Aviation Investigation Final Report

Location:	Clinton, Massachusetts	**Accident Number:**	ERA14LA347
Date & Time:	July 19, 2014, 20:00 Local	**Registration:**	N976TC
Aircraft:	COLT BALLOONS 160A	**Aircraft Damage:**	Minor
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	3 Serious, 4 None
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

The commercial pilot departed on the hot air balloon tour flight with 6 passengers. After about 1 hour of flight, the balloon approached a town; with about 20 minutes of fuel remaining and about 30 minutes until sunset, the pilot descended the balloon to locate a landing site. He subsequently selected the yard of a residence near an intersection. The pilot initiated a descent, intermittently activating the balloon's burners to maintain the descent path. As the balloon approached the landing site, the envelope contacted powerlines, resulting in an electrical discharge, a shower of sparks, and portions of the powerlines falling onto the ground and a parked vehicle. The balloon sustained thermal damage to the basket, but continued a controlled descent to the intended landing site. Three of the passengers received serious electrical burns as a result of the balloon's contact with the powerlines. The pilot stated that there were no mechanical malfunctions or anomalies with the balloon that would have precluded normal operation. The pilot further stated that he was unfamiliar with the area and was navigating with the aid of a map application on his cell phone.

Although the pilot reported that the overflight of the town was the result of a sudden shift in wind direction, given the balloon's departure location and the accident site, the balloon maintained a predominately northerly heading throughout the flight; there was no indication of any variation in wind direction. Based on this information, the pilot should have been able to predict the balloon's flight path with reasonable accuracy both before and after reaching the town and plan a landing site accordingly. Review of satellite imagery for the surrounding area showed several suitable landing fields about 1 ¼ nautical miles north of the accident site.

The accident was one of 4 events involving the accident pilot, all of which occurred during low-level operation or confined area landings and resulted in property damage. The events displayed a pattern of poor decision-making which was also exhibited during the accident flight with the pilot's decision to land in a populated area confined by powerlines. Given this history, it is possible that, with a more robust system of oversight and surveillance of balloon operators, the Federal Aviation Administration would have identified the accident pilot as a potential safety risk and taken steps to mitigate this risk.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight and inflight planning and improper landing site selection and approach path, which resulted in the balloon contacting powerlines during landing. Contributing to the accident was the Federal Aviation Administration's inadequate oversight of balloon tour operators.

Findings

Personnel issues	Flight planning/navigation - Pilot
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Incorrect action performance - Pilot
Aircraft	Altitude - Incorrect use/operation
Aircraft	Altitude - Not attained/maintained
Aircraft	Descent/approach/glide path - Not attained/maintained
Environmental issues	Wire - Awareness of condition
Environmental issues	Wire - Decision related to condition
Organizational issues	Oversight of operation - FAA/Regulator

Factual Information

History of Flight

Prior to flight	Preflight or dispatch event
Enroute	Low altitude operation/event
Maneuvering-low-alt flying	Collision with terr/obj (non-CFIT)
Approach	Controlled flight into terr/obj (CFIT) (Defining event)
Approach	Collision with terr/obj (non-CFIT)

On July 19, 2014, about 2000 eastern daylight time, a Colt Balloons 160A, N976TC, contacted powerlines in Clinton, Massachusetts. The balloon received minor damage. The pilot and three passengers were uninjured, and three passengers were seriously injured. The local sightseeing flight was operated by Damn Yankee Balloons under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which departed from a field in Shrewsbury, Massachusetts, about 1845.

The pilot stated that the accident flight was the second flight that day. After meeting the passengers and ground crew at the departure location, he provided the passengers with a safety briefing that included all aspects of the flight, including the risks involved and the flight procedures and timeline. While the pilot conducted the safety briefing, his ground crew assembled the balloon. The pilot then performed a preflight inspection before inflating the envelope. The passengers boarded, and the pilot conducted a second preflight inspection before launching.

