Aviation Investigation Final Report

Location:	Adrian, Michigan	**Accident Number:**	CEN10FA027
Date & Time:	October 23, 2009, 16:31 Local	**Registration:**	N6025U
Aircraft:	Commander Aircraft Company 114-B	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The air traffic controller cleared the flight for a non-precision instrument approach and provided vectors to an intermediate fix located on the inbound course for the airport, which was reporting a ceiling of 700 feet above ground level. Radar track data revealed that, as the airplane proceeded on the inbound approach segment from the intermediate fix toward the final approach fix, there were significant heading changes and large altitude fluctuations, including rapid ascents and descents. As the airplane neared the final approach fix, instead of proceeding straight on the inbound course as called for by the approach procedure, it entered a left descending turn during which the rate of descent increased to 3,600 feet per minute. A witness reported hearing an airplane circle above his residence at a low altitude, but was unable to see the airplane due to a low cloud ceiling and limited ground visibility. He subsequently saw the airplane in a descent, about 200 to 300 feet above the ground, when the left wing separated from the fuselage. Another witness reported seeing the airplane rolling clockwise in a 45-degree nose-low descent before the left wing separated from the airplane. Neither witness reported seeing any smoke or fire until after the airplane collided with terrain.

The postaccident examination did not reveal any preimpact mechanical malfunctions or failures that would have precluded normal operation of the airplane. Additionally, the left wing main spar exhibited upward deformation consistent with an overload separation during flight.

Pilots are vulnerable to spatial disorientation if they do not properly rely on cockpit instrumentation to maintain basic orientation while operating in instrument meteorological conditions. Because the airplane was in an overcast cloud layer throughout the instrument approach, the pilot lacked a discernible horizon; therefore, he would likely have been

susceptible to spatial disorientation. The radar flight path and witness observations were consistent with the pilot becoming spatially disorientated and losing control of the airplane.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot did not maintain control of the airplane due to spatial disorientation while on an instrument approach in instrument meteorological conditions.

Findings

Personnel issues	Spatial disorientation - Pilot
Personnel issues	Aircraft control - Pilot
Aircraft	(general) - Capability exceeded

Factual Information

History of Flight

Approach-IFR initial approach	Loss of control in flight (Defining event)
Uncontrolled descent	Aircraft structural failure
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

HISTORY OF FLIGHT

On October 23, 2009, at 1631 eastern daylight time, a Commander Aircraft Company model 114-B airplane, N6025U, was substantially damaged when it collided with terrain following a loss of control near Adrian, Michigan. A postimpact fire ensued that consumed a majority of the fuselage. The private pilot and passenger were fatally injured. The airplane was registered to and operated by DEM Enterprises, LLC, under the provisions of 14 Code of Federal Regulations Part 91. Day instrument meteorological conditions prevailed for the flight that was operated on an instrument flight rules (IFR) flight plan. The personal flight departed Wilkes-Barre/Scranton International Airport (KAVP), Scranton, Pennsylvania, at 1329 and was on an instrument approach to Lenawee County Airport (KADG), Adrian, Michigan, when the accident occurred.

At 1246, the pilot filed an IFR flight plan through a direct user access terminal service (DUATS) provider. The filed flight plan was from KAVP to Ann Arbor Municipal Airport (KARB), Ann Arbor, Michigan, with an estimated time en route of 2 hours 40 minutes. There was no record of any weather products being requested or provided by DUATS within 24 hours of the departure time. Additionally, there was no record that the pilot had contacted an automated flight service station for a weather briefing or to file a flight plan during the same time period.

At 1329, the pilot was cleared for takeoff on runway 29 at KAVP. After departure, the flight was handled by multiple Federal Aviation Administration (FAA) air traffic control facilities as it proceeded westbound toward Michigan. At 1456, the pilot reported to the air traffic controller that the airplane was in smooth air at 6,000 feet mean sea level (msl) above a broken ceiling at 5,500 feet msl. At 1526, as the airplane approached Michigan, the air traffic controller told the pilot to fly direct to LLEEO intersection for the LLEEO-Two terminal arrival procedure. At 1600, the air traffic controller told the pilot to descend to maintain 4,000 feet msl. At 1609, after receiving the current weather conditions at KARB, the pilot requested to divert to KADG because of the low ceiling at KARB. The weather at KARB included an overcast ceiling at 300 feet above ground level (agl) and a ground visibility of 1-1/2 miles with light rain and mist.

