Aviation Investigation Final Report

Location:	Jackson, Michigan	**Accident Number:**	CHI02LA188
Date & Time:	July 11, 2002, 10:02 Local	**Registration:**	N5061J
Aircraft:	Cessna 310R	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	4 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The twin-engine airplane departed control flight and impacted the terrain during a landing attempt. The pilot reported that while landing the airplane experienced an uncommanded right roll after he advanced engine power to arrest the airplane's descent rate. The pilot attempted a go-around by adding engine power; however, this exacerbated the airplane's right turning tendency. The pilot reported he reduced power on both engines, and attempted to bring the airplane back to a level attitude using left rudder and aileron. The airplane impacted the terrain in a right wing down, nose low attitude. No anomalies were found with the flight control system during the post-accident examination. Inspection of the propellers indicate at impact the left engine was producing significantly more power than the right engine. The right engine was test run and no anomalies were noted with its operation. All four fuel tanks were found damaged and/or ruptured, which prevented the post-accident determination of the fuel quantity and its distribution. The airplane was fully fueled (163 gallons) prior to departing on the 2.5 hour flight. The pilot reported he used the auxiliary fuel tanks during cruise flight, but did not recall if he had switched back to the main fuel tanks prior to landing. The pilot said that "as a habit" he would have normally switched back to the main tanks. The pilot reportedly turned the fuel selectors to the off position after the accident. The flight's total fuel burn was approximately 75 gallons, based on an average fuel burn of 30 gallons/hour. Although the auxiliary tanks hold a total of 63 gallons of fuel, pilots should only expect one hour of operation from the tanks because the engine recovery fuel is returned to the main tanks, not the auxiliary tanks. The engine manufacturer reports up to 31.66 gallons/hour of fuel is recovered into the two main tanks. The Cessna 310R Pilot Operating Handbook (POH) recommends the engines be operated on their respective main tanks for the first 90 minutes of a flight, as to allow ample space in the tanks to accept the recovery fuel from operating on the auxiliary tanks. The POH specifically states that all takeoffs and landings should be made with the fuel selectors positioned on their respective main fuel tanks.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper management of the fuel system, including his failure to reposition the fuel selectors to the main fuel tanks prior to landing, as directed in the pilot operating handbook. Additional causes to the accident were the pilot not maintaining aircraft control during the engine failure and his delayed remedial action to the encountered uncommanded roll (VMC roll). A factor to the accident was the loss of engine power due to fuel starvation.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (F) FLUID,FUEL - STARVATION
2. (C) FUEL MANAGEMENT - IMPROPER - PILOT IN COMMAND
3. (C) PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
4. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
5. (C) REMEDIAL ACTION - DELAYED - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
6. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On July 11, 2002, at 1002 eastern daylight time, a Cessna 310R, N5061J, piloted by a commercial pilot, sustained substantial damage while landing on runway 6 (5,344 feet by 150 feet, dry/asphalt) at the Jackson County Airport (JXN), Jackson, Michigan. Visual meteorological conditions prevailed at the time of the accident. The personal flight was operating under the provisions of 14 CFR Part 91 on a flight plan. The pilot and his three passengers reported minor injuries. The flight departed the Martin State Airport (MTN), Baltimore, Maryland, at 0730 eastern daylight time.

According to the pilot's written statement, the airplane was fueled with 163 gallons of fuel prior to departing MTN and the accident flight was approximately 2.5 hours in length. The pilot reported the cruise portion of the flight was flown at 8,000 feet and the flight was uneventful up to the landing attempt. The pilot stated, "... as we were over the runway numbers we started to [flare] at 75 feet - slowing airplane down to 90 knots - we carried 15[inches] of power." The pilot reported that approximately 1/3 down the runway the airplane began to, "... veer to the right, we tried to get [the] airplane back to centerline and the airplane [continued] right." The pilot stated that adding more engine power did not bring the airplane out of the low altitude right turn. The pilot reported he reduced power on both engines, and attempted to bring the airplane back to a level attitude using left rudder and aileron. The airplane impacted a grass area off the right side of the runway.

The pilot stated in an interview that air traffic control had delayed his initial descent from 8,000 feet, resulting in a prolonged descent with minimal engine power. The pilot reported that during the landing flare he added engine power to arrest the airplane's descent rate, after which the uncommanded right roll began. The pilot added that he attempted a go-around by adding engine power; however, this exacerbated the airplane's right turning tendency. When asked about the fuel management procedures used during the accident flight, the pilot replied he had switched to the auxiliary fuel tanks during cruise flight. The pilot was asked if he had switched from the auxiliary fuel tanks back to the main tanks prior to landing. He replied that did not recall if he had switched back to the main fuel tanks; however, "as a habit" he would have normally.

