



Aviation Investigation Final Report

Location:	Ruther Glen, Virginia	Accident Number:	ERA14FA231
Date & Time:	May 9, 2014, 19:40 Local	Registration:	N3016Z
Aircraft:	Eagle C-7	Aircraft Damage:	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	Injuries:	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Witnesses to the accident reported observing the balloon approaching the landing zone from the south where another balloon had just landed. A video obtained from one of the witnesses showed that, as the balloon descended and approached the landing site, the pilot engaged the burner; however, shortly after, the balloon struck power lines, which resulted in a spark. Subsequently, the basket and a section of the balloon's envelope caught fire. The balloon then began an accelerated climb and drifted out of the camera's view. The wreckage was found about 6 miles north of the power lines. Examination of the wreckage revealed no preexisting mechanical anomalies with the balloon.

Federal Aviation Administration guidance on balloon flying states that, if there is an obstacle between the balloon and the landing site, the pilot should either give the obstacle appropriate clearance and drop in from altitude; reject the landing and look for another landing site; or fly a low approach to the obstacle, fly over the obstacle allowing plenty of room, and then land. It is likely that the pilot identified the power lines late in the approach and ignited the burner to climb but that insufficient time remained to clear the power lines.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's inadequate approach and his failure to maintain clearance from power lines, which resulted in a subsequent fire.

Findings

Aircraft	Descent/approach/glide path - Not attained/maintained
Aircraft	Altitude - Not attained/maintained
Personnel issues	Monitoring environment - Pilot
Personnel issues	Identification/recognition - Pilot
Environmental issues	Wire - Awareness of condition

Factual Information

History of Flight

Approach	Controlled flight into terr/obj (CFIT) (Defining event)
Approach	Attempted remediation/recovery

HISTORY OF FLIGHT

On May 9, 2014, about 1940 eastern daylight time, an Eagle C-7 Balloon, N3016Z, was destroyed by fire after a landing attempt to a field and subsequent impact with powerlines near Ruther Glen, Virginia. The commercial pilot and two passengers were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the local sightseeing flight that departed from Meadow Event Park, Doswell, Virginia, approximately 4 miles to the south of the accident location. The local sightseeing flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

Multiple eyewitnesses reported that the accident balloon approached the intended landing area from the south where another balloon had just landed. As the accident balloon approached the landing site, the pilot engaged the burner; however, the balloon struck powerlines, which resulted in a spark. A video obtained from a witness indicated that as the pilot approached the intended landing area, he engaged the burner for about 15 seconds prior to impacting the powerlines. Subsequently, the balloon basket and a section of the envelope caught fire. The balloon then began an accelerated climb and drifted out of the top view of the video recording.

PERSONNEL INFORMATION

The pilot, age 65, held a commercial pilot certificate, with a rating for lighter-than-air free balloon, which included a limitation for hot air balloon with airborne heater. He did not hold, nor was he required to maintain, a Federal Aviation Administration (FAA) medical certificate. According to a souvenir card, being handed out at the balloon festival, the pilot had 31 years of experience and over 660 hours of flight time.

BALLOON INFORMATION

According to FAA and balloon maintenance records, it was equipped with two aluminum propane tanks, a wicker basket, and a 78,133 cubic foot envelope. In addition, it contained a small pod of instruments that consisted of a vertical speed indicator, altimeter, and envelope temperature gauge. The most recent annual inspection, on the balloon, was performed on August 5, 2013, and at that time it had accumulated 270.4 hours of total time in service.

The balloon was comprised of a basket, which was composed of wood, padding, woven wicker, rope handles for passengers to hold onto, and a fuel cylinder compartment which contained the two fuel cylinders. Attached to the top center of the basket were the single burner valve/can, coils, pilot light regulator, and pilot light valve. Fuel lines ran from each of the two fuel cylinder tanks, up opposite sides

of the basket, and attached to the burner can assembly. The balloon envelope was comprised of nomex and nylon panels. The envelope throat was to be attached to the top of the basket with cables.

METEOROLOGICAL INFORMATION

The 1854 recorded weather observations from Hanover County Municipal Airport (OFP), Ashland, Virginia, located approximately 12 miles to the south of the wire strike site, included wind from 180 degrees at 10 knots, visibility 10 miles, few clouds at 12,000 feet above ground level (agl), temperature 28 degrees C, dew point 14 degrees C, and an altimeter setting of 29.99 inches of mercury.

