Aviation Investigation Final Report

Location:	Thief River Falls, Minnesota	**Accident Number:**	CEN17FA361
Date & Time:	September 23, 2017, 07:42 Local	**Registration:**	N4777T
Aircraft:	Cessna TR182	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The noninstrument-rated private pilot and 2 passengers departed in instrument meteorological conditions (IMC) with an overcast cloud layer at 400 ft above ground level (agl). Data obtained from an onboard GPS unit showed the airplane depart toward the destination airport and climb and descend several times. About 2 minutes after takeoff, the airplane descended to 250 ft above ground level (agl), then turned and quickly climbed to 1,400 ft agl. The final GPS points showed the airplane in a descending right turn. A witness reported hearing the airplane overhead and stated that the engine was "screaming" before impact. The airplane impacted a field about 4 minutes after takeoff resulting in a debris path about 230 yards long, consistent with a relatively high forward airspeed at the time of impact.

A postaccident examination of the airframe and engine did not reveal any preimpact anomalies that would have precluded normal operation. The primary vacuum pump was not found in the wreckage; however, an examination of the standby vacuum pump revealed that the rotor was fractured by impact, but the vanes were intact. The heading indicator and turn coordinator gyros exhibited rotational scoring consistent with rotation at the time of impact. The damage to the propeller blades was consistent with the engine producing power at impact.

The autopsy report revealed no significant coronary artery disease; however, microscopic examination revealed focal areas of fine fibrosis suggestive of prior ischemic episodes. This finding was not significant enough to suggest an incapacitating event. No other significant natural disease was present that could pose a hazard to flight safety.

Review of the pilot's logbook and his statements to individuals who spoke with him before the accident suggested that he had a history of flying in and around IMC. Given the weather conditions at the time of departure and observations of the pilot checking the weather conditions before the flight, the pilot was aware that he would be required to fly in or under IMC during the flight and chose to do so despite not holding an instrument rating. Based on the reported weather conditions and GPS data, it is likely that,

while maneuvering on course after takeoff, the pilot entered IMC; he likely subsequently experienced spatial disorientation, which resulted in a loss of control and descent into terrain.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The noninstrument-rated pilot's decision to depart into instrument meteorological conditions, and his subsequent loss of control due to spatial disorientation.

Findings

Aircraft	(general) - Not attained/maintained
Personnel issues	Qualification/certification - Pilot
Personnel issues	Total instrument experience - Pilot
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Aircraft control - Pilot
Personnel issues	Spatial disorientation - Pilot
Personnel issues	Weather planning - Pilot
Personnel issues	Flight planning/navigation - Pilot
Environmental issues	Low ceiling - Decision related to condition
Environmental issues	Low ceiling - Contributed to outcome

Factual Information

History of Flight

Initial climb	Other weather encounter
Initial climb	Loss of control in flight (Defining event)

On September 23, 2017, about 0742 central daylight time, a Cessna TR182 airplane, N4777T, impacted terrain about 3 miles west of Thief River Falls Regional Airport (TVF), Thief River Falls, Minnesota. The private pilot and two passengers were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91. Instrument meteorological conditions prevailed at the time of the accident and no flight plan was filed for the personal flight, which departed from TVF at 0738 and was en route to Rawlins Municipal Airport (RWL), Rawlins, Wyoming.

Several individuals who spoke to the pilot in the days preceding the accident stated that he had flown the same passengers from RWL to TVF on September 17, 2017. The pilot stated to one individual that he descended through the clouds on approach to TVF that day. The pilot returned to RWL, then flew back to TVF the day before the accident to retrieve the passengers. After landing, the pilot asked the local fixed base operator (FBO) owner about obtaining a local sectional aeronautical chart, but the FBO did not have any charts for sale. The FBO owner later found an expired chart that the pilot accepted. A taxi driver who transported the pilot from TVF to a local hotel stated that the pilot described the flight as "terrible," because he flew at 1,500 ft above ground level (agl) under a cloud layer.

A hotel employee stated that the pilot checked into the hotel at 1655. He spoke to the pilot and passengers the following morning; the pilot was in the hotel lobby about 0530 checking the weather conditions on the hotel computer. The pilot stated to the employee that, when he arrived the evening before, he descended through clouds and that ice had accumulated on the airplane's windshield. The passengers did not eat breakfast and expressed concern about the turbulence expected for the flight. The pilot checked out of the hotel at 0640; the passengers were hesitant to check out because they didn't know if they would actually depart due to the weather conditions. The employee drove the pilot and passengers to TVF about 0705 and they arrived 5 to 10 minutes later. During the drive the pilot inquired about the distance to the Grand Forks Air Force Base and then guessed that it was 10 miles to the west.

