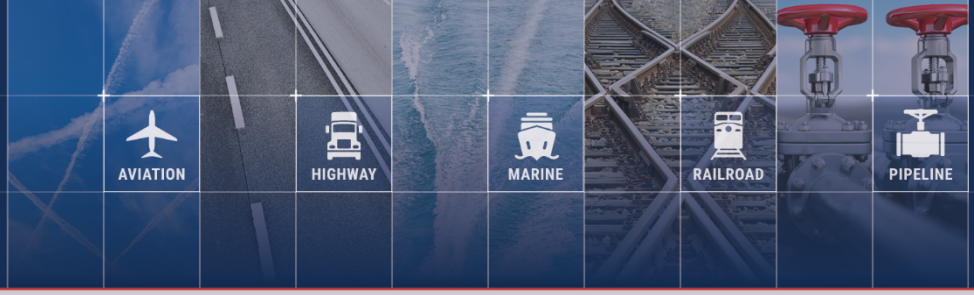

Aviation Investigation Final Report

Location:	Fellsmere, Florida	**Accident Number:**	ERA19FA116
Date & Time:	March 5, 2019, 07:03 Local	**Registration:**	N556PU
Aircraft:	Piper PA28	**Aircraft Damage:**	Substantial
Defining Event:	Loss of visual reference	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The student pilot was scheduled to complete a solo cross-country flight the day before the accident, and her flight instructor had provided the required endorsements for that flight; however, the flight was subsequently cancelled due to weather and was rescheduled for the following morning. When the pilot arrived on the airport the morning of the accident, she was released for the flight by the operations duty officer (DO), who was responsible for confirming that students had the proper endorsements for solo flight, even though her endorsements for the previous day's flight would have been no longer valid. The DO was also responsible for ensuring that weather conditions along a student's planned route of flight met the student's prescribed limitations, and found that although the departure airport was reporting visual flight rules (VFR) conditions, the destination airports were reporting instrument flight rules (IFR) conditions. He stated that airports in the area tended to be IFR in the early-morning hours due to fog, then quickly improve to VFR after sunrise. He signed the pilot's flight risk assessment so that she could conduct her preflight inspection, but stressed to her that she needed to check the weather again before takeoff, and if conditions were still IFR, then the flight needed to be cancelled.

Between the time the DO released the pilot for the flight and the time she subsequently departed just after sunrise, weather conditions at the departure airport deteriorated from VFR to low IFR, including a cloud ceiling around 400 to 500 ft above ground level. The airplane likely entered instrument meteorological conditions (IMC) immediately after takeoff. A review of radar data revealed that the pilot flew west-northwest of the airport and made a series of climbing and descending turns before the airplane impacted terrain around 6 minutes after takeoff about 7.3 miles northwest of the airport. Postaccident examination of the airplane and the engine revealed no discrepancies that would have precluded normal operation. The airplane's radar track after takeoff did not suggest an immediate loss of control upon entering IMC; however, the climbing and descending turns near the end of the data are consistent with the known effects of spatial disorientation.

On the morning of the accident, four other students departed on solo flights. Three of the pilots departed just before the accident pilot. Two of these pilots stated that they checked the weather before their flights

and conditions were VFR; however, it was still dark out and they could not see the clouds. All three pilots entered the clouds immediately after takeoff but were able to climb to a safer altitude and divert to another airport.

Students were required to obtain a weather briefing and file a flight plan as part of the preflight planning process. It could not be determined what weather information, if any, the pilot obtained the morning of the accident, and she did not file a flight plan for the flight.

The pilot was behind in her flight training schedule and had expressed concerns about being removed from the flight program. It is possible that she felt self-imposed pressure to complete the flight to remain in the program. Additionally, she may have assumed that she was cleared to conduct the flight upon being released by the DO, though previous communications with her instructor indicated that she was aware of the endorsement requirements.

Although the pilot should have known that her decision to depart on the flight without a flight plan and without an instructor endorsement met neither Federal Aviation Administration nor the school's published requirements, the DO should have recognized that the endorsements contained in her logbooks were for the previous day and not released the pilot for the flight without consulting the instructor.

Probable Cause and Findings

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

The student pilot's loss of control due to spatial disorientation following an encounter with instrument meteorological conditions shortly after takeoff. Contributing to the accident was the failure of both the pilot and the flight school to ensure that the pilot had received the proper endorsements for the flight and the pilot’s self-imposed pressure to complete the flight in order to remain in the flight program.

