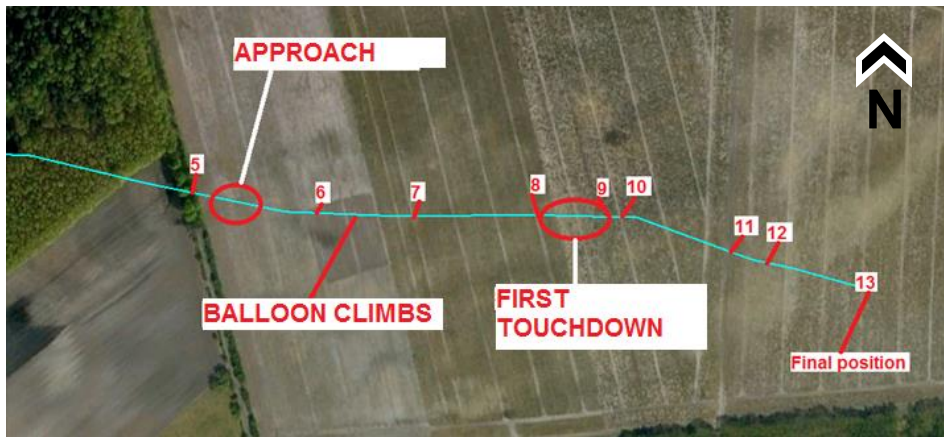
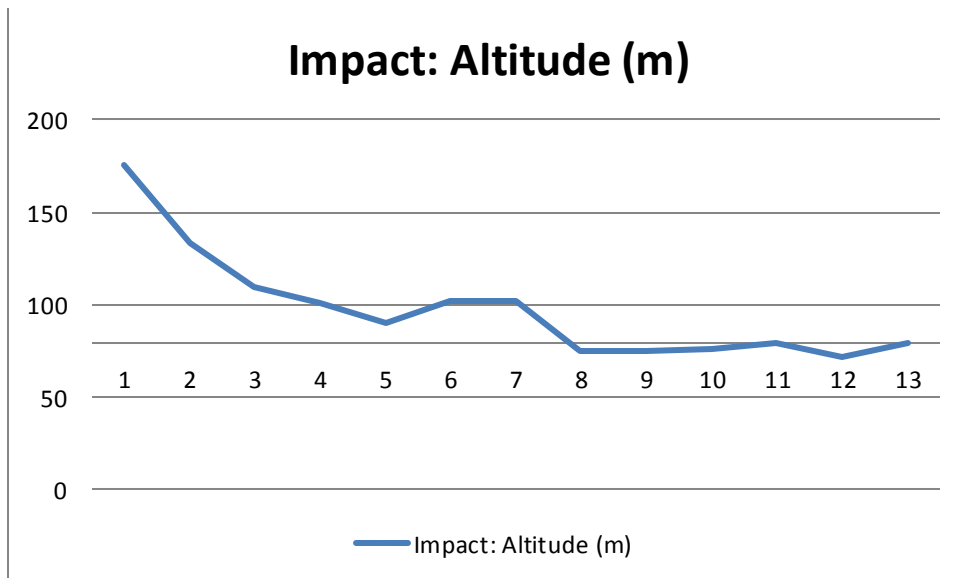


