National Transportation Safety Board
Aviation Accident Final Report

Location:	Northglenn, CO	**Accident Number:**	CEN14FA230
Date & Time:	05/05/2014, 1543 MDT	**Registration:**	N4519Y
Aircraft:	PIPER PA 25-235	**Aircraft Damage:**	Destroyed
Defining Event:	Low altitude operation/event	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General Aviation - Banner Tow		

Analysis

The pilot reported that the purpose of the banner-tow flight was to tow an advertisement billboard over a ballpark. He stated that, despite the engine operating normally, the airplane had little to no climb performance as he flew southbound toward the ballpark; therefore, he decided to make a 180-degree turn and return to the departure airport. He released the banner after the airplane developed an excessive descent rate during the turn. The pilot reported that he was unable to recover sufficient airspeed after releasing the banner and that the airplane encountered an aerodynamic stall/spin at a low altitude. The airplane then descended, inverted, into a house where a postimpact fire ensued. A postaccident examination of the airplane revealed no preimpact mechanical failures or malfunctions that would have precluded normal operation. At the time of the accident, the low-level surface winds were from the south between 5 and 10 knots with gusts reaching 20 to 30 knots.

A review of radar track data confirmed that the accident airplane flew over a congested area at altitudes below 1,000 ft above ground level (agl). The final portion of the accident flight included an S-turn maneuver below 500 ft agl. According to radar data, during the S-turn, the airplane flew within 1,000 ft laterally and 200 ft vertically of the pilot's personal residence. Additionally, radar data revealed that the pilot made a tight 360-degree turn near his residence, between 600 and 700 ft agl, during another recent banner-tow flight. Based on the available radar evidence, the pilot, on at least two occasions, flew below the minimum safe altitude required by federal regulation 91.119(b), which prohibited operating an airplane, over a congested area, at an altitude below 1,000 ft above the highest obstacle within a horizontal radius of 2,000 ft.

The pilot's intentional flight below the required minimum safe altitude likely limited his ability to recover from a potential loss of airspeed due to a gusting wind condition during the banner-tow flight. Additionally, his delayed decision to release the banner allowed the airplane to exceed its critical angle-of-attack, which resulted in an aerodynamic stall/spin from which he was unable to recover.

Probable Cause and Findings

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

The pilot's decision to operate the banner-tow flight below the minimum safe altitude specified by federal regulation, which likely limited his ability to recover from a potential loss of airspeed due to a gusting wind condition. Also causal was the pilot's delayed decision to release the banner, which allowed the airplane to exceed its critical angle-of-attack and resulted in an aerodynamic stall/spin from which he was unable to recover.

Findings

Aircraft	
	Angle of attack - Not attained/maintained (Cause)
Personnel issues	Decision making/judgment - Pilot (Cause)
	Delayed action - Pilot (Cause)
	Aircraft control - Pilot (Cause)
Environmental issues	Gusts - Ability to respond/compensate (Cause)

Factual Information

History of Flight

Maneuvering-low-alt flying	Low altitude operation/event (Defining event)
	Loss of control in flight
	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 5, 2014, at 1543 mountain daylight time (MDT), a Piper model PA-25-235 airplane, N4519Y, was destroyed when it collided with a residential structure and caught fire in Northglenn, Colorado. The commercial pilot was not injured. The banner-tow airplane, registered to Airspeed Enterprises LLC and operated by Drag 'N' Fly Banners, was operating under the provisions of 14 Code of Federal Regulations (CFR) Part 91. Day visual meteorological conditions prevailed for the local flight that departed from Platte Valley Airpark (18V), Hudson, Colorado, about 1500.

