National Transportation Safety Board
Aviation Accident Final Report

Location:	Highmore, SD	**Accident Number:**	CEN14FA224
Date & Time:	04/27/2014, 2116 CDT	**Registration:**	N8700E
Aircraft:	PIPER PA 32R-300	**Aircraft Damage:**	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

During a dark night cross-country flight, the instrument-rated pilot was approaching the intended airport for landing when the airplane collided with the blades of a wind turbine tower. The weather had started to deteriorate and precipitation echoes were observed on radar. Witnesses in the area described low clouds, windy conditions, and precipitation. In addition, weather briefing records and statements made to a witness indicate that the pilot was aware of the current and forecast weather conditions for the route of flight. Investigators were unable to determine why the airplane was operating at a low altitude; however, the pilot was likely attempting to remain clear of the clouds even though both the pilot and the airplane were capable of flying in instrument meteorological conditions. An examination of the airplane, systems, and engine revealed no anomalies that would have precluded normal operation. Toxicology findings revealed a small amount of ethanol in the pilot's blood, which was unlikely due to ingestion since no ethanol was found in liver or muscle tissue.

The investigation revealed that the wind turbine farm was not marked on either sectional chart covering the accident location; however, the pilot was familiar with the area and with the wind turbine farm. Investigators were not able to determine what the pilot was using for navigation just before the accident. The light on the wind turbine tower that was struck was not operational at the time of the accident, and the outage was not documented in a notice to airmen. The wind turbine that was struck was the 5th tower in a string of towers oriented east to west, then the string continued south and southwest with an additional 13 towers. If the pilot observed the lights from the surrounding wind turbines, it is possible that he perceived a break in the light string between the wind turbines as an obstacle-free zone.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's decision to continue the flight into known deteriorating weather conditions at a low

altitude and his subsequent failure to remain clear of an unlit wind turbine. Contributing to the accident was the inoperative obstruction light on the wind turbine, which prevented the pilot from visually identifying the wind turbine.

Findings

Aircraft	Altitude - Not attained/maintained (Cause)
Personnel issues	Incorrect action performance - Pilot (Cause)
Environmental issues	Object/animal/substance - Effect on operation (Factor) Low ceiling - Effect on operation Dark - Effect on operation

Factual Information

HISTORY OF FLIGHT

On April 27, 2014, about 2116 central daylight time (CDT), a Piper PA-32R-300 airplane, N8700E, was destroyed during an impact with the blades of a wind turbine tower 10 miles south of Highmore, South Dakota. The commercial pilot and three passengers were fatally injured. The airplane was registered to and operated by a private individual under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Dark night instrument meteorological conditions prevailed for the flight, which operated without a flight plan. The flight originated from Hereford Municipal Airport (KHRX), Hereford, Texas, approximately 1700, and was en route to Highmore Municipal Airport (9D0), Highmore, South Dakota.

According to family members, the pilot and three passengers had been in Texas for business. The pilot's family reported that they had intended to leave earlier in the day, on the day of the accident, but elected to delay, and subsequently left later than they had planned. The family stated that most likely, the flight was going to stop at 9D0 to drop off one passenger before continuing to Gettysburg Municipal Airport (0D8), Gettysburg, South Dakota.

A fixed base operator employee at KHRX witnessed the pilot fuel the accident airplane at the self-serve fuel pump just prior to the accident flight. He reported that the fuel batch report showed 82.59 gallons of fuel had been dispensed. The pilot commented to the employee that he was going to "top it off" as he had "pushed his luck on the trip down." The pilot also discussed the weather conditions in South Dakota, noting that it was raining there. The pilot also added that the only reason they were leaving was because one of the passengers was anxious to get home.

The pilot contacted the Fort Worth Lockheed Martin Contract Flight Service Station at 1711 when the airplane was 38 miles west of Borger, Texas, on a direct flight to North Platte, Nebraska. The pilot requested and obtained an abbreviated weather briefing. During this briefing, winds aloft and weather advisories for the reported route of flight were provided. The pilot also provided a pilot report for his position.

