Aviation Investigation Final Report

Location:	Gainesville, Georgia	**Accident Number:**	ERA15FA016
Date & Time:	October 16, 2014, 11:29 Local	**Registration:**	N1148J
Aircraft:	ROCKWELL INTERNATIONAL 112	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of engine power (partial)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor and private pilot were conducting an instructional flight. A witness reported that, when the airplane about 400 ft above the ground, he heard a "surging" sound coming from the engine and observed pitch and roll oscillations occurring; he then lost sight of the airplane. A video provided by the fixed-based operator showed the airplane take off and begin to climb. Shortly after, it recorded a radio call on the common traffic advisory frequency indicating that an emergency existed and that the airplane was returning to the airport. Another witness reported seeing the airplane's landing gear barely clear a building as it flew toward the airport. He added that, as the airplane neared power lines, the airplane pitched up, likely in an attempt to avoid them. The airplane then collided with a telephone pole and unmarked transmission lines, which ruptured the fuel tank, and then struck the ground. A postcrash fire ensued that nearly consumed the cockpit, cabin, and both wings.

Examination of the flight controls and heat-damaged engine revealed no evidence of preimpact failures or malfunctions. Examination of the manifold valve revealed that the inlet and outlet ports were blocked to varying degrees. Analysis of the blockage material determined that it was an organic polymer material consistent with polyester; however, the source of the contamination could not be determined. Although the blockages of the inlet and outlet ports precluded postaccident flow testing of the manifold valve, it is likely that the blockages resulted in the surging reported by the witness and the subsequent loss of engine power. The blockages likely would not have created a condition that would have been detectable to the pilots during the pretakeoff engine run-up.

Although the fuel vent lines of both wings were found blocked with organic material consistent with insect nest material, the accident flight was very short and, therefore, it is unlikely that these blockages affected the engine operation. The blockages of the fuel vents were located in an area that would not have been visible to the pilots during the preflight inspection of the airplane.

Probable Cause and Findings

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

The partial loss of engine power due to the undetected blockage of the inlet and outlet ports of the manifold valve by an organic compound of an unknown source.

Findings

Aircraft	Fuel divider - Not specified
Aircraft	Fuel divider - Damaged/degraded
Aircraft	(general) - Not specified
Aircraft	Fuel - Not specified

Factual Information

History of Flight

Initial climb	Loss of engine power (partial) (Defining event)
Emergency descent	Loss of engine power (partial)
Maneuvering-low-alt flying	Abrupt maneuver
Maneuvering	Collision with terr/obj (non-CFIT)
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On October 16, 2014, about 1129 eastern daylight time, a Rockwell International 112A, N1148J, registered to and operated by a private individual, collided with a powerline pole, unmarked transmission lines, then the ground during a forced landing in Gainesville, Georgia. Visual meteorological conditions prevailed at the time and no flight plan was filed for the 14 Code of Federal Regulations (CFR) Part 91 instructional, local flight from Lee Gilmer Memorial Airport (GVL), Gainesville, Georgia. The airplane was destroyed by a postcrash fire and the flight instructor and private pilot were fatally injured during the flight that originated about 1 minute earlier.

According to the airplane owner's next door neighbor, about 1 week before the accident the owner told him he would be flying from the right seat with a flight instructor on-board.

A witness who was outside his hangar which is located south of runway 29 near the departure end of runway 29, reported that he observed the airplane flying at an estimated altitude of 400 feet, He heard a surging sound from the engine, and noticed oscillations of pitch and roll. The witness saw the airplane for about 3 to 4 seconds and then lost sight due to obstructions. He then heard a loud sound from the powerlines and heard the sound of impact followed by seeing smoke. He then ran to the sight, called 911 to report the accident, and when he arrived there were already 8 to 9 people on-scene. When he arrived the flight instructor was out of the airplane and on grass located north of the location of the wreckage.