Figure 1: Last part of the flight path



Note: the item numbers on the graph correspond to the location on Figure 1

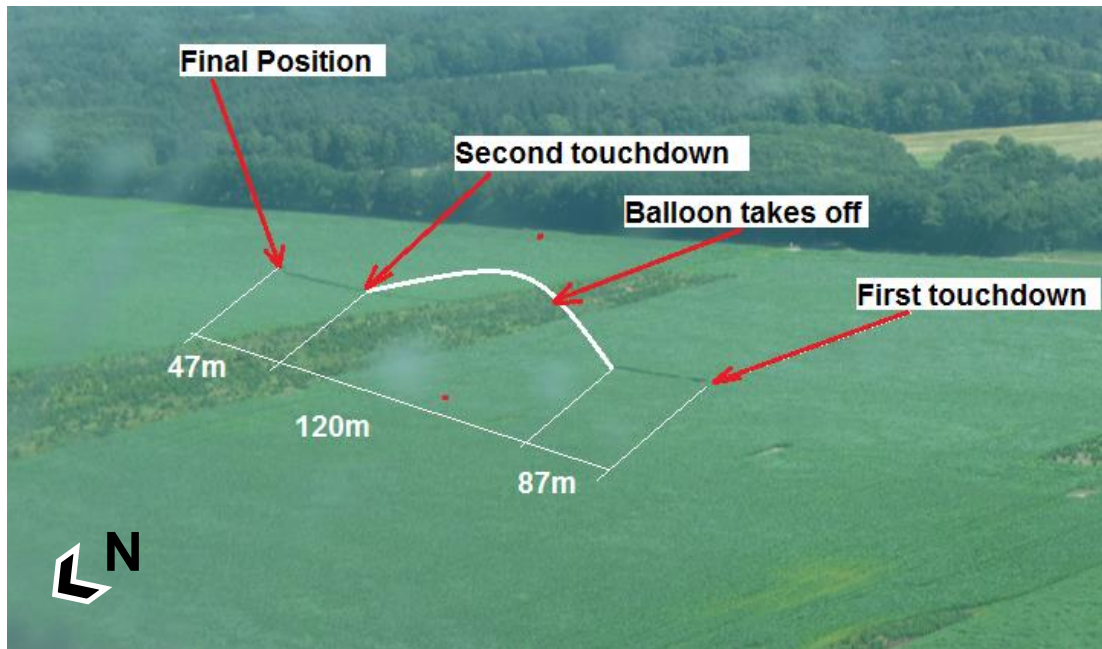


Figure 2: Landing path

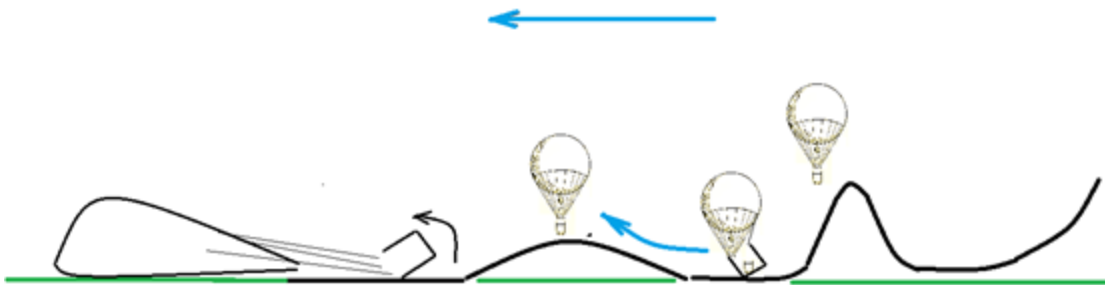


Figure 3: Sketch of the landing

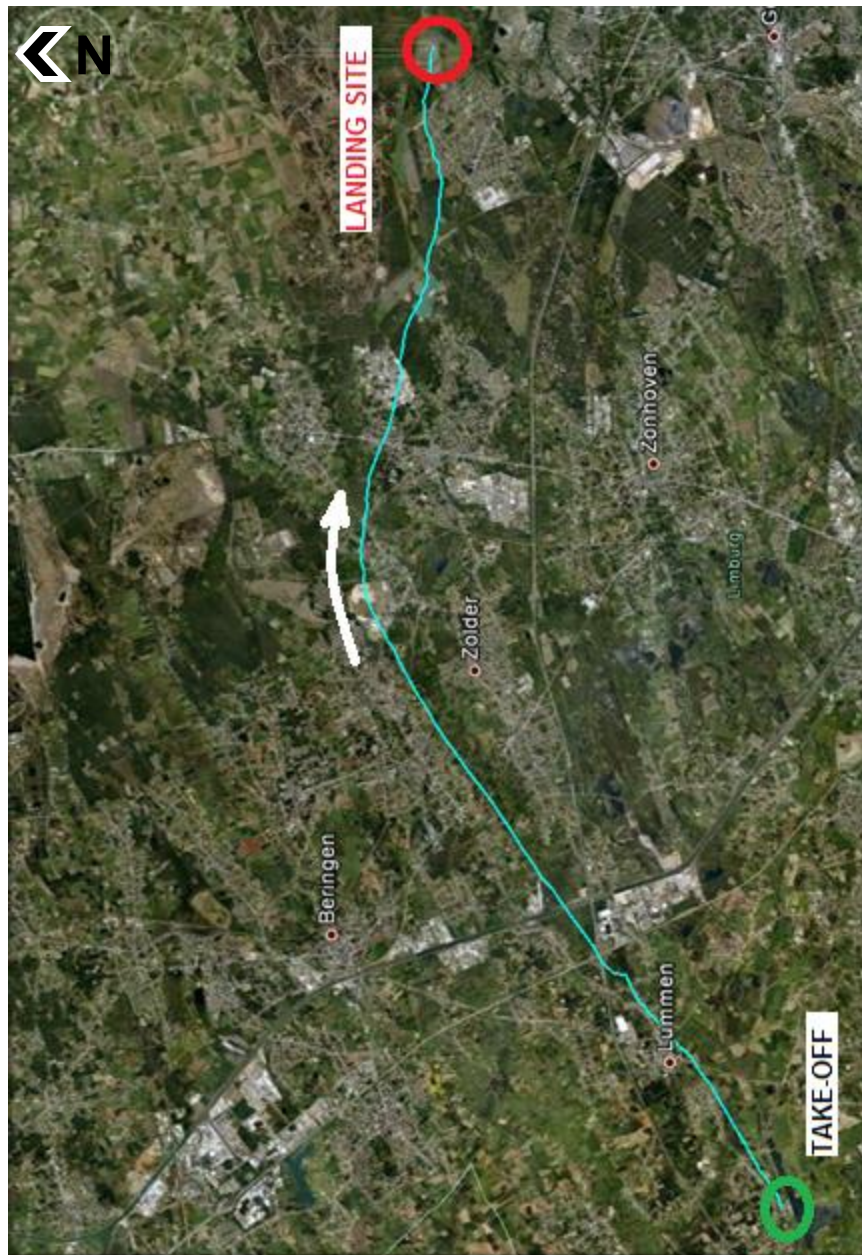


Figure 4: Flight path

### Injuries to persons

Injuries	Crew	Passenger	Others	Total
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	1	12	0	13
None	0	0	0	0
<b>Total</b>	<b>1</b>	<b>12</b>	<b>0</b>	<b>13</b>

## Damage

Impact damage to the basket and envelope.



Figure 5: Basket after impact

## Other damage

Minor damage to the corn field

## Pilot information

Age: 58 years old

Holder of a Free Balloon Pilot Licence, first issued on 20/06/1995, valid until 21/10/2012.

Rating: authorized for commercial flights.

Medical certificate Class 4, issued on 19/09/2011, valid until 21/10/2012

Experience:

The pilot accumulated a flight experience of 1140 flights, and flew 50 FH per year on average.

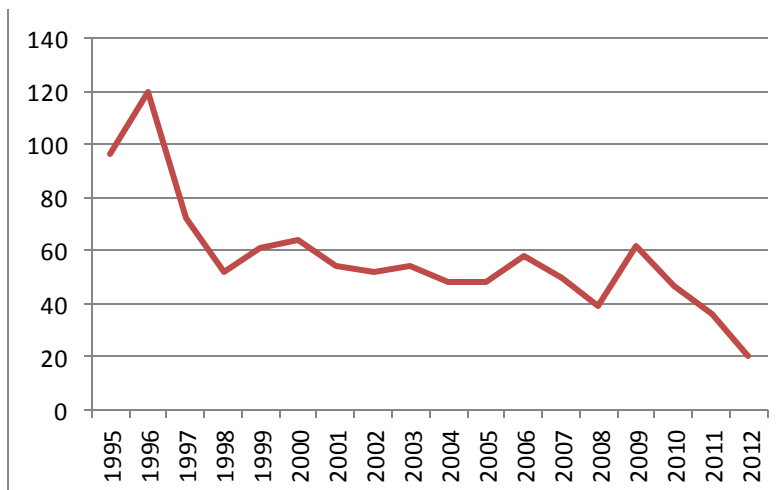


Figure 6: Pilot experience

## Aircraft information

The aircraft is a Ultramagic N-300 Hot Air Balloon, equipped with a C9 basket and a double burner.