At 1614:47, the air traffic controller told the pilot to fly direct to EZHAF intersection, an intermediate fix for the global positioning system (GPS) runway 23 instrument approach

procedure into KADG. At 1618:36, the air traffic controller told the pilot to descend to 3,000 feet msl and to fly a 270 degree heading toward EZHAF intersection. At 1624:15, the air traffic controller cleared the pilot for the GPS runway 23 approach and to maintain 3,000 feet msl until established on the inbound course. At 1628:08, the air traffic controller told the pilot to change to the KADG advisory frequency and to cancel his flight plan via phone upon landing. Additionally, he was told to fly the published missed approach if required. At 1628:33, the pilot acknowledged the frequency change and that he would have to cancel his flight plan via phone upon landing. No additional voice transmissions were received from the pilot.

According to FAA radar track data, the airplane crossed over EZHAF intersection at 3,000 feet msl before turning southwest toward KADG. As the airplane approached the final approach fix, KUJZO, the airplane entered a series of turns north of the desired inbound course. The airplane initially turned to a westerly course before turning back toward the final approach path. The airplane descended from 2,900 feet msl to 2,200 feet msl during these turns. The minimum descent altitude for that approach segment was 2,400 feet msl. At 1629:13, the airplane briefly turned onto a southwest course before entering a left 200 degree turn north of KUJZO. During the first half of the turn, the airplane climbed from 1,800 feet msl to 2,400 feet msl over a 23 second period. The average rate of climb was 1,600 feet per minute during the first half of the turn. During the second half of the turn, the airplane descended from 2,400 feet msl to 1,900 feet msl over a 14 second period. The average rate of descent was 2,150 feet per minute during the second half of the turn. The airplane descended from 2,200 feet msl to 1,900 feet msl during the final 5 seconds of recorded data, equating to an average descent rate of 3,600 feet per minute. At 1630:04, the last radar return was recorded 1/2 mile north of KUJZO intersection at 1,900 feet msl, with the airplane in a descending left turn.

A witness reported hearing an airplane overfly his residence at a low altitude, but he was unable to see the airplane due to heavy fog in the area. He noted that the airplane had come from the north and was traveling to the southeast. He then heard the same airplane turn northbound for a short time before seeing it pass over his residence about 200-300 feet above the ground traveling southeast. The witness noted that the left wing had separated from the fuselage. He stated that the airplane then impacted behind a tree line in a field south of his residence. The witness did not report seeing any smoke or fire until after the airplane collided with terrain.

Another witness reported seeing the airplane rolling clockwise in a 45 degree nose-low descent before one of the wings separated from the fuselage 200 to 300 feet above the ground. The witness stated that he heard the airplane's engine operating until it descended behind a tree line and collided with terrain. The witness did not report seeing any smoke or fire until after the airplane collided with terrain.

PERSONNEL INFORMATION

According to FAA records, the pilot, age 51, held a private pilot certificate, issued on January 30, 2009, with airplane single engine land and instrument airplane ratings. His last aviation

medical examination was completed on July 30, 2008, when he was issued a first-class medical certificate with the limitation that he use corrective lenses for near vision. A search of FAA records showed no accident, incident, enforcement, or disciplinary actions.

The pilot's flight logbook was consumed during the postimpact fire. The most recent pilot data was obtained from the pilot's FAA application for his instrument rating, dated January 30, 2009. On that application, the pilot indicated having accumulated 287.6 hours total flight time, of which 236.4 hours were as pilot-in-command. He had accumulated 193.8 hours in the accident airplane make and model, 31.3 hours at night, and 47.8 hours in instrument conditions.

AIRCRAFT INFORMATION

The accident airplane was a 1994 Commander Aircraft model 114-B, serial number (s/n) 14611. The airplane was a low wing, all-metal, single-engine, four-place monoplane. The airplane had a maximum takeoff weight of 3,250 pounds. The airplane was equipped for operation under instrument flight rules. A Lycoming model IO-540-T4B5 reciprocating engine, s/n L-25185-48A, powered the airplane. The 260-horsepower engine provided thrust through a McCauley model B3D32C419-C, s/n 930993, constant-speed, three-blade, metal propeller.

