Aviation Investigation Final Report

Location:	Englewood, Colorado	**Accident Number:**	CEN15FA090
Date & Time:	December 30, 2014, 04:29 Local	**Registration:**	N404MG
Aircraft:	Cessna 404	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The pilot was conducting an early morning repositioning flight of the cargo airplane. Shortly after takeoff, the pilot reported to air traffic control that he had "lost an engine" and would return to the airport. Several witnesses reported that the engines were running rough and one witness reported that he did not hear any engine sounds just before the impact. The airplane impacted trees, a wooden enclosure, a chain-linked fence, and shrubs in a residential area and was damaged by the impact and postimpact fire.

The airplane had been parked outside for 5 days before the accident flight and had been plugged in to engine heaters the night before the flight. It was dark and snowing lightly at the time of the accident. The operator reported that no deicing services were provided before the flight and that the pilot mechanically removed all of the snow and ice accumulation.

The wreckage and witness statements were consistent with the airplane being in a right-wing-low descent but the airplane did not appear to be out of control. Neither of the propellers were at or near the feathered position. The emergency procedures published by the manufacturer for a loss of engine power stated that pilots should first secure the engine and feather the propeller following a loss of engine power and then turn the fuel selector for that engine to "off." The procedures also cautioned that continued flight might not be possible if the propeller was not feathered. The right fuel selector valve and panel were found in the off position. Investigators were not able to determine why an experienced pilot did not follow the emergency procedures and immediately secure the engine following the loss of engine power.

It is not known how much snow and ice had accumulated on the airplane leading up to the accident flight or if the pilot was successful in removing all of the snow and ice with only mechanical means. The on-scene examination of the wreckage and the teardown of both engines did not reveal any preimpact mechanical malfunctions or failures. While possible, it could not be determined if water or ice ingestion lead to the loss of engine power at takeoff.

Probable Cause and Findings

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

The loss of power to the right engine for reasons that could not be determined during postaccident examination and teardown and the pilot's failure to properly configure the airplane for single-engine flight.

Findings

Aircraft	(general) - Failure
Not determined	(general) - Unknown/Not determined
Personnel issues	Use of policy/procedure - Pilot
Personnel issues	Lack of action - Pilot

Factual Information

History of Flight

Initial climb	Loss of engine power (total) (Defining event)
Emergency descent	Controlled flight into terr/obj (CFIT)
Post-impact	Fire/smoke (post-impact)

On December 30, 2014, about 0429 mountain standard time a Cessna 404, N404MG, was substantially damaged when it impacted a residential area north of Centennial Airport (KAPA), Englewood, Colorado. A post impact fire ensued. The airline transport pilot was fatally injured. The airplane was operated by Key Lime Air under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight. Night visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules flight plan. The flight was originating at the time of the accident and was en route to Denver International Airport (KDEN), Denver, Colorado

According to representatives from Key Lime Air, the pilot was positioning the airplane from KAPA to KDEN for a potential 14 Code of Federal Regulations Part 135 freight flight. The airplane was parked outside and uphill from their facility at KAPA since December 25, 2014. The night before the accident the airplane was towed to a parking space outside of their hangar so that the engine heaters could be plugged in.

On the morning of the accident, the pilot was observed removing the blankets from the engine and the snow and ice on the airframe. The pilot used mechanical means to deice the airplane and was not assisted with a chemical deice or deicing services. Key Lime Air estimated that the airplane had 800 pounds of fuel on board. There were no services requested or received by the pilot on the morning of the accident.

A Key Lime Air employee estimated that the pilot started his number 1 engine about 0408. The engine started immediately and ran for 5 to 10 minutes before the pilot started the number two engine. This engine also started immediately and ran for several minutes. The airplane taxied from its parking spot several minutes later.

According to air traffic control (ATC) recordings the pilot requested clearance from ATC and was cleared to the Denver Airport at an altitude of 8,000 feet. At 0419:11 the pilot announced his taxi and was cleared to runway 35 right via the alpha taxiway. At 0425 the pilot was cleared for takeoff.

At 0427:22 the pilot reported to the tower controller that he had "lost an engine" and needed to return to the airport. The controller responded that any runway was available and provided a wind of 030 degrees at 3 knots. At 0427:38 the controller asked the pilot if he would be able to make "that left turn." At 0427:42 the pilot responded by saying "standby".

