Aviation Investigation Final Report

Location:	Rochester, Minnesota	**Accident Number:**	CEN13LA088
Date & Time:	December 2, 2012, 18:33 Local	**Registration:**	N9853Q
Aircraft:	Cessna 172M	**Aircraft Damage:**	Substantial
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	4 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The commercial pilot was conducting a personal cross-country flight. According to recorded air traffic control (ATC) transmissions and radar track data, the pilot attempted an instrument landing system (ILS) approach to an airport where the reported weather conditions were below published minimums for the approach. The pilot reported that the airplane descended on the glideslope into fog where there was limited to no forward visibility and that he initiated a missed approach at 1,600 ft mean sea level (msl) because he could not see the runway environment. The airplane impacted terrain shortly after the pilot increased engine power to transition into a climb for the missed approach. A review of the pilot's flight logbook established that he had not maintained his instrument currency, as required by federal regulations, during the 6 months preceding the accident.

According to radar track data, the airplane made multiple course corrections on both sides of the localizer centerline as it proceeded inbound toward the runway. The airplane eventually flew through the right localizer limit about 1.2 miles from the runway threshold. The airplane continued to fly away from the localizer and descended below the published decision height of 1,480 ft msl. The airplane impacted terrain about 1/2 mile right of the localizer centerline and about 3/4 mile from the runway threshold while in a descending right turn.

Postaccident testing revealed that there were no anomalies with the airplane's altimeter that would have prevented its normal operation. Additionally, the pilot had selected a Kollsman window setting that would have minimized any indication errors during the instrument approach. Further avionic testing identified no anomalies with the airplane's primary navigation radio and its associated course deviation indicator. According to ATC documentation, all components of the ILS approach were fully functional at the time of the accident. Further, 12 minutes before the accident, another airplane had completed the same ILS approach to the runway without any reported issues or anomalies.

In conclusion, the weather and light conditions at the time of the accident and the pilot's maneuvering during the approach were conducive to the development of spatial disorientation. Therefore, it is likely

that the pilot became spatially disoriented during the instrument approach, which resulted in the airplane descending below decision height and impacting terrain outside the lateral limits of the localizer. The pilot's lack of recent instrument flight experience likely contributed to him becoming spatially disoriented during the instrument approach.

Probable Cause and Findings

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

The pilot's spatial disorientation during the instrument approach in night, instrument meteorological conditions, which resulted in the airplane descending below decision height and impacting terrain outside the lateral limits of the localizer. Contributing to the accident was the pilot's lack of recent instrument flight experience.

Findings

Aircraft	Altitude - Not attained/maintained
Personnel issues	Spatial disorientation - Pilot
Personnel issues	Recent instrument experience - Pilot
Environmental issues	Below approach minima - Effect on operation
Environmental issues	Dark - Effect on operation

Factual Information

History of Flight

Approach-IFR missed approach	Controlled flight into terr/obj (CFIT) (Defining event)

On December 2, 2012, about 1833 central standard time, a Cessna model 172M airplane, N9853Q, was substantially damaged when it collided with terrain during an instrument approach to Rochester International Airport (RST), Rochester, Minnesota. The commercial pilot and three passengers sustained minor injuries. The airplane was registered to and operated by the Southeastern Minnesota Flying Club, Inc. under the provisions of 14 Code of Federal Regulations Part 91 while on an instrument flight plan. Night instrument meteorological conditions prevailed at the destination airport. The cross-country flight departed from Austin Straubel International Airport (GRB), Green Bay, Wisconsin, about 1603.

