



National Transportation Safety Board Aviation Accident Final Report

Location:	Paris, IL	Accident Number:	CEN13FA509
Date & Time:	08/27/2013, 1120 CDT	Registration:	N229H
Aircraft:	CESSNA 421C	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

Company personnel reported that, in the weeks before the accident, the airplane's left engine had been experiencing a problem that prevented it from initially producing 100 percent power. The accident pilot and maintenance personnel attempted to correct the discrepancy; however, the discrepancy was not corrected before the accident flight, and company personnel had previously flown flights in the airplane with the known discrepancy.

Witnesses reported observing a portion of the takeoff roll, which they described as slower than normal. However, the airplane was subsequently blocked from their view. Examination of the runway environment showed that, during the takeoff roll, the airplane traveled the entire length of the 4,501-ft runway, continued to travel through a 300-ft-long grassy area and a 300-ft-long soybean field, and then impacted the top of 10-ft-tall corn stalks for about 50 ft before it began to climb. About 1/2 mile from the airport, the airplane impacted several trees in a left-wing, nose-low attitude, consistent with the airplane being operated below the minimum controllable airspeed. The main wreckage was consumed by postimpact fire.

Postaccident examinations revealed no evidence of mechanical anomalies with the airframe, right engine, or propellers that would have precluded normal operation. Given the left engine's preexisting condition, it is likely that its performance was degraded; however, postimpact damage and fire precluded a determination of the cause of the problem.

Probable Cause and Findings

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

The pilot's failure to abort the takeoff during the ground roll after detecting the airplane's degraded performance. Contributing to the accident was the pilot's decision to attempt a flight

with a known problem with the left engine and the likely partial loss of left engine power for reasons that could not be determined during the postaccident examination of the engine.

Findings

Personnel issues	Incorrect action performance - Pilot (Cause) Decision making/judgment - Pilot (Factor)
Not determined	Not determined - Unknown/Not determined (Factor)

Factual Information

HISTORY OF FLIGHT

On August 27, 2013, approximately 1120 central daylight time, a Cessna 421C Riley Turbine Rocket twin-engine airplane, N229H, impacted wooded terrain shortly after takeoff from the Edgar County Airport (PRG), Paris, Illinois. The airline transport pilot, who was the sole occupant, sustained fatal injuries. The airplane was destroyed and a post-impact fire ensued. The airplane was registered to Venezia Marine, Inc., Terre Haute, Indiana, and operated by RSB Aviation, Inc., Paris, Illinois, under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight. Visual meteorological conditions prevailed for the flight, and a flight plan was not filed. The flight was originating at the time of the accident and was en route to the Terre Haute International Airport - Hulman Field (HUF), Terre Haute, Indiana.

According to RSB Aviation company personnel, prior to the flight, the pilot fueled the airplane with 178 gallons of fuel, which according to a company pilot, would have topped off the fuel tanks. The pilot intended to depart PRG, pick up an individual at HUF, and then continue to Cincinnati, Ohio.

Witnesses, located inside a building on the airport, observed a portion of the airplane's takeoff roll from runway 9. They stated the airplane seemed to be very slow in comparison to other takeoff rolls they have observed with the accident airplane. Due to corn and other obstacles on the airport property blocking their view, and concerned with the slow takeoff roll, the witnesses exited the building and went to the edge of the runway to see if the pilot stopped the airplane or turned around. The witnesses did not observe the airplane; however, shortly thereafter, they noticed a smoke plume about 1 mile east of the airport.

PERSONNEL INFORMATION

The pilot, age 33, held an airline transport pilot certificate with an airplane multiengine land rating, a commercial certificate with airplane single-engine land and airplane single-engine sea ratings, and a flight instructor certificate with airplane single-engine land, airplane multiengine land, and instrument airplane ratings. The pilot's most recent Federal Aviation Administration (FAA) first-class medical certificate was dated August 13, 2012, and had no limitations. The pilot's application for his medical certificate indicated no use of any medications and no medical history conditions.

According to an insurance application dated December 4, 2012, the pilot reported he had accumulated at least 8,600 total flight hours, 4,700 total flight hours in multiengine airplanes, and 2,000 total flight hours in Cessna 421C Riley Turbine Rocket powered airplanes. The pilot's logbooks were not located during the investigation.