The pilot reported that the purpose of the banner-tow flight was to orbit Coors Field, located in downtown Denver, Colorado, with an advertisement billboard that measured about 55 ft long by 30 ft tall. He stated that there were no anomalies identified with the airplane during his preflight inspection and that he held a briefing with his ground support team before departing. After takeoff, he entered the traffic pattern and retrieved the banner at 1505. After retrieving the banner, he proceeded west, staying below the Class B airspace, toward Interstate I-25 where he turned southbound toward downtown Denver and Coors Field. The pilot reported that while en route the airplane did not perform as expected, with little to no climb performance, but the engine appeared to be operating without any anomalies. He stated that the airplane was at 6,100 ft mean sea level (msl), about 700 ft above ground level (agl), when he decided to enter a right 180-degree turn and return to the departure airport. He subsequently released the banner after the airplane developed an excessive descent rate during the turn. The pilot reported that the airplane accelerated slightly after he released the banner; however, it remained near the aerodynamic stall and, about 10-15 seconds after he released the banner, the airplane encountered a stall/spin at a low altitude. The airplane descended, inverted, into a house located within a residential area. Following the accident, the pilot was able to release his restraints and exit the airplane uninjured. A postaccident fire destroyed the airplane and significantly damaged the house. There were no reports of ground injuries.

According to available air traffic control (ATC) data, radar contact was established with the accident airplane at 1515:10 (hhmm:ss) about 6.6 nautical miles (nm) west of the departure airport at 5,500 ft msl (600 ft agl). The airplane proceeded on a westerly course while it climbed to 5,700 ft msl (700 ft agl). At 1522:23, as the airplane approached Interstate I-25, the airplane entered a left 90-degree turn toward south. The airplane descended to 5,400 ft msl (300 ft agl) during the left turn toward south.

The airplane continued south for about 1.5 nm before it began a climbing 360-degree left turn. At 1526:18, the airplane had climbed to 5,700 ft msl (600 ft agl) and continued southbound

toward downtown Denver while maintaining a course parallel to and about 1/3 nm west of Interstate I-25. At 1531:09, about a mile north of 168th Avenue, the airplane was at 6,100 ft msl (900 ft agl). At 1534:14, the airplane flew over the Northwest Parkway Toll Road as it continued southbound toward downtown Denver.

Based on available radar data, the pilot flew the remainder of the accident flight over heavily populated or congested areas. Between 1535:46 and 1536:23, the airplane flew over the Orchard Town Center shopping mall, located in Westminster, Colorado, at 5,800 ft msl (600 ft agl). As the airplane continued south, it began to climb and, at 1537:37, crossed 136th Avenue at 6,100 ft (900 ft agl). However, after crossing 136th Avenue, the airplane began to descend and, at 1540:23, crossed 120th Avenue at 5,800 ft (450 ft agl).

During the final 2.5 minutes of radar track data, the airplane continued southbound as it completed an S-turn maneuver over Huron Street between 120th Avenue and Kennedy Drive. The first half of the S-turn, was completed west of Huron Street and between 118th and 114th Avenues. At 1542:32, the airplane completed the second half of the S-turn as it crossed over Huron Street on a west heading. At that time, the airplane had descended to 5,600 ft msl (150 ft agl). The airplane continued to fly west during the final 20 seconds of recorded radar data. At 1542:37, the airplane was at 5,500 ft msl (likely less than 100 ft agl). At 1542:50, the airplane then descended below radar coverage, about 0.2 miles south-southwest of the accident site, at 5,600 ft msl (150 ft agl).

Numerous witnesses reported seeing the airplane flying at a low altitude before it released its banner and descended into a residential area. One witness reported that the airplane was flying at a slow groundspeed in a nose-up flight attitude before it descended into the residential area. Several witnesses remarked that the banner barely cleared the power lines as the airplane crossed over Huron Street.

