National Transportation Safety Board
Aviation Accident Final Report

Location:	Englewood, CO	**Accident Number:**	DEN05FA038
Date & Time:	12/17/2004, 1522 MST	**Registration:**	N421FR
Aircraft:	Cessna 421	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

The pilot's father had just purchased the airplane for his daughter, and she was receiving model-specific training from a contract flight instructor. Her former flight instructor was aboard as a passenger. The engines were started and they quit. They were restarted and they quit again. They were started a third time, and the airplane was taxied for takeoff. Shortly after starting the takeoff roll, the pilot reported an unspecified engine problem. The airplane drifted across the median and parallel runway, then rolled abruptly to the right, struck the ground, and cartwheeled. The landing gear was down. Neither propeller was feathered. Disassembly of the right engine and turbocharger revealed no anomalies. Disassembly and examination of the left engine and turbocharger revealed the mixture shaft and throttle valve in the throttle and fuel control assembly were jammed in the idle cutoff and idle rpm positions, respectively. Manifold valve and fuel injector line flow tests produced higher-than-normal pressures, indicative of a flow restriction. Disassembly of the manifold valve revealed the needle valve in the plunger assembly was stuck in the full open position, collapsing the needle valve spring. A scribe was used to free the needle valve, and the manifold valve and fuel injector lines were again flow tested. The result was a lower pressure. Plunger disassembly revealed the threads had been tapped inside the retainer and metal shavings were found between the retainer and spring. The Teledyne Continental Motor (TCM) retainer has no threads. GPS download showed that 2,698 feet had been covered between the start of the takeoff roll and the attainment of rotation speed. Maximum speed attained was 132 mph. Computations indicated distance to clear a 50-foot obstacle was 2,000 feet, distance to clear a 50-foot obstacle (single engine) was 2,600 feet, and accelerate-stop distance was 3,000 feet.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: loss of engine power due to fuel starvation, and the instructor's failure to maintain aircraft control. Contributing factors were a partially blocked fuel line resulting in restricted fuel flow, the instructor's failure to perform critical emergency procedures, and his failure to abort the takeoff in a timely manner.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. ALL ENGINES
2. (F) FUEL SYSTEM,LINE - BLOCKED(PARTIAL)
3. (F) FLUID,FUEL - FLOW RESTRICTED
4. (C) FLUID,FUEL - STARVATION

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
5. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND(CFI)
6. (F) EMERGENCY PROCEDURE - NOT PERFORMED - PILOT IN COMMAND(CFI)
7. (F) ABORTED TAKEOFF - NOT PERFORMED - PILOT IN COMMAND(CFI)

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
8. AIRPORT FACILITIES,RUNWAY/LANDING AREA CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On December 17, 2004, at 1522 mountain standard time, a Cessna 421, N421FR, registered to and piloted by a commercial pilot, was destroyed when it impacted terrain 0.5-mile south-southwest of Centennial Airport (APA), Englewood, Colorado. Visual meteorological conditions prevailed at the time of the accident. The instructional flight was being conducted under the provisions of Title 14 CFR Part 91 without a flight plan. The pilot, flight instructor, and pilot certificated-passenger were fatally injured. The flight was originating at the time of the accident, and was en route to the Fort Collins-Loveland Airport (FNL), Fort Collins, CO.

The airplane arrived at Centennial Airport between 1330 and 1400, and the three occupants had lunch at the airport restaurant. The airplane was not refueled. According to a Denver Jet Center East employee, approximately 1500 a "pretty" female boarded the airplane and sat in the left seat. She was followed by "two older gentlemen, the one wearing a baseball cap, [who] sat in the right seat." She said that after both engines were started, the right engine quit, followed by the left engine. Her first impression was that the pilot had retarded the mixture handles. After some effort, the engines were restarted, but they quit one after another shortly thereafter. "It took many cranks to get them going again," she said. "They messed with the engines for at least 10 minutes." As the airplane taxied out for takeoff, she noticed a puff of black smoke but she could not be sure "which engine it was coming from."

According to the pilot's father, his daughter called him from the airport and told him they were having "engine problems" or "fuel problems," and that something had been "hooked up backwards." She asked that he notify the repair facility that they were returning the airplane for repairs. That was the last contact he had with his daughter.