AIRCRAFT INFORMATION

The accident airplane was manufactured in 1976 by The Cessna Aircraft Company as model 421C, serial number 421C0088, and was a high-performance, twin engine, low wing, piston-

powered airplane. The airplane was originally issued a standard airworthiness certificate in the normal category on April 22, 1976, and the airplane was registered to Venezia Marine, Inc., on March 5, 2009. At the time of the accident, the airplane was equipped with two 675 shaft horsepower (shp) Lycoming LTP101-600A-1A engines, flat rated to 475 shp, per a supplemental type certificate (STC), and Hartzell Propeller HC-B3TN-3C three-blade, single-acting, constant speed, hydraulically operated propellers with feathering and reversing capability.

On January 28, 1982, in accordance with Riley Aircraft STC SA4293WE, two Lycoming turboprop engines were installed on the airplane. The airplane was then issued a new standard airworthiness certificate in the normal category on January 29, 1982.

A review of STC SA4293WE indicated the minimum controllable airspeed is 97 knots with the inoperative engine propeller in the feathered position.

Current airframe, engine, and propeller maintenance logbooks were not located during the investigation. RSB Aviation company personnel stated the maintenance records were in the accident airplane; no evidence of maintenance records were noted within the aircraft wreckage. The airplane's current weight and balance documents were not located.

According to RSB Aviation company maintenance personnel, the airplane underwent its most recent annual inspection in May or June of 2013.

According to RSB Aviation company personnel, during the previous several weeks before the accident, the left engine had been experiencing a delay/lag in obtaining 100 percent power after engine start-up. A company pilot reported the following: "The left engine sometimes would 'hang' at 70 [percent] gas [generator]. Upon moving (cycling) the throttle and or cycling the fuel pump on/off, the power to the left engine would accelerate and be normal. To say another way, it was slow to accelerate on power up to 70 [percent] gas [generator] and would stop at that power setting. Moving the throttle more forward (toward full) would not do anything. This sometimes would go on for minutes before coming up and would operate normal after that." The company pilot stated the delay/lag would not occur at each engine start-up, but at intermittent times. The airplane was flown on several flights by RSB Aviation pilots with the known delay/lag condition. According to maintenance personnel and another company pilot, the known problem with the left engine had not been corrected prior to the accident flight.

During an interview with a Honeywell technical representative, he stated that at an unknown date preceding the accident, the accident pilot contacted him to inquire about troubleshooting the left engine issue. The technical representative offered several suggestions to troubleshoot the problem; however, he had not received a call back whether the issue had been resolved.

METEOROLOGICAL INFORMATION

At 1155, the PRG automated weather observation system, located approximately 0.5 miles west of the accident site, reported the wind from 260 degrees at 8 knots, visibility 10 miles, clear skies, temperature 30 degrees Celsius (C), dew point 24 degrees C, and an altimeter setting of 30.07 inches of mercury.

COMMUNICATION AND RADAR INFORMATION

There were no recorded air traffic communications or radar data for the accident flight.

AIRPORT INFORMATION

The Edgar County Airport, PRG, is a public, non-towered airport located about 5 miles north of Paris, Illinois, at a surveyed elevation of 654 feet. The airport features two asphalt runways, runway 9/27, which is 4,501 feet by 75 feet, and runway 18/36, which is 3,200 feet by 75 feet.

Runway 9 has a 38 foot tree located approximately 1,411 feet from the runway and 104 feet left of runway centerline.

FLIGHT RECORDERS

The airplane was not equipped, and was not required to be equipped, with a cockpit voice recorder, flight data recorder, or cockpit image recorder.

WRECKAGE AND IMPACT INFORMATION

The accident site was located approximately 1/2 of a mile from the departure end of runway 9. The airplane wreckage was distributed on a heading of 090 degrees for approximately 300 feet. The airplane impacted numerous trees prior to coming to rest at the base of a large tree. A post-impact fire and 2 post-impact explosions ensued. Several separated sections of the left wing, left horizontal stabilizer, and left elevator were located near the initial tree impacts. The main wreckage consisted of the fuselage, right wing, a portion of the left wing, both engines, and portions of the empennage.

Visual examination and aerial photographs of the departure end of runway 9 and adjacent terrain showed the airplane's main landing gear exit the end of the runway surface, travel approximately 300 feet through grass, continue to travel approximately 300 feet through 3-foot-tall soybeans, and then impact the top of 10-foot-tall corn stalks for approximately 50 feet. Damage to the soybean and corn vegetation was greater on the right path area than on the left path area. Following the damaged corn stalks, there was no evidence of the airplane impacting terrain prior to the tree impacts.