The balloon envelope has a volume of 8500 m<sup>3</sup> and can carry up to 23 persons when equipped with a C-12 basket.

**Envelope:** Ultramagic N-300 Hot Air Balloon, msn 300/35  
**Burner:** Ultramagic BMK-050, double, s/n 047/057 (valve block)  
**Basket:** Ultramagic C9, s/n C9/31  
 Aircraft Total time: 84 flights.

## Technical data

Model	Basket	Pv	Lmax
N 300 Vol=85.0	C-9	522	2680

Pv= empty weight (without any cylinder)

Lmax= Maximum Lift (kg) authorized

## Basket

TYPE	INTERNAL MESURES(m)	WEIGHT(kg)	MOST SUITABLE ENVELOPES	NUMBER OF COMPARTEMENTS	PAX ALLOWED
C-9	3,00x1,60	250	250 / 300	5	2+12

## Flight Manual

### 2.2. Meteorological Limitations

The surface wind speed must not exceed 7.5 m/s (27 km/h or 15 kts).

There should be no, or only weak thermal activity.

There should be no sign of storms, either active or building.

## Meteorological information

METAR EBLG - 1950Z  
Wind : 250 degrees - 08KT  
CAVOK  
Temperature : 19°C – dew point :11°C  
QNH: 1012 hPa  
NOSIG=

METAR EBLG 2020Z  
Wind: 280 degrees - 07KT  
CAVOK  
Temperature: 17°C – dew point:13°C  
QNH: 1013 hPa  
NOSIG=