Pilot Information

Certificate:	Commercial	**Age:**	52, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With Waivers/Limitations	**Last FAA Medical Exam:**	04/16/2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	12/30/2013
Flight Time:	462 hours (Total, all aircraft), 127 hours (Total, this make and model), 374 hours (Pilot In Command, all aircraft), 52 hours (Last 90 days, all aircraft), 37 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

According to Federal Aviation Administration (FAA) records, the pilot, age 52, held a commercial pilot certificate with single engine land airplane and helicopter ratings. The pilot did not possess an instrument rating and, as such, his pilot certificate prohibited the carriage of passengers for hire in airplanes on cross-country flights in excess of 50 nm or at night. His last aviation medical examination was completed on April 16, 2014, when he was issued a second-class medical certificate with a limitation for corrective lenses. A search of FAA records showed no previous accidents, incidents, or enforcement proceedings. His last flight review, as required by FAA regulation 61.56, was completed upon the issuance of his commercial helicopter rating dated December 30, 2013. The pilot's flight logbook contained an endorsement, dated August 13, 2013, following banner-tow training in a Piper PA-25-235 airplane. According to the endorsement, the pilot had demonstrated the ability to tow banners and billboards approved for the Piper PA-250-235 airplane after completing 25 practice banner pickup-and-drops.

The pilot's flight history was reconstructed using logbook documentation. The most recent logbook entry was for the accident flight. The pilot had accumulated 462 hours total flight time, of which 374.2 hours as pilot-in-command. He had accumulated 318.6 hours in single engine airplanes and 142.4 hours in helicopters, and 1 hour in a glider. He had logged 127.2 hours of flight time in Piper PA-25-235 airplanes. The pilot reported having accumulated 85.4 hours during banner-tow operations.

According to the flight logbook, he had flown 207.9 hours during the prior 12 months, 97.3 hours in the previous 6 months, 52.3 hours during prior 90 days, 48.9 hours in the previous 60 days, and 36.8 hours in the 30 days before the accident flight. The pilot reported that the accident occurred during his first flight of the day.

Aircraft and Owner/Operator Information

Aircraft Make:	PIPER	**Registration:**	N4519Y
Model/Series:	PA 25-235	**Aircraft Category:**	Airplane
Year of Manufacture:	1966	**Amateur Built:**	No
Airworthiness Certificate:	Restricted	**Serial Number:**	25-4069
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	03/15/2014, Annual	**Certified Max Gross Wt.:**	2900 lbs
Time Since Last Inspection:	13 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	6509 Hours at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	O-540-B2B5-C
Registered Owner:	Airspeed Enterprises, LLC	**Rated Power:**	250 hp
Operator:	Drag 'N' Fly Banners	**Operating Certificate(s) Held:**	None

The accident airplane was a 1966 Piper model PA-25-235, serial number (s/n) 25-4069. A 250-horsepower Lycoming model O-540-B2CD-A1D5 reciprocating engine, s/n L-7299-40, powered the airplane through a fixed-pitch, two blade, McCauley model 1A200/FA8452 propeller, s/n 99524. The airframe incorporated a steel-tube-truss design with fabric covering. It was equipped with externally braced wings, wing flaps, and a fixed conventional landing gear. The airplane seated a single occupant and had a maximum takeoff weight of 2,900 lbs. The airplane had a useful load of 1,332.7 lbs. The pilot reported the airplane had 36 gallons (216 lbs) of aviation fuel at the time of departure. The pilot weighed 160 lbs, according to his aviation medical certificate dated April 16, 2014. The fabric banner measured 55 ft by 29 ft and entire assembly (banner, tow bar, ropes and banner pole) weighed about 47 lbs. A postaccident calculation determined that the airplane was within the permitted weight-and-balance envelope at the time of the accident.

