# Aviation Investigation Final Report

| | | | |
|---|---|---|---|
| **Location:** | Kansas City, Missouri | **Accident Number:** | CEN13FA496 |
| **Date & Time:** | August 18, 2013, 14:48 Local | **Registration:** | N9201R |
| **Aircraft:** | Mooney M20J | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Fuel contamination | **Injuries:** | 2 Fatal |
| **Flight Conducted Under:** | Part 91: General aviation - Personal | | |

## Analysis

**This report was modified on 1/5/2015. Please see the public docket for this accident to view the original report. **

The airplane experienced a total loss of engine power during takeoff from a runway that had a usable length of 6,827 feet; however, the pilot initiated the takeoff from a taxiway intersection, which left only about 5,313 feet of runway remaining. After the loss of engine power, the airplane descended to about 10 feet above ground level (agl) with the landing gear retracted; about half of the runway length remained. Engine power was restored, and the airplane subsequently climbed to between about 300 and 400 agl. The engine again lost power, and the airplane subsequently stalled and impacted a field. The landing gear remained retracted. Typically, the landing gear should be retracted after liftoff when the airplane has reached an altitude where, in the event of an engine failure or other emergency requiring an aborted takeoff, the airplane could no longer be landed on the runway.

The airplane arrived at the departure airport 3 days before the accident and was parked on the ramp. There was a trace of precipitation at the airport on the day of arrival and no precipitation on subsequent days. Examination of the airplane revealed the presence of water in the fuel diaphragm and fuel servo. No evidence of fuel contamination in the fuel pumps was found, and no reports of fuel contamination or engine power loss of airplanes that had been refueled from the fuel pumps before and after the accident were made.

Examination of the fuel filler caps revealed that the cap components were in place and that both caps were in place and secure. When water was poured onto the fuel caps when they were placed and secured back into position, they exhibited leakage into the fuel tank; however, the extent of deformation around the filler neck due to accident damage was unknown. During the most recent annual inspection, it was noted that the fuel cap O-rings were replaced because of water contamination of the fuel system. No record was found indicating that maintenance personnel pressurized the fuel tanks to check for fuel cap leakage in accordance with the airplane manufacturer's maintenance instructions. No internal obstruction

was noted in the fuel system that would have precluded the pilot from detecting water in the system while sumping it during the preflight inspection.

## Probable Cause and Findings

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

The pilot's improper decision to attempt continued flight after a momentary loss of engine power with usable runway remaining. Contributing to the accident were the pilot's premature retraction of the landing gear, the loss of engine power due to fuel system water contamination, and the pilot's failure to detect the fuel contamination during the preflight inspection.

### Findings

| | |
|---|---|
| **Personnel issues** | Incorrect action selection - Pilot |
| **Personnel issues** | Decision making/judgment - Pilot |
| **Personnel issues** | Preflight inspection - Pilot |
| **Aircraft** | Fuel - Fluid condition |

# Factual Information

## History of Flight

| | |
|---|---|
| **Initial climb** | Landing gear not configured |
| **Initial climb** | Fuel contamination (Defining event) |
| **Enroute-climb to cruise** | Loss of control in flight |
| **Enroute-climb to cruise** | Aerodynamic stall/spin |
| **Uncontrolled descent** | Collision with terr/obj (non-CFIT) |

On August 18, 2013, about 1448 central daylight time, a Mooney M20J, N9201R, descended and impacted terrain after takeoff from Charles B. Wheeler Downtown Airport (MKC), Kansas City, Missouri. The airplane sustained substantial damage to the wings and fuselage. The private pilot and a passenger were fatally injured. The airplane was registered to Air McRoyal, LLC and operated by the pilot under 14 Code of Federal Regulations Part 91 as a personal flight that was not operating on a flight plan. Visual meteorological conditions prevailed at the time of the accident. The flight was originating at the time of the accident and was en route to Youngstown, Ohio.

On August 15, 2013, the personal flight originated from Youngstown, Ohio and arrived at MKC. The airplane was parked on a ramp in front of a fixed base operator (FBO) at MKC. The president and owner of a general aviation consultant, sales, and refurbishment firm, stated that a text message from the pilot was received on August 16, 2013. The provided text message stated:

"Hey… . Just an update. ... Landed kmkc yesterday from kyng. Ran really well. Total trip time was 4:30. Not too bad. Better than spending 8 hrs in airports."