The accident airplane was issued a standard airworthiness certificate on January 28, 1994. The pilot purchased the airplane on March 15, 2007. The recording hour meter was destroyed during the postimpact ground fire, which prevented the determination of the total service time at the time of the accident. The airframe, engine, and propeller had a total service time of 842 hours at the last annual inspection, which was completed on April 15, 2009. The biennial testing of the static system, altimeter system, automatic pressure altitude reporting system, and transponder were completed during the last annual inspection. The last recorded maintenance was performed on October 16, 2009, at a total service time of 885 hours. A postaccident review of the maintenance records found no history of unresolved airworthiness issues.

METEOROLOGICAL INFORMATION

The closest weather reporting facility was at the intended destination (KADG), located about 6 miles southwest of the accident site.

At 1612, the airport's automated surface observing system (ASOS) reported the following weather conditions: Wind 180 degrees at 17 knots, gusting 23 knots; visibility 6 miles in mist; overcast ceiling at 700 feet agl; temperature 14 degrees Celsius; dew point 14 degrees Celsius; altimeter setting 29.47 inches of mercury. Remarks: rain ended at 1611; ceiling variable between 500 and 1,200 feet agl.

At 1653, the airport's ASOS reported the following weather conditions: Wind 190 degrees at 14 knots; visibility 10 miles; overcast ceiling at 900 feet agl; temperature 16 degrees Celsius; dew

point 14 degrees Celsius; altimeter setting 29.46 inches of mercury. Remarks: rain ended at 1611; ceiling variable between 600 and 1,200 feet agl.

AIDS TO NAVIGATION

The accident airplane was cleared for the GPS runway 23 instrument approach into KADG. The air traffic controller issued radar vectors to EZHAF intersection, an intermediate fix located on the inbound course to runway 23. The inbound course was 233 degrees from EZHAF intersection. The approach procedure consisted of several segments with corresponding assigned minimum descent altitudes (MDA). Aircraft are to maintain at or above 3,000 feet msl until crossing EZHAF on the final approach course inbound. After crossing EZHAF, aircraft are allowed to descend to 2,400 feet msl until crossing KUZJO, the final approach fix. After crossing KUZJO, aircraft are allowed to descend to 1,380 feet msl until crossing KICEC. After crossing KICEC, located 1.7 nautical miles from the runway 23 threshold, aircraft are allowed to descend to the final MDA of 1,260 feet msl. The missed approach point is the runway 23 runway threshold.

AIRPORT INFORMATION

The Lenawee County Airport (KADG) is located about 3 miles southwest of Adrian, Michigan. The airport has two runways: 5/23 (5,001 feet by 100 feet, asphalt) and runway 11/29 (1,810 feet by 150 feet, grass/turf). The general airport elevation is listed as 798 feet msl. The elevation of the runway 23 threshold is listed as 798 feet msl. A high intensity runway lighting system is installed on runway 5/23.

WRECKAGE AND IMPACT INFORMATION

The airplane collided with open terrain about 6 miles northeast of KADG. The entire left wing was found separated from the fuselage about 90 feet northwest of the initial point of impact. The initial point of impact consisted of a 3 foot deep crater that contained engine and propeller components. The wreckage debris path was orientated on a southerly heading and was about 50 feet long. All remaining airframe structural components and flight control surfaces were located along the wreckage debris path or amongst the main wreckage. The main wreckage included the entire fuselage, right wing, and empennage components. The overall wreckage distribution was consistent with an in-flight separation of the left wing at a low altitude.