At 1812 the pilot sent a text stating that they were "Into KS aways" (sic). At 1923 he sent a text stating that they were "into NE". At 2054 he stated that they were flying by Chamberlain, South Dakota.

Several witnesses in the area reported seeing an airplane fly over their homes the evening of the accident. The first witness, located near the shore of the Missouri River, near Fort Thompson, South Dakota, reported seeing an airplane about 200 feet above the ground, flying to the northeast, about 2045. He stated that the airplane was low and was moving quickly. The second witness, located a few miles southwest of the accident site, reported seeing an airplane flying at a very low altitude, headed north, about 2115. Neither witness reported hearing problems with the engine.

According to the Federal Aviation Administration (FAA), the airplane was reported missing by a concerned family member when the airplane did not arrive in Gettysburg, South Dakota, on the evening of April 27, 2014. The wreckage of the airplane was located by members of the Hyde County Fire Department and the Hyde County Sheriff's department around 0330 on the morning of April 28, 2014. The pilot was not communicating with air traffic control at the time of the accident and radar data for the accident flight was not available.

OTHER DAMAGE

Wind turbine tower #14, part of the South Dakota Wind Energy Center owned by NextEra Energy Resources, was damaged during the accident sequence. One of the three blades was fragmented into several large pieces. One large piece remained partially attached to a more inboard section of the turbine blade. The inboard piece of this same turbine blade remained attached at the hub to the nacelle. The outboard fragmented pieces of the wind turbine blade were located in a radius surrounding the base of the wind turbine tower. The other two wind turbine blades exhibited impact damage along the leading edges and faces of the blades.

PERSONNEL INFORMATION

The pilot, age 30, held a commercial pilot certificate with airplane single engine land, multiengine land, and instrument ratings. He was issued a second class airman medical certificate without limitations on January 19, 2014. The pilot was a professional agricultural pilot and had flown agricultural airplanes in the area for several seasons.

The family provided investigators the pilot's flight logbook. The logbook covered a period between April 22, 2010, and April 20, 2014. He had logged no less than 3,895.8 hours total time; 100.7 hours of which were in the make and model of the accident airplane and 95.1 hours of which were in the accident airplane. This time included 76.2 hours at night, 1.1 hours of which had been recorded within the previous 90 days. The pilot was current for flight with passengers at night. He successfully completed the requirements of a flight review on January 18, 2013. He successfully completed an instrument proficiency check in a PA-32R on February 7, 2014.

According to the FAA, the pilot was familiar with the accident area. Specifically, the pilot was familiar with the wind turbine farm and had expressed his concern about the wind turbine farm to the FAA Flight Standards District Office in Rapid City, South Dakota. The details of his concerns were not available.

AIRCRAFT INFORMATION

The accident airplane, a Piper PA-32R-300 (serial number 32R-7680159), was manufactured in 1976. It was registered with the FAA on a standard airworthiness certificate for normal operations. A Lycoming IO-540-K1G5D engine rated at 300 horsepower at 2,700 rpm powered the airplane. The engine was equipped with a 2-blade Hartzell propeller. The airplane was equipped and certified for flight in instrument meteorological conditions.

The airplane was maintained under an annual inspection program. A review of the maintenance records indicated that an annual inspection had been completed on April 17, 2013, at an airframe total time of 4,766 hours.

METEOROLOGICAL INFORMATION

The closest official weather observation station was Pierre Regional Airport (KPIR), Pierre, South Dakota, located 35 miles west of the accident location. The elevation of the weather observation station was 1,744 feet mean sea level (msl). The routine aviation weather report (METAR) for KPIR, issued at 2124, reported wind from 010 degrees at 19 knots, visibility 10 miles, light rain, sky condition broken clouds at 1,000 feet, overcast at 1,600 feet, temperature 6 degrees Celsius (C), dew point temperature 5 degrees C, altimeter 29.37 inches, remarks ceiling variable between 800 and 1,200 feet.

The METAR issued at 2139 for KPIR reported wind from 070 degrees at 19 knots, visibility 4 miles, rain, mist, sky condition ceiling overcast clouds at 800 feet, temperature 6 degrees C, dew point temperature 5 degrees C, altimeter 29.37 inches, remarks ceiling variable between 600 and 1,300 feet.