The airplane was cleared for takeoff on runway 17L at 1521:41. At 1522:30 a female reported, "centennial tower four two one foxtrot romeo we're having engine trouble just to let you know." (See Transcript of Radio Communications, EXHIBITS). At 1522:43, there was a garbled transmission from the pilot. The airplane was seen to drift right across the median and runway 17R, then roll abruptly to the right and descend in a steep nose-low attitude. The airplane struck the ground, cartwheeled, and came to rest 1,017 feet southwest of the departure end of runway 17R (251° magnetic).

There were numerous witnesses to the accident (see EXHIBITS). One (witness #1) of two linemen working outside the Signature Flight Support facility, located near the intersection of runways 17L and 11, said that as the airplane passed his position, it did not appear to be climbing. "The aircraft appeared to be using right rudder as the nose of the aircraft had yawed to the right." His co-worker (witness #2) agreed that there was "full right rudder deflection." He then observed the airplane bank right "at a rapid rate . . . very steep bank angle . . . 90 degrees or more . . . [It] began to sink very fast . . . The aircraft hit the ground without changing its bank angle." Another employee (witness #3) inside the building said the airplane was crabbing "significantly to the right . . . The left wing would dip (in the down position) and the pilot would recover. This action continued 3 or 4 more times . . . The aircraft did not seem to gain or lose altitude . . . The aircraft's landing gear was extended."

Another witness (#4) who was driving home saw the airplane bank to the right and slowly descend. "I noticed the gear were still in transit mode coming up slow." He did not hear any

unusual engine sounds, or notice any smoke or windmilling propellers.

Two flight instructors observed the accident. One instructor (witness #5) was on landing approach. He said the airplane "appeared to be aligned with its axis along the runway (17L) centerline, and about the same altitude as I was (250 feet agl) . . . It began to drift slowly to the right. The axis always was parallel to the departure runway, with wings level, no turn was initiated. The plane continued to drift over the grass between runways 17L and 17R, with no apparent climb or descent . . . Rather suddenly, the left wing rose, and in a continuing descending arc to the right, the aircraft made ground impact, followed by a cartwheel." The other instructor (witness #6) was departing on the downwind leg. He said the airplane "flying very slowly and pointed in a southwesterly direction. The left wing came up and the airplane did what appeared to be a Vmc roll."

The accident occurred during the hours of daylight at a location of 39 degrees, 33.367' north latitude, and 104 degrees, 51.249' west longitude. The accident site was at a GPS (Global Positioning System) elevation of 5,916 feet msl.

PERSONNEL (CREW) INFORMATION

First Pilot

The first pilot held an airline transport pilot certificate with an airplane multiengine land rating, and commercial privileges in airplanes single-engine land, dated October 8, 1986. He also held a flight instructor certificate with airplane single/multiengine and instrument ratings, dated May 30, 2003, and a ground instructor certificate with an advanced rating, dated January 14, 1987. His second class airman medical certificate, dated May 6, 2004, contained the restriction, "Must wear corrective lenses." He was the owner and chief executive officer of Aircraft Training Resources. According to his most recent application for medical certification, he estimated he had logged the following flight time (in hours):

Total Time: 11,000

Last 6 Months: 250

Two pages of the pilot's logbook (which was kept on a computer, were provided by his daughter. The first page contained entries from March 31, 2003, to December 5, 2003, and the second page contained entries from January 1, 2004, to July 26, 2004, to wit (in hours):

Total Time:	222.7		197.5	
Single-engine:		5.4		
Multiengine:	217.3		197.5	
Turboprop:	66.4		143.7	
Night:	11.2		13.8	
Actual Instruments:		20.9		18.3
Simulated Instruments:		0.5		87.5
Solo:	1.2			
Pilot-in-Command:		224.7		197.5

Instruction Received: 1.5

Instruction Given: 205.8 187.7

Cessna 421: 74.7 5.5

According to his sister, the pilot's resume, updated in November 2004, showed the following flight time (in hours):

Total Time: 12,000

Multiengine: 7,850

Turboprop: 4,900

Total Instruments: 2,120

Pilot-in-Command: 11,700

Instruction Given: 3,500

His last biennial flight review, 1.5 hours duration, was dated May 30, 2003, and was taken in a Cessna 172.