## General forecast

FABX56 EBBR 300230  
GENERAL FORECAST  
ISSUED: 30/06/12 AT 0345 UTC

VALID FOR PERIOD: 30/06/12 - 0600 UTC TO 30/06/12 - 1800 UTC

SUNRISE: 300333 UTC  
SUNSET: 301959 UTC

### 1. SYNOPTIC SITUATION

OUR COUNTRY IS SITUATED ON THE SOUTHEASTERN FLANK OF A LOW PRESSURE, CENTERED OVER THE BRITISH ISLES ( EXTENDING TOWARDS SCANDINAVIA). POTENTIAL UNSTABLE AIR FROM SOUTH-SOUTHWEST IS COVERING FRANCE AND BELGIUM. MEANWHILE THE WAVING COLD FRONT,RELATED TO THE BEFORE MENTIONED LOW IS STILL TRAILING OVER WESTERN GERMANY TO NE-FRANCE,AFFECTING THE EXTREME SE OF BELGIUM (GAUME AND LUXEMBOURG.)DURING THE DAY. IN LATER FORENOON AN OCCLUSION,CAUGHT IN THE SSW'LY AIRFLOW, WILL ARRIVE FROM FRANCE, AFFECTING THE COAST AND WEST-BELGIUM.

### 2. WEATHER

PARTLY CLOUDY AT FIRST.  
AT COAST AND IN W-BELGIUM IN LATE FORENOON AND EARLY AFTERNOON MORE CLOUDY IN TROUGH AND TEMPO SOME RAIN SHOWERS. DURING THE DAY ALSO OCCASIONAL (MOSTLY LIGHT) SHOWERS INLAND. OVER SE-BELGIUM IN TRAILING FRONT OVER LUXEMBOURG,CLOUDY TO OVERCAST BY CUSC AND AC AND RISK FOR SOME FEEBLE RAIN OR SHOWERY RAIN.



### 3. WINDS

SURFACE : SSW GRADUALLY VEERING WSW 07-12KT

AT 1000FT / 300M : 210 DEG 15KT IN SE 15-18Z 190 DEG 05KT  
 AT 2000FT / 600M : 230 DEG 15-20KT IN SE 15-18Z 190 DEG 05-10KT  
 AT 3000FT / 1000M : 220 DEG 15-20KT  
 AT 4000FT / 1300M : 220 DEG 20-25KT  
 AT 5000FT / 1600M : 220 DEG 20-25KT  
 AT 6000FT / 2000M : 220 DEG 25-30KT  
 AT 10000FT / 3000M : 230 DEG 25-30KT

### 4. VISIBILITY

10KM+,  
 LOCALLY IN SOME SHOWERS (ESP AT COAST AND IN W-BELGIUM) 05-08KM.

### 5. CLOUDINESS

CUMULIFORM CLOUDS:IN BREAKS SCT CU AND LOCALLY IN A SHOWER TCU.

	INITIAL			MAX (IN SE)
BASE (FT)	XXXX	2000	3000	2500
TOPS (FT)	XXXX	6000	10000	13000 TO 18000
QUANTITY	XXXX	SCT	SCT	SCT TCU /CB
SURF TEMP (C)	XXXX	+18	+21	+23

OTHER CLOUDS:IN EARLY FORENOON SCT CUSC 050-070,LATER SCT CU 035/070.

IN OCCLUSION, IN WEST SCT TO BKN CUSC +TCU+ 025/140 ON TOP SCT TO BKN C1240/300 (RISK ISOL EMBD CB 015/180).

IN SE-BELGIUM IN AFTERNOON TEMPO BKN CUSC TCU+AC 030/130.  
 (SMALL RISK ISOL EMBD CB 020/150)

IN EVENING AGAIN FEW TO SCT CUSC 040-070 AND SCT AC100-120.

### 6. ISOTHERM

0'C: 9000 IN W TO 11000FT IN SE-BELGIUM.  
 -10'C: 17000FT( IN AFTERNOON FROM W 15000FT.

### 7. TEMPERATURE

MAX 20-24C

### 8. MINIMUM QNH: 1009 HPA

### 9. WARNING

FOR EMBD TCU OR EVEN ISOL EMBD CB IN EXTREME SE  
 FOR EMBD TCU IN OCCLUSION IN W (SMALL RISK FOR ISOL (EMBD) CB.

10. SOARING CAPABILITIES

FAIR IN BREAKS.

LATER IN WEST POOR (MORE CLOUDY AND RISK SHRA).

SOUTH OVER ARDENNES (GAUMES/LUXEMBOURG) ALSO DIFFICULT BY INSTABILITY AND CLOUDY SKIES (LATER RISK FOR SHRA).

11. OUTLOOK NEXT 24HRS

LOW PRESSURE OVER UK MOVING EAST TO THE NORTH SEA. BELGIUM WILL BE AFFECTED BY A COOLER W'LY MARITIME AIRFLOW, RETURNING AROUND THE FORE MENTIONED LOW. THE INSTABILITY WILL BE LIMITED BY A WEAK (FLAT) RIDGE OVER FRANCE, TOUCHING SSW BELGIUM. STRENGTHENING (GUSTY) SFC WIND 250-260 12-15 G 25KT AT COAST EVEN 18KT G 28-30KT

MAX T. ON SUNDAY: 16-19C.