Huron Regional Airport (KHON) in Huron, South Dakota, was located 53 miles to the east of the accident site at an elevation of 1,289 feet. The METAR issued at 2055 for KHON reported wind from 100 degrees at 20 knots, gusting to 27 knots, visibility 10 miles, sky condition ceiling overcast at 1,000 feet, temperature 9 degrees C, dew point temperature 7 degrees C, altimeter 29.36 inches, remarks peak wind of 29 knots from 090 degrees at 2015, rain began at 1956 and ended at 2006.

The National Weather Service (NWS) Surface Analysis Chart for 2200 CDT depicted a low-pressure center in southern Nebraska, with an occluded front extending into northeastern Kansas. A stationary front extended from northeastern Nebraska southeast through southern Iowa. Surface wind east of the accident location was generally easterly, with surface wind to the west of the accident location generally northerly. Station models across the state of South Dakota depicted overcast skies, with temperatures ranging from the high 30's Fahrenheit (F) to the mid-50's F. Rain and haze were depicted across the state.

A regional Next-Generation Radar (NEXRAD) mosaic obtained from the National Climatic Data Center (NCDC) for 2115 identified a large portion of South Dakota under light to moderate values of reflectivity, including the region surrounding the accident site. WSR-88D Level II radar data obtained at 2114 from Aberdeen, South Dakota, (KABR), depicted altitudes between 5,460 and 13,200 feet at the accident site. The KABR data identified an area of light reflectivity coincident with the accident location approximately two minutes prior to the accident time.

Advanced Very High Resolution Radiometer (AVHRR) data from the NOAA-16 satellite data were obtained from the National Oceanic and Atmospheric Administration and identified cloudy conditions at or near the accident site. Cloud-top temperatures in the region varied between -53 degrees C and 6 degrees C. The temperature of -53 degrees C corresponded to heights of approximately 35,000 feet. Due to a temperature inversion in the ABR sounding near 4,000 feet, the temperature of 6 degrees C may correspond to various cloud heights ranging from at or very near the surface to between 3,500 and 6,500 feet.

An Area Forecast that included South Dakota was issued at 2045 CDT. The portion of the Area Forecast directed toward the eastern two-thirds of South Dakota forecasted for the accident time: ceiling overcast at 3,000 feet msl with cloud tops to flight level (FL)180, widely scattered light rain showers, and wind from the east at 20 knots with gusts to 30 knots. Prior to the 2045 CDT Area Forecast, another Area Forecast that included South Dakota was issued at 1345 CDT. The portion of the Area Forecast directed toward the central and eastern portions of South Dakota forecasted for the accident time: ceiling overcast at 3,000 feet msl with clouds layered up to FL300, scattered thunderstorms with light rain, cumulonimbus cloud tops to FL400, wind from the southeast at 20 knots with gusts to 35 knots.

Airmen's Meteorological Information (AIRMET) SIERRA for IFR conditions was issued at 1959 CDT for a region that included the accident location. AIRMET TANGO for moderate turbulence for altitudes below 15,000 feet was issued at 1545 CDT for a region that included the accident location. The AIRMET also addressed strong surface winds for a region that did

not include the accident location. AIRMET ZULU for moderate ice for altitudes between the freezing level and FL200 was issued at 1545 CDT for a region that included the accident location.

There were no non-convective Significant Meteorological Information (SIGMET) advisories active for the accident location at the accident time. There were two Convective SIGMETs issued for convection close to the accident location in the two hours prior to the accident time

According to the United States Naval Observatory, Astronomical Applications Department Sun and Moon Data, the sunset was recorded at 2037 and the end of civil twilight was 2109. The moon rose at 0615 on the following day.

At the time of the accident the wind turbine tower #14 recorded the wind velocity at 9.7 meters per second or 21 miles per hour and the ambient temperature was 7 degrees C.

The pilot logged on to the CSC DUAT System on April 26, 2014, at 2141:36 and requested a low altitude weather briefing quick path service. The pilot identified the route of flight as a direct flight between KHRX and 0D8, at an altitude of 8,500 feet.

