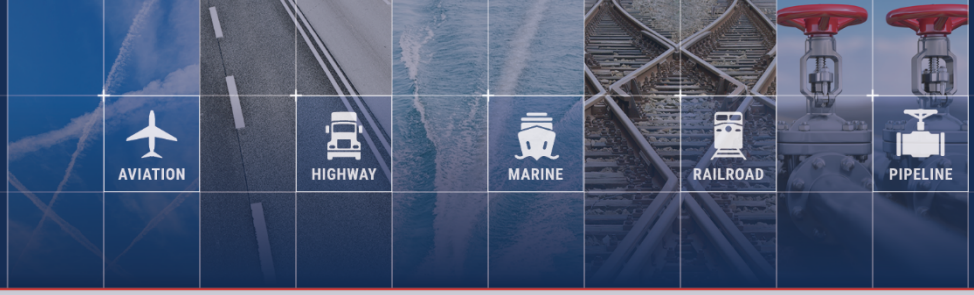

Aviation Investigation Factual Report

Location:	Golden, Colorado	**Accident Number:**	CEN13LA356
Date & Time:	June 8, 2013, 08:30 Local	**Registration:**	N753ZF
Aircraft:	Ultramagic N-250	**Aircraft Damage:**	Minor
Defining Event:	Hard landing	**Injuries:**	1 Serious, 2 Minor, 8 None
Flight Conducted Under:	Part 91: General aviation - Other work use		

Factual Information

HISTORY OF FLIGHT

On June 8, 2013 about 0836 mountain daylight time, an Ultramagic S A, N-250 hot air balloon, N753ZF, impacted terrain during a high wind landing to an open area near Golden, Colorado. One passenger on board was seriously injured. Another passenger received minor injuries. The commercial rated pilot and 9 remaining passengers on board were not injured. The balloon was not damaged. The balloon was owned and operated by Adventure Balloon Sports, LLC, under the provisions of 14 CFR Part 91 as a business flight. Visual meteorological conditions prevailed at the time of the flight, which operated without a flight plan. The local flight originated from Gunbarrel, Colorado, about 0730.

The pilot said prior to the flight they had looked at the forecasted weather. There was a cold front to the north of them. He said he reviewed the weather information with the other pilots that were flying that day. At that time there was some wind, but it subsided around the time they were ready to fly. Everything looked good, but the pilot stated he did not want to be up in the air too long.

The pilot said they took off near the foothills. The plan was to drift eastward, but once they were up he noted that they were being pushed to the south. Then about 20 to 30 minutes into the flight the wind picked up. The wind was strong and was accompanied by up and down drafts. The pilot said they were moving fast and recalled seeing the balloon envelope collapsing on itself. The top of the envelope was not moving, but the bottom was making it concave, "sort of a question mark shape". The concave shape was causing heat and air to spill out. The pilot said he had to burn a lot to keep the balloon under control.

The pilot said he looked at the surface and saw the trees rustling. The wind speed was faster than he had expected. He said he watched another person who had been flying his balloon at the same time, land. He said he saw that balloon get dragged during the landing. After seeing that, the pilot decided he needed to get his balloon on the ground immediately. He noted there were large power lines south of where he was and he was headed that way. He needed to be on the ground before reaching them. He said he did not have time to worry about noise-sensitive areas or where his chase crew was. His concern at that time was safety. The pilot said he wanted to land in the biggest place he could find. That happened to be the Rocky Flats National Wildlife Refuge near Golden. He made his approach and landed about 0836. When he touched down, the basket tipped over and they were immediately dragged. The pilot pulled in the vent line to spill the air from the envelope. He said he had half of the air out and they were still moving fast across the ground. By the time the balloon came to a stop, he figured they had covered about 200 yards. The pilot said he checked his passengers before getting them out of the basket. One woman had a broken ankle. Another woman received a bloody nose. The pilot said he sustained some scrapes. The remaining passengers were okay.

PERSONNEL INFORMATION

The 27 year old pilot held a commercial certificate for single engine and multi-engine land, instrument airplanes, and lighter than air (LTA) balloon with airborne heater. The pilot also held a flight instructor certificate for single engine land airplane. The pilot reported having 750 total flying hours, 300 hours of which was in balloons. The pilot reported having completed a flight review on August 1, 2011. The pilot also held a first class medical certificate with no restrictions dated May 17, 2012.