**Ballooning bulletin:**

FABX58 EBBR 301433

ANNEX: BALLOONING BULLETIN

ISSUED: 30/06/12 AT 14:30 UTC

PLEASE REFER TO THE GENERAL FORECAST ISSUED ON 30/06/12 AT 0530 UTC

PERIOD: 2 HOURS BEFORE AND 1 HOUR AFTER SUNSET

1. WINDS

SURFACE: 240 06-09KT, IN VICINITY OF SHOWERS & TCU GUSTY UP TO 15KT

BECMG AROUND SS 270 03-07KT (STILL GUSTY NEAR SHOWERS)

COAST: 240 10-12KT

SE: 220 04-07KT BECMG VRB 02-05KT

250 FT: 260 05-10KT

500 FT: 260 05-10KT

1000 FT: 250 05-10KT

1500 FT: 250 05-10KT

2000 FT: 240 10-15KT

3000 FT: 240 15KT

2. WEATHER

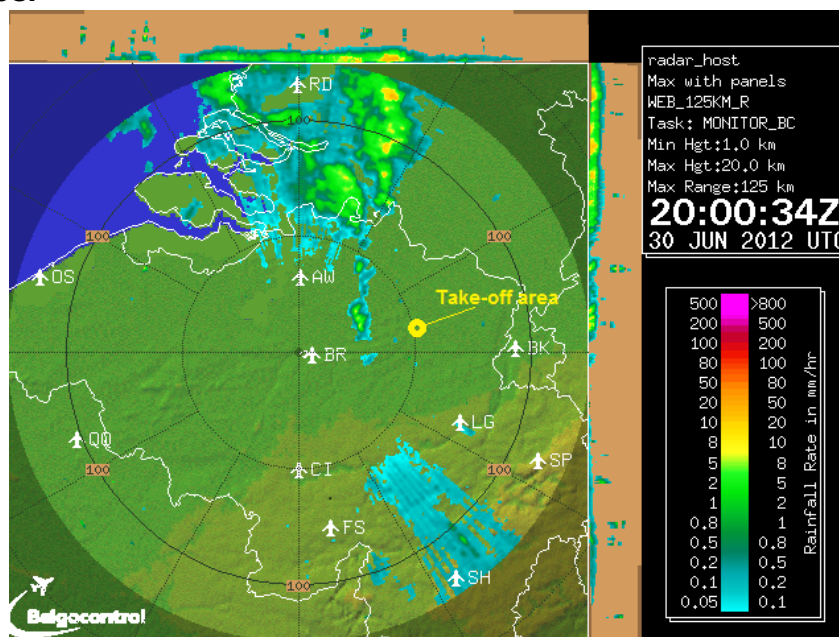
PARTLY CLOUDY, OVER WEST AND CENTER A FEEBLE SHOWER OF RAIN IS POSSIBLE.

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

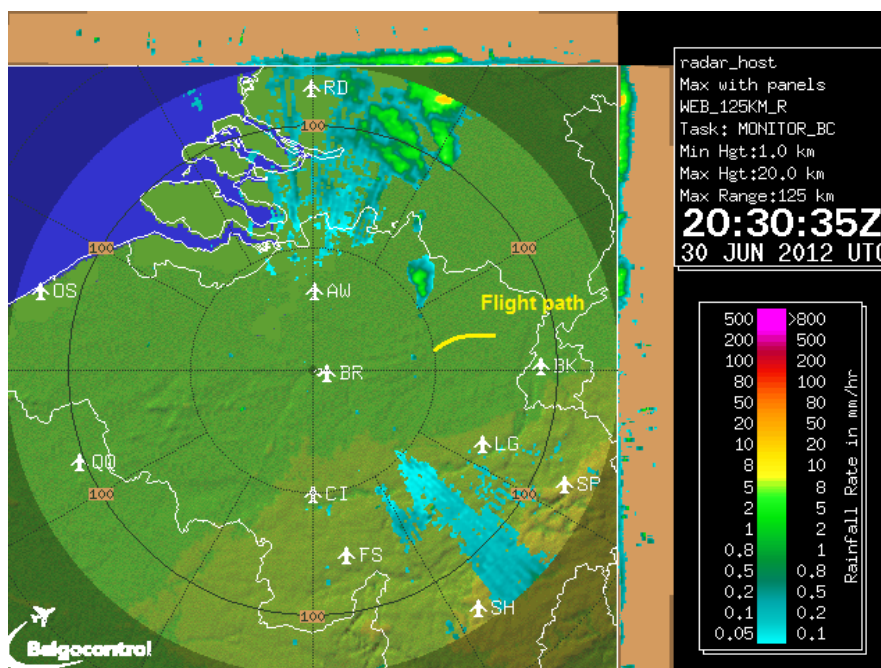
AFTER SUNSET UP TO 500 FT (10KT ABOVE)