AIDS TO NAVIAGATION

The FAA Twin Cities Sectional Chart 87th edition, dated 9 January, 2014, through 26 June, 2014, depicted the city of Highmore, South Dakota, and the Highmore Airport on the southern edge of the chart boundary. The city of Highmore and the airport were both within the same boundary box with a maximum elevation figure of 24 or 2,400 feet msl. The maximum elevation figure immediately south of Highmore was 27 or 2,700 feet msl. An obstacle at an elevation of 276 feet above ground level (agl) and 2,180 feet msl was depicted immediately south of the city of Highmore. A wind farm was depicted south and east of Ree Heights, South Dakota – this wind farm was at an elevation of 420 feet agl and 2,447 feet msl. The wind farm involved in this accident was not depicted on this sectional chart.

The FAA Omaha Sectional Chart 89th edition, dated 6 February, 2014, through 24 July, 2014, depicted the city of Highmore, South Dakota, and the Highmore Airport on the northern edge of the chart boundary. The city of Highmore and the airport were both within the same boundary box with a maximum elevation figure of 24 or 2,400 feet msl. The maximum elevation figure immediately south of Highmore was 27 or 2,700 feet msl. A wind farm was depicted south and east of Ree Heights, South Dakota – this wind farm was at an elevation of 420 feet agl and 2,447 feet msl and 420 feet agl and 2,500 feet msl.

A single obstruction was depicted on the chart about 7 miles south of the city of Highmore, just to the east of highway 57. The obstruction was at an elevation of 215 feet agl and 2,335 feet msl. A group of obstructions was depicted on the chart about 9 miles south of the city of Highmore, just to the west of highway 57. The obstructions were at an elevation of 316 feet agl and 2,496 feet msl. The wind farm involved in this accident was not depicted on this sectional chart as a wind farm.

According to the FAA, the 90th edition of the Omaha Sectional Chart, effective from 24 July, 2014, through 5 February, 2015, added the depiction of the accident wind farm just south of the city of Highmore. This depicted the wind farm west and southwest of highway 57 at an elevation of 2,515 feet msl. In addition, an unlit obstruction at an elevation of 415 feet agl and 2,597 feet msl was depicted just south of the wind farm boundary.

There are no instrument approach procedures into 9D0. There are two RNAV (GPS)

approaches, runway 13 and runway 31, into 0D8.

FLIGHT RECORDERS

The accident airplane was equipped with an Apollo GX-50 panel-mount 8-channel GPS receiver. The unit includes a waypoint database with information about airports, VOR, NDB, en route intersections, and special use airspace. Up to 500 custom user-defined waypoints may be stored, as well. The GX-50 is a TSO-C129a class unit capable of supporting IFR non-precision approach operations. Thirty flight plans composed of a linked list of waypoints may be defined and stored. The real-time navigation display can be configured to show: latitude/longitude, bearing, distance to target, ground speed, track angle, desired track, distance, and an internal course deviation indicator (CDI). The unit stores historical position information in volatile memory; however, by design there is no method to download this information.

The unit was sent to the NTSB Vehicle Recorders Lab in Washington D.C. for download. Upon arrival at the Vehicle Recorders Laboratory, an exterior examination revealed the unit had sustained significant structural damage. An internal inspection revealed most internal components, including the battery, were dislodged. Since the internal battery was dislodged and the unit relied upon volatile memory to record information, no further recovery efforts were attempted.

WRECKAGE AND IMPACT INFORMATION

The accident scene was located in level, vegetated terrain, in the middle of a wind turbine farm, about 10 miles south of Highmore, South Dakota. The terrain was vegetated with short and medium grass. The wreckage of the airplane was fragmented and scattered in a radius to the north, through to the west, and then through the south, surrounding the base of wind turbine tower #14. The fragmented pieces of the fuselage, empennage, engine and propeller assembly, and both wings were accounted for in the field of debris.