Second Pilot

The second pilot, age 20, was a student at Metropolitan State College of Denver, majoring in aviation technology, and aspired to become an airline pilot. She held a commercial pilot license with airplane single/multiengine land and instrument ratings, dated July 12, 2004. Her third class airman medical certificate, date January 2, 2003, contained no restrictions or limitations. According to her logbook, containing entries from November 14, 2002, to December 4, 2004, she had accrued the following flight time (in hours):

Total Time: 414.6

Single-engine: 180.8

Multiengine: 247.1

Pilot-in-Command: 303.3

Instruction Received: 212.0

Night: 32.1

Actual Instruments: 8.7

Simulated Instruments: 53.5

Simulator: 14.0

Cessna 421: 31.9

Her commercial single/multiengine practical tests, taken in a Cessna 182 and a Piper PA-23-250 on July 12, 2004, respectively, constituted her biennial flight review.

Third Pilot

The third pilot held a commercial pilot certificate with airplane single/multiengine land and instrument ratings, dated February 15, 1974. He also held a flight instructor certificate with airplane single/multiengine land and instrument ratings, dated December 8, 2002. He was the

second pilot's former flight instructor. His second class airman medical certificate, dated August 10, 2004, contained the restriction, "Must wear corrective lenses and possess glasses for near and intermediate vision." He was a retired General Electric and Woodward Governor engineer. According to his logbook, he had accumulated the following flight time (in hours):

Total Time: 3,928.2

Single-Engine: 3,766.5

Multiengine: 164.0

Pilot-in-Command: 3,759.9

Instruction Received: 163.7

Instruction Given: 663.0

Night: 333.7

Actual Instruments: 490.4

Simulated Instruments: 173.5

Simulator: 8.6

Cessna 421:4.0

His last biennial flight review/instrument proficiency check, taken in a Piper PA-28C-180, was dated June 30, 2003.

AIRCRAFT INFORMATION

N421FR (s/n 421-0069), a model 421, was manufactured in 1968 by the Cessna Aircraft Corporation. It was powered by two Continental GTSIO-520-D engines (s/n 188137-7-D, left; 219426R, right), each rated at 375 horsepower, driving two McCauley 3-blade, all-metal, constant speed propellers (m/n 3AF34C92-R; s/n 800799, left; 799841, right).

According to the aircraft maintenance records, the last airframe annual/engine 100-hour inspections were accomplished on August 26, 2004. At that time, the airframe and both engines and propellers had accrued 2,666.2 total hours. The left engine and right engines which were overhauled on September 21, 1998, and October 24, 1994, respectively, and had since accrued 804.2 and 822.7 hours, respectively. Both propellers were overhauled on March 6, 2001, and each had since accrued 251.7 hours. The last pitot-static and altimeter checks and transponder/encoder systems checks were accomplished on October 27, 2004.

During the last annual inspection, both engine oil filters and induction air filters were replaced and the fuel filter screens were cleaned. The fuel injectors were removed, inspected and cleaned, and replaced with new seals and O-rings. The spark plugs were cleaned, gapped, and rotated, and the left engine air/oil separator was removed "for weld repair due to chaffing." On November 2, 2004, the left fuel transfer pump and left landing light circuit breaker were replaced because the circuit breaker, which controls the transfer pump and landing light, kept opening. These were the only recent maintenance items accomplished.

METEOROLOGICAL INFORMATION

The following APA AWOS (automatic weather observation station) observations was recorded at 1536 (see EXHIBITS): Wind, 210 degrees at 3 knots; visibility, 10 statute miles (or greater); sky conditions, few clouds at 9,000 feet, scattered clouds at 11,000 feet; ceiling, 14,000 feet broken, 22,000 feet broken; temperature, 6 degrees C.; dew point, -6 degrees C.; altimeter, 30.27 inches of mercury; remarks: altocumulus standing lenticular clouds distant southwest.