4. OUTLOOK FOR NEXT BALLOONING FORECAST PERIOD  
 PARTLY CLOUDY, AFTER SUNRISE FIRST FEEBLE SHOWERS  
 CAN DEVELOP IN  
 SOUTH.  
 WIND: 230 03-06KT BECMG IN W 230 10-12KT (AT COAST 230 15-  
 18KT)  
 NEXT UPDATE OF BALLOONING BULLETIN: 02:30 UTC =

**Radar images:**



**Figure 7: WX Radar - situation at take-off**



**Figure 8: WX Radar - situation at the flight path deviation**

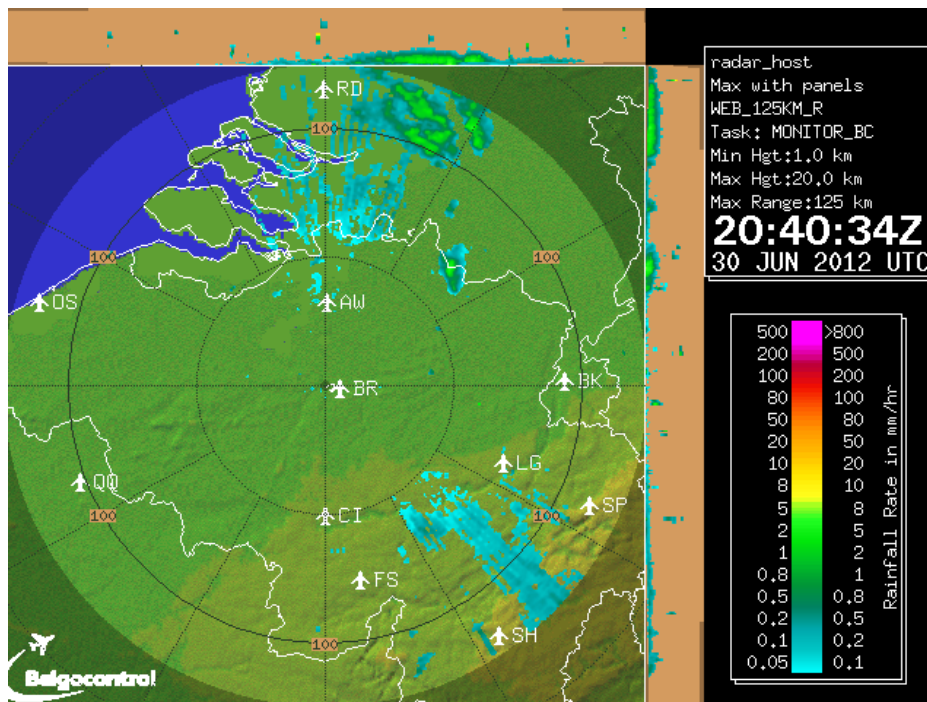


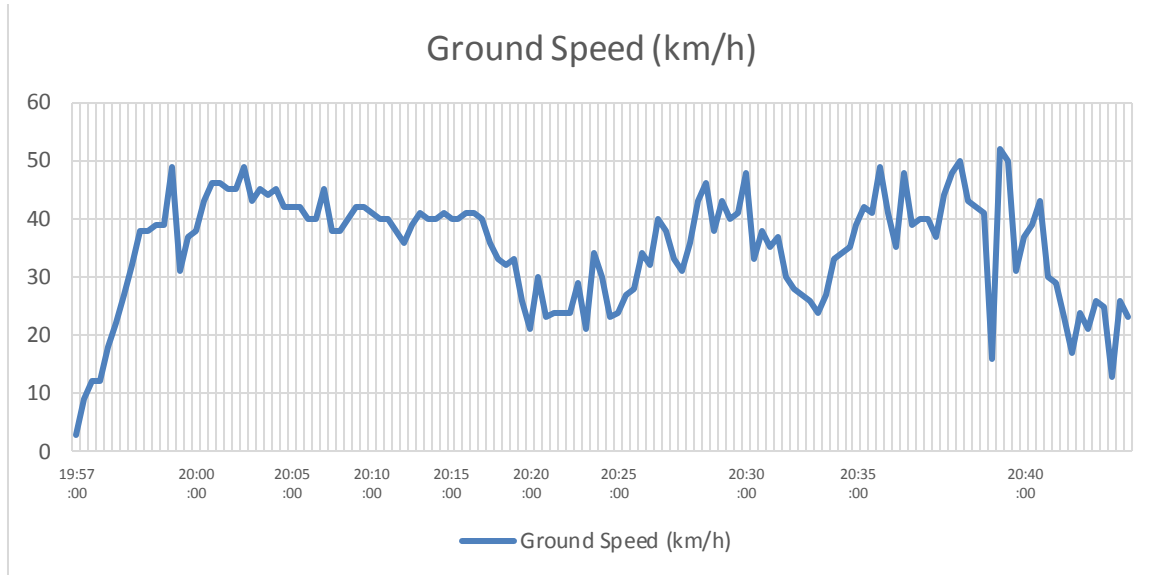
Figure 9: Situation at landing

Meteorological observations made in EBBL(15 km to the North) and EBDT (30km to the West).