MEDICAL AND PATHOLOGICAL INFORMATION

The autopsy was performed by the Sanford Health Pathology Clinic on April 29, 2014, as authorized by the Hyde County Coroner's office. The autopsy concluded that the cause of death was multiple blunt force injuries and the report listed the specific injuries.

The FAA's Civil Aerospace Medical Institute (CAMI), Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens that were collected during the autopsy (CAMI Reference #201400071001). Results were negative for all carbon monoxide and drugs. Testing of the blood detected 11 mg/dL ethanol; however, none was detected in the muscle or liver. Tests for cyanide were not conducted.

TESTS AND RESEARCH

Wreckage Examination

The wreckage was recovered and relocated to a hangar in Greeley, Colorado, for further examination. The wreckage was examined by investigators from the National Transportation Safety Board, Piper Aircraft, and Lycoming Engines.

The left wing separated from the fuselage and was fragmented. The fuel tanks were impact damaged and the left main landing gear separated from the wing assembly. The aileron and the flap separated from the wing assembly and were impact damaged.

The right wing separated from the fuselage and was fragmented. The fuel tanks were impact damaged. The right main landing gear was extended and remained attached to the right wing spar. The aileron and the flap separated from the wing assembly and were impact damaged.

The fuel selector valve was impact damaged. The position of the selector handle was at the left main fuel tank. Disassembly of the valve found the selector in an intermediate position between off and the left main tank. The fuel screen was clear of debris.

The instrument panel was fragmented and many of the instruments, radios, and gauges were destroyed. The ADI case and the directional gyro exhibited signatures of rotational scoring. The tachometer exhibited a reading of 2,400 to 2,500 rpm. The altimeter was broken and the needles separated. The Kollsman window was set at 29.27 inches. The airspeed indicator exhibited a reading of 235 miles per hour.

The pitot static system was impact damage and fragmented. The pitot tube and static port were clear and free of debris or mechanical blockage. Due to the damage, the system could not be functionally tested.

The empennage separated from the fuselage and was impact damaged. The aft portion of the vertical stabilizer was impact damaged and remained partially attached to the rudder at the hinge points. The stabilator was impact damaged and fragmented.

Flight control continuity to the ailerons, stabilator, and rudder could not be confirmed. The flight control cables were fractured in overload in multiple locations. The position of the flaps and landing gear could not be determined due to impact damage.

The engine was impact damaged impeding examination and testing for functionality. The spark plugs exhibited worn out normal signatures when compared to the Champion Aviation Check-A-Plug chart. The fuel injectors for the 1, 3, and 5 cylinders were clear of debris. The fuel injectors for the 2, 4, and 6 cylinders were impact damaged. The oil pick-up screen was clear of debris. The fuel servo and fuel pump were impact damaged and could not be functionally tested. The fuel flow divider was clear of debris. The vacuum pump case was bent and exhibited internal scoring consistent with operation at the time of the accident.

The propeller separated from the engine at the propeller flange. One blade exhibited S-bending, a curled tip, chord-wise scratches, and nicks and gouges along the leading edge of the propeller blade. The second blade exhibited chord-wise scratches, nicks and gouges along the leading edge of the propeller blade, and grey angular pain transfer near the tip of the propeller blade.

Wind Turbine Tower #14 Obstruction Light Power Supply, Flash Head, and Photocell Examination

The obstruction light, which included the power supply, flash head, and photocell (44812A), was removed from wind turbine tower #14 by an employee of ESI at the request of the wind turbine company. All of the components were shipped to Hughey & Phillips for further examination.

During the examination the following observations were made:

- The flash head gasket was broken into 5 pieces. The day lens was crazed and a screw was loose in flash head.
- The photocell which was in the container is an aftermarket unit and not as supplied by

Hughey & Phillips.

- An aftermarket transformer was added to the power supply above the TB1 terminal block. This was not wired into the power supply and two wires hung from the transformer.

The power supply was placed on test jig and the power supply and flash head were connected via a 7-wire power cable, 7 feet in length, provided by Hughey & Phillips. When power was applied to the unit the flash head did not work - the red lamp attempted to flash and the white lamp did not flash.