The airplane was issued a restricted airworthiness certificate on March 24, 2014. The airplane's recording tachometer was destroyed during the postimpact fire. According to pilot documentation located in the wreckage, the recording tachometer hour meter indicated 2,164 hours before the accident flight. The airframe had accumulated a total service time of 6,509 hours. The engine had accumulated a total service time of 5,609.2 hours since new. The engine had accumulated 1,461.2 hours since a field-overhaul on February 11, 1992. The last annual inspection of the airplane was completed on March 15, 2014, at 6,496 total airframe hours. A postaccident review of the maintenance records found no history of unresolved airworthiness issues.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	EIK, 5119 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	1536 MDT	**Direction from Accident Site:**	342°
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots / 20 knots	**Turbulence Type Forecast/Actual:**	/ Unknown
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	/ Unknown
Altimeter Setting:	29.78 inches Hg	**Temperature/Dew Point:**	27°C / -10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hudson, CO (18V)	**Type of Flight Plan Filed:**	None
Destination:	Hudson, CO (18V)	**Type of Clearance:**	VFR Flight Following
Departure Time:	1500 MDT	**Type of Airspace:**	Class G

At 1536 MDT, the automated surface observing system (ASOS) located at Erie Municipal Airport (EIK), about 8 miles north-northwest of the accident site, reported: wind from 170 degrees at 10 knots, gusting 20 knots, visibility 10 miles, clear sky, temperature 27 degrees Celsius, dew point -10 degrees Celsius, and an altimeter setting of 29.78 inches of mercury.

The National Weather Service (NWS) Surface Analysis Chart for 1500 MDT, depicted a low pressure system at 1000-hectopascals (hPa) over Wyoming along a frontal wave with a stationary front extending south-southeast across eastern Colorado into the Oklahoma and Texas panhandles, where a second low pressure system was located at 1001-hPa. Another high pressure system at 1011-hPa was over southwest Colorado. The resultant pressure systems resulted in a general southerly wind flow over eastern Colorado. The NWS regional radar mosaic indicated no significant weather echoes over the Denver metropolitan area. The Denver upper air sounding for 1800 MDT had a wind profile that supported mountain wave activity near 10,000 ft msl with the potential for strong up/downdrafts and moderate and greater turbulence. According to a survey of nearby weather observation stations, the low-level surface winds were from the south between 5 and 10 knots with gusts reaching 20 to 30 knots. The density altitude was about 8,500 ft, based on the weather conditions reported near the accident site.

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	39.896944, -105.000833

The main wreckage consisted of the entire airplane, which was found inverted and nose down in a house. The engine, firewall, and propeller were located within the house. The remaining steel-tube fuselage structure, both wings, and the empennage were located outside the residence. The postimpact fire destroyed a majority of the airplane, including the cockpit, instrument panel, interior, pilot seat and fuselage/wing fabric covering. The empennage surfaces were relatively undamaged. A postaccident examination of the airplane confirmed flight control cable continuity from the cockpit controls to their respective flight control surfaces. The flight control trim position could not be determined due to fire damage. The flap control handle and its ratchet mechanism were in an extended position; however, the actual position of the flaps at the time of impact could not be determined due to impact damage. The postaccident examination revealed no evidence of a preimpact mechanical malfunction or failure that would have precluded normal airplane operation.

The engine remained attached to the firewall by its mounts. The engine exterior exhibited damage from the postimpact fire. An engine control continuity check was not possible due to the extent of damage; however, all observed separations were consistent with impact related damage. Internal engine and valve train continuity was confirmed as the engine crankshaft was rotated. Compression and suction were noted on all cylinders in conjunction with crankshaft rotation. No anomalies were identified with the accessory drive gears. Both magnetos exhibited extensive thermal damage and would not rotate by hand. Further examination revealed the internal components of both magnetos had melted during the postimpact fire. The spark plugs exhibited features consistent with normal engine operation. A borescope inspection revealed no anomalies with the cylinders, valves, or pistons. A disassembly of the carburetor did not reveal any anomalies with the metal floats, needle valve, or inlet fuel screen. The two-blade propeller remained attached to the engine crankshaft flange. One blade appeared straight with leading edge damage. The other blade exhibited an aft bend about midspan, leading edge damage, and chordwise scratching. The postaccident examination revealed no evidence of a preimpact mechanical malfunction or failure that would have precluded normal engine operation.