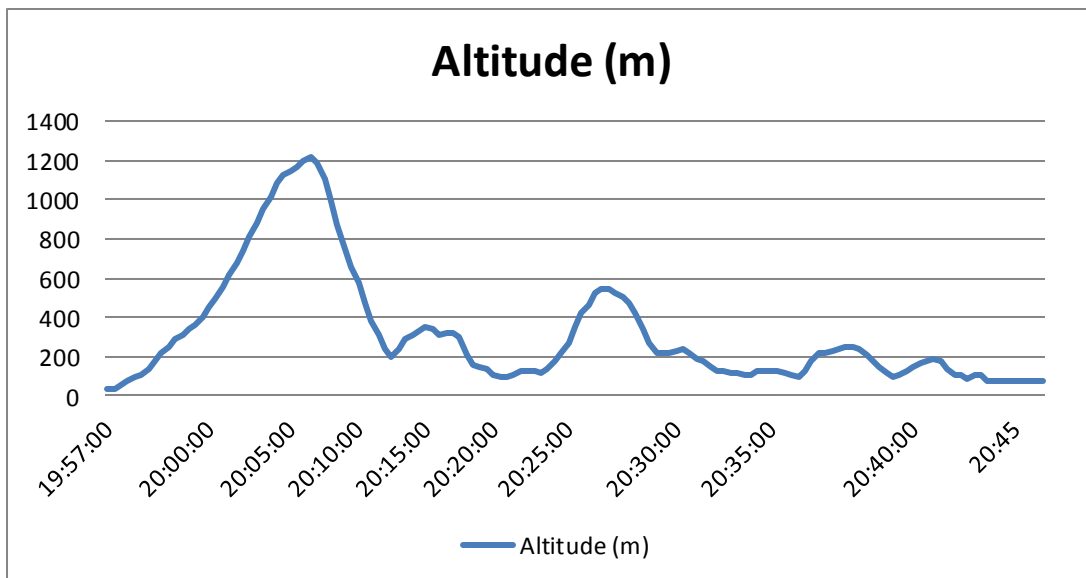
		Kleine-Brogel (manned) 06479				Schaffen (AUTO) 06465			
date	Hour (UTC)	Wind direction in °	Wind speed in Kts	Gusts in kts		Wind direction in °	Wind speed in Kts	Gusts in kts	
				gusts	During past ... Hrs			gusts	During past ... Hrs
30/06/12	18.00	230	10	19	6	220	10	19	6
	19.00	230	10	14	1	220	6	14	1
	20.00	270	12	21	1	280	6	19	1
	21.00	VRB	4	21	3	VRB	4	19	3

## Flight Recorder

The balloon is not equipped with a flight recorder, nor is it required. However, the balloon was equipped with a Garmin GPSmap 496, with memory recording capability. The flight track record was downloaded by AAIU.



Average ground speed for the flight is 33 km/h, with peaks above 50 km/h.



## ANALYSIS

### Meteorological conditions

The meteorological situation for the day in question was that the chance for local rain showers was higher in the western part of the country (west of the line Antwerp – Brussels – Charleroi) than in the east.

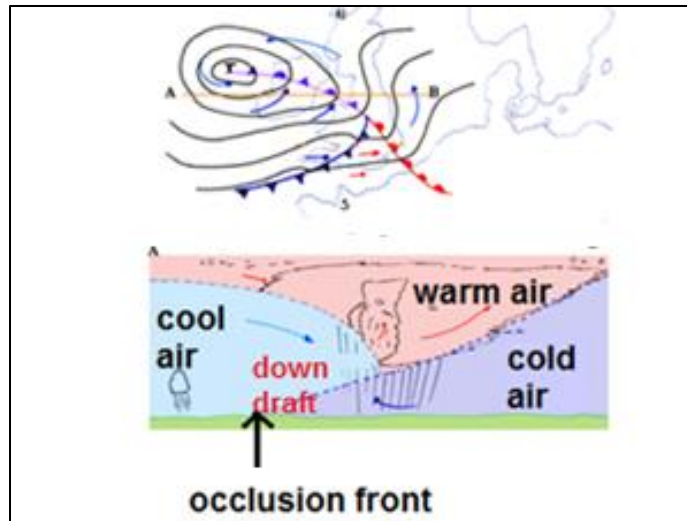


Figure 10

During the whole day, the remains of an occlusion front moved over the western part of the country. This brought along humid and warmer air causing moderate local showers of rain over East-, West Flanders and the western part of Antwerp province. The rain activity was more geographically spread than anticipated.

The turbulent winds experienced during the flight were due to an outflow boundary, also known as “gust front”.

