National Transportation Safety Board
Aviation Accident Final Report

Location:	Hammond, LA	**Accident Number:**	CEN16FA013
Date & Time:	10/14/2015, 1542 CDT	**Registration:**	N33FA
Aircraft:	CESSNA 421B	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

The twin-engine airplane, flown by a commercial pilot, was departing on a business flight from runway 31 when the right engine lost power. According to a pilot-rated witness, the airplane was about halfway down the 6,500 ft runway at an altitude of about 100 ft above ground level when he heard a "loud pop" and then saw the airplane's right propeller slow. The witness reported that the airplane yawed to the right and then began a right turn toward runway 18 with the right engine's propeller windmilling. The witness further reported that the airplane cleared a tree line by about 150 ft, rolled right, descended straight down to ground impact, and burst into flames.

Postaccident examination of the airplane's right engine revealed that the crankshaft was fractured adjacent to the No. 2 main bearing, which had rotated. The crankcase halves adjacent to the No. 2 main bearing were fretted where the case through-studs were located. The fretting of the mating surfaces was consistent with insufficient clamping force due to insufficient torque of the through-stud nuts. Records indicated that all six cylinders on the right engine had been replaced at the airplane's most recent annual inspection 8 months before the accident. In order to replace the cylinders, the through-stud nuts had to be removed as they also served to hold down the cylinders. It is likely that when the cylinders were replaced, the through-stud nuts were not properly torqued, which, over time, allowed the case halves to move and led to the bearing spinning and the crankshaft fracturing.

During the accident sequence, the pilot made a right turn in an attempt to return to the airport and did not feather the failed (right) engine's propeller, allowing it to windmill, thereby creating excessive drag. It is likely that the pilot allowed the airspeed to decay below the minimum required for the airplane to remain controllable, which combined with his failure to feather the failed engine's propeller and the turn in the direction of the failed engine resulted in a loss of airplane control.

Probable Cause and Findings

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

The loss of right engine power on takeoff due to maintenance personnel's failure to properly tighten the crankcase through-studs during cylinder replacement, which resulted in crankshaft fracture. Also causal were the pilot's failure to feather the propeller on the right engine and his failure to maintain control of the twin-engine airplane while maneuvering to return to the airport.

Findings

Aircraft	Maintenance/inspections - Incorrect service/maintenance (Cause)
	Recip engine power section - Failure (Cause)
	Engine out control - Not attained/maintained (Cause)
	Prop/rotor parameters - Not attained/maintained (Cause)
Personnel issues	Aircraft control - Pilot (Cause)
	Lack of action - Pilot (Cause)

Factual Information

HISTORY OF FLIGHT
On October 14, 2015, about 1542 central daylight time, a Cessna 421B airplane, N33FA, was destroyed when it impacted terrain following a loss of right engine power during initial climb after takeoff. The airplane was departing the Hammond Northshore Regional Airport (HDC), Hammond, Louisiana, on runway 31, when the accident occurred. The pilot and passenger were fatally injured. The aircraft was registered to SD Management, Inc., Lafayette, Louisiana, and operated under the provisions of 14 Code of Federal Regulations Part 91 as business flight. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules flight plan. The flight was originating from HDC at the time of the accident and the intended destination was the Hartsfield - Jackson Atlanta International Airport (ATL), Atlanta, Georgia.

A witness, who was an airline transport rated pilot, reported seeing the accident airplane take off on runway 31 at HDC. When the airplane was about 3,500 ft down the 6,500 ft runway at an altitude of 100 feet above ground level (agl), the witness heard a "loud pop" followed by slowing of the airplane's right engine and right propeller. The airplane then yawed to the right. The witness then saw the airplane begin a right turn toward runway 18. At this time the right engine's propeller was still windmilling. The airplane cleared the tree line by about 150 ft and then rolled and descended straight down into the field north of runway 18. The airplane then exploded and burst into flames.