According to the pilot, after launch, the balloon climbed to about 1,000 ft above ground level (agl) and traveled 170°-180° (southbound) at a groundspeed of about 5 knots. About 1 hour into the flight, the balloon passed over a reservoir, then the wind "shifted" and the balloon began approaching the town of Clinton. Witness photographs captured images of the balloon as it traveled over the reservoir between 50 and 100 ft agl. One witness reported that the balloon's basket was "skimming the water." The pilot reported that he approached the town at an altitude of 100 ft agl in preparation for landing should an adequate landing site appear. Shortly thereafter, he saw a large side yard next to a house at an intersection. He initiated a descent using the balloon's burners intermittently to maintain the proper descent path. Photographs showed the balloon approaching the landing site about 50 feet agl.

According to the pilot, as the balloon approached the landing site, the basket skid (attached to the bottom of the basket), contacted the top wire of a set of electrical wires perpendicular to the balloon's flight path. The balloon continued forward, causing the top wire to contact another wire; a large arc and flash ensued. The balloon then continued its descent to the landing site, where it touched down normally.

Video footage of the accident showed that the pilot engaged the burner several times as the balloon approached the landing site. Subsequent footage showed the balloon descending toward the landing site. As it descended, the envelope contacted the three uppermost powerlines, resulting in an electrical

discharge, a shower of sparks, and portions of the powerlines falling onto the ground and a parked vehicle. The balloon then continued in a controlled descent to the landing area. After the balloon landed, the ground crew and others who had stopped to render assistance helped the passengers egress from the basket. Three of the passengers received serious electrical burns as a result of the balloon's contact with the powerlines.

The pilot stated that he decided to land in the town because the balloon had about 20 minutes of fuel remaining, and that sunset would occur in about 30 minutes. He also stated that he was unfamiliar with the area, and reported to law enforcement personnel that he was navigating with the use of a map application on his cell phone. In his written statement to the NTSB, he suggested that the accident may have been prevented with a steeper approach to the landing site.

Pilot Information

Certificate:	Commercial	**Age:**	66,Male
Airplane Rating(s):	Single-engine land	**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:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	September 1, 2012
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	August 15, 2013
Flight Time:	(Estimated) 4388.8 hours (Total, all aircraft), 2708 hours (Total, this make and model), 24 hours (Last 90 days, all aircraft), 16.7 hours (Last 30 days, all aircraft), 3.5 hours (Last 24 hours, all aircraft)		

The pilot held a commercial pilot certificate with a rating for lighter-than-air balloon, and private pilot privileges for airplane single-engine land. His most recent Federal Aviation Administration (FAA) third-class medical certificate was issued on September 14, 2012. He reported 4,388.9 total hours of flight experience, of which 2,708.2 hours were in lighter-than-air balloons.

Aircraft and Owner/Operator Information

Aircraft Make:	COLT BALLOONS	**Registration:**	N976TC
Model/Series:	160A	**Aircraft Category:**	Balloon
Year of Manufacture:	1989	**Amateur Built:**	
Airworthiness Certificate:	Balloon	**Serial Number:**	1482US
Landing Gear Type:	N/A; Skid	**Seats:**	9
Date/Type of Last Inspection:	May 28, 2014 Annual	**Certified Max Gross Wt.:**	3197 lbs
Time Since Last Inspection:		**Engines:**	None
Airframe Total Time:	711 Hrs at time of accident	**Engine Manufacturer:**	
ELT:	Not installed	**Engine Model/Series:**	
Registered Owner:	YOUNG DERALD E	**Rated Power:**	
Operator:	YOUNG DERALD E	**Operating Certificate(s) Held:**	None

The balloon envelope and basket were manufactured in 1989. The balloon was powered by 2 propane burners, and had a basket capacity of 9 occupants. The balloon's most recent annual inspection was completed on May 28, 2014. At the time of the accident, the balloon had accrued about 711.1 total hours of operation.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FIT,348 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	23:52 Local	**Direction from Accident Site:**	360°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.23 inches Hg	**Temperature/Dew Point:**	23°C / 17°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Shrewsbury, MA (NONE)	**Type of Flight Plan Filed:**	None
Destination:	Clinton, MA	**Type of Clearance:**	None
Departure Time:	18:45 Local	**Type of Airspace:**	Class G