Radar data indicated the accident airplane departed from runway 17L/35R to the north – the field elevation at KAPA was 5,885 feet mean sea level (msl). The radar track was consistent with a slight

right turn to the northeast. Radar data indicated an altitude of 6,125 feet msl when the turn to the right was initiated. The highest altitude indicated was 6,225 feet msl. The last recorded radar return indicated an altitude of 5,975 feet msl, and was coincident with ATC's loss of radar and voice communications.

One witness observed the airplane in a right turn. Several other witnesses heard the airplane and described a rough-running engine. One witness stated that he did not hear either engine running just prior to the accident.

The airplane impacted several trees, a wooden trash enclosure, a fence, and hedges in a residential area. The trees, hedges, and grass were all damaged during the impact and the post impact fire. The driveway was damaged during the impact and the siding and roof of one house was damaged by flying debris and the post impact fire.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	55
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
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 2 With waivers/limitations	**Last FAA Medical Exam:**	May 23, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 22, 2014
Flight Time:	2566 hours (Total, all aircraft), 624 hours (Total, this make and model), 1917 hours (Pilot In Command, all aircraft), 89 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft)		

The pilot, age 55, held an airline transport pilot certificate with an airplane multiengine land rating and a commercial pilot certificate with an airplane single engine land rating. He held type ratings for the Dornier 328 and the Fairchild SA227. He also held a flight instructor certificate with airplane single, multiengine, and instrument airplane ratings. He was issued a special issuance second class airman medical certificate on May 23, 2014. The certificate contained the limitation "Not valid for any class after 05/31/2015."

According to Key Lime Air records, the pilot had flown 89 hours in the last 90 days; 4 hours of which were logged in the make and model of the accident airplane. The pilot had flown 24 hours in the past 30 days; 3 hours of which were at night, 5 hours in actual instrument conditions, and 24 hours were logged in a twin-engine Piper. Key Lime Air estimated the pilot's total flight time as 2,566 hours; 676 hours of which were at night.

Neither Key Lime Air nor the family had the pilot's flight logbook. On an insurance form dated June 22, 2014, the pilot reported 4,280 hours total time. About 3,760 hours were logged in multiengine airplanes and 800 hours at night.

A company flight log, dated from July 1, 2014, through December 30, 2014, indicated the last time the pilot flew the accident airplane was September 2, 2014, on a flight between Alamosa and KAPA. The flight duration was one hour at night. Key Lime records showed that the pilot was first assigned to the Cessna 404 on August 16, 2004, as pilot in command. He was assigned as a flight instructor for the Cessna 404 on October 18, 2004, and a check airman on March 7, 2005.

The pilot's airman competency/proficiency check for CFR 135.293 (Initial and recurrent pilot testing), CFR 135.299 (Pilot in command: Line checks: Routes and Airports), and CFR 135.297 (Instrument Proficiency) was completed with a satisfactory rating in all tested areas on December 22, 2014. A company check-airman conducted the flight check in a Piper PA31-350 in daylight conditions. The flight lasted for 1.7 hours. During this check, he received simulation in instrument meteorological conditions and emergencies including engine failures. The check-airman reported no concerns with the pilot or his performance during the flight check.

The pilot was the Director of Safety at Key Lime Air. According to his family, he had been flying and working since Thanksgiving. Depending on the day and the need for an additional aircraft and activities in the office he would fly in the morning and then return to the office to work in the afternoon. He usually returned from flying around 1030. Workload permitting, he would nap until 1300 and then return to the office and work until 1600 or 1700. On the Monday prior to the accident, he flew in the morning and then went into the office. He had dinner around 1800 and fell asleep in his chair in the living room. He went to bed around 1930 and slept well through the night. On the morning of the accident he likely got up between 0300 and 0305 and left the house about 0330.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N404MG
Model/Series:	404	**Aircraft Category:**	Airplane
Year of Manufacture:	1980	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	404-0813
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	December 15, 2014 Annual	**Certified Max Gross Wt.:**	8400 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	16681.7 Hrs	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91A installed	**Engine Model/Series:**	GTSIO-520-M
Registered Owner:	EDB AIR INC	**Rated Power:**	375 Horsepower
Operator:	KEY LIME AIR CORPORATION	**Operating Certificate(s) Held:**	Flag carrier (121), Supplemental, On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	KY7A

The accident airplane, a Cessna 404 (serial number 404-0813), was manufactured in 1980. It was

registered with the Federal Aviation Administration (FAA) on a standard airworthiness certificate for normal operations. Two Teledyne Continental Motors GTSIO-520-M engines rated at 375 horsepower at 3,350 rpm each powered the airplane. The engines were equipped with McCauley 3-blade, controllable pitch propellers.