Another witness who was in a building located immediately west of the accident site reported to FAA seeing the airplane's landing gear barely clear the building as it flew in an easterly direction towards the airport. The witness heard a sputtering or popping sound from the engine but did not see any smoke trailing the airplane. The witness reported that as the airplane flew towards powerlines that were located east of the building, he observed the airplane pitch up, as if in an attempt to avoid them. A portion of a wing contacted a powerline pole, and then the airplane rolled and impacted the ground coming to rest inverted. The witness ran to the accident site and assisted the flight instructor from the airplane, and also attempted to rescue the other occupant but was unable. He then rendered assistance to the flight instructor until first responders arrived.

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	50,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:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	September 10, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 14, 2014
Flight Time:	4171 hours (Total, all aircraft), 4011.3 hours (Pilot In Command, all aircraft), 253.3 hours (Last 90 days, all aircraft), 69.8 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Pilot Information

Certificate:	Private	**Age:**	74,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 22, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	February 15, 2014
Flight Time:	711 hours (Total, all aircraft)		

The left seat occupant, age 50, held a commercial pilot certificate with airplane single and multi-engine land, instrument airplane ratings. A review of his Federal Aviation Administration (FAA) airman file revealed that on August 5, 2006, he received a FAA Form 8060-5, titled Notice of Disapproval of Application for the private pilot certificate. He subsequently passed on August 18, 2006. He also held a flight instructor certificate with airplane single engine, and instrument airplane ratings. He was issued a second class medical certificate with no limitations on September 10, 2014. On the application for the medical certificate he listed a total time of 4,100 hours, and 500 hours in the previous 6 months. His last flight review in accordance with 61.56 occurred on January 14, 2014.

According to personnel of a fixed base operator, the left seat occupant began flying with them as a student pilot in 2005, and has been a flight instructor with them since 2008 or 2009. He was reported to be in good health, and the accident flight was his 3rd flight with the airplane owner flying from the right seat.

A review of copies of the left seat occupant's pilot logbook that contained entries from June 28, 2014, to the last entry dated October 15, 2014, revealed that he logged flying with the owner in the accident airplane on October 1st and 6th, 2014. Both flight durations were recorded to be 1.2 hours and the remarks section of the first flight indicated, "Larry right seat", while the remarks section of the second

flight indicated, "Larry Right Seat Landing." Excluding the accident flight, he logged a total time of 4,171 hours.

The right seat occupant, age 74, held a private pilot certificate with airplane single engine land rating, issued December 13, 2005. A review of his FAA airman file revealed that 3 days earlier, or on December 10, 2005, he received a FAA Form 8060-5, titled Notice of Disapproval of Application for the private pilot certificate. The areas on the disapproval notice included takeoff's, landings, go-arounds, and ground reference maneuvers. On August 22, 2014, he was issued a third class medical certificate with a limitation that he, "Must wear corrective lenses for near and distant vision." On the application for the medical certificate he listed a total time of 711 hours, and 37 hours in the previous 6 months. A review of his 2nd pilot logbook that was found in the wreckage revealed his last flight review in accordance with 61.56 occurred on February 15, 2014; the flight review consisted of 2 hours of ground instruction and 1.1 hours of flight instruction.

Aircraft and Owner/Operator Information

Aircraft Make:	ROCKWELL INTERNATIONAL	**Registration:**	N1148J
Model/Series:	112 A	**Aircraft Category:**	Airplane
Year of Manufacture:	1975	**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	428
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	September 1, 2014 Annual	**Certified Max Gross Wt.:**	2950 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3657 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:		**Engine Model/Series:**	IO-360-C1D6
Registered Owner:	YOUHANAIAN LAWRENCE	**Rated Power:**	200 Horsepower
Operator:	YOUHANAIAN LAWRENCE	**Operating Certificate(s) Held:**	None

The airplane was manufactured in 1975, by Rockwell International as model 112, and was designated serial number 428. It was powered by a 200 horsepower Lycoming IO-360-C1D6 engine and equipped with a Hartzell constant speed HC-E2YR-1BF propeller with F766A blades propeller.

Review of the maintenance records revealed the airplane was last inspected in accordance with an annual inspection on September 1, 2014. The airplane total time at the time of the inspection was 3,656.6 hours. Further review of the maintenance records revealed the fuel tanks were sealed last on March 17, 2006; at airplane total time of about 3,196.7 hours.

