Aviation Investigation Final Report

Location:	Plant City, Florida	**Accident Number:**	WPR18LA166
Date & Time:	June 11, 2018, 01:40 Local	**Registration:**	N13RF
Aircraft:	Cessna 421C	**Aircraft Damage:**	Substantial
Defining Event:	Unknown or undetermined	**Injuries:**	1 Minor, 1 None
Flight Conducted Under:	Part 91: General aviation - Aerial observation		

Analysis

During takeoff on a night aerial observation flight, the pilot reported that the airplane did not accelerate adequately, and he chose to abort the takeoff. The airplane continued off the end of the runway and came to rest in a field about 750 ft past the departure end, resulting in substantial damage to the wings and fuselage.

Examination revealed that the left engine turbocharger compressor air duct was disconnected from the throttle body. The right engine's engine-driven fuel pump was contaminated with water and debris and would not produce normal pressures and flow; however, whether these anomalies were present at the time of the accident or occurred as a result of or after the accident could not be determined. There were no other anomalies observed that would have precluded normal engine operation.

Review of performance information revealed that, given the airplane's weight and atmospheric conditions at the time of the accident, the pilot had adequate runway available to accelerate the airplane to a decision speed, abort the takeoff, and stop on the remaining runway. Airport surveillance video revealed that the pilot did not activate the pilot-controlled runway lighting before takeoff, and tire skid marks on the runway were consistent with heavy braking within the last 200 ft of the runway's paved surface. The circumstances of the accident are consistent with the pilot's delayed decision to abort the takeoff. The pilot's failure to activate the runway lighting system before takeoff likely contributed to the accident by reducing his ability to judge the airplane's acceleration with respect to the runway distance remaining and abort the takeoff in a timely manner upon recognizing an anomaly.

Probable Cause and Findings

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

The pilot's delayed decision to abort the takeoff, which resulted in a runway overrun. Contributing to the accident was an engine anomaly for reasons that could not be determined based on the available information, and the pilot's failure to activate the runway lighting system before takeoff.

Findings

Personnel issues	Delayed action - Pilot
Personnel issues	Use of available resources - Pilot
Personnel issues	Forgotten action/omission - Pilot
Not determined	(general) - Unknown/Not determined
Personnel issues	Task monitoring/vigilance - Pilot
Environmental issues	Runway/taxi/approach light - Decision related to condition

Factual Information

History of Flight

Takeoff-rejected takeoff	Unknown or undetermined (Defining event)
Takeoff-rejected takeoff	Runway excursion
Takeoff-rejected takeoff	Collision with terr/obj (non-CFIT)

On June 11, 2018, about 0140 eastern daylight time, a Cessna 421C, N13RF, sustained substantial damage when it was involved in an accident at Plant City Airport (PCM), Plant City, Florida. The airline transport pilot sustained minor injuries and the passenger was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 aerial observation flight.

According to the pilot, during the takeoff roll, the airplane did not accelerate adequately, and he elected to abort the takeoff. The airplane continued past the departure end of the runway, across a road, and came to rest in a grass field.

Review of airport surveillance video indicated that the pilot did not activate the airport's pilot-controlled runway lighting before takeoff.

Pilot Information

Certificate:	Airline transport; Commercial; Flight engineer	**Age:**	69,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	December 21, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 10, 2017
Flight Time:	(Estimated) 26486 hours (Total, all aircraft), 606.5 hours (Total, this make and model)		

Passenger Information

Certificate:		**Age:**	28,Male
Airplane Rating(s):		**Seat Occupied:**	Center
Other Aircraft Rating(s):		**Restraint Used:**	Lap only
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N13RF
Model/Series:	421C C	**Aircraft Category:**	Airplane
Year of Manufacture:	1980	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	421C0816
Landing Gear Type:	Retractable - Tricycle	**Seats:**	3
Date/Type of Last Inspection:	July 27, 2017 Annual	**Certified Max Gross Wt.:**	7500 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	7530.2 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	C126 installed, not activated	**Engine Model/Series:**	GTSIO-520L
Registered Owner:		**Rated Power:**	375 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None
Operator Does Business As:	Digital Aerial Solutions	**Operator Designator Code:**	

The Pilot's Operating Handbook (POH) Engine Failure During Takeoff checklist (Speed Below 100 knots or Gear Down) stated to "close throttles immediately and brake as required" during an aborted takeoff. The handbook recommended discontinuing the takeoff for rough engine operation, unequal power between engines, and sluggish engine acceleration.