The airplane was registered to EDB Air, Inc., operated by Key Lime Air Corporation, and was maintained under an annual inspection program. An annual inspection had been completed on December 15, 2014, at an airframe total time of 16,681.7 hours.

A review of the maintenance records indicated the number 1, or left engine, was overhauled by RAM Aircraft and was installed on August 14, 2012. The number 2, or right engine, was overhauled by RAM Aircraft and was installed on March 20, 2014.

In the Aircraft Flight/Maintenance Log for N404MG, two discrepancies were reported by the accident pilot on the right engine. The first discrepancy (not dated) stated that the right engine "Floods when aux pump turned on. Appears to be in high position. Fuel flow touchy @ 1500." The corrective action was completed on December 18, 2014. The log contained the following entry "adjusted … fuel hi and low pressure on fuel pump, adjusted fuel mixture and adjusted turbo controller linkage, ground run ops check good." The second discrepancy (not dated, same page) stated that the right engine "prop feathers way before detent." The corrective action was completed on December 18, 2014. The log contained the following entry: "adjust … governor control cable, ground run ops check good."

The airplane was flown on December 19, 2014, from KAPA, to KDEN, to KCOD, and then back to KAPA. The pilot for that day did not report any issues or anomalies with the airplane or specifically the right engine. The last pilot to fly the airplane, 4 or 5 days prior to the accident, reported that there were no anomalies or concerns with the airplane. He parked the airplane on the hill, to the south of the Key Lime Air hangar. The airplane remained in that location until the night prior to the accident when it was towed to the Key Lime Air Hangar and parked just outside of the hangar until the morning of the accident.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KAPA,5828 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	04:06 Local	**Direction from Accident Site:**	215°
Lowest Cloud Condition:	2900 ft AGL	**Visibility**	7 miles
Lowest Ceiling:	Broken / 2900 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.37 inches Hg	**Temperature/Dew Point:**	-19°C / -22°C
Precipitation and Obscuration:	Light - None - Snow		
Departure Point:	Englewood, CO (KAPA)	**Type of Flight Plan Filed:**	IFR
Destination:	Denver, CO (KDEN)	**Type of Clearance:**	IFR
Departure Time:	04:25 Local	**Type of Airspace:**	Class D

The closest official weather observation station was Centennial Airport (KAPA), Englewood, Colorado, located 1.8 nautical miles (nm) southwest of the accident site. The elevation of the weather observation station was 5,885 feet msl. The routine aviation weather report (METAR) for KAPA issued at 0353 reported wind 050 degrees at 3 knots, visibility 6 miles in light snow and mist, ceiling of broken clouds at 3,100 feet, temperature minus 19 degrees Celsius (C), dew point temperature minus 22 degrees C, altimeter 30.36 inches.

The special METAR for KAPA issued at 0406 reported wind calm, visibility 7 miles in light snow, ceiling of broken clouds at 2,900 feet, temperature minus 19 degrees C, dew point temperature minus 22 degrees C, altimeter 30.37 inches.

The special METAR for KAPA issued at 0451 reported wind 040 at 4 knots, visibility 9 miles, few clouds at 1,300 feet, scattered clouds at 12,000 feet, temperature minus 20 degrees C, dew point temperature minus 22 degrees C, altimeter 30.37 inches. The snow had ended at 45 minutes after the hour.

Snow totals for the 60 hours prior to the accident ranged between 1.9 and 4.2 inches of snow – the liquid equivalent of between 0.10 and 0.30 inches.

Airman's Meteorological Information (AIRMETs) for mountain obscuration, instrument flight rules conditions, moderate icing conditions, and moderate turbulence were all valid at the time of the accident for the accident location.