PERSONNEL INFORMATION
The pilot, age 47, held a commercial pilot certificate with airplane single-engine land, airplane multiengine land and instrument airplane ratings. He also held a flight instructor certificate with airplane single-engine, and instrument airplane ratings.

The pilot's flight logbook was not recovered during the investigation and was believed to have been consumed by the post-impact fire. A review of Federal Aviation Administration (FAA) records showed that on May 13, 2014, the pilot submitted an application for the addition of a Learjet model 60 type rating. On the application, the pilot reported having 1,370 hours total flight experience with 355 hours instruction received, 40 hours solo, 1,090 hours as pilot in command, and 145 hours as second in command. The records further showed that the pilot originally tested for the addition of an airplane multiengine rating on November 9, 1998, which resulted in a notice of disapproval. The areas of operation noted to be deficient were VIII "Slow Flight and Stalls", and IX "Emergency Operations". The pilot was retested on November 18, 1998, which resulted in the successful completion of the practical test and the addition of the airplane multiengine land rating to his certificate. The records showed that in the time between the successful completion of the airplane multiengine land practical test and the accident, the pilot tested for and receive type ratings for MU-300, BE-400, and LR-60 airplanes. No further flight records of the pilot's flight activity were discovered during the investigation.

At the time of the accident the pilot held a second class airman medical certificate, issued on October 23, 2014, with no limitations listed.

AIRCRAFT INFORMATION
The airplane was a 1973 Cessna model 421B, serial number 421B0502. It was a seven seat twin engine monoplane of predominately aluminum construction with retractable tricycle landing gear. It was powered by two 435 horsepower Continental GTSIO-520-F-K engines, bearing serial numbers 817562-R and 235065-R.

The airplane maintenance records were kept within the airplane and were mostly consumed in the post-impact fire. Copies of the annual inspection records were obtained from the facility that performed the annual inspection. The inspection was completed on February 1, 2015. The inspection records did not indicate the airframe, engine or propeller total times. The entry for the right engine indicated that all 6 cylinders were replaced with overhauled units at the time of the inspection.

METEOROLOGICAL INFORMATION
The weather conditions recorded at HDC at 1535 were: Calm wind, 10 miles visibility, clear skies, temperature 33 degrees Celsius, dew point -1 degree Celsius, altimeter setting 30.03 inches of mercury.

COMMUNICATIONS
The pilot was in communication with ground and tower controllers at HDC prior to the accident. About 153623 (hhmmss), the pilot contacted HDC ground control requesting an IFR clearance to Atlanta. The clearance was issued, and subsequently the pilot requested and was granted taxi clearance to runway 31. About 153931, the pilot advised the HDC tower controller that he was holding short of runway 31 and that he would remain holding short of runway 31 for a moment. Less than one minute later the pilot advised that he was ready for takeoff and a takeoff clearance was issued by the HDC tower controller. About 154039, the pilot advised that the airplane was on the takeoff roll on runway 31. About 154146, the pilot declared an emergency and advised "mayday mayday mayday we gotta come back right away". The controller cleared the airplane for landing on runway 18 and issued the current wind, which was calm. Two more transmissions were received from the accident airplane however the audible portion of the transmissions was unrecognizable.

WRECKAGE AND IMPACT INFORMATION
The airplane impacted a level field about 1,600 ft and 335 degrees from the approach end of runway 18. Most of the airplane was consumed by the post-impact explosion and fire, however, all primary structure and control surfaces were located within the immediate area of the accident site. The airplane came to rest upright, facing in a northerly direction. The upper portion of the fuselage was consumed by fire with extensive fire damage to the cabin interior. The wings came to rest on the ground adjacent to the fuselage in their appropriate positions. Both wings had crush damage consistent with a near vertical impact. Both propellers had separated from the engines and were located within the immediate area of the accident site. The tail surfaces remained attached to a section of the aft fuselage that had separated from the remainder of the fuselage. The landing gear was found in the retracted position. On-site examination of the airplane's control system confirmed control cable continuity from the primary flight controls (ailerons, elevator, and rudder) to the cabin area of the fuselage. Due to the extensive impact and fire damage to the airplane, control continuity to the cockpit controls could not be determined. Both engines and propellers were retained for future examination.