The airplane's fuel system consists of an integral 25.0 gallon fuel tank in each wing, which routes fuel to the five-position fuel selector valve, fuel strainer or gascolator, electric (auxiliary) fuel pump, mechanical fuel pump, servo fuel injector, flow divider, to each fuel injector nozzle installed in each cylinder. Each wing contains a fuel vent scoop assembly part number (P/N) 48550-1) installed on the lower wing skin outboard of the integral fuel tank. The fuel vent scoop contains two openings; the first faces forward, while the second is parallel to the lower wing skin. Both openings at the fuel vent scoop have fittings that protrude inside the wing, and those fittings are connected to the fuel tank via flexible rubber hoses, aluminum lines, and fittings. Each fuel tank is also vented from a fitting on the fuselage that is connected by aluminum lines and fittings.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	GVL,1276 ft msl	**Distance from Accident Site:**	
Observation Time:	11:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 2200 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 4200 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/ Unknown
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/ Unknown
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	14°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Gainesville, GA (GVL)	**Type of Flight Plan Filed:**	None
Destination:	Gainesville, GA (GVL)	**Type of Clearance:**	None
Departure Time:	11:28 Local	**Type of Airspace:**	

A surface observation weather report taken at GVL at 1153, or approximately 24 minutes after the accident indicates the wind was from 280 degrees at 9 knots, the visibility was 10 statute miles, scattered clouds existed at 2,200 and 3,300 feet, and overcast clouds existed at 4,200 feet. The temperature and dew point were 14 and 09 degrees Celsius, respectively, and the altimeter setting was 29.92 inches of Mercury.

Airport Information

Airport:	Lee Gilmer Memorial Airport GVL	**Runway Surface Type:**	Asphalt
Airport Elevation:	1276 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	29	**IFR Approach:**	None
Runway Length/Width:	4001 ft / 100 ft	**VFR Approach/Landing:**	Forced landing

The GVL Airport is equipped in part with runway 29, which is 4,001 feet in length and 100 feet wide. While the airport common traffic advisory frequency is not officially recorded, a fixed base operator on

the field has security cameras that contain a portion of runway 29, and also record audio transmission from radio calls on the CTAF.

A review of the provided video recording revealed that a portion of the takeoff was recorded, as well as a radio call from an occupant of the airplane. The video depicted the airplane when it was about 1/2 way down the runway in a normal climb attitude. The airplane went out of view of the camera, and a short time later, a radio call on the CTAF frequency was recorded by the FBO security system. The radio call indicated an emergency existed and advised the flight was returning runway 05. Approximately 2 seconds later, power to the video camera was shut off, which was attributed to impact to the power lines.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	34.27,-83.837219

The airplane crashed off airport; the main wreckage was located at 34 degrees 16.201 minutes North latitude and 083 degrees 50.226 minutes West longitude, or 0.28 nautical mile and 211 degrees from the departure end of runway 29.

Examination of the accident site revealed the crash site was southwest of the intersection of Scott Street and Palmour Drive. Two powerline poles were broken; 1 pole immediately adjacent to the accident site and 1 pole near the intersection of Scott Street and Palmour Drive. The powerline pole immediately adjacent to the accident site was broken in three pieces (including a piece that was underground). Additionally, damage to unmarked 7200KV three phase electrical wires oriented on a magnetic heading of 035 degrees was noted; the pole and wires were repaired before NTSB arrival, but the damaged components were retained at the accident site. Examination of the broken powerline that was immediately adjacent to the accident site revealed it was approximately 40 feet long, and was set approximately 6 feet below the ground. The pole was fractured at ground level and also about 25 feet above ground level. Pieces of white paint with green color on the opposite side and gouges were noted on the upper 40 inches of the pole, consistent with contact by a portion of the airplane. Wiring from the left Aeroflash Signal Box was found hanging on a telephone wire to the northeast of the broken powerline pole immediately adjacent to the accident site.

Nearby businesses were contacted to determine if either contained security video that captured the accident sequence; no video depicting the accident sequence was recorded.