According to air traffic control transmissions, at 1745:57 (hhmm:ss), the pilot established radio contact with Rochester Approach and reported being level at 6,000 feet mean sea level (msl). The pilot further confirmed that he had the current automatic terminal information service (ATIS) weather information at RST. At 1801:05, the pilot asked the approach controller if any other flights had successfully landed at RST. The approach controller replied that no recent traffic had landed and that the current runway visibility range (RVR) was 1,000-1,200 feet. The approach controller also provided the pilot with the weather conditions at Dodge Center Airport (TOB) and Austin Municipal Airport (AUM), which, at the time, were reporting visual meteorological conditions. At 1806:18, the approach controller asked the pilot if he wanted to enter a hold while he decided on where he would like to land. The pilot replied that he wanted radar vectors to TOB. The approach controller subsequently cleared the flight direct to TOB and to maintain 6,000 feet msl. At 1808:07, the approach controller asked the pilot which instrument approach he wanted to attempt into TOB. The pilot replied that he wanted the RNAV/GPS Runway 16 instrument approach. The approach controller subsequently cleared the flight direct to JOPSU intersection. At 1809:21, the flight was cleared to descend and maintain 3,000 feet msl. At 1811:23, the pilot told the approach controller that the current weather at TOB included a 200 foot overcast ceiling and that he would not be able to land at TOB because the reported weather was below the published minimums for the non-precision instrument approach. The approach controller told the pilot that the weather at AUM was 7 miles visibility and a clear sky. The approach controller also issued a radar vector 300 degrees and cleared the flight to maintain 5,000 feet msl.

At 1813:23, the controller cleared a Cessna Citation, N521FP, who had been holding at the outer marker (ELLIE), for the Instrument Landing System (ILS) Runway 13 instrument approach to RST.

At 1814:16, the controller asked the pilot if he would like to be vectored to the southwest toward AUM. The pilot replied "Affirmative" and that "it was a good idea." The controller subsequently cleared the flight to turn left to a heading of 200 degrees toward AUM.

At 1821:05, the controller advised the pilot that the Cessna Citation, N521FP, had successfully landed at RST using the ILS Runway 13 instrument approach and that the current RVR was 1,200 feet. At

1821:40, the controller asked the pilot what his intentions were; if he wanted to continue toward TOB, attempt an instrument approach to RST, or divert to AUB. The pilot initially replied that he wanted to divert to AUB because the ILS Runway 13 landing minimums required a RVR of 1,800 feet. However, at 1822:32, the pilot subsequently requested to attempt the ILS runway 13 approach to RST before diverting to AUM. The pilot remarked that the previous Cessna Citation might have encountered better weather conditions that allowed a successful landing. At 1822:51, after confirming the pilot's decision to attempt the ILS Runway 13 approach, the controller cleared the flight to turn right to a heading of 030 degrees and to descend to maintain 3,000 feet msl. The pilot acknowledged the descent to 3,000 feet msl and receiving radar vectors for the final approach course for the ILS Runway 13 approach. At 1823:18, the controller asked the pilot if he had the current ATIS weather information "foxtrot." The pilot replied "affirmative."

At 1825:27, the controller told the pilot to turn right to a heading of 130 degrees. At 1825:34, the controller told the pilot to maintain 3,000 feet msl until established on the localizer and cleared the flight for the ILS Runway 13 approach to RST. At 1825:44, the controller told the pilot to continue the right turn to 160 degrees to intercept the localizer. At 1827:04, the controller told the pilot that the flight was 1-1/2 miles from ELLIE intersection and told him to contact Rochester Tower. The pilot acknowledged the frequency change and thanked the controller for his assistance.

At 1827:26, the pilot established contact with Rochester Tower and reported being inbound on the ILS Runway 13 approach. The tower controller cleared the flight to land on runway 13 and issued a pilot report (PIREP) that was provided by the previous Cessna Citation that had landed about 7 minutes earlier. The PIREP included the top of the fog layer being about 470 feet above ground level (agl), that they were able to identify the approach lighting and runway end identifier lights at published approach minimums, and that the inflight visibility was about 1/2 mile at minimums. At 1827:47, the pilot acknowledged the landing clearance and PIREP with "Roger, 9853Q." At 1833:03, the tower controller asked the pilot if he was going missed approach. There was no reply from the accident flight.