A majority of the airframe primary structure exhibited severe impact damage and fragmentation. There was evidence of an extensive postimpact ground fire that completely destroyed the fuselage cabin and cockpit. All structural component failures were consistent with overload separations. The left wing main spar at the wing root was deformed upwards and aft. The observed deformation of the left wing spar was consistent with an overload separation. All primary flight controls remained attached to their respective hinge assemblies. Flight control cable continuity could not be established due to multiple cable separations; however, all observed flight control cable separations were consistent with overload or were

cut to facilitate wreckage recovery. The landing gear position could not be determined due to damage. The flap torque tube exhibited fire damage, but the extension of the flap jackscrew was consistent with the flaps in an extended position. The fuel selector was found positioned to draw fuel from the right fuel tank. The electrically-powered remote directional gyro was disassembled and rotational scoring was noted on its internal gyro and housing. The vacuum-powered attitude indicator was dissembled and slight rotational scoring was noted on its internal gyro and housing. The internal components of the attitude indicator also exhibited significant fire damage.

The engine was found separated from the firewall at the initial impact point. Engine crankshaft continuity could not be established by rotating the engine because of impact damage sustained by forward crankshaft. The engine was disassembled and no mechanical discontinuities were noted. Oil was present throughout the engine. The fuel injector servo was found separated from the engine and exhibited fire damage. A liquid with an odor consistent with aviation fuel was drained from the flow divider. The engine driven fuel pump had significant impact damage that precluded an operational test. Both magnetos were found separated from the engine accessory section and could not be tested due to impact damage. The removed sparkplugs exhibited a light brown coloration and normal wear signatures when compared to a manufacturer's service chart. Both vacuum pumps were found separated from the engine. Disassembly of the vacuum pumps showed no evidence of preimpact failure or malfunction. All three propeller blades were found separated from the hub assembly and exhibited blade twist, spanwise bending, chordwise scratching, and leading edge damage.

The postaccident investigation revealed no preimpact mechanical malfunctions or failures that would have precluded the normal operation of the airplane.

MEDICAL AND PATHOLOGICAL INFORMATION

On October 23, 2009, an autopsy was performed on the pilot at the Bixby Medical Center located in Adrian, Michigan. The pilot's cause of death was attributed to multiple blunt force injuries sustained during the accident.

The FAA's Civil Aerospace Medical Institute (CAMI) in Oklahoma City, Oklahoma, performed toxicology tests on samples obtained during the pilot's autopsy. No ethanol was detected in muscle and brain samples. Chloroquine was detected in liver and kidney samples. Chloroquine is an antimalarial and amebicidal agent and is also used as an immunosuppressant in some autoimmune disorders such as rheumatoid arthritis and lupus erythematosis.

Pilot Information

Certificate:	Private	**Age:**	51,Male
Airplane Rating(s):	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 1 With waivers/limitations	**Last FAA Medical Exam:**	July 30, 2008
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	January 30, 2009
Flight Time:	288 hours (Total, all aircraft), 194 hours (Total, this make and model), 236 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Commander Aircraft Company	**Registration:**	N6025U
Model/Series:	114-B	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	14611
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	April 15, 2009 Annual	**Certified Max Gross Wt.:**	3250 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	842 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-540-T4B5
Registered Owner:	DEM Enterprises, LLC	**Rated Power:**	260 Horsepower
Operator:	DEM Enterprises, LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KADG,798 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	16:12 Local	**Direction from Accident Site:**	226°
Lowest Cloud Condition:		**Visibility**	6 miles
Lowest Ceiling:	Overcast / 700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	17 knots / 23 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.46 inches Hg	**Temperature/Dew Point:**	14°C / 14°C
Precipitation and Obscuration:	N/A - None - Mist		
Departure Point:	Scranton, PA (KAVP)	**Type of Flight Plan Filed:**	IFR
Destination:	Adrian, MI (KADG)	**Type of Clearance:**	IFR
Departure Time:	13:29 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	Lenawee County Airport KADG	**Runway Surface Type:**	Asphalt
Airport Elevation:	798 ft msl	**Runway Surface Condition:**	Wet
Runway Used:	23	**IFR Approach:**	Global positioning system
Runway Length/Width:	5001 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	41.936111,-83.999443

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Wesley Shartle; Federal Aviation Administration - Detroit FSDO; Belleville, MI Dana Carver; Federal Aviation Administration - Detroit FSDO; Belleville, MI Carl Gull; CPAC, Inc.; Scott City, MO Mike Childers; Lycoming Engines; Marietta, GA
Original Publish Date:	May 3, 2012
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74948