An FAA inspector that was at the launch site prior to the flight departing stated that a mandatory safety briefing by the event organizer reviewed the weather conditions with the pilot participants of the balloon festival including the accident pilot. In addition, he stated that "wind conditions were measured on site several times prior to launch to establish a trend. I recall winds were slowly decreasing, from initially about 12 knots to some as low as 6 knots at the surface. The winds aloft indicated that winds by 1000 feet were increasing in velocity and shifting the course to the right."

WRECKAGE AND IMPACT INFORMATION

The debris path was approximately 6 miles in length and was oriented on a northeast heading from the attempted landing field. The balloon impacted electrical powerlines that were about 30 feet agl near the attempted landing field. Several pieces of charred material were present in the vicinity of the powerline. Two aluminum propane fuel tanks, a hand-held fire extinguisher, the instrument pod, and various pieces of the charred envelope fabric, that were associated with the lower portion of the balloon envelope, were recovered along the debris path. Both propane fuel tanks were intact but exhibited thermal and impact damage and were devoid of fuel.

The balloon crown, crown ring, deflation port, and the burner were recovered on May 27, 2014, approximately 9 miles northeast of the takeoff location and about 5.9 miles north of the powerline strike location. An examination of the recovered components was performed on August 25, 2014, at a salvage facility located in Clayton, Delaware.

The balloon crown, crown ring, deflation port, basket bottom, and burner remained attached through several cables. The balloon envelope was torn in several sections. Several vertical and horizontal load tapes were torn. The skirt and throat of the balloon were torn and exhibited thermal damage. The crown line remained attached to the top of the envelope and the crown ring was found with all retained cords attached. Cord continuity of the crown, vent, and deflation line was established from the top of the envelope to the balloon basket. The bottom section of the deflation line exhibited thermal damage. The wood section of the basket was burned away, but the bottom section of the basket remained attached to the heating system of the balloon through stainless steel wires.

The single burner remained attached to the basket frame. The valve block assembly, burner can, coil assembly, liquid fire jet assembly, and igniter assembly all exhibited thermal discoloration. The fuel lines remained attached to the burner assembly but exhibited thermal damage. When the burner assembly handle was operated, it did not exhibit any anomalies. In addition, the burner assembly was able to move freely among the assembly frame as designed.

Further examination of the two recovered propane cylinder tanks revealed that the main valve on the center aluminum cylinder was damaged by fire and its position was not able to be determined. In addition, the fuel quantity gauge on each tank exhibited thermal damage and could not be read.

MEDICAL AND PATHOLOGICAL INFORMATION

The Office of the Chief Medical Examiner, Richmond, Virginia, conducted an autopsy on the pilot on May 12, 2014. The autopsy listed "blunt force trauma" as the cause of death.

Forensic toxicology was performed on specimens from the pilot by the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The toxicology report stated no ethanol was detected. However, both Fexofenidine and Valsartan were detected in the blood and liver.

According to the FAA Aerospace Medical Research, Forensic Toxicology Drug website, Fexofenadine, marketed under the trade name Allegra, was known as a nonsedating antihistamine used in the treatment of hay fever symptoms and the common cold.

According to the FAA Aerospace Medical Research, Forensic Toxicology Drug website, Valsartan, marketed under the trade name Diovan, was an angiotensin II receptor antagonist, commonly referred to as an Angiotensin Receptor Blocker or "ARB." It was typically used for the treatment of high blood pressure, congestive heart failure, and post-myocardial infarction.

TESTS AND RESEARCH

Handheld Global Positioning System

A Garmin 12 handheld global positioning system (GPS) was sent to the National Transportation Safety Board (NTSB) recorders laboratory for download in Washington, DC. The Garmin 12 handheld GPS system did not contain any pertinent information to the accident investigation.

A Garmin Rhino 530HCX handheld GPS was recovered and sent to the NTSB recorders laboratory for download in Washington, DC. The Garmin 530HCS GPS did not contain any pertinent information to the accident investigation.

Cellular Phones

Three cellular phones were sent to the NTSB recorders laboratory for download. The cellular phones held photographs prior to the accident, but did not contain any photographic documentation of the accident itself.

ADDITIONAL INFORMATION

Witness Photographs

Several photos were submitted by witnesses. In particular, a witness located in another balloon that landed at the intended landing zone of the accident balloon, photographed another balloon landing at the intended landing zone site. In the photograph, the other balloon is shown on the ground in the field and unmarked powerlines are noted above a road just prior to the intended landing field. In addition, the

photograph showed that the field that was the intended landing zone site had several trees just prior to it and located in front of the powerlines.