On the day of the accident, the airplane was taxied from the ramp to the airport self-serve fuel pump and 25.25 gallons of 100 low lead aviation fuel was obtained.

An airplane mechanic at the FBO stated that he heard the airplane engine run-up and takeoff. The run-up was "short" and was "less than a minute." He did not hear any engine power hesitations during the run-up, just a "quick" magneto check. He did not hear any power hesitation prior to the engine quitting during takeoff.

At 1946, N9201R was cleared for takeoff on runway 19 (6,827 feet by 150 feet, grooved concrete) at intersection K (runway available from intersection K was about 5,313 feet). During takeoff, N9201R reported an emergency during the climb. The airplane descended to an estimated height of 10 feet above the runway surface with the landing gear retracted. The airplane was approximately no farther than half down the runway before a second climb began and N9201R reported "I'm okay." The airplane attained an altitude of about 300-400 feet above ground level when it was observed to enter a turning stall. The airplane descended and impacted a field about 0.25 miles southwest of the departure end of runway 19.

## Pilot Information

| | | | |
|---|---|---|---|
| **Certificate:** | Private | **Age:** | 52 |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | Lap only |
| **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:** | December 2, 2011 |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 309 hours (Total, all aircraft), 31 hours (Total, this make and model) | | |

The pilot, age 52, was issued a private pilot certificate on May 11, 2004, after passing a private pilot examination on his second attempt. A Cessna 172R was used for the examination and the pilot's total time at the time of the examination was 88.7 hours.

The first entry of the pilot's logbook was dated October 20, 2001, which was an "intro flight" using a Cessna 152.

Prior to February 12, 2013, logbook entries showed that the pilot had only flown Cessna 152, Cessna 172 and Piper PA-28-160 airplanes. From February 12 to February 14, 2013, the pilot received 11.4 hours of Mooney airplane training and a complex airplane endorsement under Part 61.31(e) using the accident airplane. The pilot's total flight time to date on February 14, 2013, was 289.5 hours. There were four entries after the pilot's last training flight. The last entry in the pilot's logbook was not dated and the total flight time to date was 308.7 hours, of which 30.6 hours were in Mooney airplanes.

The flight instructor, who provided the pilot's Mooney airplane training, stated that the pilot was a "pretty good pilot" and "pretty adept." He was "pretty thorough" and did not rush or hurry up and would not skip items. The pilot did "fine" and there were "no issues." The pilot did not have any flight time in retractable landing gear airplanes before he started training. He thought that it was "unusual" that the pilot did not have an airplane instrument rating.

The pilot did not have any previous Federal Aviation Administration (FAA) record of accident, incidents, or violations.

## Aircraft and Owner/Operator Information

| | | | |
|---|---|---|---|
| **Aircraft Make:** | Mooney | **Registration:** | N9201R |
| **Model/Series:** | M20J | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 1978 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 24-0614 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 4 |
| **Date/Type of Last Inspection:** | January 8, 2013 Annual | **Certified Max Gross Wt.:** | 2740 lbs |
| **Time Since Last Inspection:** | | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 2424 Hrs as of last inspection | **Engine Manufacturer:** | Lycoming |
| **ELT:** | Installed | **Engine Model/Series:** | IO-360-A3B6D |
| **Registered Owner:** | Air McRoyal LLC | **Rated Power:** | 200 Horsepower |
| **Operator:** | Pilot | **Operating Certificate(s) Held:** | None |

N9201R was a 1978 Mooney M20J, serial number 24-0614, airplane was purchased by Air McRoyal, LLC (the aircraft registration application was signed by the pilot as president of McRoyal Industries, Inc. on December 14, 2012) on December 31, 2013.

The airplane was powered by a Lycoming IO-360-A3B6D, serial number L-19288-51A, engine. The engine was equipped with a Bendix RSA-5AD1, serial number 67270, fuel servo.

