Aviation Investigation Final Report

Location:	Saratoga, Wyoming	**Accident Number:**	WPR14FA382
Date & Time:	September 20, 2014, 23:15 Local	**Registration:**	N4618J
Aircraft:	Piper PA 28R-180	**Aircraft Damage:**	Substantial
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot was conducting a personal cross-country flight. The airplane took off on a moonless night from an uncontrolled rural airport that resides in rolling prairie grass and has a sparse population. The airplane wreckage was found by a local rancher the morning after the accident. The airplane had collided with terrain that was about 100 ft above the airport elevation, 1.3 miles southeast from the center of the runway. The initial point of impact was a shallow 7-ft-long ground scar that contained green/blue lens fragments from the right wing tip. The ground scar was oriented in a direct line with the main wreckage on a magnetic bearing of 240 degrees.

Based on the direction of the ground scar, it is likely that the airplane took off from runway 23 and drifted south without establishing a positive climb rate and then impacted the slightly elevated terrain southeast of the airport. Additionally, the environment southeast of the airport lacked ground features and lighted buildings or roads, which, on a moonless night, would produce very dark conditions with no ground references or natural horizon. The private pilot had no significant instrument or night flying experience.

Probable Cause and Findings

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

The pilot's failure to maintain a positive climb rate after takeoff in dark, night conditions, which resulted in his controlled flight into terrain due to the lack of ground references or natural horizon.

Findings

Aircraft	Climb rate - Not attained/maintained
Environmental issues	Sloped/uneven terrain - Awareness of condition
Environmental issues	Dark - Effect on personnel

Factual Information

History of Flight

Initial climb	Controlled flight into terr/obj (CFIT) (Defining event)

HISTORY OF FLIGHT

On September 20, 2014, about 2315 mountain daylight time, a Piper PA28R-180, N4618J, impacted terrain about 1.3 miles southeast of the Shively Field Airport, Saratoga, Wyoming. The private pilot and student pilot were fatally injured, and the airplane was substantially damaged. The airplane was registered to a private individual, and operated by the private pilot under the provisions of 14 Code of Federal Regulations, Part 91. Dark night conditions prevailed for the flight, and a visual flight rules flight plan had not been filed. The flight originated from Shively Field Airport about 2314, and was destined for Denver, Colorado.

The airplane wreckage was found by a local rancher about 0815 on September 21. First responders confirmed both occupants were fatalities. The initial point of impact was a shallow 7-foot-long ground scar that was oriented in direct line with the main wreckage on a magnetic bearing of 240 degrees. The main wreckage was located 130 feet from the initial point of impact on the same bearing.

The registered owner of the airplane stated that he received a voice message from the pilot on September 20, which was time stamped 2303 mountain daylight time. In the message, the pilot stated that they were in Saratoga, and were preflighting the airplane in the dark. The registered owner returned the call at 2331, which went unanswered by the pilot.

PERSONNEL INFORMATION

The pilot, age 52, held a private pilot certificate for airplane single-engine land issued May 26, 2014, and a third-class medical certificate issued September 9, 2013, with the limitation that he must wear corrective lenses and that the medical certificate was not valid after September 30, 2015. Examination of the pilot's logbook revealed that as of September 20th he had 209.8 total flight hours, 45.1 hours in the make and model of the accident airplane, 12.9 hours within the previous 30 days, 3.3 hours of simulated instrument time, and 4.7 hours of night time.

The student pilot, age 54, held a student pilot certificate/third-class medical certificate issued September 18, 2013, with the limitation that she must wear corrective lenses for near and distant vision. Examination of her logbook revealed that as of her last logged instructional flight on August 26, 2014, she had 7.2 flight hours

AIRCRAFT INFORMATION

The four-seat, low-wing, retractable landing gear airplane, serial number 28R-30501, was manufactured in 1968. It was powered by a Lycoming IO-360-B1E, 180-hp engine, and equipped with a Hartzell

model HC-C2YK-1B two-bladed constant speed propeller. Examination of the airplane maintenance records revealed that an annual inspection had been completed on May 19, 2014, at a recorded tachometer reading of 2,136.24 hours. The airspeed indicator, landing gear warning horn, and the throttle gear warning microswitch were replaced on September 10, 2014, at a recorded tachometer time of 2,170.07 hours. The most recent maintenance was a new altitude encoder mount installed on September 18, 2014. The tachometer reading recorded after the accident was 2,191.33 hours.