Powerline Information

According to the power company, after the accident, they dispatched a team of employees to examine the powerlines. Upon examination, they noted that there was no structural damage to the lines. One phase line had a burn mark on the side that was closest to the intended landing zone. According to the power company, the powerlines were three-phase lines that were 7,200 volts phase to ground.

Balloon Flight Manual

In the "Normal Flight Operations" section of the balloon flight manual, there was a note that stated, "Extreme care and judgment should be used in selection of landing sites in avoiding downwind powerlines."

In the "Performance" section of the balloon flight manual, it stated "during certification, the maximum demonstrated surface winds for landing were 7 knots." In addition, it stated that the "maximum demonstrated surface wind for take-off [was] 5 knots."

FAA-H-8083-11A Balloon Flying Handbook

In Chapter 3, "Preflight Planning," it stated "Almost all balloon flying is done in relatively benign weather conditions and mild winds. Most pilots prefer to launch and fly in winds less than 7 knots. While balloon flying is performed in higher winds, pilots accept that the faster the winds, the more they are exposed to risk and injury."

In Chapter 7, "Inflight Maneuvers," stated in part "One technique to determine if the balloon is ascending, flying level, or descending is to sight potential obstacles in the flight path of the balloon as the balloon approaches the wires, the pilot should determine how the wires (or other obstacles) are moving in his or her field of vision relative to the background. If they are moving up in the pilot's field of vision, or staying in stationary, then the balloon is on a descent that may place the pilot and passengers at risk. Conversely, if the wires are moving down in the pilot's field of vision, then the balloon is either in level flight or ascending, and able to clear the obstacle. Vigilance is required for constant scanning of the terrain along the flight path, and the pilot must be alert to avoid becoming fixated on sighting objects." In addition, it stated that "the balloon actually responds to a burn 6 to 15 seconds after the burner is used."

In Chapter 8, "Landing and Recovery," it stated, "Having the skill to predict the balloon's track during the landing approach, touching down on the intended landing target, and stopping the balloon basket in the preferred place can be very satisfying. It requires a sharp eye trained to spot the indicators of wind direction on the ground. Dropping bits of tissue, observing other balloons, smoke, steam, dust, and tree movement are all ways to predict the balloon track on its way to the landing site. During the approach, one of the pilot's most important observations is watching for power lines."

In addition, Chapter 8 reviews, "To summarize, if there is an obstacle between the balloon and the landing site, the following are the three safe choices.

1. Give the obstacle appropriate clearance and drop in from altitude.

2. Reject the landing and look for another landing site.
3. Fly a low approach to the obstacle, fly over the obstacle allowing plenty of room, and then make the landing."

Lastly, Chapter 8 addressed a "high-wind landing," which stated "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. This situation is somewhat analogous to the driver's training maxim of "do not overdrive your headlights." For example, a balloon traveling at 5 mph covers a distance of approximately 73 feet in the 10 seconds it takes for the balloon to respond to a burner input—a distance equal to a semi-truck and trailer on the road. However, at a speed of 15 mph, the balloon covers a distance of 220 feet, or a little more than two-thirds of a football field. 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	Age:	65
Airplane Rating(s):	None	Seat Occupied:	None
Other Aircraft Rating(s):	Balloon	Restraint Used:	None
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	None	Last FAA Medical Exam:	
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 660 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eagle	Registration:	N3016Z
Model/Series:	C-7	Aircraft Category:	Balloon
Year of Manufacture:	2000	Amateur Built:	
Airworthiness Certificate:	Balloon	Serial Number:	EE207203
Landing Gear Type:	None	Seats:	
Date/Type of Last Inspection:		Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	
Airframe Total Time:		Engine Manufacturer:	
ELT:	Not installed	Engine Model/Series:	
Registered Owner:	KIRK DANIEL T	Rated Power:	
Operator:	KIRK DANIEL T	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KOFP,205 ft msl	Distance from Accident Site:	12 Nautical Miles
Observation Time:	23:54 Local	Direction from Accident Site:	183°
Lowest Cloud Condition:	Few / 12000 ft AGL	Visibility	10 miles
Lowest Ceiling:	Broken	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	180°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.98 inches Hg	Temperature/Dew Point:	28°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Doswell, VA	Type of Flight Plan Filed:	None
Destination:	Doswell, VA	Type of Clearance:	None
Departure Time:	19:00 Local	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Fatal	Aircraft Fire:	In-flight
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 Fatal	Latitude, Longitude:	37.905834,-77.4225

Administrative Information

Investigator In Charge (IIC):	Moats, Heidi
Additional Participating Persons:	Michael Dows; FAA/FSDO; Richmond, VA
Original Publish Date:	May 6, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89188

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