AIRCRAFT INFORMATION

The aircraft, serial number 250/75, was an Ultramagic N-250 LTA balloon with airborne heater. The system was comprised of a 250,000 cubic feet of air, envelope, a partitioned basket capable of carrying 13 persons, and a propane-powered airborne heater which provides heat to the air in the envelope creating lift. The basket was partitioned into three sections, a center section for the pilot, propane tanks and the heater, and two passenger sections on each side of the pilot. The balloon had 130 total hours and had undergone an annual inspection in May 2013.

METERROLOGICAL INFORMATION

The National Weather Service (NWS) Surface Analysis Chart at 0600 MDT depicted a low pressure system over North Dakota with an associated occluded front al system extending from the low south-southeast to another low pressure system over South Dakota where the triple point of the front was located. There it split into a warn front to the southeast and a cold front to the southwest across Nebraska and northern Colorado, and then west-northwest back into Wyoming. Two high pressure systems were located over western Colorado and two low pressure systems were located over eastern Colorado with a trough of low pressure extending between the lows into New Mexico. The resultant pressure systems created a light westerly wind component over the region with wind speeds of 10 knots or less, with the cold front oriented in an east-to-west direction over northern Colorado south of the cold front.

The station model for Denver International Airport depicted a wind from the west-southwest at approximately 10 knots. The station model for Cheyenne, Wyoming, 78 miles north of Denver depicted a northerly wind sustained at approximately 25 knots. Several stations over Wyoming and Nebraska behind the cold front depicted northerly winds at 15 to 20 knots.

At 0900, the low pressure system over South Dakota became the primary system with the cold front extending south-southwestward across Nebraska and into central Colorado. The station model for Denver depicted a wind from the north at 15 knots. Several other stations in northeast Colorado depicted northerly winds sustained at 15 to 35 knots, with stations south of the front reporting westerly winds at 10 knots or less.

At 0655, the routine aviation weather report (METAR) for the Erie Airport (KEIK), 11 miles northeast of the accident site, was wind 300 degrees at 4 knots, clear skies, visibility 10 miles, temperature 68 degrees Fahrenheit (F), dew point 43 degrees F, and altimeter 29.81 inches.

At 0755, KEIK METAR reported wind 030 degrees at 16 knots, gusts to 24 knots, clear skies, visibility 10 miles, temperature 65 degrees F, dew point, 47 degrees F, and altimeter 29.89 inches.

The first weather observation for the area that indicated a frontal passage was at Cheyenne Regional Airport, Wyoming. At 0453, automated wind was reported as 270 degrees at 9 knots. At 0549 the automated wind was from 350 degrees at 23 knots gusting to 38 knots.

Wind conditions at Fort Collins-Loveland Municipal Airport, 38 miles north of Denver, at 0635 were calm. At 0655 when the front passed through, the wind was 020 degrees at 13 knots gusting to 25 knots. By 0815, the wind was gusting to 35 knots.

The front moved through Denver International Airport at 0744, when a squall or sudden increase in wind speed was reported from 020 degrees at 24 knots gusting to 34 knots. Wind gusts would continue for the next few hours with gusts of 36 knots reported at 0753 and gusts of 24 knots at 0853.

The front continues to south reaching Front Range Airport, 19 miles east of Denver, at 0755 and Centennial Airport, 15 miles southeast of Denver, at 0834 and producing gusts to 30 and 35 knots respectively.

The Denver upper air sounding or rawinsonde observation at 0800 depicted a surface-based temperature inversion due to radiational cooling from the surface to approximately 500 feet agl with light winds below and winds from the west immediately above the inversion through 10,000 feet and veering to the northwest with wind speeds increasing with height. A low-level wind maximum was identified at 7,000 feet from 270 degrees at 30 knots. A mean 18,000 feet wind was from 308 degrees at 31 knots, and the level of maximum wind at 35,000 feet was from 330 degrees at 80 knots. The sounding depicted a stable atmosphere with a Lifted Index of 5. The lifted condensation level wat identified at 5,055 feet agl with a convective condensation level at 12,226 feet agl. The equilibrium level or expected top of convective clouds was at 37,000 feet. The freezing level was identified at approximately 14,801 feet.