METEOROLOGICAL INFORMATION

Meteorological conditions recorded by the Automated Weather Observation System (AWOS) at Shively Field at 2335 was wind from 140 degrees at 5 knots, 10 statute miles visibility, clear sky, temperature 13 degrees centigrade, dew point 06 degrees centigrade, and altimeter setting of 30.36 inHg.

Astronomical conditions were determined using moon rise and set tables for September 2014. The moon set at 1705 MDT on September 20, which would have resulted in no moon illumination at the time of the accident.

AERODROME INFORMATION

Shively Field Airport (KSAA) is an uncontrolled airport located in Saratoga, Wyoming, in the southeast corner of the town. Shively Field's elevation is 7,015 feet mean sea level (msl), and has a single 8,801 foot by 100 foot runway oriented 050/230 degrees magnetic. Aircraft parking apron and airport entrance are located at the eastern end of the airport (near the approach end of runway 23). It utilizes a common traffic advisory frequency (CTAF) on 122.8 kHz for aircraft position reporting and coordination. Runway lighting consists of medium intensity runway lights (MIRL) along both sides of the runway, and is pilot activated through the CTAF. The airport beacon alternates white-green, and operates from dusk to dawn. An automated weather observation system (AWOS-3PT) broadcasts weather information on 118.175 kHz.

WRECKAGE & IMPACT INFORMATION

The terrain consisted of rolling hills, prairie grass, and sage brush. The wreckage was located at a terrain elevation that was approximately 100 feet above the runway elevation. The initial point of impact was a shallow 7-foot-long ground scar that contained green/blue lens fragments. The ground scar was oriented in direct line of the main wreckage on a magnetic bearing of 240 degrees. The main wreckage was located 130 feet from the initial point of impact on the same bearing. The airplane was upright oriented on a bearing of 212 degrees magnetic. The cockpit had split open behind the engine firewall, the left wing was attached, and the right wing had separated at the wing root. The fuselage behind the cabin and tail appeared undamaged. The propeller had separated from the engine at the crankshaft flange. The engine remained on the engine mount, but displaced down and to the right.

The fuselage was examined while on the scene of the accident. The left wing was attached, and the right wing was separated at the wing root. The vertical stabilizer, rudder, and horizontal stabilator were present on the aft fuselage, and exhibited minimal damage. The stabilator trim drum exhibited 4 threads (neutral). The engine was attached to the engine mount, which was partially attached to the firewall. The instrument panel was impact damage. The pilot's control yoke was seized; the copilot's control yoke had separated from the control shaft. Control continuity was established from all control surfaces forward to the cabin area with some restriction due to impact damage to the airframe, which restricted cable

movement. There was no separation of control cables, and all control cables were attached to their respective bell cranks.

The left wing exhibited leading edge crushing, and 45° buckling of the upper wing skin from mid span to the trailing edge. The fuel cap was in place. A bluish fluid could be seen in the tank through the filler port when the fuel cap was removed. The flap was in the up position, and the landing gear was extended with the over center lock in the lock position. The aileron was attached to its hinge, and the balance weight was present.

The right wing was separated from the fuselage at the wing root, but the aft spar remained connected to the airframe. The wing tip leading edge indicated aft and upward crushing. The flap was folded under the wing. The aileron and balance weight were present. The fuel cap was in place, and fuel was observed at the tab level when viewed through the filler port. The landing gear was extended, and the over center lock was locked.

The cockpit was split open behind the firewall. The wind screen was not present and revealed the entire cockpit and cabin area. The right cockpit floor section by the rudder pedals was deformed inward. The right yoke had separated from the control shaft; the left yoke remained in place. The right seat had separated from the rails; the left seat remained on the rails. Two iPads that were in the cockpit had been ejected out and forward of the fuselage. The iPads were sent to the NTSB Vehicle Recorders Lab for examination. The laboratory technicians were unsuccessful in their attempts to unlock and recover data from either iPad.

The engine was attached to the engine mount, which was partially attached to the fire wall. The propeller had separated from the engine at the crankshaft flange. The throttle cable was connected to the throttle body, the propeller condition cable was attached to the propeller governor control arm, and the mixture cable was broken from the fork and exhibited overload signatures. The vacuum pump was removed; it could be rotated by hand, plastic shear drive coupling was intact. The vacuum pump was disassembled; the rotor was intact and all vanes showed even ware with no signs of binding. The top spark plugs were removed, Champion REM40E's, and exhibited normal worn wear according to the Champion Check-A-Plug chart. The engine crankshaft was rotated using the vacuum pump drive. Thumb compression was achieved on all four cylinders, and the valves moved in sequence. The fuel distribution valve was removed, and fuel/fluid was observed in the valve. The fuel injectors were removed and found to be clear. The fuel pickup screen was clear. The fuel pump was removed, manually actuated, and fuel was observed to be ejected out of the pump outlet. Oil was observed draining out of the engine; the oil pickup screen was removed, and found clear of debris. Both magnetos were removed, and spark was produced on all leads by rotating the magneto drive by hand. The propeller governor was removed, and the screen on the gasket was clear of debris.