The fuselage, to include the cockpit and cabin areas, was destroyed by fire and thermal damage. The six seat frames (2 cockpit, 4 cabin) were separated from the fuselage structure. No seat restraint webbing was observed or located. No cockpit instrument readings or navigation/communication radio settings were discernable due to thermal damage.

The flight control cables and linkage system were examined for continuity. One elevator control cable was continuous from the ball end to a separation in the aft fuselage. The separation was consistent with an overload failure. The other elevator control cable was continuous from a damaged turn barrel near the cockpit to a separation in the aft fuselage. The separation was consistent with an overload failure. The aileron, rudder, and flap control continuity could not be determined due to damage associated with the impact and fire.

Landing gear and flap positions could not be determined due to damage associated with the impact and fire.

The National Transportation Safety Board (NTSB) completed the on-scene examination/wreckage documentation, and a recovery company removed all remaining airplane wreckage from the accident site. The engines, propellers, and miscellaneous airframe structure were transported to Honeywell, Phoenix, Arizona, for further examination. Details of the engine and propeller examinations are found later in this report.

PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot by the Terre Haute Regional Hospital, Department of Pathology, Terre Haute, Indiana. The autopsy ruled the cause of death as the result of blunt force trauma, and the manner of death as an accident. No unusual findings were discovered during the autopsy.

Biological specimens from the pilot's body were forwarded to the FAA's Civil Aerospace Medical Institute for toxicological testing. These specimens tested negative for ethanol and drugs. The specimens were unsuitable for carbon monoxide testing, and testing for cyanide was not performed.

TESTS AND RESEARCH

Engine Examination

The engines were disassembled at Honeywell's facilities in Phoenix, Arizona, under the supervision of the NTSB. Disassembly and examination of the engines did not reveal evidence of preimpact malfunctions.

The left engine external surfaces were covered in black soot and displayed deposits of solidified aluminum. The power turbine rotated freely with continuity established to the propeller. The gas producer shaft would not rotate; however, remained connected to the gearbox. The gas producer rotated with resistance after the fuel and oil pumps were removed. The accessory gearbox rotated freely through both high and low speed gear train after the power section was removed from the gearbox housing.

Disassembly of the left engine revealed the cup lock and nut were rotated 45 degrees from the anti-rotation slot to the crimped area of the cup washer. No torque on the nut was noted during the disassembly. Circumferential rubs were noted on the inner diameter of the compressor vane assembly. The axial compressor rotor was covered in black soot and the blade tips displayed rubs and material buildup on the trailing edge. The compressor impeller was covered in black soot and the blades displayed rubs at the inducer, knee, and exducer. The impeller shroud displayed a light rub at the inducer from about the 12 to 3 o'clock position (aft looking forward), rub in the knee area at 3 to 4 o'clock position, and a rub in the exducer area from the 5 to 3 o'clock position. The compressor diffuser assembly showed evidence of metallic deposits on the inlet side of the vanes. The gas producer turbine rotor assembly showed evidence of metal spray on the pressure side of the blades at the trailing edge. The power turbine nozzle assembly displayed a light circumferential rub mark at the trailing edge and evidence of metal

spray on the aft side of the vanes. The power turbine rotor assembly was covered in black soot and displayed evidence of blade tip rubs at the trailing edge. The accessory gearbox module components were intact and appeared undamaged. The following items were removed and retained for further examination: fuel pump, fuel control, fuel manifold, overspeed limiter, and propeller governor.

The right engine power section was separated from the accessory gearbox and the engine was covered in white ash. The power turbine was free to rotate. The gas producer would not rotate. The high and low speed spool in the accessory gearbox would not rotate.

Disassembly of the right engine revealed the cup lock and nut were missing. Circumferential rubs were noted on the inner diameter of the compressor vane assembly. The axial compressor rotor blade tips displayed material rolled in the direction opposite of rotation. Several blades were missing material at the forward leading edge, and several blades displayed damage on the leading edge with missing material. The compressor impeller was covered in light soot and the blade tips displayed rubs on the entire length of the blade. Material buildup was noted on both sides of the blades. The impeller shroud displayed a rub with material missing at the inducer from about the 10 to 2 o'clock position (aft looking forward), static blade indications on the shroud in area of a rub in the knee, a rub in the exducer area from the 11 to 1 o'clock position, and a light rub at the exducer area from the 1 to 11 o'clock position. The gas producer turbine rotor assembly showed evidence of metal spray on the aft side of the blades, and a circumferential rub on the outer diameter of the seal plate. The power turbine nozzle assembly displayed a light 360-degree circumferential rub at the aft area of the blade. The power turbine rotor assembly forward end of shaft was fractured approximately 5 1/4 inches from forward end. The forward end of the shaft displayed a blue tint. The assembly displayed evidence of blade tip rubs at the trailing edge. The accessory gearbox module housing had missing areas due to thermal damage which exposed internal gears and bearings.