A review of the Federal Aviation Administration (FAA) Air Traffic Control (ATC) and radar data revealed that the pilot was not in communication with ATC and that only 4 radar returns were identified that corresponded with the accident flight. The radar returns showed the airplane in a right turn about 2,900 ft above ground level (agl) in the vicinity of the accident site.

A Garmin handheld GPS was found in the wreckage and was sent to the NTSB recorders laboratory for download. The device contained data that corresponded to the accident flight. The airplane departed TVF then climbed and descended several times. About 2 minutes after takeoff, the airplane descended to 250 ft agl and then quickly climbed to 1,400 ft agl. The airplane then circled in the vicinity of the accident site in a right descending turn as seen in figure 1, which depicts the altitudes in mean sea level.

The final GPS point was about 280 yards west-southwest of the accident site on a true heading of about 20°.

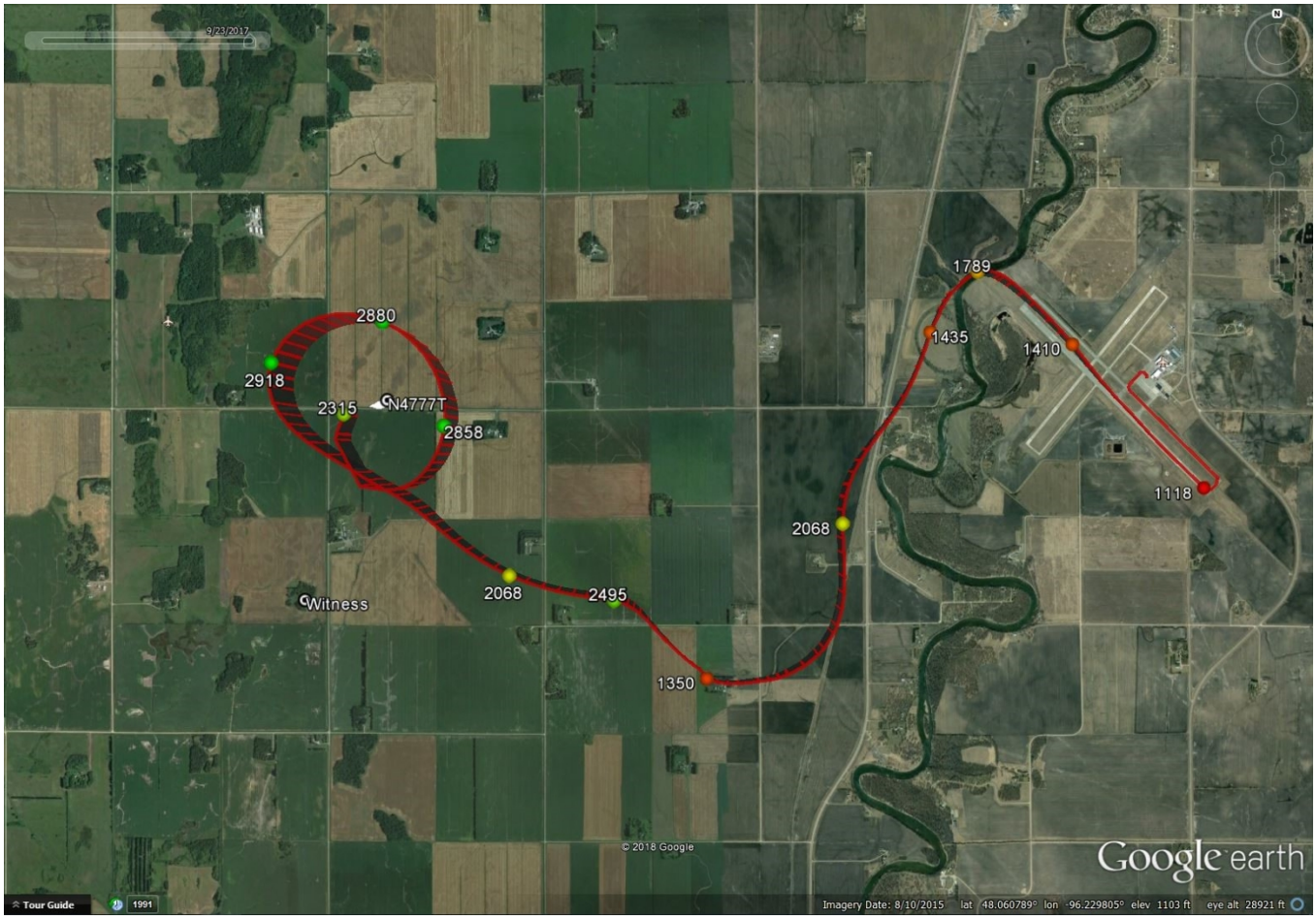

Figure 1 – Accident flight GPS track

A witness about 1 mile southwest of the accident site stated that he heard the airplane overhead and that the airplane's engine was "screaming" before he heard the impact.