- The lower flash tube was black consistent with age/use
- The power supply - capacitor C3 – was bulged at the top consistent with a bad capacitor

The capacitor was replaced and the red lamp functioned as designed. The white lamp did not function. The white flash tube was replaced with a new flash tube.

- When it was in day mode the white light activated
- When in night mode the red light activated
- When in auto mode, light was applied to the photocell sensor and after 30 seconds it switched from night to day mode. When light was removed and the sensor was covered to remove light, it switched back to night mode after 30 seconds.

The photocell was placed in a test chamber. When all light was removed, one light bulb illuminated. When 5 candelas was applied there was no change. The candelas were increased incrementally to 30 with no change. When the candelas were increased to 50, the test chamber switched to night mode within a minute or more.

The flash rate of the unit was tested.

- The red lamp tested at a rate of 25 flashed per minute – This is within the FAA specifications for the L-864 fixture, 20 to 40 flashes per minute.
- The white lamp tested at a rate of 40 flashes per minute- This is within the FAA specifications for the L-865 fixture, 40 flashes per minute.

The alarm function tested as designed.

The entire system operated normally with basic replacement of the flashtube and capacitor. The system was not operational in its as removed state.

ADDITIONAL INFORMATION

Wind Turbine

The wind turbine farm south of Highmore, South Dakota, was constructed in 2003. There are 27 towers in the entire farm oriented from east to west across highway 57. It was reported to the NTSB, on scene, that each turbine tower is about 213 feet tall (from the ground to the center of the hub) and the blade length is 100 feet long. Each tower is equipped with three blades and FAA approved lighting. The blades are constructed from carbon fiber.

On June 2, 2003, the FAA issued a Determination of No Hazard to Air Navigation, regarding the installment of wind turbine tower #14 near Highmore, South Dakota. The document identified that the wind turbines would be 330 feet agl and 2,515 feet msl. A condition to the determination included that the structure be marked and/or lighted in accordance with FAA

Advisory Circular 70/7460-1K Change 1.

The wind turbine tower #14 was located to the west of highway 57, and was the 5th wind turbine tower in a string of wind turbine towers, oriented from east to west. Wind turbine tower #14 was 0.3 miles to the west of the 4th wind turbine tower and 0.5 miles to the west of the 3rd wind turbine tower. The string of wind turbine towers changed direction after wind turbine tower #14 and continued to the south and south west for about 2 additional miles with 13 additional wind turbine towers in the string. The next closest wind turbine tower to #14 was 0.5 miles south.

The wind turbine tower #14 recorded an alert in the system when the airplane and the turbine blade collided and the turbine went offline. The impact was recorded at 2116:33. The blades were pitched at -0.5 degrees and the nacelle was at 112 degrees yaw angle (not a compass heading, rather nacelle rotation). There were no employees at the wind farm maintenance facility when the accident occurred. The NextEra control center in Juno Beach, Florida, received an immediate alert when the collision occurred. The company response would have been to send an employee to the wind turbine the next morning to determine why the turbine had gone offline.

Maintenance records for wind turbine tower #14, for 5 years prior to the accident, were submitted to the NTSB investigator in charge for review. These records included major and minor inspection sheets for 2010 and 2011 in addition to work management records for general maintenance, repairs, and fault troubleshooting that occurred between June 2010, and October of 2014 (after the accident). The major and minor inspection sheets for 2010 and 2011 indicated that the FAA lighting was inspected and found to be "normal" or "OK." No other maintenance records were provided which illustrated maintenance that was conducted or performed on the FAA lighting system between 2010 and the accident.

It was reported to the NTSB IIC that the light on tower #14 was not functioning at the time of the accident and had been inoperative for an undefined period. The actual witness to the inoperative light did not return telephone calls in attempt to confirm or verify this observation.

FAA Lighting Requirements

The US Department of Transportation – FAA issued Advisory Circular AC 70/7460-1K Obstruction Marking and Lighting on February 1, 2007.