The 2052 recorded weather at Fitchburg Municipal Airport (FIT) Fitchburg, Massachusetts, located about 9 miles northwest of the accident site included wind from 090° at 3 knots,

visibility 10 statute miles, clear skies, temperature 22°C, dew point 17°C, and altimeter setting of 30.23 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	3 Serious, 3 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Serious, 4 None	**Latitude, Longitude:**	42.416667,-71.683334(est)

Examination of the balloon envelope and basket by an FAA inspector revealed that the outside of the wicker basket had been scorched on one side and that both burner support covers on that side of the basket displayed thermal damage.

Additional Information

Balloon's Flight Path

Contrary to the pilot's statement, the departure location of the flight, and the accident site location were consistent with the balloon traveling on a predominantly northerly course throughout the 1 hour 15 minute, 7-nautical-mile (nm) flight. Review of satellite imagery of the area showed several fields about 1 ¼ nm north of the accident site located along the balloon's established route of flight.

Balloon Manufacturer's Guidance

According to the balloon manufacturer's flight manual, section 2.9, LANDING PROCEDURE, when choosing a landing site, the pilot should allow for possible variations in the wind at ground level, and choose a site:

(a) Free of obstructions, especially power lines;
(b) Overshoot area should also be clear;
(c) Field free of crops and animals;
(d) If possible, look for upwind shelter to reduce speed;
(e) If possible, choose a field with good accessibility for retrieve crew, and minimum inconvenience for

the owner.

The manual also states:

Do not fly into power lines at any cost. If contact is inevitable descend as fast as possible so that the contact of the wires is with the envelope and not with the basket assembly. Shut down the fuel system and vent lines before contact. If the balloon is caught in the wires DO NOT TOUCH ANY METAL PAR'I'S. If possible, remain in the basket until the power is shut off. Never attempt to remove the balloon until the power authority has arrived. Do not allow crew members to make contact between the ground and the basket until the power is shut off.

Balloon Flying Handbook

The FAA Balloon Flying Handbook (FAA-H-8083-11A), 7-7, "Maneuvering," states, "The balloon is officially a nonsteerable aircraft." Although a hot air balloon has no direct controls for steering, a balloon's flightpath can be indirectly influenced using the burner and parachute valve. The handbook also states:

Being knowledgeable of the wind at various altitudes, both before launch and during flight, is the key factor for maneuvering. Maneuvering, or steering, comes indirectly from varying one's time at different altitudes and different wind directions.

To initiate a climb, a balloon pilot activates one or more of the balloon's propane fuel burners. Rate of climb is adjusted by the duration and/or frequency of burner activations. Level flight is achieved by executing a series of burns that minimizes changes in vertical velocity. Descent is achieved either by allowing the air in the envelope to cool or by opening the parachute valve to allow hot air to escape. The rate of descent can be increased by leaving the parachute valve open longer or reopening the valve. Rate of descent can be slowed or stopped by activating the burner(s).

The FAA Balloon Flying Handbook further states that when contour flying, or during an approach to a landing site, the potential of collision with trees, power lines, and other obstacles is increased. For balloons, landing accidents consistently account for over 90 percent of the total number of accidents in any given year. The most common causal factors for landing accidents include collision with obstructions in the intended landing area.

In addition, these accidents account for the majority of injuries to pilots and damage to balloons. Accidents are more likely during landing because the tolerance for error is greatly diminished and opportunities for pilots to overcome errors in judgment and decision-making become increasingly limited, particularly in high wind conditions.

Additional Incidents

Over the course of the investigation, the NTSB became aware of other incidents with the operator. In October 2004, one passenger received minor injuries when, during landing, the balloon encountered a downdraft. The pilot applied the burners to ascend and overshot the intended landing site. In an attempt to slow the balloon, the pilot brushed the basket through a tree, during which a branch cut the

passenger's hand.