Findings

Personnel issues	Motivation/respond to pressure - Student/instructed pilot
Personnel issues	Spatial disorientation - Student/instructed pilot
Personnel issues	Aircraft control - Student/instructed pilot
Environmental issues	Clouds - Effect on operation
Personnel issues	Qualification/certification - Student/instructed pilot
Personnel issues	Qualification/certification - Flt operations/dispatcher
Environmental issues	Clouds - Contributed to outcome

Factual Information

History of Flight

Initial climb	Loss of visual reference (Defining event)
Maneuvering	Loss of visual reference
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On March 5, 2019, at 0703 eastern standard time, a Piper PA-28-161, N556PU, was substantially damaged when it was involved in an accident near Fellsmere, Florida. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations (CFR)* Part 91 solo instructional flight.

The student pilot had been training at the FlightSafety International Inc. (FSI) FlightSafety Academy (FSA) in Vero Beach, Florida; the accident flight was her second solo cross-country flight. The Vero Beach Regional Airport (VRB) control tower was not open at the time of departure, and there were no recorded radio transmissions documenting the pilot's departure.

The airplane was first observed on radar shortly after it departed runway 30L at 0657:23. At that time it was at a groundspeed of 106 knots, and an altitude of 525 ft mean sea level (msl). For about the next 1 minute 30 seconds, the airplane flew on a westerly heading and descended to 325 ft msl and reduced groundspeed to 83 knots.

The airplane then made a right turn toward the northwest before making a left turn back to the southwest. The airplane slowed to a groundspeed of 70 knots and the altitude varied between 425 ft and 300 ft msl before it made a right turn to the north about 0700:36. At that time, the airplane was at a groundspeed of 79 knots, a heading of 336°, and an altitude of 625 ft msl.

Over the next 2 minutes 30 seconds, the airplane made a series of climbing and descending turns with varying groundspeeds and headings, before it entered a steep right turn at 0703:05. At that time, the airplane was at groundspeed of 93 knots, a heading of 242°, and an altitude of 725 ft msl.

Over the next 34 seconds, the airplane continued to turn right before the data ended at 0703:39. At that time, the airplane was at a groundspeed of 117 knots, a heading of 153°, and an altitude of 550 ft msl. The airplane impacted terrain about 1/4-mile south of the last radar return in heavily wooded farmland about 7.3 miles northwest of VRB.

Student pilot Information

Certificate:	Student	**Age:**	24,Female
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	April 8, 2018
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	96 hours (Total, all aircraft), 96 hours (Total, this make and model), 6 hours (Pilot In Command, all aircraft), 47 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft)		

The pilot's planned route on the day of the accident was VRB to Palm Beach County Glades Airport (PHK), Pahokee, Florida, to Okeechobee County Airport (OBE), Okeechobee, Florida, to VRB. According to her logbook, she had completed this same route numerous times with a flight instructor and once as a solo cross-country flight.

A review of text messages provided by the instructor and the pilot's previous instructor revealed that the pilot's initial flight instructor at FSA would not endorse her for solo flight and recommended that she be removed from the flight program. FSA subsequently assigned her a new instructor, who stated that the pilot "was fine" and endorsed her for a solo cross-country flight. This instructor then left FSA, and the pilot was assigned to her current flight instructor.

The pilot's current flight instructor stated that she had only flown with the pilot twice before the accident, both of which were dual cross-country flights. The instructor described the pilot as a "remedial student" who had expressed concern that she would be released from the flight program due to her high flight time. The pilot knew that she needed to complete the solo cross-country flights to remain in the training program.

A review of the pilot's training records, and lesson plans revealed that she started her private pilot training in March 2018 and logged her first training flight on June 11, 2018. She was scheduled to have completed the private pilot course by March 1, 2019. A review of her lesson plans revealed that she had 34 unsatisfactory lessons and 36 satisfactory lessons.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N556PU
Model/Series:	PA28 161	**Aircraft Category:**	Airplane
Year of Manufacture:	2000	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2842093
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 3, 2019 AAIP	**Certified Max Gross Wt.:**	2447 lbs
Time Since Last Inspection:	4 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	13103.4 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	O-320-D3G
Registered Owner:		**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	Pilot school (141)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	VRB,23 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	07:03 Local	**Direction from Accident Site:**	120°
Lowest Cloud Condition:	Unknown	**Visibility**	6 miles
Lowest Ceiling:	Overcast / 400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	250°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	19°C / 18°C
Precipitation and Obscuration:	N/A - None - Mist		
Departure Point:	Vero Beach, FL (VRB)	**Type of Flight Plan Filed:**	None
Destination:	Pahokee, FL (PHK)	**Type of Clearance:**	None
Departure Time:	06:57 Local	**Type of Airspace:**	Class D;Class E