COMMUNICATIONS

According to the tower communications transcript, the second pilot called for taxi clearance at 1514:54. Takeoff clearance was give at 1521:41. At 1522:30 the second pilot reported, "centennial tower four two one foxtrot romeo we're having engine trouble just to let you know." The airplane was cleared to land one any runway. At 1522:43 the pilot said, "we'll let . . . " (unintelligible, broken transmission). This was the last transmission from the airplane.

AERODROME INFORMATION

Centennial Airport (APA) is an IFR-certified airport, situated at an elevation of 5,883 feet msl, and located at coordinates 39 degrees, 34.21' latitude, and 104 degrees, 50.96' west longitude. The Denver Automated Flight Service Station (AFSS) is located on the field. At the time of the accident, the control tower was in operation. N421FR took off on runway 17L-35R, which is 10,002 ft. x 100 ft., made of asphalt and grooved.

WRECKAGE AND IMPACT INFORMATION

The on-scene investigation was conducted on December 18, 2004. The wreckage path was aligned on a magnetic heading of 240 degrees. There was a 27-foot long ground scar, consistent with the right wing, followed by a crater containing pieces of the right propeller and engine. A crater, containing nose dome Fiberglass, was 12 feet beyond, next to the main body of wreckage.

The main body of wreckage was aligned on a magnetic heading of 310 degrees. Underneath the cockpit area were both wings. The left engine remained attached to the wing. The cockpit and cabin areas were destroyed by fire. The empennage sustained impact damage but not severely burned. Fifteen feet beyond the main wreckage was another crater, containing pieces of the left propeller and some engine parts.

Most of the cockpit instruments were destroyed by fire. Engine instruments and controls that were discernible were: left/right tachometers, 600/400 rpm; left/right fuel flow, 0/0; left/right manifold pressure, 31/49 inches; left/right throttle, full forward/retarded 1.5 inches; left/right mixture controls, retarded 1.5 inches; left/right propeller controls, retarded 2.0 inches, respectively. The landing gear bellcrank was extended. Measurement of the flap chain and sprockets were consistent with the flaps being retracted.

The upright right engine came to rest 40 feet to the left of the main wreckage and was 130 feet along the wreckage path. The right propeller was 70 feet up and 20 feet to the right of the wreckage path, near the engine. The spinner was crushed, torn, and sustained some thermal damage. Blade A (arbitrarily labeled) was relatively undamaged. Both blades B and C bore chordwise scratches on the cambered surface near the tips. In addition, blade C had leading

edge damage gouges and was twisted about 30 degrees back and bowed about aft about 25 degrees.

The left propeller was partially buried along the wreckage centerline. The spinner was crushed and torn. Blade A was relatively undamaged. Blade B was bowed back about 20 degrees and bore some chordwise scratches on the cambered surface near the tip. Blade C was bowed aft about 25 degrees, was slightly twisted, and had some leading edge damage.

On December 20, 2004, the airframe and powerplants were examined at the facilities of Beegles Aircraft Services in Greeley, Colorado. The left engine had sustained thermal damage. All cylinders had compression when the crankshaft was turned, and there was continuity from the accessory section to the propeller shaft. The top leads of both magnetos sparked. There was some thermal damage to the fuel control unit (FCU), but the screen was clear of foreign debris. The throttle was closed and the mixture control arm was at the midpoint position. The fuel pump was thermally damaged and the top of the swirl chamber was broken off. Although the coupler was intact, it would not turn freely. Numbers 1 and 5 top spark plugs were oil-soaked, and there was corrosion on the electrode of the number 4 top spark plug. The left turbocharger turned freely. There was leading edge damage to six of the turbine blades, but there was no scoring on the housing. The wastegate was jammed in the closed position.

The right engine had sustained impact but no thermal damage. The oil pump drive shaft turned with difficulty. The fuel pump coupler was intact and turned freely. All cylinders had compression when the crankshaft was turned, and there was continuity from the accessory section to the propeller shaft. The top leads of both magnetos sparked. The top leads of both magnetos sparked. The fuel manifold valve diaphragm was intact, the screen was clear of debris, and the chamber contained fuel. Although the fuel pump was broken into four pieces and scattered along the wreckage path, the coupler was intact, and the drive turned with difficulty. The upper deck pressure line had a ½-mm hole in the backside, just aft of the right magneto. It did not appear to be due to chaffing, but was more consistent with two chisel marks. The top spark plugs were clean and showed normal wear but needed changing. The electrodes were dark in color. The right turbocharger could not be turned. There was scoring on the compressor case, and two blades were bent opposite the direction of rotation. There was no scoring on the turbine case. The wastegate was almost fully closed.