In October 2011, a witness observed the balloon flying low in the middle of Northborough, Massachusetts. During the flight, the pilot flew below the tops of the surrounding trees and the balloon passed between and struck two houses, which sustained soffit and gutter damage.

On September 30, 2013, the pilot landed in the parking lot of a Kmart store in Auburn, Maine. The eight passengers onboard were not injured. The pilot reported to a local media outlet that the flight was going according to plan when an unexpected breeze kicked in around sunset. During the approach to landing, the balloon contacted and damaged a light pole in the parking lot.

On September 22, 2015, about 14 months after the accident in Clinton, Massachusetts, the pilot and his six passengers were uninjured when he landed the balloon in the parking lot of a Massachusetts Bay Transportation Authority commuter rail station in Grafton, Massachusetts. The balloon had launched from Shrewsbury, Massachusetts earlier that morning. The pilot advised that, sometime during the flight, the wind conditions changed. He originally tried to land in an open field at Tufts University, but instead landed in the parking lot which was about 1,000 yards northwest of the field. During the balloon's descent, it contacted an overhead guide wire that stretched between two light poles, knocking one pole over and resulting in damage to 3 vehicles.

Articles published by local media in Portland, Maine, and Miramichi, New Brunswick, Canada, stated that the pilot's invitations to two separate balloon festivals were rescinded as a result of the open investigation into the Clinton, Massachusetts, accident.

NTSB Recommendations

On April 7, 2014, the NTSB issued recommendations to the FAA (A-14-11 and A-14-12) to address operational deficiencies in commercial sightseeing (air tour) balloon operations that have resulted in occupant injuries and a fatality. They were derived from the NTSB's investigations of several air tour balloon accidents. The accidents highlighted operational deficiencies in commercial air tour balloon operations, such as operating in unfavorable wind conditions and failure to follow flight manual procedures, that the NTSB considered a result of the lack of oversight relative to similar airplane and helicopter air tour operations.

In its recommendations, the NTSB stated that, depending on gondola capacity, balloons can carry more than 20 passengers per flight. Given the various safety deficiencies noted in the NTSB's investigations of the subject balloon accidents, the potential for a high number of fatalities in a single air tour balloon accident is of particular concern if air tour balloon operators continue to conduct operations under less stringent regulations and oversight. Although such an accident had yet to occur in the United States at the time of the issuance of the recommendations, a high-fatality accident occurred in Egypt on February 26, 2013, when a commercial air tour balloon carrying 21 occupants experienced a fire on board, resulting in 19 deaths.

On July 30, 2016, about 0742 central daylight time, a Balóny Kubícek BB85Z hot air balloon, N2469L (NTSB Case No. DCA16MA204), crashed into a field after striking high voltage powerlines while landing near Lockhart, Texas. The 15 passengers and pilot onboard were fatally injured. The NTSB

determined that the probable cause of this accident was the pilot's pattern of poor decision-making that led to the initial launch, continued flight in fog and above clouds, and descent near or through clouds that decreased the pilot's ability to see and avoid obstacles. Contributing to the accident were (1) the pilot's impairing medical conditions and medications and (2) the FAA's policy to not require a medical certificate for commercial balloon pilots.

The investigation further concluded that the FAA's primary method of oversight—sampling balloon operators at festivals and events—does not effectively target the operations that pose the most significant safety risks to members of the public who choose to participate in commercial balloon sightseeing activities. As a result of this investigation, the NTSB classified Safety Recommendations A-14-011 and -12 as "Closed—Unacceptable Action/Superseded," and made the following new safety recommendation to the FAA:

Analyze your current policies, procedures, and tools for conducting oversight of commercial balloon operations in accordance with your Integrated Oversight Philosophy, taking into account the findings of this accident; based on this analysis, develop and implement more effective ways to target oversight of the operators and operations that pose the most significant safety risks to the public.

Administrative Information

Investigator In Charge (IIC):	Gunther, Todd
Additional Participating Persons:	Ganesh Persaud; FAA FSDO; Windsor Locks, CT
Original Publish Date:	December 11, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89713