The last annual inspection of the airframe was dated January 8, 2013. A work order for the annual inspection, which was also a presale inspection, referenced an airplane total time of 2,423.84 and a tachometer time of 2,423.84. The work order for the inspection listed Item 7 with the following:

Discrepancy: Replace fuel cap O-rings

Note: Water in fuel system

Corrective Action: Replaced the fuel cap O-rings

The parts listed under Item 7 were two MS29513-010 Fuel Cap O-Rings, Small and two MS29513-338 Fuel Cap O-Rings. The work order and airframe logbook did not cite that the fuel tanks were pressurized to check for leaks of the fuel caps.

The Mooney M20J Service and Maintenance Manual, Section 28-00-01, Fuel Filler Cap Maintenance and Assembly, stated in part:

3. The sealing capability of each cap assembly should be checked periodically and at each annual inspection. This can be accomplished per the following procedures:

A. Remove cap assembly from wing filler port and inspect o'ring (1) for any damage or brittleness.

Remove and replace if needed.

B. Adjust tension of shaft (2) and rotating lock plate (3) by removing cotter pin (5) from nut (6) on threaded portion of shaft (2). Tighten nut (6) so cap assembly handle (7) can be opened, turned and shut with hand pressure and still provide the necessary seal of cap assembly to keep water from entering fuel tank.

NOTE: Fuel selector should be in the OFF position before proceeding with paragraph C to pressurize the fuel tanks.

C. Connect rubber hose to each tank's vent line. Apply only one-half pound (1/2 lb.) air pressure. Check for fuel cap leaks by soaping circumference of filler cap assembly and observing bubbles. Replace o'ring if bubbles are observed and adjustment of the nut does not stop the leak.

The engine was overhauled May 22, 1992. The last annual inspection of the engine was dated January 8, 2013, at an engine total time of 2,423.84, a time since major overhaul of 1,027.25, and a tachometer time of 2,423.84.

## Meteorological Information and Flight Plan

| | | | |
|---|---|---|---|
| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | MKC,757 ft msl | **Distance from Accident Site:** | 25 Nautical Miles |
| **Observation Time:** | 14:54 Local | **Direction from Accident Site:** | 225° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | Broken | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 5 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 140° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30.1 inches Hg | **Temperature/Dew Point:** | 28°C / 14°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Kansas City, MO (MKC ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Youngstown, OH | **Type of Clearance:** | None |
| **Departure Time:** | 14:40 Local | **Type of Airspace:** | |

The MKC automated surface observing system recorded at 1345: wind - 170 degrees at 7 knots, wind variable between 120 and 210 degrees; visibility - 10 statute miles. sky condition – broken at 5,000 feet above ground level, temperature 28 degrees Celsius, dew point 14 degrees Celsius, altimeter setting - 30.12 inches of mercury.

Rain totals at MKC for August 15, 16, and 17, 2013, were recorded as: trace of precipitation or less than 0.01 inches, no precipitation, and no precipitation, respectively. There was no precipitation recorded on the day of the accident.

## Airport Information

| | | | |
|---|---|---|---|
| **Airport:** | Charles B. Wheeler Downtown MKC | **Runway Surface Type:** | |
| **Airport Elevation:** | 757 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 19 | **IFR Approach:** | None |
| **Runway Length/Width:** | 6827 ft / 150 ft | **VFR Approach/Landing:** | None |

## Wreckage and Impact Information

| | | | |
|---|---|---|---|
| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | 1 Fatal | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 2 Fatal | **Latitude, Longitude:** | 39.150463,-94.579025(est) |

The main wreckage, which included the fuselage, attached wings and empennage with their respective control surfaces, engine, and propeller was located in a field about 0.25 nautical miles southwest of the departure end of runway 19 at an elevation of about 705 feet mean sea level. The airplane was oriented in an upright position and a tail to nose heading of approximately 170 degrees. The landing gear jack screw extension was consistent with the landing gear in the retracted position. The flap jack screw extension was consistent with flaps in the 10-degree position. The empennage trim jack screw extension was consistent for a setting for a flaps 10 degree takeoff. There was no evidence of soot or fire.

The fuselage exhibited aft crushing to about the rear cabin entry door frame and cockpit roof was broken open. The engine compartment exhibited aft crushing damage. The leading edge of both wings exhibited aft crushing about 1/3 wing chord. The deformation included upward bending near the forward portion of both wing tank fuel filler necks. Both wing fuel tanks were broken open. Both wings exhibited about a 90-degree crush angle. The outer wing section of the left wing was had greater relative aft deformation and was curled upwards. The empennage was bent laterally toward the right about 10 degrees and the left horizontal stabilizer and its elevator tip was bent upwards.