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies were performed on all three occupants by the Douglas County Coroner's Office. In addition, FAA's Civil Aeromedical Institute (CAMI) conducted toxicological screenings (see EXHIBITS). According to the CAMI reports, no carbon monoxide, cyanide, ethanol, or drugs were detected in the first and second pilots, but the third pilot tested positive for an unspecified amount of quinine and Ibuprofen.

TESTS AND RESEARCH

Engines and Turbochargers

The engines and turbochargers were shipped to Teledyne Continental Motors (TCM) in Mobile, Alabama, where on, March 29-31, they were disassembled and examined under the auspices of NTSB. Disassembly and examination of the right engine revealed no anomalies. Manifold valve

and fuel injector line flow tests produced pressures within manufacturer-recommended parameters.

Disassembly and examination of the left engine revealed the mixture shaft and throttle valve in the throttle and fuel control assembly were jammed in the idle cutoff and idle rpm positions, respectively. Manifold valve and fuel injector line flow tests produced higher-than-normal pressures, indicative of a flow restriction. Disassembly of the manifold valve revealed the needle valve in the plunger assembly was stuck in the full open position, collapsing the needle valve spring. TCM was of the opinion that this was not the result of the accident. A scribe was used to free the needle valve, and the manifold valve and fuel injector lines were again flow tested. The results was a lower pressure. Plunger disassembly revealed the threads had been tapped inside the retainer and metal shavings were found between the retainer and spring. The TCM retainer has no threads. Other anomalies noted were the oil sump drain plug was not safetied, and the oil pressure relief valve was set at the maximum limit. The accessory case squirt plug was missing. According to TCM, this could cause an "internal leak" within the engine, and would explain why the oil pressure relief valve was set at the maximum limit. Additionally, the silk gasket between the crankcase halves was double strung and had been routed outside, not inside, the bolt holes, contrary the TCM overhaul procedures. This produced fretting on the upper front portion of the crankcase halves. A magneto bushing retainer, bearing gear teeth chewing signatures, was found in the left engine oil pan. All bushing retainers were found in place. It was TCM's opinion that this bushing had been "lost" during a previous maintenance event, and had fallen through the accessory case.

Both left and right magnetos from both engines were intact and turned freely, producing a 7 mm spark when bench tested. Examination of the left and right turbochargers was unremarkable. There was evidence that both turbochargers were rotating at impact.

Propellers

Both propellers were shipped to McCauley Propellers in Wichita, Kansas, where, on February 28 and March 1, they were disassembled and examined under the auspices of NTSB. According to McCauley's report, there was no evidence of preimpact failure/malfunction, and all damage observed was due to impact. Both propellers were rotating at low power and at, or near, low pitch blade angles (high rpm).

Fuel Pumps and Fuel Selector Valve

On March 2, the fuel transfer pumps, auxiliary boost pumps, and fuel selector valve were taken to B&S Aircraft Parts and Accessories, Inc., in Wichita, Kansas, for flow checks. The pumps produced rated pressures, and both fuel selector valves were determined to be positioned at the main tank positions.

The faulty fuel transfer pump that had been replaced was retrieved from the repair facility and sent to the manufacturer for testing. According to Facet-Purolator, one of three legs on the clip retainer had broken, preventing the inlet valve from centering and sealing the cup. Upon replacement of the inlet valve assembly, the pump operated normally and produced new product delivery specifications: 32 gph free flow, 23 gph at 2 psi, and a zero delivery pressure of 6.65 psi.

Airport Security Surveillance Video

A video of the accident was recovered from airport security cameras. Although the airplane and

its flight path were not discernible, the video captured a fireball at 1509:21. The fire department arrived on scene at 1517:51 and the paramedics arrived at 1519:40. Water was applied on the burning wreckage at 1519:45. (Note: The foregoing times do not coincide with the times recorded by air traffic control. ATC times are considered official and are used throughout this report).