According to the United States Naval Observatory, Astronomical Applications Department Sun and Moon Data, sunrise was at 0720 on the morning of the accident. The moon rose at 1258.

Airport Information

Airport:	CENTENNIAL APA	**Runway Surface Type:**	Asphalt
Airport Elevation:	5885 ft msl	**Runway Surface Condition:**	Snow
Runway Used:	35R	**IFR Approach:**	None
Runway Length/Width:	10001 ft / 100 ft	**VFR Approach/Landing:**	None

Centennial Airport (KAPA), is a public, tower- controlled airport (Class D airspace), at a surveyed elevation of 5,885 feet. Class B, E, and G airspace surround the area immediately outside of the Class D airspace at KAPA. The airport had 3 open runways, runway 17L/35R (10,001 feet by 100 feet, asphalt), runway 17R/35L (7,001 feet by 75 feet, asphalt), and runway 10/28 (4,800 feet by 75 feet, asphalt).

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	39.595275,-104.82611(est)

The accident site was located in a residential area. The airplane impacted several trees, a wooden enclosure, a fence, and shrubs, and came to rest oriented on a northeast heading. The accident site was at an elevation of 5,680 feet msl and the airplane impacted on a magnetic heading of 160 degrees.

The initial impact point was located at the tops of two pine trees, approximately 30 feet high, to the north of the main wreckage. Broken tree branches were located directly beneath the trees. The outboard tip of the right wing, paint chips, torn metal, and a light panel with green lens fragments were located between the two trees in the snow.

Debris continued for 23 feet from the trees to the start of the ground impact scar. Dirt and snow was pushed in the direction of the main wreckage to the south. A propeller blade was located to the west of the first ground scar. The blade had penetrated a wooden fence. The chain linked fence surrounding the back yard, to the south of the initial impact point, was impact damaged.

The ground scar continued 12 feet to the propeller hub. The face of the propeller hub assembly, including two propeller blades, was embedded in the ground.

Impact damage and witness marks continued along the ground, chain linked fence and through the bushes (located along the east edge of the fence) 56 feet to the main wreckage. Torn metal, Plexiglas, fiberglass, radios, instruments, and propeller blades were all located throughout the debris field. The right engine cowling and one propeller blade were located in the back yard, to the west of the debris

field. The rear face of the house exhibited damage consistent with impact from the propeller blade.

The debris along this path and the bushes exhibited exposure to heat and fire.

The main wreckage came to rest oriented on an approximate heading of east. The wreckage included the left wing, the right wing, the fuselage, and the empennage. The forward fuselage, including the cabin and instrument panel, and the cargo area exhibited impact damage and was charred, melted, and partially consumed by fire.

The left wing included the left engine, left main landing gear assembly, the left aileron, and the left flap. The left engine had partially separated and exhibited impact and fire damage. The left main landing gear was located within the wheel well. The leading edge of the wing exhibited impact damage and the entire upper surface of the wing exhibited exposure to heat and fire. The left aileron cable was continuous from the aileron inboard to the forward cabin.

The right wing included the right main landing gear assembly and the right flap. The right main landing gear was located within the wheel well. The wing was bent and torn and exhibited exposure to heat and fire. The right engine separated from the right wing and was located to the south of the main wreckage, adjacent a tree.

The empennage remained partially attached to the fuselage and included the horizontal and vertical stabilizers, elevator, and rudder. The right horizontal stabilizer exhibited leading edge impact damage. The left horizontal stabilizer was buckled. The vertical stabilizer and rudder were unremarkable. The flight control cables were continuous from the empennage forward to the forward cabin.

No preaccident mechanical malfunctions or failures were found that would have precluded normal operation.

Medical and Pathological Information

The autopsy was performed by the Arapahoe County – Office of the Coroner on December 30, 2014, as authorized by the Arapahoe County Coroner's office. The autopsy concluded that the manner of death was accident and the report listed the specific injuries.

The FAA's Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, performed toxicological tests on specimens that were collected during the autopsy (CAMI Reference #201500004001). Results were negative for carbon monoxide and ethanol. Tests for cyanide were not performed. Tests of the blood and liver tissue were positive for loratadine. The FAA Forensic Toxicology Website indicates that loratadine is a non-sedating tricyclic antihistamine.