Section 23. Light Failure Notification states in part that "...conspicuity is achieved only when all recommended lights are working. Partial equipment outages decrease the margin of safety. Any outage should be corrected as soon as possible. Failure of a steady burning side or intermediate light should be corrected as soon as possible, but notification is not required. B. Any failure or malfunction that lasts more than thirty (3) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to the appropriate flight service station (FSS) so a Notice to Airmen (NOTAM) can be issued."

Section 44. Inspection, Repair, and Maintenance states in part that "Lamps should be replaced after being operated for not more than 75 percent of their rated life or immediately upon failure. Flashtubes in alight unit should be replaced immediately upon failure, when the peak effective intensity falls below specification limits or when the fixture begins skipping flashes, or at the manufacturer's recommended intervals. Due to the effects of harsh environments, beacon lenses should be visually inspected for ultraviolet damage, cracks, crazing, dirt, build up, etc., to insure that the certified light output has not deteriorated."

Section 47. Monitoring Obstruction Light stated in part that "Obstruction lighting systems should be closely monitored by visual or automatic means. It is extremely important to visually inspect obstruction lighting in all operating intensities at least once every 24 hours on systems without automatic monitoring."

Chapter 13, Sections 130 through 134, addressed Marking and Lighting Wind Turbine Farms. Wind turbine farms are defined as "a wind turbine development that contains more than three (3) turbines of heights over 200 feet above ground level." In addition, a linear configuration in a wind farm is "a line-like arrangement… The line may be ragged in shape or be periodically broke, and may vary in size from just a few turbines up to 20 miles long."

Section 131. General Standards states in part that "Not all wind turbine units within an installation or farm need to be lighted." "Definition of the periphery of the installation is essential; however, lighting of interior wind turbines is of lesser importance…" "Obstruction lights within a group of wind turbines should have unlighted separations or gaps of no more than ½ statute mile if the integrity of the group appearance is to be maintained."

Section 134. Lighting Standards states in part that "Obstruction lights should have unlighted separations or gaps of no more than ½ mile. Lights should flash simultaneously. Should the synchronization of the lighting system fail, a lighting outage report should be made in accordance with paragraph 23 of this advisory circular." Section c. Linear Turbine Configuration states in part "Place a light on each turbine positioned at each end of the line or string of turbines. Lights should be no more than ½ statute mile, or 2,640 feet from the last lit turbine."

History of Flight

Enroute	Controlled flight into terr/obj (CFIT) (Defining event)

Pilot Information

Certificate:	Commercial	**Age:**	30
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without Waivers/Limitations	**Last Medical Exam:**	01/19/2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	01/18/2013
Flight Time:	(Estimated) 3895.8 hours (Total, all aircraft), 100.7 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	PIPER	**Registration:**	N8700E
Model/Series:	PA 32R-300	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	32R-7680159
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	04/17/2013, Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	4766 Hours	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	IO-540-K1G5D
Registered Owner:	On file	**Rated Power:**	300 hp
Operator:	On file	**Air Carrier Operating Certificate:**	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	KPIR, 1744 ft msl	**Observation Time:**	2124 CDT
Distance from Accident Site:	35 Nautical Miles	**Condition of Light:**	Night/Dark
Direction from Accident Site:	270°	**Conditions at Accident Site:**	Instrument Conditions
Lowest Cloud Condition:	Thin Broken / 1000 ft agl	**Temperature/Dew Point:**	6°C / 5°C
Lowest Ceiling:	Overcast / 1600 ft agl	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	19 knots, 10°	**Visibility (RVR):**	
Altimeter Setting:	29.37 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:	Light - Rain; No Obscuration		
Departure Point:	Hereford, TX (KHRX)	**Type of Flight Plan Filed:**	None
Destination:	Highmore, SD (9D0)	**Type of Clearance:**	None
Departure Time:	1700 CDT	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal		

Administrative Information

Investigator In Charge (IIC):	Jennifer Rodi	**Adopted Date:**	04/22/2015
Additional Participating Persons:	Todd Obritsch; FAA Flight Standards District Office; Rapd City, SD Michael McClure; Piper; McKinney, TX Troy R Helgeson; Lycoming Engines; Williamsport, PA		
Publish Date:	04/20/2015		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=89131		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.