Further examination of the accident site revealed ground scars on the road 53 feet 6 inches from the pole contact location. With an estimated pole contact located 31 feet 8 inches above ground level, the descent path to the ground was calculated to be approximately 59 degrees. The ground scar was oriented on a magnetic heading of 068 degrees.

Examination of the wreckage revealed the engine, cockpit, and wing carry-thru were inverted. A postcrash fire nearly consumed the cockpit, cabin, and both wings. The outer 4 feet of the left wing was initially found on the sidewalk in the area of the powerline pole, but subsequently moved closer to the main wreckage before NTSB arrival.

Examination of the left wing revealed the outer 4 feet was separated; the upper and lower wing skins exhibited sawtooth type fractured oriented in a spanwise direction. The separated section contained the outer portion of the integral fuel tank, and fuel vent lines. The full span of the aileron remained connected, and the aileron counterweight was in-place. The main landing gear was fractured, and the wheel assembly was damaged. The aileron control cables were connected the aileron bellcrank adjacent to the control surface and the pushrod was connected to the bellcrank and the remaining portion of the aileron. Examination of the separated outer section of left wing revealed the fuel tank vent lines were detached at both fittings of the fuel vent scoop assembly; both openings of the fuel vent scoop assembly were free of obstructions. Examination of the ends of the flexible hoses attached to each of the vent lines revealed both were free of obstructions at the opening. When air was blown into the separated forward oriented vent tube, a solid particle of debris exited the tube at the tank connection with force; the debris was collected. Additional air was applied and small particles of dust/dirt exited. Further examination of the forward oriented fuel vent line revealed tan colored debris adhering to the wall approximately 1.25 inches from the end, which obstructed part of the tube opening. Evidence of tan colored material adhering to the entire inner circumference was noted; the material was consistent with insect nest material. The lines were removed from the "T" fitting, and the 90 degree portion was inspected and found to be completely blocked by tan colored material.

Examination of the right wing which was upright revealed it was fractured at the wing root, and bent up at about a 45 degree angle about 7 feet outboard of the wing root. The main landing gear was extended. The flap was attached at the inboard and outboard hinges, and the aileron was connected at the inboard hinge. A portion of aileron counterweight was found adjacent to the right wing. The aileron control cable was connected at the aileron bellcrank near the control surface. The fuel vent lines were found loose among the wreckage. The line that attaches to the tank fitting was fractured, but the fractured portion of line was recovered. The line and wing section exhibited extensive fire damage. Examination of the fuel vent lines associated with the right fuel vent scoop assembly revealed evidence of soot adhering to the exterior surfaces. The end openings of all three lines were free of obstructions. The aluminum line that connects to the forward fitting of the scoop assembly was disconnected from the "T" fitting, and black colored loose material including a round shaped object measuring 11/32 inch in diameter came from the line. The other fuel vent line at the "B-nut" at the "T" reduction fitting well downstream of the end of the hose was completed blocked by debris. The remaining identified portions of fuel vent lines were free of obstructions.

Examination of the empennage revealed it was heat damaged. The right horizontal was bent up about 90 degrees approximately 2 feet outboard of the root, and also bent inboard 90 degrees. The left elevator remained connected at the inboard 2 hinges, and also the spar was attached at the outboard hinge, while the right elevator with trim tab connected remained attached at the inboard 2 hinges; the full span was accounted for. Both the left and right elevator trim tab actuators were connected by chains, and were symmetrically extended 2.125 inches, which equates to trim tab deflection of 6 degrees nose-up.

Examination of the aileron, elevator, and rudder flight controls revealed control cable continuity was confirmed from each control surface to the respective cockpit control. The flap torque tube assembly with attached right arm assembly and portion of actuator screw was found loose in the wreckage. Examination of the actuator screw revealed it was extended 12 threads, which equates to flap extension of 8 degrees.

One fuel vent check valve with attached fitting and section of hard aluminum line was found in the wreckage debris by the FAA-IIC. The check valve was inspected and photographed. No determination was made as to what tank the check valve was for. Disassembly examination of the fuel selector valve revealed it was positioned to both; no obstructions were noted internally of the ports.