Tests and Research

The flight control cables for ailerons, the elevator, and rudder were examined. Breaks or points of separation through these cables were consistent with impact damage or wreckage recovery efforts. The impact damage on the right stabilizer was consistent with an impact with the chain link fence post. A film of yellow colored engine oil was located along the entire right side of the empennage including the horizontal and vertical stabilizer.

Shop air was applied to the deice air lines. The left horizontal stabilizer boot inflated. The right stabilizer boot was impact damaged and could not be tested. The vertical stabilizer boot inflated. The boots along both wings were impact damaged and could not be tested.

The rudder trim was measured at 1.3 inches. When compared to the Cessna Charts, this measurement is considered unreliable/beyond limits. The elevator trim was measured at 1.2 inches on the right and 1.3 inches on the left. The aileron trim was measured at 0.8 inches. When compared to the Cessna Charts, this measurement is considered unreliable/beyond limits.

Engine control quadrant - were not restricted or bound in movement. The following measurements were taken:
Throttles - L 1 3/4 " up from closed R 2 9/16" up from closed
Propellers - L 2 7/16" up from detent R 1 13/16" up from detent
Mixture - L 2 3/4 R 1 3/4 rich

The fuel selector panel exhibited the following positions:
Right engine – "off"
Left engine – "left main"

Fuel selector valves within the wing assemblies exhibited the following positions:
Right engine - "off"
Left engine - "left main"

Field Engine Examination

All 3 blades from the right propeller separated from the propeller hub. The hub was fragmented.
The propeller blades were labeled R1, R2, and R3 for identification purposes. Blade R1 exhibited leading edge scoring along the first 2.5" of the blade, and face scoring along the entire span of the blade. Otherwise the blade was visually unremarkable. Blade R2 exhibited scoring along the outboard trailing edge of the blade. Otherwise the blade was visually unremarkable. Blade R3 exhibited scoring on the face of the blade leading edge nicks and was bowed aft and twisted.

One blade separated from the left propeller assembly. The propeller hub was impact damaged.
The propeller blades were labeled L1, L2, and L3 for identification purposes. Blade L1 exhibited leading edge gouges and nicks. Otherwise the blade was visually unremarkable. BladeL2 was bowed forward. Otherwise the blade was visually unremarkable. Blade L3 separated from the propeller hub and exhibited leading edge gouges and nicks. Otherwise the blade was visually unremarkable.

The left engine exhibited exposure to heat and fire and impact damage. The top bank of spark plugs and the valve covers were removed. The spark plugs exhibited worn out normal signatures when compared

to Champion spark plug chart. The p-leads were damaged by fire and could not be functionally tested. A lighted bore scope was used to examine the engine through the upper spark plug orifice at each cylinder. The examination revealed no anomalies. The engine was rotated through at the accessory housing. Air movement was noted on all cylinders at the upper spark plug orifice. Valve train continuity was observed on all cylinders.

The right engine forward gear case was impact damaged. The intake and exhaust valve arms on the No. 5 cylinder separated. The oil sump was impact damaged. The top bank of spark plugs and valve covers were removed. The spark plugs exhibited worn out normal signatures when compared to Champion spark plug chart. A lighted bore scope was used to examine the engine through the upper spark plug orifice at each cylinder. The examination revealed no anomalies.
The engine could not be rotated through by hand.

Lab Engine Examination

Left engine
The vacuum pump was disassembled and no anomalies were noted. The fuel pump spline was intact and the fuel pump rotated without hesitation. Disassembly of the pump revealed no preimpact anomalies.

A slave harness was placed on the right magneto and it was operated on a test bench. No spark was noted on any of the leads. Internal heat damage to the capacitor terminals and the points prevented normal operation. Examination of the left magneto revealed similar internal heat damage to the capacitor terminals and the points.

Examination of the cylinders, pistons, crankshaft, crankcase, sparkplugs, valves, and other components revealed signatures of exposure to heat and fire and impact damage. No mechanical anomalies were noted that would have precluded normal operation.

Right Engine
The left and right magnetos were equipped with a slave harness and ran on a test bench. A blue spark was observed on each lead at varying rpm. The vacuum pump was disassembled and no anomalies were noted.