From the time the student pilot arrived at VRB to the time she departed and the airplane impacted terrain, the weather had deteriorated from visual flight rules to instrument flight rules conditions. Sunrise was at 0642.

The 0553 weather reported at VRB included wind from 230° at 4 knots, 10 miles visibility, light rain, scattered clouds at 2,700 ft above ground level (agl), broken clouds at 10,000 ft agl, temperature 18°C, dewpoint 17° C, with an altimeter setting of 30.00 inches of mercury (inHg).

At 0653, the wind was 270° at 7 knots, 8 miles visibility, light rain, ceiling broken at 500 ft agl, overcast clouds at 1,900 ft agl, temperature 19°C, dewpoint 18°C, and an altimeter setting of 30.03 inHg.

At 0703, the wind was 250° at 8 knots, visibility 6 miles, light rain and mist, ceiling overcast at 400 ft agl, temperature 19° C, dewpoint 18° C, and an altimeter setting of 30.03 in Hg.

Similar conditions were reported 13 miles south of the accident site at Treasure Coast International Airport (FPR), Fort Pierce, Florida, which reported at 0715 wind from 270° at 7 knots, 2 1/2 miles visibility in mist, ceiling overcast at 300 ft agl, temperature 19°C, dew point 18°C, altimeter 30.04 inHg.

A review of the terminal aerodrome forecast (TAF) for VRB on the morning of the accident revealed it was issued at 0044 and was amended at 0632, about 25 minutes before the pilot's departure. The 0044 forecast expected variable winds of 3 knots, visibility unrestricted at 6 miles or more, with broken clouds at 1,500 ft agl between 0300 and 0900. The 0632 forecast reported no change in the forecast through 0900.

The TAF was amended after the accident at 0741 and expected a temporary period of instrument flight rules (IFR) conditions between 0700 and 0900 with visibility of 2 miles in mist with a ceiling overcast at 300 ft.

The National Weather Service issued AIRMET Sierra at 0345, which was current until 1000, for IFR conditions over Florida and the coastal waters, which included the accident site, for ceiling below 1,000 ft agl and visibilities below 3 miles in mist.

FSA required students to obtain their own weather briefings as part of the preflight planning process. The school had a separate room where students could call Leidos Flight Service (LFS) to obtain weather briefings and file flight plans. There were also computers available to obtain weather information and file flight plans electronically. According to the flight school, the computers used to obtain weather information do not require a student to sign in, so there was no record available to determine if the pilot used one of the school's computers to obtain weather information before the accident flight.

According to LFS, neither they nor any of the other vendors that use the LFS database, provided the student pilot any services (weather briefing, flight plan filing) before the accident flight.

A review of FSA's Aviation Safety Action Program (ASAP) dispatch occurrence forms submitted by the four other FSA pilots who flew on the morning of the accident revealed that two of the pilots specifically stated that they had checked the METAR and TAF before they departed and weather was VFR. However, it was still dark out and they could not see the cloud bases. Both pilots departed between 0630 and 0650 and entered the clouds on takeoff between 400 and 700 ft agl. Both pilots were able to climb above the clouds and divert to another airport. Another pilot, who did not specifically say that he checked weather that morning, said that the sky was "dim and gray" and he departed at 0645. After takeoff, he entered the clouds at 600 ft agl, but was able to climb and divert to another airport. The

fourth pilot was the first on the flight line that morning and said that the ceiling and visibility were good, and he departed at 0610. The pilot flew east and noted that the cloud layers were not good for practicing maneuvers, so he returned to VRB. He said that the ceiling height was dropping quickly, but he was able to maintain visual contact with the airport and land.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	27.715,-80.527221

The airplane’s initial impact point was an approximate 30-ft-tall tree; the wreckage path continued about 460 ft through trees and the airplane came to rest on its right side on a magnetic heading of about 115°. All major components of the airplane were located at the accident site and there was no post-impact fire.