Pilot Information

Certificate:	Private	**Age:**	69,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	May 17, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	814 hours (Total, all aircraft), 15.6 hours (Last 30 days, all aircraft)		

Passenger Information

Certificate:		**Age:**	Male
Airplane Rating(s):		**Seat Occupied:**	Unknown
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Passenger Information

Certificate:		**Age:**	Male
Airplane Rating(s):		**Seat Occupied:**	Unknown
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Review of FAA records revealed that the pilot did not hold an instrument rating; his logbook revealed that he had accumulated 6.4 hours in simulated instrument conditions.

The pilot's logbook contained entries for the flights to and from TVF. The entry for the flight on September 17 from RWL to TVF contained the pilot's remarks, "[passengers flown to TVF for] training at Arctic Cat. Very smooth and cold. Had to fly around and under clouds most of the way."

The logbook entry for the return flight on September 17, from TVF to RWL, contained the pilot's

remarks, "Flew above and between clouds most of the way back. Very windy and bumpy and thick clouds. Went up to 16,500 ft."

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N4777T
Model/Series:	TR182	**Aircraft Category:**	Airplane
Year of Manufacture:	1981	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	R18201763
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	August 5, 2016 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	67 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	579.9 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	O-540-L3C5D
Registered Owner:		**Rated Power:**	235 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Fueling records from RWL showed that the pilot serviced the airplane with 81.1 gallons of 100LL fuel on September 20, 2017. The manager of the fixed-base operator at TVF stated that the pilot purchased about 55 gallons of 100LL on September 22.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KTVF,1115 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	08:01 Local	**Direction from Accident Site:**	87°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	310°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	10°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	THIEF RIVER FALLS, MN (TVF)	**Type of Flight Plan Filed:**	None
Destination:	RAWLINS, WY (RWL)	**Type of Clearance:**	None
Departure Time:	07:38 Local	**Type of Airspace:**	Class E

The investigation did not find any evidence that the pilot obtained an official preflight weather briefing. The only evidence of the pilot checking the weather conditions was the statement from the hotel employee.

At 0701, the automated weather observation system (AWOS) at TVF recorded wind from 340° at 6 knots, 10 statute miles visibility, overcast clouds at 400 ft agl, temperature 50°F, dew point 48°F, and an altimeter setting of 29.95 inches of mercury; remarks – pressure rising rapidly.

At 0801, the TVF AWOS recorded wind from 310° at 7 knots, 10 statute miles visibility, overcast clouds at 400 ft agl, temperature 50°F, dew point 48°F, and an altimeter setting of 29.98 inches of mercury.

Around the time of the pilot's flight into TVF the previous evening, at 1701, the TVF AWOS recorded wind from 040° at 10 knots, 10 statute miles visibility, overcast clouds at 2,200 ft agl, temperature 75°F, dew point 67°F, and an altimeter setting of 29.69 inches of mercury. At 1801, the AWOS recorded wind from 070° at 8 knots, 10 statute miles visibility, overcast clouds at 2,000 ft agl, temperature 74°F, dew point 68°F, and an altimeter setting of 29.68 inches of mercury.

Airport Information

Airport:	THIEF RIVER FALLS RGNL TVF	**Runway Surface Type:**	Asphalt
Airport Elevation:	1118 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:	31	**IFR Approach:**	None
Runway Length/Width:	6504 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	3 Fatal	**Latitude, Longitude:**	48.064723,-96.256942

The accident site was located in a harvested wheat field next to a gravel road. The wreckage debris path began with a ground impact mark, which contained broken green glass from the right wing navigation light, and continued on a heading of 060° for about 230 yards. The airplane was highly fragmented, but all major components were found at the accident site (figure 2).

Figure 2 – Debris Path and Main Wreckage

Isolated postimpact fire damage was observed on the left wing, parts of the seats, and some of the baggage. Vegetation throughout the accident site exhibited fuel blighting. The fuel lines were fragmented and found along the wreckage path. The fuel selector handle was separated from the airplane and found positioned to BOTH; the fuel selector valve was also positioned to BOTH.