The sounding wind and temperature profile supported mountain wave conditions with waves at 12,000, 15,000, and 19,000 feet.

The NWS Terminal Aerodrome Forecast (TAF) was issued by the Denver/Boulder Weather Service Forecast Office located in Boulder, Colorado. The TAF for Denver International Airport during the period in which the accident took place were as follows:

Denver Terminal Area Forecast, July 8, 2013 at 1139 UTC (0539 MDT,) wind 210 degrees at 13 knots, visibility more than 6 statute miles, few clouds at 8,000 feet mean sea level (MSL), scattered clouds at 12,000 feet MSL

From 0800, wind 310 degrees at 11 knots, visibility more than 6 statute miles, few clouds at 8,000 feet MSL

From 1000, wind 020 degrees at 13 knots, gusts to 23 knots, visibility more than 6 statute miles, few clouds at 8,000 feet MSL

From 1700, wind 060 degrees at 13 knots, visibility more than 6 statute miles, few clouds at 8,000 feet MSL, broken ceiling at 15,000 feet MSL

From 2000, wind 140 degrees at 5 knots, visibility more than 6 statute miles, few clouds at 8,000 feet MSL

From 0000 on June 9, 2013, wind 200 degrees at 7 knots, visibility more than 6 statute miles, few clouds at 10,000 feet MSL

From 0700 on June 9, 2013, wind 270 degrees at 5 knots, visibility more than 6 statute miles, few clouds at 10,000 feet MSL

An amended TAF was issued for KDEN at 0652, with forecast wind 210 degrees at 13 knots, visibility more than 6 statute miles, few clouds at 8,000 feet MSL, scattered clouds at 12,000 feet MSL, and scattered clouds at 22,000 feet MSL

From 0830, wind 010 degrees at 18 knots, gusts to 30 knots, visibility more than 6 statute miles, scattered clouds at 8,000 feet MSL, scattered clouds at 12,000 feet MSL

From 1300, wind 020 degrees at 15 knots, gusts to 25 knots, visibility more than 6 statute miles, scattered clouds at 8,000 feet MSL, scattered clouds at 12,000 feet MSL

From 1600, wind 060 degrees at 13 knots, visibility more than 6 statute miles, scattered clouds at 8,000 feet MSL, and broken ceiling at 15,000 feet MSL

From 2000, wind 140 at 5 knots, visibility more than 6 statute miles, scattered clouds at 8,000 feet MSL

From 0000 on June 9, 2013, wind 200 degrees at 7 knots, visibility more than 6 statute miles, few clouds at 10,000 feet MSL

From 0700 on June 9, 2013, wind 270 degrees at 5 knots, visibility more than 6 statute miles, few clouds at 10,000 feet MSL

The TAF issued at 0539 expected VMC conditions to prevail with a wind from the southwest or 210 degrees at 13 knots shifting northwest or 310 degrees at 11 knots at 0800. After 1000 through 1700, the wind was expected from the north at 020 degrees at 13 knots with gusts to 23 knots.

The forecast was amended at 0652 with the primary change being the wind shift occurring at 0830 with the wind from the north or 010 degrees at 18 knots gusting to 30 knots, with gusts continuing through 1700.

According to NWS forecast directives, the decision to amend the TAF relies on the forecaster's assessment of existing conditions and expectations. If the conditions change earlier or later than forecast, but the TAF shows the expected trend and will soon recover, an amendment may not be needed. Small fluctuation in the observed conditions should not result in a minor adjustment to the TAF, unless an improving weather conditions occur sooner than forecast, then an amended TAF is necessary. The prevailing wind direction will be forecast for any speed greater than or equal to 7 knots. The TAF should be amended if the mean wind direction differs by 30 degrees or more with a mean wind speed greater than or equal to 12 knots, or the forecast/actual mean wind speed differ more than (or equal to) 10 knots and the mean wind is expected to be greater than or equal to 12 knots.

A review of the NWS forecast discussion issued 0430 indicated that the cold front was expected to drop across Colorado during the middle of the day and that the NWS aviation forecaster was expecting a wind shift to the west-northwest during the morning and then north to northeast with the passage of the front before 1200, with wind gusts possible in the 20 to 30 knot range for a couple of hours behind the front. No weather warnings or high wind advisories were in effect during the period.