Teardown examination of both engines was conducted at the engine manufacturer's facility. The examination of the left engine did not show any defects that would prevent normal operation.

During disassembly of the right engine it was noted that little torque was required to loosen the nuts on several crankcase through studs. Once the crankcase halves were separated, it was found that the engine crankshaft was fractured adjacent to the No. 2 main bearing. The No. 2 main bearing was spun and the crankcase mating surfaces for the No. 2 bearing through studs exhibited fretting of the mating surfaces, consistent with insufficient torque of the through studs. It was also found that the cylinders of the right engine appeared to be new. The No. 2 bearing through studs also serve to hold down the No. 2 and No. 3 cylinders. In order to remove the cylinders, the nuts were required to be removed from the through studs.

MEDICAL AND PATHOLOGICAL INFORMATION
An autopsy of the pilot was performed by the Tangipahoa Parish Coroner's Office, Hammond, Louisiana, on October 15, 2015. The pilot's death was attributed to injuries received in the accident.

Toxicology testing was performed by the FAA Civil Aerospace Medical Institute. Testing results indicated that Diphenhydramine was detected in liver and muscle tissue, and Ibuprofen was detected in liver tissue.

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over-the-counter under the trade names Benadryl and Unisom. Diphenhydramine carries the following FDA warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).

Ibuprofen is a non-narcotic medication used to treat pain and fever. It is marketed under many brand names including Motrin

ADDITIONAL INFORMATION
According to FAA publication FAA-H-80383-3A, "Airplane Flying Handbook", "In OEI (one engine inoperative) flight at low altitudes and airspeeds such as the initial climb after takeoff, pilots must operate the airplane so as to guard against the three major accident factors: (1) loss of directional control, (2) loss of performance, and (3) loss of flying speed. All have equal potential to be lethal. Loss of flying speed will not be a factor, however, when the airplane is operated with due regard for directional control and performance."

History of Flight

Initial climb	Loss of engine power (total) (Defining event) Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Commercial	**Age:**	47, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	None
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without Waivers/Limitations	**Last FAA Medical Exam:**	10/23/2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	**Registration:**	N33FA
Model/Series:	421B B	**Aircraft Category:**	Airplane
Year of Manufacture:	1973	**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	421B0502
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	02/01/2015, Annual	**Certified Max Gross Wt.:**	7449 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed, not activated	**Engine Model/Series:**	GTSI0-520-F-K
Registered Owner:	S D MANAGEMENT INC	**Rated Power:**	435 hp
Operator:	Aero One, Inc.	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	HDC, 47 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	2035 UTC	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	Calm /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	33°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hammond, LA (HDC)	**Type of Flight Plan Filed:**	IFR
Destination:	Atlanta, GA (ATL)	**Type of Clearance:**	IFR
Departure Time:	1530 CDT	**Type of Airspace:**	Class D

Airport Information

Airport:	HAMMOND NORTHSHORE RGNL (HDC)	**Runway Surface Type:**	Asphalt; Concrete
Airport Elevation:	46 ft	**Runway Surface Condition:**	Dry
Runway Used:	31	**IFR Approach:**	None
Runway Length/Width:	6502 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-Ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	30.521667, -90.418333

Administrative Information

Investigator In Charge (IIC):	John M Brannen	**Report Date:**	11/17/2016
Additional Participating Persons:	George Waddell; FAA - Baton Rouge FSDO; Baton Rouge, LA John Kent; Continental Motors; Mobile, AL Ricardo Asensio; Textron Air Safety (Cessna); Wichita, KS		
Publish Date:	11/17/2016		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=92176		

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.