According to a statement provided by the pilot, the airplane descended on the glideslope into fog where there was limited to no forward visibility. The pilot stated that he continued to descend to an altitude of about 1,600 feet msl where he initiated a missed approach because he could not see the runway environment. The pilot reported that the airplane impacted terrain shortly after he increased engine power to transition into a climb for a missed approach.

A review of available aircraft radar track data was conducted for the instrument approach flight segment. According to the plotted data, the flight approached the outer marker (ELLIE) from the northwest and crossed over ELLIE at 2,600 feet msl slightly left of the localizer centerline. The plotted radar data established that the flight made multiple course corrections on both sides of the localizer centerline as it proceeded inbound toward the runway. The plotted course established that, at 1832:09, about 1.2 miles from the runway 13 threshold, the airplane traveled outside of the right localizer limit. At that time the airplane was at 1,700 feet msl. The airplane continued south-southeast, away from the localizer centerline, and continued to descend through 1,600 feet msl. At 1832:44, the airplane began a right turn toward south-southwest and continued to descend through 1,500 feet msl. According to the radar data, the airplane impacted terrain about 1833:03, at an altitude of 1,300 feet msl, while established in a right turn. The final radar return was located about 1/2 mile right of the localizer centerline and about 3/4 mile from the runway 13 threshold.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	23,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	December 7, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 16, 2012
Flight Time:	(Estimated) 841 hours (Total, all aircraft), 135 hours (Total, this make and model), 428.2 hours (Pilot In Command, all aircraft), 135 hours (Last 90 days, all aircraft), 22.2 hours (Last 30 days, all aircraft), 3.2 hours (Last 24 hours, all aircraft)		

According to Federal Aviation Administration (FAA) records, the pilot, age 23, held a commercial pilot certificate with single and multi-engine land airplane and instrument airplane ratings. He also held a flight instructor certificate with single-engine land airplane and instrument airplane ratings. His last aviation medical examination was completed on December 7, 2011, when he was issued a first-class medical certificate with a limitation for corrective lenses.

A review of available logbook information indicated that the last recorded flight was completed earlier on the day of the accident. As of that logbook entry, the pilot had accumulated 841 hours total flight experience, of which 428 hours were listed as pilot-in-command. He had accumulated 680 hours in single-engine airplanes and 161 hours in multi-engine airplanes. He had accumulated 26.2 hours in actual instrument conditions, 62.7 hours in simulated instrument conditions, and 69 hours at night. The pilot had flown 135 hours in the previous 90 days, 22 hours in the previous 30 days, and 3.2 hours during the 24 hour period before the accident flight. His last recorded flight review was completed on September 16, 2012, in a Piper model PA-28-140 single-engine airplane.

A review of available flight logbook information, as completed by a FAA Operations Inspector, revealed that the pilot's most recent instrument proficiency check had been completed on September 10, 2011. During the 6 months before the accident, the pilot had completed 2 instrument approaches that were determined to have been completed in actual instrument meteorological conditions. Additionally, during the same 6 month period, the pilot had not logged any simulated instrument time that could be associated with an instrument approach that had been flown with the aid of a safety pilot. According to the FAA inspector's logbook review, at the time of the accident flight, the pilot was not instrument current as per FAA regulation 14 CFR 61.57(c)(1). The FAA regulation specified that a pilot must have, within the 6 calendar months preceding the month of the flight, performed and logged at least 6 instrument approaches, holding procedures, and intercepting and tracking courses through the use of navigational electronic systems.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N9853Q
Model/Series:	172M	**Aircraft Category:**	Airplane
Year of Manufacture:	1975	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	17265797
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	November 14, 2012 Annual	**Certified Max Gross Wt.:**	2300 lbs
Time Since Last Inspection:	16 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	13143.6 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C91A installed, activated, aided in locating accident	**Engine Model/Series:**	O-320-E2D
Registered Owner:	Southeastern Minnesota Flying Club, Inc.	**Rated Power:**	150 Horsepower
Operator:	Southeastern Minnesota Flying Club, Inc.	**Operating Certificate(s) Held:**	None