Sound Spectrum Study

A tape recording of voice communications between N421FR and Centennial Tower was sent to NTSB headquarters for audio spectrum analysis. The propellers have a certificated maximum rotation speed of 2,275 rpm. According to the specialist's factual report, "No sounds could be identified as coming from either the engines or rotating propellers" when the aircraft was on the ground. However, when the pilot reported they were having engine trouble, the primary blade passing frequency and the 2nd and 3rd harmonic frequencies of the rotating propellers were identified. During this transmission only one propeller sound signature could be identified, and it was rotating at 2,234 rpm. The report said, "It is not known if two propellers rotating at the same speed caused the observed frequency or if it was only one propeller creating the signature. No background aircraft warning tones or alarms were heard."

Global Positioning System

A hand-held Garmin GPS was recovered from the wreckage. Stored data was downloaded into a computer, then printed on a spreadsheet and plotted on a satellite photograph (see EXHIBITS). The data showed the taxi route from the ramp to the runup area at the end of the runway. At a GPS time of 1521:46 (point 17), the airplane began to accelerate on a magnetic heading of 178 degrees and at an elevation of 5,819 msl. At 1521:35 (point 21), the airplane was at 118 mph. It reached a maximum speed of 132 mph at 1522:18 (point 22). Eight seconds later, at 1522:26 (point 23), the airplane reached an altitude of 5,947 feet msl, but the speed dropped to 127 mph and the heading drifted right to 184 degrees. At 1522:57 (point 27), speed had dropped to 104 mph and heading had turned to 196 degrees true.

The Cessna Aircraft Corporation commissioned a private consultant to analyze the same data. According to his printout, the airplane accelerated to 115 knots in 29 seconds and used 1,552 feet of runway. Thereafter, speed started to decay as the airplane drifted right.

Performance Study

A performance study was performed. N421FR's licensed empty weight was 4,785 pounds. Medical certificate weights of the three pilots were 182, 115, and 197 pounds, respectively. If both engines were full of oil (26 quarts), the oil would weigh 49 pounds. Assuming little, if any, baggage and approximately 100 gallons of fuel on board, the airplane would weigh approximately 5,731 pounds at takeoff. According to the Cessna 421 Owner's Manual, the published rotate speed is 115 mph (120 mph is the "blue line" or best single engine rate of climb speed). The temperature at Centennial Airport was 6 degrees C. (42.8 degrees F.) The airport elevation was 5,883 feet msl and the altimeter was 30.27 inches of mercury, yielding a pressure altitude of 5,533 feet msl (30.27 - 29.92 = .350, or 5883 - 350 = 5,533). The 3-knot headwind was negligible. According to the Normal Takeoff Distance chart, a distance of 2,000 feet would be required to clear a 50-foot obstacle. According to the Single Engine Takeoff Performance chart, a distance of 2,600 feet would be required to clear a 50-foot obstacle (this assumes an engine failure at takeoff, and feathering the propeller and retracting the landing gear during climb). According to the Accelerate Stop Distance chart, a distance of 3,000 feet would be

required to accelerate to takeoff speed and bring the airplane to a stop (this assumes an engine failure at takeoff speed, followed by heavy braking). The distance between GPS points 17 and 21 was 2,698 feet.

ADDITIONAL INFORMATION

The pilot's father purchased the airplane for his daughter and registered it in her name. Reportedly, she planned to log time in the pressurized airplane, and then sell it. The airplane had previously been registered to a company in Prescott, Arizona.

On December 14, 2004, three days before the accident, the airplane was ferried from Greeley to Firewall Forward, a repair facility at the Fort Collins-Loveland Airport. The ferry pilot said the airplane was typical of an older Cessna 421. He said the engines could be difficult to start but if you knew the airplane, it was no problem. During his preflight, he noticed the fuel sumps drain valves were new and the fuel samples were clean. He had a little difficulty locating the right fuel selector detent because there was some looseness. He said when you pressed the prime button to start the engines, it automatically placed the boost pumps on HIGH. When you released the button, the boost pumps would revert to LOW BOOST. He said the right engine idled high approximately 1,000 rpm. You took off with the fuel selectors on the main tanks, and you never took off with the boost pumps on high. On takeoff, there was about 6 pounds per hour fuel flow difference between the engines.