The pilot reportedly turned the fuel selector valves, magnetos, and master switch to the off position after the accident.

The JXN control tower manager reported seeing the accident airplane approach midfield when the airplane "started a sharp right turn and appeared to apply power for some sort of 'go-around'." He stated the airplane started a "climb still in a sharp right turn" which was followed

by a right descending turn into the terrain. He reported that there was no additional airplane traffic in the area around the time of the accident.

A witness reported seeing the accident airplane at about midfield when the "right wing dipped and the aircraft banked to the right, into the field."

INJURIES TO PERSONS

All four occupants were treated for minor injuries at a local hospital.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with airplane single-engine land, airplane multiengine land, and instrument airplane ratings. The FAA issued his pilot certificate on September 18, 1998.

FAA records indicate his last medical examination was completed on June 26, 2002, and that he was issued a third-class medical certificate with limitation "must wear lenses for distant - posses glasses for near vision."

The pilot reported an accumulated total flight time of 4,300 hours, of which 1,400 hours were in the Cessna 310R. The pilot reported having 800 flight hours in single-engine airplanes and 3,500 hours in multiengine airplanes. He flew 35 hours during the previous 3 months, 10 hours during the prior 30 days, and 2 hours during the last 24 hours.

The pilot reported he completed his last flight review, as required by 14 CFR Part 61.56, during December 2000.

AIRCRAFT INFORMATION

The accident airplane was a 1975 Cessna 310R, serial number 310R0181. The Cessna 310R is a twin engine, low wing airplane. The Cessna 310R is equipped with a retractable tricycle landing gear, electrically actuated wing flaps, and is powered by two reciprocating fuel-injected engines incorporating constant-speed propellers. The fuselage and empennage are of an all-metal semimonocoque design. The airplane was equipped with dual controls and could accommodate four occupants. The accident airplane had a certified maximum takeoff weight of 5,680 lbs.

The airplane was issued a Standard Airworthiness Certificate on March 27, 1975, and was certified as a standard category airplane. The accident airplane had accumulated a total flight time of 4,488.8 hours since new.

The last annual inspection was completed on April 5, 2002, and the airplane had accumulated 22.9 hours since the inspection. According to the aircraft maintenance logbooks, all applicable FAA Airworthiness Directives had been complied with as of the last annual inspection.

The left engine was a 285 horsepower Continental IO-520-M(1), serial number 235653R. The engine had accumulated 4,488.8 hours total time since new, 1,449.8 hours since the last overhaul. The inspection of the left engine was completed on April 5, 2002.

The right engine was a 285 horsepower Continental IO-520-M(1), serial number 235302R. The engine had accumulated 4,500.9 hours total time since new, 1,461.9 hours since the last overhaul. The last inspection of the right engine was completed on April 5, 2002.

The left and right propellers were three-bladed McCauley 3AF32C87-N1 models, hub serial numbers 774439 and 774449 respectively. Both propellers had accumulated 1,738.4 hours since the last overhaul.

The accident airplane was delivered from the factory with an extended-range fuel system. The airplane was configured with four fuel tanks; two main (tip) tanks that held 100 gallons and two auxiliary tanks that held 63 gallons. The airplane was not configured with the optional wing-locker tanks.

The airplane was modified with vortex generators, authorized by a supplemental type certificate (STC), which increased the maximum takeoff gross weight from 5,500 lbs to 5,680 lbs.

METEOROLOGICAL INFORMATION

A weather observation station located at Jackson County Airport (JXN) recorded the weather at the time of the accident as:

Wind 060 degrees true at 5 knots; 10 statute mile visibility; sky clear; temperature 19 degrees Celsius; dew point of 11 degrees Celsius; altimeter 30.26 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

Investigators from the Federal Aviation Administration and the Cessna Aircraft Company performed the on-scene investigation. The aircraft wreckage was located in a grass area off the right side of runway 6. The main cabin remained intact and the main landing gear was found fully extended. All three landing gear were displaced to the right. The right wing, outboard of the engine nacelle, was bent aft and its main tip fuel tank had separated from the

wing. A four-foot section of wing leading edge remained attached to the right main tip fuel tank. The left wing was displaced forward and up, with buckling of the upper wing skins outboard of the engine nacelle. The left main tip fuel tank remained attached to the wing; however, the forward tip portion of the tank had separated from the remainder of the tank.

Flight control cable continuity was established from the cockpit controls to the individual flight controls and/or their respective bellcrank assemblies. The rudder trim tab was positioned 15-degrees right of the neutral position. The aileron trim tab was positioned in a neutral position.