Examination of the engine was performed by a representative of the engine manufacturer with NTSB oversight. The engine, which sustained heat damaged associated with the postcrash fire remained partially attached to the aircraft firewall via the tubular engine mount, was removed for examination. Following removal of the cylinders, continuity of the crankshaft to the accessory case and valve train was confirmed. The engine-driven fuel pump, which remained attached to the engine was heavily fire damaged. It was removed and disassembled which revealed the diaphragms were destroyed. Both magnetos and ignition harness sustained fire damage that precluded operational testing. Examination of the lubrication system revealed the oil suction screen was absent of ferrous debris, and the oil filer paper media was charred, but was absent ferrous debris between the media pleats. Examination of the fuel injector nozzles revealed no blockage. Following examination of the engine, the servo fuel injector and manifold valve were retained for further examination.

Examination of the propeller revealed the propeller spinner exhibited minimal damage. One propeller blade was loose in the hub, and 1 blade was bent aft with very course chordwise scratches on the blade face.

Medical and Pathological Information

The flight instructor seated in the left seat was transported to a hospital for treatment of his injuries, but died while hospitalized on November 10, 2014. Because of the length of hospital stay, a postmortem examination and toxicology testing by FAA Bioaeronautical Sciences Research Laboratory was not performed.

A postmortem examination of the right seat occupant was performed by Forensic Medicine Associates, Inc., at the DeKalb County Forensic Science Center. The cause of death was listed as "Blunt Force Head Trauma."

Forensic toxicology testing on specimens of the right seat occupant was performed by the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The toxicology report stated the results were negative for carbon monoxide, volatiles, and tested drugs, while testing for cyanide was not performed.

Tests and Research

Examination of the servo fuel injector revealed extensive heat damage which precluded operational testing. The fuel regulator plug which was safety wired was removed and the fuel diaphragm stem nut was observed to be in-place. Disassembly examination revealed the air diaphragm was heat damaged and the fuel diaphragm was destroyed. The plastic portion of the seat was destroyed, while the metal portion of the seat was in-place. Removal of the mixture control and fuel control section revealed ghost mark indicating the mixture was just off the full rich position. The clevis was broken to facilitate removal of the idle valve. Based on internal components of the servo, the throttle was in the wide open position. A detailed report concerning the servo fuel injector examination is contained in the NTSB public docket.

Examination of the manifold valve revealed that the inlet fitting, inlet port and the ports of the valve body for each cylinder were obstructed to varying degrees by an unknown substance. Because of the obstructions, flow testing was not performed. Following removal of the cover from the bottom of the manifold valve, brown colored material was noted. The top cover of the manifold was removed and the fuel side of the diaphragm and housing were clean. The manifold valve was sent to the NTSB Materials Laboratory for analysis of the obstruction material. A detailed report concerning the manifold valve examination is contained in the NTSB public docket.

According to the NTSB Materials Laboratory Report concerning the examination of the manifold valve, most of the portals had substance build-up that limited the openings to approximately half of the portal diameter or more. The blockages of each portal were estimated as follows: 45 percent and 75 percent for the inlet fitting and valve body opening, respectively; 60 percent for both the portal 'A' fitting and valve body opening; 70 percent for the portal 'B' valve body opening; 45 percent for the portal 'C' valve body opening; and 60 percent for the portal 'D' valve body opening. Samples of substances were taken from each port, along with the larger central opening of the back cover for testing by Fourier Transform Infrared (FTIR) spectrometer with a diamond attenuated total reflectance (ATR) accessory. Multiple FTIR analyses were performed on each portal sample, including the hard and soft areas of each sample, as well as areas of different colors for each sample. A spectral library search found the unknown material spectrum to be a very strong spectral match to several types of polyester-a type of organic polymer. Because the sample was degraded and the spectra for polyesters are so similar, it was difficult to differentiate between different types of polyesters. A copy of the NTSB Materials Laboratory Factual Report is contained in the public docket.

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Robert Williams; FAA/FSDO; College Park, GA James M Childers; Lycoming Engines; Williamsport, PA
Original Publish Date:	May 23, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=90259