The airplane's right wing, left wing, section of left stabilator, baggage door, nose gear fork, left main gear, engine cowling, pilot's seat, and a section of the outboard seat rail were found along the wreckage path. The main wreckage included the propeller, engine, fuselage, empennage, vertical stabilizer, rudder, and right stabilator.

The left wing separated from the airframe at the wing root and exhibited extensive leading-edge impact damage. The fuel tank was breached. The aileron and flap remained partially attached to the wing. The aileron cables remained attached at the bell crank and exhibited broomstraw fractures.

The right wing separated at the wing root and was fractured into two sections. The outboard section of wing sustained extensive impact damage. The inboard section (fuel tank) was breached. The flap and aileron remained attached to their respective hinges. The aileron cables were attached to the bell crank and the ends exhibited broomstraw fractures.

The wing flap handle was in the 10° flaps-extended position; the flap torque tube was dislodged from its supporting structure.

Measurement of the stabilator trim jackscrew corresponded to a slight nose-down position.

The vertical stabilizer sustained some impact damage. The rudder remained partially attached. The stabilator remained attached to the fuselage. The right side of the stabilator exhibited leading edge damage and the stabilator was deformed aft. The leading edge of the left side of the stabilator was separated from the assembly and displayed impact damage.

Flight control continuity was established from all flight control surfaces to the cockpit. Any breaks in the system exhibited broomstraw fracturing consistent with overstress.

The cockpit area sustained impact damage. The throttle was in the idle position and the mixture was in the full lean position. The carburetor heat was off. The navigation lights and pitot heat were off. The pilot's seat was separated from the fuselage and its seat frame was fractured and deformed to the left. The pilot's outboard seat track and supporting structure were separated from the fuselage. The airplane was equipped with shoulder harnesses for each of the four seat positions. The pilot's restraint system remained attached to its fuselage attaching points. Its inboard latch assembly webbing was separated about 6 inches from its attaching point and the latch was not located within the recovered wreckage. Field testing of its shoulder harness inertia reel determined it to be functional.

The attitude indicator and directional gyro were removed and disassembled. The gimbals for each were intact, and no scoring was noted on the interior of either drum casing.

The fuel selector was found in the right main tank position. The valve moved freely to each detent when manually turned. The fuel lines to the valve were fractured. The fuel strainer remained attached to the firewall, but the cap was partially dislodged from the bowl. No fuel was found in the bowl, and the screen was not located. The electric boost pump was intact. The cap and screen were removed. A small amount of fuel was found in the pump and the screen was absent of debris. The fuel finger screen was intact on the left wing and absent of debris. The right-wing screen was separated from impact and not located. The carburetor was removed and disassembled. The metal floats were intact, and some fuel was found in the bowl. The fuel screen was absent of debris. The engine-driven fuel pump was removed. The pump moved freely when manually operated and produced suction and compression.

No mechanical discrepancies were noted that would have precluded normal operation of the airplane.

The two-bladed propeller remained attached to the engine. The spinner was crushed inward. Both blades exhibited "S" bending with leading edge polishing, leading edge deformation, and chordwise scratching out to the tip of the propeller.

The engine remained attached to the airframe and exhibited some impact damage. The upper engine cowling was impact damaged and separated from the fuselage. The lower engine cowlings were fragmented, and thermal damage was observed to a small area near the gascolator assembly.

Compression and valve train continuity were established on each cylinder by manual rotation of the propeller.

The vacuum pump was removed. The pump rotated freely when manually rotated. The pump was disassembled, and the coupling, drum, and vanes were undamaged.

The magnetos were removed, and the ignitions leads were cut near the terminals. Both magnetos were manually rotated and produced spark at each terminal.

The top and bottom spark plugs were removed. The Nos. 2 and 4 plugs were oil-soaked, and the Nos. 1 and 3 plugs were gray, consistent with normal wear per the Champion Check-A-Plug chart.

The oil sump was intact and filled with oil. The screen was absent of debris. The oil filter sustained impact and could not be opened.

No discrepancies were noted that would have precluded normal operation of the engine.

The airplane's 406-MHz emergency locator transmitter (ELT) remained in the empennage but had come loose from its mount and was still connected via coaxial cables. The unit was armed, beeping, and a small red light was flashing on the unit. The ELT antenna had separated from the airframe during impact. A metallurgical examination of the fractured section that attached the antenna to the airframe revealed it was fractured on a slant plane relative to its longitudinal axis, consistent with overstress separation from impact. As a result, there was no way for the ELT to transmit the emergency signal, which delayed finding the airplane for several hours.