The fuel pump spline was intact and the fuel pump rotated. The fuel pump was impact damaged and epoxy was applied at a fitting for bench testing purposes. An additional fitting in the vapor tower was impact damaged and replaced for testing purposes. The fuel pump was installed on a test stand and ran at rpms between 700 and 3,200 for five minutes. The pressure was high and the unit test results were out of limits.

Scoring was noted on the rear propeller reduction gear bolt and the aft propeller gear reduction journal. This scoring was consistent with rotation at the time of impact. The intake and exhaust valve rockers were impact damage and separated.

Examination of the cylinders, pistons, crankshaft, crankcase, sparkplugs, valves, crank case halves, and other components revealed signatures of impact damage. No mechanical anomalies were noted that would have precluded normal operation.

Organizational and Management Information

The FAA issued Key Lime Air a Part 135 operating certificate in 1997 to conduct on demand cargo and passenger flights. They also hold a Part 121 certificate for scheduled operations between KAPA, Rocky Mountain Metropolitan Airport (KBJC) Broomfield, Colorado, and Grand Junction (KGJT), Colorado. At the time of the accident, Key Lime Air conducted cargo operations in six states. The corporate headquarters, including training, the Director of Operations, Chief Pilot, and Director of Safety were located in Englewood, Colorado. The FAA Flight Standards District Office in Denver, Colorado managed the operating certificate.

The company operated six different make and models of airplane and employed about 35 pilots. Prior to employment, each pilot was required to meet the minimum flight time and experience requirements per the Federal Aviation Regulations for Part 135 operations.

Additional Information

De-Icing Procedures

According to Key Lime Air, the method for deicing airplanes is dependent on the extent and thickness of the ice and is left to pilot's discretion for requesting deicing services. Generally pilots will physically remove frost, ice, snow, and surface contaminations. If the contamination is thicker or a jet is being operated the pilot can use chemicals for deicing.

The Cessna Pilot Safety And Warning Supplement – Airframe Icing – discusses that the "inflight ice protection equipment is not designed to remove ice, snow or frost accumulation on a parked airplane… Other means … must be employed to ensure that all wing, tail, control, propeller, windshield, static port surfaces and fuel vents are free of ice, snow, and frost accumulations, and that there are no internal accumulations of ice or debris in the control surfaces, engine intakes, brakes, pitot-static system ports, and fuel vents prior to takeoff."

Engine Inoperative Procedures

The Cessna Model 404 single-engine airspeeds for safe operation were as follows:

VX – 98 knots (takeoff and approach flaps) 105 knots (flaps up)
VY - 102 knots (takeoff and approach flaps) 109 knots (flaps up)

The Engine Inoperative Procedures for an engine failure after takeoff were as follows:

Mixture – Full Rich
Propellers – Full Forward

Throttles – Full Forward
Landing gear – up
Inoperative Engine – Throttle closed, mixture idle cutoff, propeller feather.
The pilot is then guided to establish a 5 degree bank into the operative engine, establish climb airspeed, raise the flaps, and then secure the inoperative engine.

The amplified procedures stated in part that "…climb or continued level flight at moderate altitude is improbable with the landing gear extended and the propeller windmilling…" The procedures warn that "The propeller on the inoperative engine must be feathered, landing gear retracted, and wing flaps up or continued flight may be impossible."

The Rate-of-Climb chart estimated that the airplane would have been able to sustain a 540 foot-per-minute climb with the airplane properly configured for single-engine operations. The chart subtracts 350 feet per minute for a windmilling propeller, 300 feet-per-minute with the landing gear down, and 100 feet-per-minute with the flaps in a takeoff or approach configuration.

Administrative Information

Investigator In Charge (IIC):	Rodi, Jennifer
Additional Participating Persons:	Sean Shambo; FAA Denver FSDO; Denver, CO John Berens; FAA Denver FSDO; Denver, CO Peter J Basile; Textron Aviation; Wichita, KS Mike Council; Continental Motors, Inc.; Mobile, AL Michael Ruhsenberger; Key Lime Air; Englewood, CO Rick Roper; RAM Aircraft ; Waco, TX
Original Publish Date:	February 8, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=90549