Downdrafts, caused by falling rain, occur in occlusion fronts, such as in Towering Cumulus (TCu) and Cumulonimbus (Cb). When the downdraft wind actually reaches the ground surface, it spreads out and moves away.

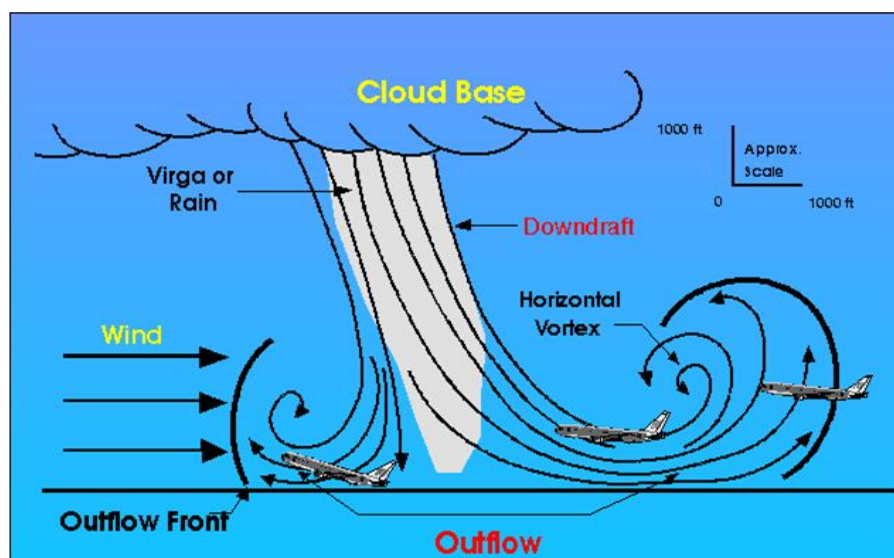


Figure 11: Movement of air in TCu / Cb

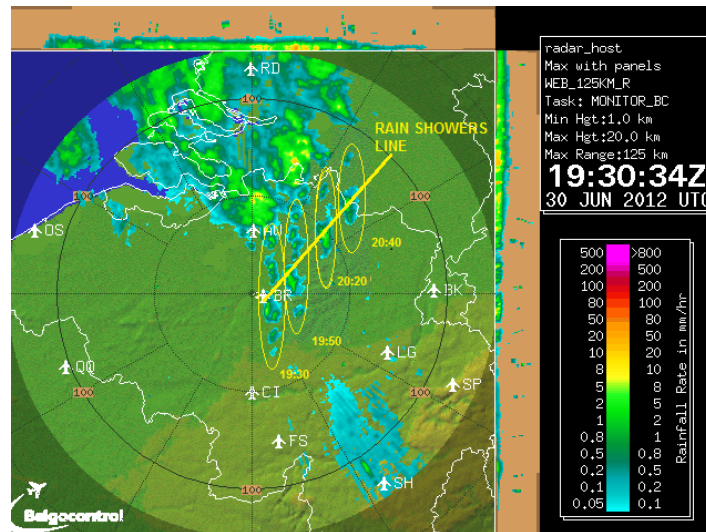


Figure 12: rain showers line

The radar imagery shows a line of rain showers moving East of Antwerp. This phenomenon caused the turbulent wind and departure from the intended flight path of the balloon.

The meteorological services confirm that such phenomenon is very difficult to predict. It occurs as soon as rain starts falling. Its effect will increase in with the intensity of rain; it will create strong wind gusts that can be felt up to 40 to 50 km from the place it originates.

### The landing.

The first touchdown occurred at ground speed of 26 km/h, as measured by the on-board GPS

The meteorological station of the Kleine-Brogel AF Base located 15 km to the North measured an average surface wind speed of 12 kts (22 km/h) and wind gusts of 21 kts (39 km/h).

These speeds explain why the impact of the basket with the ground was hard and why it was dragged on the ground.

### Survival aspects.

The impact with the ground was hard.

The pilot had ensured that all passengers did receive a pre-flight briefing and assumed the correct position before the first impact. The pilot itself used a safety belt.

In spite of these precautions, one passenger was ejected from the basket, but only after the second impact.

This would demonstrate the effectiveness of the pilot's safety belt and the pre-flight briefing in a 'hard landing' situation.

## CONCLUSIONS

### Cause

The incident was caused by an unexpected change in the wind direction caused by a meteorological phenomenon – a gust front – in the region of Antwerp that led to a hard landing of the hot air balloon due to a high ground speed.

## SAFETY ACTIONS AND RECOMMENDATIONS

None

### About this report

*As per Annex 13 and EU regulation EU 996/2010, each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident and serious incident. For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report.*

*It is not the purpose of the Air Accident Investigation Unit to apportion blame or liability. The sole objective of the investigation and the reports produced is the determination of the causes, and, where appropriate define recommendations in order to prevent future accidents and incidents.*