All four fuel tanks were found damaged and/or ruptured; however, approximately 25 gallons of 100 low-lead avgas was recovered from the right main tip fuel tank prior to repositioning the wreckage. Both fuel control valves were found in the off position. Continuity from the valve handles to the remote fuel control valves was confirmed and no anomalies were noted with the individual valves.

The left engine was found separated from the airframe and the left propeller had separated from the engine. Two of the three propeller blades exhibited chordwise scoring, leading edge impact damage, and twisting. The remaining blade was displaced forward of its normal plane of rotation.

The right engine remained attached to the airframe and its propeller remained attached to the engine. Two of the three propeller blades were bent aft of the normal plane of rotation and exhibited minor rotation damage. The remaining blade exhibited minor leading edge impact damage.

TESTS AND RESEARCH

Both propellers were sent to McCauley for additional examination and documentation. The propellers were compared to each other during a side-by-side examination. The left propeller exhibited more blade twisting, bending, and impact damage than the right propeller. Both propellers were rotating at impact and neither propeller was at or near a feathered position.

The right engine was sent to Teledyne Continental Motors for additional examination and an engine test run. The engine was installed in a test cell that incorporated a computerized engine monitoring system. The engine started and was run at idle power until the engine reached normal operating temperatures. The engine was then accelerated to 1,600 rpm where the magnetos were tested. No anomalies were noted with either magneto and the engine continued to run when operated individually on each magneto. Following the magneto check the engine was accelerated to the maximum engine rpm of 2,700 rpm. No anomalies were noted during the engine test run. A copy of the computer-generated results is included with the docket material associated with this factual report.

The Cessna 310R pilot operating handbook (POH) states the fuel consumption at 7,500 feet is

between 25.8 and 31.3 gallons/hour, assuming appropriately leaned engines with manifold pressures between 20.0 and 23.2 inches of mercury. The POH additionally states that the excess fuel and vapor from the engines are returned to their respective main fuel tanks, not to the auxiliary fuel tanks, resulting in the auxiliary tanks becoming depleted "sooner than expected."

The POH recommends the engines to be operated 90 minutes on their respective main fuel tanks prior to switching to the auxiliary tanks. The 90 minutes of fuel burn from the main tanks allow for ample space in the tanks to accept the recovery fuel from engine operation on the auxiliary fuel tanks. If the main tanks become full, while the engines are operating on the auxiliary tanks, the recovery fuel will overflow the tanks and be discharged overboard through the tank vent lines.

According to Teledyne Continental Engines, up to 15.83 gallons/hour of fuel is recovered during the operation of a single IO-520-M(1) engine, or 31.66 gallons/hour for two engines.

The POH specifically states that all takeoffs and landings should be made with the fuel selectors positioned on their respective main fuel tanks.

ADDITIONAL INFORMATION

The right engine and both propellers were released to a representative of the aircraft owner on January 9, 2003.

Parties to the investigation included the Federal Aviation Administration and the Cessna Aircraft Company.

Pilot Information

Certificate:	Commercial	**Age:**	74,Male
Airplane Rating(s):	Single-engine land; Multi-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:**	No
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	June 26, 2002
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	December 1, 2000
Flight Time:	4300 hours (Total, all aircraft), 1400 hours (Total, this make and model), 35 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N5061J
Model/Series:	310R	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	310R0181
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	April 5, 2002 Annual	**Certified Max Gross Wt.:**	5680 lbs
Time Since Last Inspection:	22.9 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	4488.8 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, not activated	**Engine Model/Series:**	IO-520-M(1)
Registered Owner:	On file	**Rated Power:**	285 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	JXN,1001 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	10:02 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.26 inches Hg	**Temperature/Dew Point:**	19°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Baltimore, MD (MTD)	**Type of Flight Plan Filed:**	IFR
Destination:	Jackson, MI (JXN)	**Type of Clearance:**	VFR
Departure Time:	07:30 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Jackson County Airport JXN	**Runway Surface Type:**	Asphalt
Airport Elevation:	1001 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	06	**IFR Approach:**	None
Runway Length/Width:	5344 ft / 150 ft	**VFR Approach/Landing:**	Full stop;Straight-in

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:**	42.259723,-84.459442

Administrative Information

Investigator In Charge (IIC):	FOX, ANDREW
Additional Participating Persons:	Gary Knaggs; Federal Aviation Administration - Detroit FSDO; Belleville, MI Andrew L Hall; Cessna Aircraft Company; Wichita, KS
Original Publish Date:	March 30, 2004
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=55235