According to the repair facility, the airplane was on an extended work order that was opened on November 2, 2004. The left fuel transfer pump was inoperative and the circuit breaker, which controls both the transfer pump and landing light, kept opening. Both were replaced. The mechanics that worked on the airplane told an FAA airworthiness inspector that it was a simple maintenance procedure, they followed the Cessna maintenance manual, and it was impossible for anything to be hooked up backwards. At th same time, the left main tire and the pilot's seat stop were replaced, and the tail deice boot pressure line was repaired. Both engine oil and filters were changed and replaced.

Approximately 0800 on the morning of the accident, a lineman towed the airplane from the repair facility to a refueling ramp, but the airplane was not serviced. The three pilots arrived approximately 1030, preflighted the airplane, and boarded. The lineman said a female occupied the left seat. He noticed an access panel hanging from beneath the empennage and brought it to the pilot's attention. She asked that he secure the panel. He agreed, but asked that one of the pilots get out and check its security. They did not comply with his request.

A witness, who was working on his airplane, said the pilot tried starting the left engine for about 10 minutes without success. The right engine was started, and then the pilot tried for another 10 minutes to start the left engine but to no avail. The pilot then shut down the right engine and waited. The witness said it seemed like the engine had no compression. The pilot was able to start both engines eventually, and the airplane taxied away for departure. The airplane was seen doing touch and go landings in the traffic pattern and then departed the area.

In addition to the Federal Aviation Administration, parties to the investigation included the Cessna Aircraft Corporation and Teledyne Continental Motors.

The wreckage was released to the insurance company on May 2, 2005.

Flight Instructor Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	60, Female
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	05/06/2004
Occupational Pilot:		**Last Flight Review or Equivalent:**	05/30/2003
Flight Time:	12000 hours (Total, all aircraft), 11700 hours (Pilot In Command, all aircraft)		

Pilot Information

Certificate:	Commercial	**Age:**	20, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	02/01/2003
Occupational Pilot:		**Last Flight Review or Equivalent:**	07/01/2004
Flight Time:	415 hours (Total, all aircraft), 32 hours (Total, this make and model), 300 hours (Pilot In Command, all aircraft), 75 hours (Last 90 days, all aircraft), 16 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N421FR
Model/Series:	421	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	421-0069
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	08/26/2004, Annual	**Certified Max Gross Wt.:**	6800 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	2666 Hours as of last inspection	**Engine Manufacturer:**	Continental
ELT:	Installed, not activated	**Engine Model/Series:**	GTSIO-520-D
Registered Owner:	Nadia E. Barghelame	**Rated Power:**	375 hp
Operator:	Nadia E. Barghelame	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	APA, 5883 ft msl	**Distance from Accident Site:**	
Observation Time:	1536 MST	**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 9000 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	Broken / 14000 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.27 inches Hg	**Temperature/Dew Point:**	6°C / -6°C
Precipitation and Obscuration:			
Departure Point:	Englewood, CO (APA)	**Type of Flight Plan Filed:**	None
Destination:	Fort Collins, CO (FNL)	**Type of Clearance:**	VFR
Departure Time:	1522 MDT	**Type of Airspace:**	Class D

Airport Information

Airport:	Centennial (APA)	**Runway Surface Type:**	Asphalt
Airport Elevation:	5883 ft	**Runway Surface Condition:**	Dry
Runway Used:	17L	**IFR Approach:**	Unknown
Runway Length/Width:	10002 ft / 100 ft	**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-Ground
Total Injuries:	3 Fatal	**Latitude, Longitude:**	39.556111, -104.854167

Administrative Information

Investigator In Charge (IIC):	Arnold W Scott	**Report Date:**	10/27/2005
Additional Participating Persons:	James S Finn; FAA Flight Standards District Office; Denver, CO Robert S August; Cessna Aircraft Corporation; Wichita, KS Robert S Boyle; Teledyne Continental Motors; Mobile, AL		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		