The accident airplane was a 1975 Cessna model 172M, serial number (s/n) 17265797. The airplane was an all-metal, single-engine, externally-braced high wing, monoplane. The airplane had a fixed tricycle landing gear, was capable of seating four individuals, and had a certified maximum gross weight of 2,300 pounds. A 150-horsepower Lycoming model O-320-E2D reciprocating engine, s/n RL-45125-27A, provided thrust through a McCauley model 1C160/DTM, s/n 726356, fixed pitch, two-blade, metal propeller.

The accident airplane was issued a standard airworthiness certificate on August 28, 1975. The current owner-of-record, Southeastern Minnesota Flying Club, purchased the airplane on February 24, 1985. The airplane's recording tachometer indicated 2,107.4 hours at the accident site. The airframe had a total service time of 13,143.6 hours at the time of the accident. The engine and propeller had accumulated 862.9 hours since their last major overhaul. The last annual inspection was completed on November 14, 2012, at 13,127.4 hours total service time. The static system, altimeter system, automatic pressure altitude reporting system, and transponder were last tested on June 2, 2011. The navigation data cards for the instrument flight rules (IFR) certified Garmin model GNS 430W GPS had been updated on November 14, 2012, and were valid through December 13, 2012. The most recent VOR check, as required by FAA regulation 91.171, was logged on June 13, 2012. A postaccident review of the maintenance records found no history of unresolved airworthiness issues.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	RST,1317 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	18:54 Local	**Direction from Accident Site:**	113°
Lowest Cloud Condition:		**Visibility**	0.25 miles
Lowest Ceiling:	Indefinite (V V) / 100 ft AGL	**Visibility (RVR):**	1200 ft
Wind Speed/Gusts:	11 knots / None	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	140°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	4°C / 2°C
Precipitation and Obscuration:	N/A - None - Fog		
Departure Point:	Green Bay, WI (GRB)	**Type of Flight Plan Filed:**	IFR
Destination:	Rochester, MN (RST)	**Type of Clearance:**	IFR
Departure Time:	16:03 Local	**Type of Airspace:**	Class D

At 1754, about 39 minutes before the accident, the airport's automated surface observing system reported the following weather conditions: wind 140 degrees true at 12 knots, visibility 1/4 mile with fog, runway visual range (RVR) variable 1,000 feet to 1,200 feet, vertical visibility 100 feet, temperature 3 degrees Celsius, dew point 2 degrees Celsius, and an altimeter setting of 29.94 inches-of-mercury. The weather report further indicated that the control tower visibility was 1/4 mile.

At 1854, about 21 minutes after the accident, the airport's automated surface observing system reported the following weather conditions: wind 140 degrees true at 11 knots, visibility 1/4 mile with fog, RVR 1,200 feet, vertical visibility 100 feet, temperature 4 degrees Celsius, dew point 2 degrees Celsius, and an altimeter setting of 29.93 inches-of-mercury. The weather report further indicated that the control tower visibility was 1/4 mile.

Airport Information

Airport:	Rochester International RST	**Runway Surface Type:**	Concrete
Airport Elevation:	1317 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	13	**IFR Approach:**	ILS
Runway Length/Width:	9033 ft / 150 ft	**VFR Approach/Landing:**	None

The Rochester International Airport (RST), a public airport located approximately 7 miles southwest of Rochester, Minnesota, was owned and operated by the City of Rochester. The airport field elevation was 1,317 feet msl. The airport had two runways: runway 13/31 (9,033 feet by 150 feet, concrete) and runway 2/20 (7,301 feet by 150 feet, concrete).