Additional Information

Under 14 *CFR* 61.93(c)(3), a flight instructor is required to endorse a student pilot's logbook for each solo cross-country flight. A review of the endorsements section of the pilot's personal logbook and a secondary logbook kept by FSA revealed she had not been endorsed for the accident flight by her flight instructor. According to the instructor, she and the student met the day before to review weather conditions, the navigation log, and her planning for a flight that day, and the instructor endorsed the student for the flight; however, that flight was subsequently cancelled due to weather. The instructor then requested that the student reserve an airplane in the afternoon the following day to complete the flight. FSA's scheduling department was unable to book the flight for the afternoon and it was scheduled for 0600 instead.

The instructor knew that there was a high probability that the flight would not take place the morning of the accident due to weather, and she did not establish a time to meet with the student on the morning of the accident flight. The instructor expected to hear from the student the following morning to repeat the flight planning review/endorsement process if the weather was adequate for the flight, but when she did not hear from the student or the flight school, she assumed that the flight was again cancelled due to weather. The instructor was not aware that the student had departed until the operations duty officer (DO) called her later that morning attempting to locate the pilot. She then also attempted to contact the pilot but received no response. She subsequently contacted LFS and learned that the student had not filed a flight plan, which she was required to do per FSA policy.

FSA required all students who did not hold a private pilot certificate to have a signed "lesson sheet" and weather endorsement by their flight instructor before they met with the school's DO on solo flights. The DO was then responsible for reviewing the student pilot's knowledge of the current and forecasted weather conditions, planned/alternate routes, applicable regulations, safe operating practices, and noise abatement procedures by using scenario-based questions. The DO was also responsible for verifying that the student pilot's flight risk assessment tool was completed, and the appropriate risk identification and mitigation measures were being taken in accordance with FSA procedures. The DO would confirm the

student pilot's route of flight and verify that weather conditions did not exceed the limitations set by the student's flight instructor. Additionally, the DO was required to verify that the student had the proper solo flight endorsements in both their personal and FSA logbooks.

The DO on duty the morning of the accident stated that students began arriving about 0545. Of the five students scheduled to fly that morning, only the accident pilot was scheduled for a solo cross-country flight.

The DO stated that he reviewed the accident pilot's lesson sheet and verified that both of her logbooks had the appropriate instructor endorsements. He said, "...I reviewed weather conditions using SkyVector and found that VRB was reporting VFR, while OBE and FPR were reporting IFR. Because of the tendency for airports in the area to be IFR in the early-morning hours due to fog, then quickly go VFR after sunrise, I signed [student pilot]'s FRAT so she could conduct her preflight inspection, but stressed she must check the weather again before take-off and must cancel the flight if the weather along her intended route was still IFR." He then signed and dated the lesson sheet and released the pilot for the flight.

Per the FSA Training Regulations manual:

Solo cross-country flights may not depart unless VFR weather of not less than 2000' ceiling and 5 miles visibility is reported and forecast along the intended route. This restriction applies to predominant forecasted weather …. It is permissible to depart VRB with reported/forecast weather below stated minimums at the destination, provided the forecast at the estimated time of arrival is at or above required minimums.

An FSA lesson sheet was found in the wreckage on the pilot's kneeboard. The sheet was signed by her flight instructor but was not dated. It was also signed and dated for the day of the accident by the DO. The instructor stated that she signed the lesson sheet the day before the accident for the flight that was cancelled, and that the lesson sheet would have been invalid for any future flights without the accompanying, current-dated logbook endorsements for the flight on March 5, 2019.

Medical and Pathological Information

The District 19 Medical Examiner's Office for Indian River County, Florida, performed the autopsy on the pilot. The cause of death was determined to be "multiple blunt trauma injuries."

Toxicological testing performed at the FAA Forensic Sciences Laboratory was negative for all substances tested.

Administrative Information

Investigator In Charge (IIC):	Read, Leah
Additional Participating Persons:	Larry Penland; FAA/FSDO; Orlando, FL Damien Galbraith; Piper Aircraft Company; Vero Beach, FL David Harsanyi; Lycoming; Williamsport, PA
Original Publish Date:	November 19, 2020 **Investigation Class:** 2
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99054