The instrument panel was impact damaged and several instruments were found along the wreckage path. The panel was bent downward above the landing gear selector handle; the handle was in the gear-extended position. The right main landing gear was found separated from the airplane. The nose gear remained attached at its mounting point and was entangled in the wreckage. The left main landing gear actuator and landing gear were retracted.

The seats were found separated from the seat rails. The front left seat remained attached to the fuselage floor via the secondary seat stop locking reel strap.

Complete flight control cable continuity was not established due to fragmentation and overall condition of the wreckage. The elevator, elevator trim, and rudder cables remained attached to their respective positions in the aft tail cone. Fragments of the aileron cables remained attached to the forward pulleys. The elevator cables remained attached to the forward bellcranks. The rudder cables remained attached to the torque tubes. The flap actuator was separated from the right wing and found in the retracted position.

The engine came to rest upright 10 ft beyond the fuselage and remained loosely attached by the stretched propeller governor control cable. The engine sustained significant impact damage and several engine accessories were found separated at the accident site; the alternator and primary vacuum pump were not found. The three-bladed propeller was impact separated at the crankshaft flange.

Propeller blades 1 and 3 remained attached to the hub; blade 2 was separated and found about 20 ft beyond the hub. Propeller blade 1 was bent aft, twisted, and exhibited diagonal scoring on the cambered side of the blade. There was also impact damage to the trailing edge of blade 1 near the tip. Propeller blade 2 was twisted and exhibited lengthwise scoring on the back of the blade near the shank. Propeller blade 3 exhibited S-bending, twisting, and paint burnishing on the cambered side of the blade. The trailing edge of blade 3 exhibited an impact mark about 9 inches from the tip.

During a postaccident examination, the engine was rotated by hand using a turning tool from the vacuum pump pad. Thumb suction and compression was obtained on cylinder Nos. 2, 4, 5, and 6. The push rods for cylinder Nos. 1 and 3 were impact damaged. Valve train continuity was verified. All cylinders were examined using a lighted borescope with no anomalies noted. The turbocharger was rotated by hand and the turbine wheel moved with no restrictions noted. The fuel pump remained secure on its mount and was removed and actuated by hand; thumb suction and compression were obtained. Residual fuel was observed in the pump. The single-drive dual-magneto was manually actuated and produced a spark at each terminal. The starter housing exhibited rotational scoring and impact damage from the adjacent starter ring gear support. Disassembly of the standby vacuum pump revealed that the rotor was fractured, but the vanes were intact. There were no preimpact anomalies observed during the examination that would have precluded normal engine operation.

A postaccident examination and disassembly of the heading indicator and turn coordinator revealed rotational scoring on each internal gyro and gyro casing consistent with rotation at the time of impact.

Additional Information

Spatial Disorientation

According to FAA Safety Team literature, pilots flying under both instrument and visual flight rules are subject to spatial disorientation and optical illusions that may cause a loss of aircraft control. Sight, supported by other senses, allows a pilot to maintain orientation while flying. However, when visibility is restricted (i.e., no visual reference to the horizon or surface detected) the body's supporting senses can conflict with what is seen. When this spatial disorientation occurs, sensory conflicts and optical illusions often make it difficult for a pilot to tell which way is up. Contributing to these phenomena are the various types of sensory stimuli: visual, vestibular (organs of equilibrium located in the inner ear), and proprioceptive (receptors located in the skin, muscles, tendons and joints). Changes in linear acceleration, angular acceleration, and gravity are detected by the vestibular system and the proprioceptive receptors, and then compared in the brain with visual information. In a flight environment, these stimuli can vary in magnitude, direction, and frequency, resulting in a sensory mismatch that can produce illusions and lead to spatial disorientation.

Medical and Pathological Information

University of North Dakota School of Medicine and Health Sciences, Forensic and Autopsy Service, Grand Forks, North Dakota, completed an autopsy on the pilot. The autopsy report concluded that the cause of death was blunt force trauma. The autopsy revealed no significant coronary artery disease; however, microscopically, there were focal areas of fine fibrosis suggestive of prior ischemic episodes.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens that were collected during the autopsy. Toxicology results were positive for salicylates (aspirin) in the urine and negative for any other substances.

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Dustin Jostad; Federal Aviation Administration; Fargo, ND John Butler; Lycoming Engines; TX Peter Basile; Textron Aviation; Wichita, KS
Original Publish Date:	October 10, 2018
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96060

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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. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available here.