Left Engine Fuel Pump

The left engine fuel pump was examined at Triumph Engine Control Systems, West Hartford, Connecticut, under the supervision of the NTSB. Extensive thermal damage was noted on the pump housing which precluded any functional test of the pump. Disassembly and examination of the pump did not reveal evidence of a preimpact malfunction.

Left Engine Fuel Control

The left engine fuel control was examined at Honeywell, South Bend, Indiana, under the supervision of the NTSB. Extensive thermal damage was noted on the control, which precluded any functional test of the control. Disassembly and examination of the control did not reveal evidence of a preimpact malfunction.

Left Engine Fuel Manifold

The left engine fuel manifold was examined at UTC Aerospace Systems Engine Components, Des Moines, Iowa, under the supervision of the FAA. Visual examination of the manifold showed it was covered in carbon and a portion of the hard line was bent. The inlet fitting threads were damaged and a new inlet fitting was installed to perform a flow test per the

approved test procedure (ATP). During the flow test, the number 1 and 2 nozzles had streaking to no flow. A pressure test was performed at 650 pounds per square inch (PSI) and several leaks were noted. The nozzles were removed from the manifold to replace the O-rings and Teflon seals. A pressure test at 650 PSI was again performed and no leaks were found. The ATP was repeated and the flow improved, however, the number 1 nozzle was clogged with no flow noted.

The left engine fuel manifold was further examined at Parker Aerospace, Glendale, Arizona, under the supervision of the FAA. The 68600501 ATP was performed on the patteration test fixture, and leakage was observed from the valve expansion plug. The manifold was installed into a spray quality chamber and all nozzles, with the exception of the number 5 nozzle, showed sputtering, backflow, and very little flow. The number 5 nozzle showed nominal flow. The nozzles were removed for further examination. New nozzles were installed on the accident manifold and the new nozzles met the test requirements. The accident nozzles were installed back onto the accident manifold with new O-rings and the flow test was repeated. All pressures were higher which was consistent with reduced flow primary circuit flow.

The left engine fuel manifold was placed on a test engine at Honeywell, Phoenix, Arizona, and an engine test was performed. The engine test revealed no discrepancy in the engine operation.

Propeller Examination

The propellers were disassembled at Honeywell's facilities in Phoenix under the supervision of the NTSB. Disassembly and examination of the propellers did not reveal evidence of a preimpact malfunction. Extensive thermal damage precluded determination of blade angle at the time of the accident; however, evidence revealed that neither propeller was in the feather or reverse position.

Disassembly of the left propeller revealed that the propeller assembly contained extensive thermal damage. All three blades remained partially attached to the hub. All three blades rotated in their respective clamps. Propeller cycling was not possible due to thermal and impact damage. The piston had thermal damage and large portions of the piston were melted. The piston contained deep impression marks consistent with the feather stops, which was indicative of the piston being forced into the feathered position. One blade was bent 90 degrees aft at mid blade, twisted forward at the blade tip, and the tip curled. One blade was bent in the forward and aft directions, and twisted forward at the blade tip. Several inches of the blade tip were missing, and the remaining portion displayed thermal damage. One blade was 90 percent missing, and the remaining portion displayed thermal damage.

Disassembly of the right propeller revealed that the propeller assembly contained extensive thermal damage. One blade was separated from the hub, and two blades remained partially attached to the hub. Propeller cycling was not possible due to thermal and impact damage. The piston was fragmented and a few fragmented sections remained on the beta rods. One blade was bent in the forward and aft directions, and twisted forward at the blade tip. One blade was 50 percent missing, and the remaining portion displayed thermal damage. One blade was bent in the forward and aft directions, and twisted forward at the blade tip.

Weight and Balance Information

The airplane's current weight and balance documents were not located. Based on the airplane's flight manual (AFM), gross weight computations were made for the accident takeoff based on the airplane's original empty weight, pilot, and fuel weights. The takeoff condition was calculated for a full fuel tank condition based on company personnel statements which indicated the pilot topped off the tanks with full fuel (total fuel capacity was 290.4 gallons, of which 281 was usable). The occupant weight was obtained from the pilot's most recent airman application, which was 200 pounds. The AFM listed the maximum takeoff weight was 7,579 pounds.

For the takeoff condition, the calculated gross weight was about 7,522 pounds.