Communications

After departure, at 1514:30, the pilot established radio communications with Denver Terminal Radar Approach Control and requested visual flight rules flight following for a several hour

banner-tow flight over Coors Field. At 15:14:54, the approach controller issued a transponder identification code to the pilot. At 15:17:06, the approach controller acknowledged radar contact with the accident airplane. At that time, the accident flight was located about 15 nm northwest of Denver International Airport (DEN) at 5,600 ft msl. There were no additional communications with the accident flight.

Tests And Research

A Garmin GPSMAP 96C, a JPI Engine Data Monitor, an Apple iPad, and a SatLoc device were located at the accident site and submitted to the National Transportation Safety Board (NTSB) Vehicle Recorders Laboratory in Washington D.C. for potential non-volatile memory (NVM) data recovery. An internal examination of the JPI Engine Monitor, Apple iPad, and SatLoc devices revealed extensive fire-related damage that precluded the recovery of any data. An external examination of the Garmin GPSMAP 96, s/n 98831422, revealed the postaccident fire had damaged the molded exterior case; however, the internal circuit board containing the NVM memory chip was relatively undamaged. The NVM data was extracted from the memory chip using forensic equipment. The extracted data included two flights, one completed on May 3, 2014, and the other, the accident flight, on May 5, 2014. The GPS device recorded position data every 3 minutes; including the date, time, latitude, longitude, and GPS altitude. Course and groundspeed parameters were derived from the recorded parameters. The extracted position data did not yield useful aircraft performance data because of the limited data-sampling rate (once every three minutes).

A postaccident review of the pilot's flight logbook established that he had flown a similar banner-tow flight over Coors Field on May 3, 2014. A review of radar track data for the May 3, 2014, flight established that the airplane paralleled Interstate I-25 while en route to/from downtown Denver. According to plotted radar data, while returning northbound, the airplane completed a single 360-degree left turn about 0.7 nm east of where the airplane crashed on May 5, 2014. The 360-degree turn was centered over a residential area located immediately west of Interstate I-25 and between Kennedy Drive and Community Center Drive. The radius of the turn was about 0.2 nm. The 360-degree turn took about 1 minute 23 seconds to complete and the airplane's altitude varied between 6,000-6,100 ft msl (600-700 ft agl) during the turn.

The pilot's personal residence was located about 1/2 nm east-southeast of where the airplane crashed on May 5, 2014. A radar plot for the May 3, 2014, flight confirmed that the pilot flew over his residence at 600 ft agl during the 360-degree left turn. Further review of radar data for the May 5, 2014, accident flight established that the pilot flew within 1,000 ft laterally and 200 ft vertically of his residence during the second half of the S-turn.

Additional Information

Federal regulation 14 CFR Part 91.119(b), stipulates that no person may operate an aircraft over any congested area of a city, town, or settlement, or over any open air assembly of

persons, at an altitude below 1,000 ft above the highest obstacle within a horizontal radius of 2,000 ft of the aircraft.

On May 18, 2012, the FAA Denver Flight Standards District Office (FSDO) issued the operator, Drag 'N' Fly Banners, a Certificate of Waiver to conduct airplane banner-tow operations. One of the waiver's provisions was that the operator must maintain compliance with the conditions of Federal regulation 14 CFR Part 91.119, including the minimum safe altitudes and distances from obstacles.

On August 5, 2013, the operator added the accident pilot to the waiver's list of approved pilots. On February 14, 2014, the operator added the accident airplane (N4519Y) to the waiver's list of approved airplanes. On March 24, 2014, a FAA inspection identified no discrepancies with the banner-tow equipment.

Administrative Information

Investigator In Charge (IIC):	Andrew T Fox	**Report Date:**	01/31/2017
Additional Participating Persons:	Eric L Horstmeyer; Federal Aviation Administration - Denver FSDO; Denver, CO Troy Helgeson; Lycoming; Milliken, CO		
Publish Date:	01/31/2017		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=89168		