MEDICAL & PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot on September 23, 2014, by a forensic pathology consultant for Carbon County. The autopsy states the cause of death was blunt force injuries. The FAA's Civil Aerospace Medical Institute Forensic Toxicology Research Team performed forensic toxicology on specimens from the pilot with negative results for carbon monoxide, ethanol, or listed drugs. The test for cyanide was not performed.

An autopsy was performed on the student pilot on September 23, 2014, by a forensic pathology consultant for Carbon County. The autopsy states the cause of death was blunt force injuries. The FAA's Civil Aerospace Medical Institute Forensic Toxicology Research Team performed forensic toxicology on specimens from the student pilot with negative results for ethanol, positive results for diphenhydramine detected in liver tissue, and pseudoephedrine detected in liver tissue and blood. Tests for carbon monoxide and cyanide were not performed.

ADDITIONAL INFORMATION

The FAA Airplane Flying Handbook, FAA-H-8083-3, chapter 10 states the following about night flying: "Night flying requires that pilots be aware of, and operate within, their abilities and limitations….Night flying is very different from day flying and demands more attention of the pilot. The most noticeable difference is the limited availability of outside visual references. Therefore, flight instruments should be used to a greater degree in controlling the airplane. This is particularly true on night takeoffs and climbs….. The procedure for night takeoffs is the same as for normal daytime takeoffs except that many of the runway visual cues are not available. Therefore, the flight instruments should be checked frequently during the takeoff to ensure the proper pitch attitude, heading, and airspeed are being attained. As the airspeed reaches the normal lift-off speed, the pitch attitude should be adjusted to that which will establish a normal climb. This should be accomplished by referring to both outside visual references, such as lights, and to the flight instruments."

According to the FAA Advisory Circular 60-4A, Pilot's Spatial Disorientation, "Surface references and the natural horizon may at times become obscured, although visibility may be above visual flight rule minimums. Lack of natural horizon or surface reference is common on overwater flights, at night, and especially at night in extremely sparsely populated areas, or in low visibility conditions. A sloping cloud formation, an obscured horizon, a dark scene spread with ground lights and stars, and certain geometric patterns of ground lights can provide inaccurate visual information for aligning the aircraft correctly with the actual horizon."

Pilot Information

Certificate:	Private	**Age:**	52,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	September 16, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 19, 2014
Flight Time:	209.8 hours (Total, all aircraft), 45 hours (Total, this make and model), 12.8 hours (Last 30 days, all aircraft), 2.2 hours (Last 24 hours, all aircraft)		

Student pilot Information

Certificate:	Student	**Age:**	54,Female
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	September 18, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	7.1 hours (Total, all aircraft), 6 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N4618J
Model/Series:	PA 28R-180 28R-30501	**Aircraft Category:**	Airplane
Year of Manufacture:	1968	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	28R-30501
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	May 19, 2014 100 hour	**Certified Max Gross Wt.:**	2500 lbs
Time Since Last Inspection:	55 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2191.33 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	C91 installed, not activated	**Engine Model/Series:**	IO360 SER
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KSAA,7015 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	23:35 Local	**Direction from Accident Site:**	70°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	140°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.36 inches Hg	**Temperature/Dew Point:**	13°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Saratoga, WY (KSAA)	**Type of Flight Plan Filed:**	None
Destination:	Denver, CO (KBJC)	**Type of Clearance:**	None
Departure Time:	23:15 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Shively Field Airport KSSA	**Runway Surface Type:**	Asphalt
Airport Elevation:	7015 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	5/23	**IFR Approach:**	None
Runway Length/Width:	8801 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	41.43222,-106.841392

Administrative Information

Investigator In Charge (IIC):	McKenny, Van
Additional Participating Persons:	Jerry Villhauer; FAA; Denver, CO Ron Maynard; Piper; Vero Beach, FL Troy Helgeson; Lycoming; Millken, CO
Original Publish Date:	July 25, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=90112