The area forecast is a forecast of VFR clouds and weather conditions over an area the size of several states. The Salt Lake City regional forecast was issued at 0445 and was valid through 1700. The synoptic section discussed a moderately strong northwesterly jet stream over the region with a surface cold front moving eastward through the region. The forecast for the northern plains expected scattered high cirrus clouds with no obstructions to visibility. Northwesterly winds of 20 knots gusting to 30 knots were expected over Wyoming, but there was no mention of wind in the forecast for Colorado. NWS guidelines require a forecaster to include wind information whenever winds of 20 knots or more are expected.

During the period the NWS had no Severe Weather Forecast Alerts, Convective SIGMETs (Significant Meteorological Information), SIGMETs, or Center Weather Advisories for high winds over Colorado outside of thunderstorm activity. AIRMET (Airmen's Meteorological Information) TANGO was in effect for Montana, Wyoming, and Colorado, for moderate turbulence between flight levels 280 and

380, and an advisory for low-level turbulence over Wyoming. The Denver Center Weather Service Unit did not issue any Center Weather Advisories for high winds or squalls impacting the area.

TESTS AND RESEARCH

The pilot stated that he uses a number of different weather reporting and forecasting resources to plan for his flights. He said the day of the accident he called Lockheed Martin Flight Service and received a briefing from them. He said he also referenced an internet site, aviation weather.gov. He said that this was the site he learned to use when he was learning to fly balloons, and is the one he trusts. Another resource he said he references and so do a number of other balloon pilots is Blastvalve.com. He said that none of the resources he used on that day warned him or the other balloon pilots who were involved in high wind landings that day of the high winds they encountered.

According to information provided by one of the other pilots who flew that day, the only forecast issue of concern was over a possible weak cold front moving into the Denver area at approximately 0900 MDT.

According to the FAA-H-8083-11A, Balloon Flying Handbook the procedures for a high wind landing are to fly at the lowest safe altitude to a large field and check that the deflation line is clear and ready. Obstacles should be avoided and the pilot should ideally make an approach to the near end of the field. When committed to the landing, brief passengers again, turn off the fuel valves, drain fuel lines and turn off pilot lights. Depending on the landing speed and surface, open the deflation valve at the appropriate time to control ground travel. The passengers should be closely monitored to ensure they are properly positioned in the basket and holding on tightly. Deflate the envelope and monitor it until all the air is exhausted. Be alert for fire, check the passengers, and prepare for recovery. When faced with a high wind landing, the balloon pilot must remember that the distance covered during the balloon's reaction time is markedly increased … at a speed of 15 mph, the balloon covers a distance of 220 feet … A pilot who is not situationally aware and fails to recognize hazards and obstacles at an increased distance may be placed in a dangerous situation with rapidly dwindling options.

Pilot Information

Certificate:	Commercial; Flight instructor; Private	**Age:**	27
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Center
Other Aircraft Rating(s):	Balloon	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 1	**Last FAA Medical Exam:**	May 17, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 1, 2011
Flight Time:	750 hours (Total, all aircraft), 130 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Ultramagic	**Registration:**	N753ZF
Model/Series:	N-250	**Aircraft Category:**	Balloon
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	250/75
Landing Gear Type:	None	**Seats:**	1
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	
Airframe Total Time:		**Engine Manufacturer:**	
ELT:		**Engine Model/Series:**	
Registered Owner:	Adventure Balloon Sports, LLC	**Rated Power:**	
Operator:	Adventure Balloon Sports, LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KEIK	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	07:55 Local	**Direction from Accident Site:**	45°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	16 knots / 24 knots	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	30°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.88 inches Hg	**Temperature/Dew Point:**	18°C / 8°C
Precipitation and Obscuration:			
Departure Point:	Gunbarrel, CO	**Type of Flight Plan Filed:**	None
Destination:	Golden, CO	**Type of Clearance:**	None
Departure Time:	07:30 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Minor
Passenger Injuries:	1 Serious, 1 Minor, 8 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 Minor, 8 None	**Latitude, Longitude:**	39.887222,-105.218887

Administrative Information

Investigator In Charge (IIC):	Bowling, David
Additional Participating Persons:	Dale W Shuel; Federal Aviation Administration; Denver, CO
Report Date:	December 16, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87231