The operator reported that the airplane's gross weight at the time of the accident was 6,870 lbs. At that weight, the airplane's takeoff distance was about 1,673 ft and the accelerate-stop-distance was about 3,040 ft; therefore, about 910 ft of runway should have remained during the aborted takeoff.

According to the POH, the accelerate-stop-distance is defined as, "the distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at that instant that speed is attained, to

bring the airplane to a stop." The accelerate-stop distance assumed engine failure at the engine failure speed and idle power and maximum braking after engine failure.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	TPF,7 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	01:55 Local	**Direction from Accident Site:**	72°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.01 inches Hg	**Temperature/Dew Point:**	26°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Plant City, FL (PCM)	**Type of Flight Plan Filed:**	None
Destination:	Immokalee, FL (IMM)	**Type of Clearance:**	Unknown
Departure Time:	01:40 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	PLANT CITY AIRPORT PCM	**Runway Surface Type:**	Asphalt
Airport Elevation:	152 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	28	**IFR Approach:**	None
Runway Length/Width:	3950 ft / 75 ft	**VFR Approach/Landing:**	None

PCM was a publicly owned non-towered airport with a reported field elevation of 152 ft mean sea level (msl). Runway 10/28 was 3,950 ft in length by 75 ft wide, paved with asphalt, and had nonprecision runway markings. Medium intensity runway edge lights (MIRL) and runway end identifier lights (REILS) were installed and available as pilot-controlled lighting using the published common traffic advisory frequency.

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 1 None	**Latitude, Longitude:**	28.000278,-82.16333(est)

Examination of the accident site by a Federal Aviation Administration inspector revealed that the airplane came to rest upright about 750 ft from the edge of the runway threshold. Skid marks from the braking of both main tires were observed beginning in the runway overrun. Both tires made impressions in the grass and dirt that continued from the end of the runway to the main wreckage.

The fuselage and vertical stabilizer displayed damage consistent with impact with the fences. The nose gear had collapsed, and the flaps were in the retracted position. Both main tires displayed wear consistent with heavy braking. Fuel was observed leaking from the wings at the accident site.

Examination of the airframe and engines revealed braking system and flight control continuity. All the engine components and accessories were present. The crankshafts were manually rotated by hand at the propellers and internal continuity was established through both engines. The combustion chamber of each cylinder was examined using a borescope and normal operational conditions were observed.

The examination revealed that a turbocharger compressor air duct was disconnected from the throttle body component on the No. 1 (left) engine. No other additional anomalies were discovered during the examination that would have precluded normal operation.

The engines were sent to the manufacturer for detailed examination and test runs. The engines were fitted with a test propeller and an oil and fuel source. Additionally, the No. 1 engine was fitted with a temporary starter adapter.

The No. 1 engine started normally and was run at various power settings for several minutes, including at full power, with no anomalies noted. A magneto check revealed no anomalies.

With the turbocharger compressor air duct disconnected from the throttle body, the No. 1 engine was started again and run; a power loss was observed. The manifold pressure indicated data similar to a naturally aspirated (non-turbocharged) engine. When the throttle was initially retarded, the engine rpm increased, consistent with a more efficient fuel/air mixture.

The No. 2 (right) engine initially failed to rotate during start and the starter motor was replaced. During the next attempt, the engine started normally but would only operate while being primed. The engine-driven fuel pump was removed and examined. Examination revealed that the fuel pump was contaminated with water and organic substances, and that its internal components were corroded and seized, which resulted in the fracture of the drive coupling. Assembly holes in the rubber diaphragm were observed. The pump vanes were corroded and frozen to the pump housing. The pump's internal

parts were removed, cleaned, reassembled, and the pump was bench tested, during which the pump failed to produce normal pressures and flow. The source of the fuel pump contamination could not be determined.

The engine-driven fuel pump from the No. 1 engine was installed, and the No. 2 engine started normally and was run at various power settings for several minutes, including at full power, with no anomalies noted. The throttle was rapidly advanced from idle to full power, and the engine performed normally with no hesitation, stumbling, or interruption.

Administrative Information

Investigator In Charge (IIC):	Nixon, Albert		
Additional Participating Persons:	Gregory Joy; Federal Aviation Administration; Tampa, FL Michael Council; Continental Motors; Mobile, AL Peter Basile; Textron Aviaiton; Wichita, KS		
Original Publish Date:	June 1, 2021	**Investigation Class:**	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97449		