Airplane Performance

According to the AFM and a temperature of approximately 85 F, the twin-engine climb performance at sea level is about 1,900 feet per minute, and the single-engine climb performance at sea level is about 390 feet per minute with the propeller feathered, and the gear and flaps in the up position. The total distance over a 50 foot obstacle with takeoff power on both engines is approximately 2,600 feet.

AFM Checklist Emergency Procedures

Section 3 of the Riley Turbine Rocket Cessna 421C AFM provides information regarding airplane emergencies, the warnings or alerts associated with a particular emergency, and the procedures to follow once the emergency has been identified. Some of those procedures are listed as follows.

Engine Inoperative Procedures:

1. Engine Securing Procedure:
 1. Power Lever – FLIGHT IDLE
 2. Condition Lever – FEATHER
 3. Main Tank Pumps – OFF
 4. Generator – OFF
 5. Cabin Air Switches – OFF
 6. Fuel Selector – OFF
 7. Engine Anti-Ice - OFF
 8. Air Conditioner – OFF (If Installed)
2. Engine Failure Before Liftoff – Speed Below 105 KIAS (knots indicated airspeed)
 1. Power Levers – GROUND IDLE or REVERSE as required
 2. Brakes – AS REQUIRED

CAUTION: Use of reverse power with one engine inoperative only to the amount that directional control can be maintained.

3. Engine Failure After Take-Off – Speed Above 105 KIAS
 1. POWER LEVERS – 51.3 PSIG Torque (DO NOT EXCEED MGT RED LINE)
 2. Landing Gear – UP after positive rate is achieved

3. Establish Bank – 5 degrees TOWARD OPERATIVE ENGINE
4. Climb to Obstacle – 110 KIAS (Best Angle of Climb Speed)
5. Accelerate to Best Single Engine Climb Speed (Vyse) – 117 KIAS
6. Trim Tabs – ADJUST (Adjust to relieve control pressures)
7. Cabin Air Switches – OFF
8. Inoperative Engine – Secure (See Sect 1-A Above)
9. As Soon As Practical – LAND

ADDITIONAL INFORMATION

Family members and friends of the pilot expressed concerns to the NTSB regarding some possible sabotage or criminal activity to the airplane by unknown persons that may have caused the accident. In the year preceding the accident, the pilot and his company felt harassed by local officials and airport personnel. The investigation did not reveal any evidence of sabotage or criminal activity that occurred before the accident.

History of Flight

Takeoff	Loss of engine power (partial) Runway excursion
Initial climb	Loss of control in flight (Defining event) Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Airline Transport; Commercial	Age:	33
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	Yes
Medical Certification:	Class 1 Without Waivers/Limitations	Last FAA Medical Exam:	08/13/2012
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 8600 hours (Total, all aircraft), 2000 hours (Total, this make and model), 8560 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	Registration:	N229H
Model/Series:	421C	Aircraft Category:	Airplane
Year of Manufacture:	1976	Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	421C0088
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	05/01/2013, Annual	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	2 Turbo Prop
Airframe Total Time:	3000 Hours at time of accident	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	LTP101-600A-1
Registered Owner:	VENEZIA MARINE INC	Rated Power:	675 hp
Operator:	RSB Aviation, Inc.	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	PRG, 694 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	1155 CDT	Direction from Accident Site:	80°
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	8 knots /	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	260°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.07 inches Hg	Temperature/Dew Point:	30° C / 24° C
Precipitation and Obscuration:	No Precipitation		
Departure Point:	Paris, IL (PRG)	Type of Flight Plan Filed:	None
Destination:	Terre Haute, IN (HUF)	Type of Clearance:	None
Departure Time:	1120 CDT	Type of Airspace:	Class E

Airport Information

Airport:	Edgar County Airport (PRG)	Runway Surface Type:	Asphalt
Airport Elevation:	654 ft	Runway Surface Condition:	Dry
Runway Used:	09	IFR Approach:	None
Runway Length/Width:	4501 ft / 75 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	On-Ground
Total Injuries:	1 Fatal	Latitude, Longitude:	39.701389, -87.650556 (est)

Administrative Information

Investigator In Charge (IIC):	Aaron M Sauer	Report Date:	06/01/2015
Additional Participating Persons:	Kerry Gambrel; Federal Aviation Administration; Springfield, IL Jan Smith; Cessna Aircraft Company; Wichita, KS Jim Allen; Honeywell Aerospace; Phoenix, AZ		
Publish Date:	06/02/2017		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=87874		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).