Flight control continuity from all the flight control surface to the cockpit controls was confirmed.

Both wing fuel caps were in place and the fuel cap locking tabs were in the down position and flush with the top of the fuel caps. The fuel caps were removed and all of the fuel cap components were in place. A brown colored stain was present on the left fuel tank filler neck flange. Both fuel caps were replaced and locked into place and water was poured over both fuel caps, which resulted in the water pouring out from the underside of both fuel caps. The fuel caps were interchanged and water was poured over each fuel cap, which resulted in the same effect. Examination of the fuel tanks revealed that a black colored sealant was present along the bottom of the wing fuel tank ribs. The sealant did not cover any of the

holes at the bottom of the ribs. There were no obstructions in the fuel sump system.

The fuel line from the fuel selector to the engine was broken open and separated. The fuel selector knob was bent and positioned near the left fuel tank selection.

The ignition key switch was at the BOTH position. The mixture, propeller, and throttle control knobs were in the forward position.

Examination of the engine confirmed control continuity of the mixture, propeller, and throttle controls from their respective engine accessories to the cockpit controls. Borescope inspection of the engine cylinders revealed no anomalies. The engine was turned through by rotating the propeller by hand, during which air was drawn in and expelled through each top spark plug hole. Valve train continuity was confirmed during the engine rotation. The magneto was rotated by hand and electrical continuity through the ignition harness was confirmed.

Examination of the airplane engine revealed the presence of a liquid consistent with water present in the fuel servo in a proportion estimated to half of that of remaining liquid that was consistent with 100 low lead aviation fuel. The fuel injector diaphragm was disassembled, and a liquid consistent with water was present under the diaphragm.

The airplane instrument panel was damaged by impact forces. The airplane's hour meter was separated from the instrument panel and three of the digits were between values. The hour meter indicated 1,176.2. The tachometer was of digital type, and no reading was obtained.

## Medical and Pathological Information

The pilot was issued a third class airman medical certificate dated December 2, 2011, with the following limitation: "Holder must wear corrective lenses for distant vision while exercising the privileges of his airman certificate."

The FAA Final Forensic Toxicology Fatal Accident Report for the pilot reported:

No carbon monoxide was detected in blood, cyanide testing was not performed, no ethanol was detected in vitreous, and no listed drugs were detected in urine.

An autopsy of the pilot was performed by the Jackson County Medical Examiner, Kansas City, Missouri. The cause of death was listed as multiple blunt force trauma.

## Tests and Research

There were no reports of fuel contamination and/or loss of engine power by airplanes fueled at the

airport self-serve fuel pump where the accident airplane was fueled from. Examination of the airport fuel facility did not reveal any fuel contamination.

The flight instructor, who provided the pilot's Mooney airplane training, stated that he taught the pilot to use the fuel strainer to check the fuel and that it takes about 10-15 minutes for contaminants to settle. They discussed that Mooney airplanes can allow water through the fuel cap O-rings.

According to the Mooney M20J Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, Section 4, Normal Procedures, the Preflight Inspection checklist precedes the Before Engine Starting Check checklist. The Preflight Inspection stated to sump the fuel tank sump drains.

According to the Airplane Flying Handbook (FAA-H-8083-3A), Chapter 11, Transition to Complex Airplanes, Takeoff and Climb:

"Normally, the landing gear should be retracted after lift-off when the airplane has reached an altitude where, in the event of an engine failure or other emergency requiring an aborted takeoff, the airplane could no longer be landed on the runway. This procedure, however, may not apply to all situations. Landing gear retraction should be preplanned, taking into account the length of the runway, climb gradient, obstacle clearance requirements, the characteristics of the terrain beyond the departure end of the runway, and the climb characteristics of the particular airplane."

## Administrative Information

| | |
|---|---|
| **Investigator In Charge (IIC):** | Gallo, Mitchell |
| **Additional Participating Persons:** | Tom Bartels; Federal Aviation Administration; Kansas City, MO<br>Troy Helgeson; Lycoming Engines; Williamsport, PA |
| **Original Publish Date:** | October 30, 2014 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=87813 |

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.