Runway 13 incorporated medium intensity approach lighting with runway alignment indicator lights, runway touchdown zone and centerline lighting, a 4-light precision approach path indicator, and high intensity runway edge lighting. Runway 13 also was equipped with a runway visibility range (RVR)

equipment located at the touchdown zone. According to air traffic control documentation, all runway lighting and the RVR equipment were fully functional at the time of the accident.

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Minor	**Latitude, Longitude:**	43.918888,-92.525558(est)

The accident airplane wreckage was examined by inspectors with the FAA Minneapolis Flight Standards District Office. The wreckage was located in an open, plowed, agricultural field, with no trees or other obstructions in the general vicinity of the accident site. The main wreckage was located about 3/4 mile west-southwest of the runway 13 threshold. A 140 foot long wreckage debris path preceded the main wreckage and included portions of the right wing tip and the nose landing gear assembly. The airframe was found inverted at the accident site. The vertical stabilizer and rudder had been crushed during the impact sequence. The wing flaps were observed to be fully retracted. Flight control cable continuity was confirmed from the cockpit controls to the individual control surfaces. The altimeter's Kollsman window was centered on 29.92 inches-of-mercury. The primary course deviation indicator (CDI), a Garmin GI-106A, equipped with a glideslope indicator, was integrated with a Garmin GNS 430W GPS/Nav/Com. The Garmin GI-106A was selected to a 310 degree course. The second course deviation indicator, a King Radio Corporation KI-201C, was integrated with a KX-170B Nav/Com. The KX-170B navigation frequency was tuned to 112.0 (RST VOR/DME). The KI-201C course deviation indicator, which was not equipped with a glideslope indicator, was selected to a 210 degree course. The propeller remained attached to the engine and the blades exhibited aft bending and leading edge burnishing. The postaccident examination revealed no evidence of preimpact mechanical malfunctions or failures that would have precluded normal operation.

Communications

A review of available air traffic control (ATC) information indicated that the accident flight had received normal services and handling. A summary of the voice communications recorded between the accident flight and Rochester ATC is included with the docket materials associated with the investigation.

Tests and Research

The altimeter, a United Instruments model 5934P-1, was examined and tested at an avionic repair facility. There was no apparent damage to the as received altimeter. A subsequent bench test revealed no position anomalies with the altimeter, which functioned as designed. A copy of the test card is included with the docket materials associated with the investigation.

The Garmin GNS 430W GPS/Nav/Com and its corresponding Garmin GI-106A course deviation indictor (CDI) were examined and tested at an avionic repair facility. The Garmin GNS 430W passed its self-test routine upon the device being powered-up. The active communication frequency was identified as 118.3 (Rochester Tower). The standby communication frequency was identified as 119.8 (Rochester Approach). The primary navigation frequency was identified as 109.10 (ILS Runway 13). The standby navigation frequency was identified as 112.95. The deflection and sensitivity of the CDI was tested while receiving a test signal from the technician bench that was processed by the GNS 430W. The localizer and glideslope indications tested normal for both deflection and sensitivity. Additionally, both localizer and glideslope inoperative flags functioned as designed. The bench testing revealed no anomalies with the Garmin GNS 430W or Garmin GI-106A that would have prevented normal operation.

The second CDI, a King Radio Corporation KI-201C, was examined and tested at an avionic repair facility. The KI-201C exhibited VOR course deviations that averaged about 6 degrees left of the calibrated test bench signal. The localizer course deviation was one-dot left of center with a centerline test bench signal; however, the overall course width indicated correctly. The KI-201C was not equipped with a glideslope indicator. The inoperative signal flag functioned properly.

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Kevin Morris; Federal Aviation Administration - Minneapolis FSDO; Minneapolis, MN David R Nelson; Federal Aviation Administration - Minneapolis FSDO; Minneapolis, MN
Original Publish Date:	July 11, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=85725