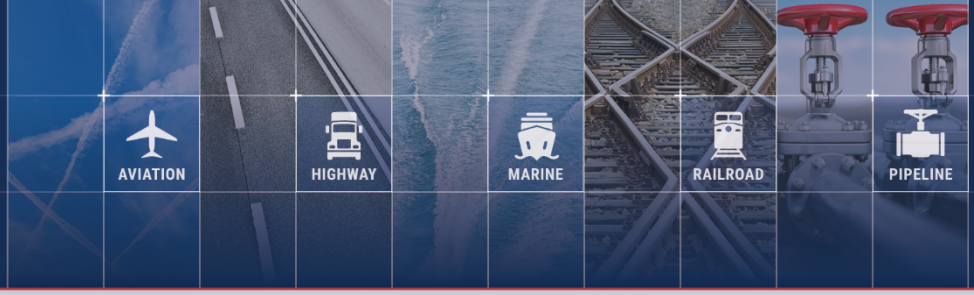

Aviation Investigation Factual Report

Location:	Arvada, Colorado	**Accident Number:**	CEN13LA347
Date & Time:	June 8, 2013, 08:15 Local	**Registration:**	N7059U
Aircraft:	AEROSTAR INTERNATIONAL INC RX 8	**Aircraft Damage:**	Substantial
Defining Event:	Collision during takeoff/land	**Injuries:**	1 Serious, 2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Factual Information

HISTORY OF FLIGHT

On June 8, 2013 at 0815 mountain daylight time, an Aerostar International Incorporated RX-8 hot air balloon, N7059U, impacted terrain and dragged across a road during a high wind landing near Arvada, Colorado. The airline transport rated pilot was seriously injured and the two passengers on board were not injured. The balloon sustained substantial damage to the envelope and basket. The balloon was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight, which operated without a flight plan. The flight originated from Gunbarrel, Colorado, about 0705.

The pilot stated that he and a number of other balloon pilots gathered at the launch site about 0530 to discuss weather information obtained from the internet and various other sources. The pilots agreed that the forecast weather provided suitable conditions for a safe flight that morning. The weather conditions at the time of their discussion, however, caused them to delay their launch. They were experiencing light and erratic winds at ground level and after putting up some pibals (small helium-filled balloon used to determine wind speed and direction), saw that the wind conditions would take them in an undesirable direction at an undesirable speed. The pilot said that these conditions were quite typical for flying in the area at the early hours of the day. The pilot said they continued monitoring the current and forecast weather using their wireless devices to monitor the internet sites. At 0615, the wind at the launch site calmed and additional pibals put up showed the wind at altitude would take the balloons to the east-southeast, and then south at about 3 to 5 miles per hour. The pilots decided that they would fly as long as there was no further increase in wind speed during the launch. The pilot said the passengers got into the balloon, he gave them a safety briefing, and they took off at 0705. At takeoff the wind was calm to about 3 miles per hour. They traveled to the east-southeast and then at about 1,000 to 1,200 feet agl made a turn toward the south. The pilot said that the first 30 to 40 minutes of flight were smooth and the balloon traveled slowly to the southeast. At about 0740, the pilot said he experienced a wind gust that buffeted the balloon. He was at an altitude of 6,200 feet msl. He said he reported the condition to the other pilots who were flying in the area, and received reports back that they were experiencing similar conditions at various altitudes. As he looked at the other balloons, the pilot noticed significant distortions in the envelopes (indicative of high winds). The pilot said he prepared his passengers for a high wind landing. He selected a landing site that he described as a construction area cleared of machinery and survey stakes. As he touched down, he pulled the deflation lines to deflate the balloon. The balloon deflated in seconds but the envelope concaved in a "spinnaker sail configuration" and dragged the balloon for several hundred feet until coming to rest on the side of a highway. He told the passengers to exit the basket and asked them if they had been injured. They told him they were okay. The pilot, however, sustained serious rib injuries. The balloon's envelope sustained torn fabric from contact with the ground and obstructions on the ground. The balloon basket was also heavily damaged during the impact and from being dragged.

PERSONNEL INFORMATION

The 69 year old pilot held an airline transport pilot certificate with ratings in single and multiengine instrument airplanes and in a free balloon. The pilot completed a flight review on September 19, 2012 and reported having 495 hours as pilot-in-command in the Aerostar RX-8. According to the FARs balloon pilots do not have to possess a medical certificate.

AIRCRAFT INFORMATION

The aircraft was a free balloon with airborne heater. It was being operated in the normal category. At the time of its last annual inspection on April 23, 2013, the balloon envelope had 495.2 total hours of flight time.

METERORLOGICAL 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), 13 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 and the other pilots who flew that day had obtained weather information from a number of internet sources to include Wunderground.com, NOAA's Central Region Headquarters website and the National Weather Service website for Colorado. 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.

ADDITIONAL INFORMATION

The pilot, in recommending how this accident could have been prevented, stated that a review of the weather information he received showed the forecast conditions for the period they had planned to fly was nearly perfect for a safe balloon flight. He said that a possible cause of the weather phenomenon they experienced was convective activity 150 to 200 miles to the east in Nebraska. The outflow from the storm system has been cited as having possibly affected the flight. The pilot stated that further study and discussion of outflow from storms could be valuable information to balloon flight safety.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	69
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):	Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	None None	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 19, 2012
Flight Time:	(Estimated) 495 hours (Total, all aircraft), 495 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	AEROSTAR INTERNATIONAL INC	**Registration:**	N7059U
Model/Series:	RX 8	**Aircraft Category:**	Balloon
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	RX8-3205
Landing Gear Type:		**Seats:**	1
Date/Type of Last Inspection:	April 23, 2013 Annual	**Certified Max Gross Wt.:**	1650 lbs
Time Since Last Inspection:		**Engines:**	0
Airframe Total Time:	495 Hrs as of last inspection	**Engine Manufacturer:**	
ELT:	Not installed	**Engine Model/Series:**	
Registered Owner:	PROVIDENCE DAVID C	**Rated Power:**	
Operator:	PROVIDENCE DAVID C	**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:**	13 Nautical Miles
Observation Time:	07:55 Local	**Direction from Accident Site:**	45°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	16 knots / 24 knots	**Turbulence Type Forecast/Actual:**	/
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:	Arvada, CO	**Type of Clearance:**	None
Departure Time:	07:05 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 None	**Latitude, Longitude:**	39.8675,-105.239723(est)

Administrative Information

Investigator In Charge (IIC):	Bowling, David
Additional Participating Persons:	Dale Shuel; Federal Aviation Administration; Denver, CO
Report Date:	December 17, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87184