# National Transportation Safety Board
# Aviation Accident Final Report

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| **Location:** | KIOWA, CO | **Accident Number:** | DEN00FA102 |
| **Date & Time:** | 06/05/2000, 1031 MDT | **Registration:** | N67BJ |
| **Aircraft:** | Piper PA-31-350 | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | | **Injuries:** | 2 Fatal |
| **Flight Conducted Under:** | Part 91: General Aviation - Instructional | | |

## Analysis

The purpose of the flight was for the instructor pilot to administer second-in-command (SIC) flight training to the commercial pilot in the twin-engine aircraft. According to the training manual, SIC training encompassed 4 hours of normal and emergency flight maneuvers to include stalls in the landing and takeoff configuration and while turning at a 15-30 degree bank. A witness heard the airplane's engines and observed the airplane from her driveway. The witness stated that as "the [engine] noise was getting louder and louder, I spotted it spiraling downward." The witness thought that the airplane was performing aerobatics; however, the airplane was getting too close to the ground. The witness heard a loud thud, and approximately 3 seconds later, she heard a loud boom and saw black smoke billow up. Another witness stated that she observed the airplane "going nose first straight down and spinning...counterclockwise." She thought the airplane was performing aerobatic maneuvers; however, the airplane did not stop descending. The airplane disappeared behind trees and the witness heard a loud explosion and saw smoke. She added that she did not observe what the airplane was doing prior to seeing it in a "downward spiral." Radar data depicted the airplane at 8,400 feet msl for the last 2 minutes and 26 seconds of the flight. The recorded aircraft ground speed during that time period fluctuated between 75 and 59 knots. The final radar returns depicted the airplane as making a 180 degree turn before radar contact was lost. No mayday calls were received from the airplane. The airplane impacted the ground in a near wings level attitude and was consumed by a post-crash fire. No anomalies were noted with the airplane or its engines during a post-accident examination. It is unknown which of the pilots was flying the airplane at the time of the accident.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the flight instructor's failure to maintain aircraft control while practicing stall maneuvers, which resulted in an inadvertent spin.

## Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
1. STALL - PERFORMED - FLIGHTCREW
2. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND(CFI)
3. (C) STALL/SPIN - INADVERTENT - PILOT IN COMMAND(CFI)
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Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
4. TERRAIN CONDITION - GROUND

## Factual Information

HISTORY OF FLIGHT

On June 5, 2000, at 1031 mountain daylight time, a Piper PA-31-350, twin-engine airplane, N67BJ, was destroyed when it impacted terrain and burned following a loss of control while maneuvering near Kiowa, Colorado. The airplane was registered to EDB Air Inc., of Greenwood Village, Colorado, and was operated by Key Lime Air, Inc., of Englewood, Colorado. The airline transport instructor pilot and the commercial pilot receiving instruction received fatal injuries. Visual meteorological conditions prevailed and a flight plan was not filed for the 14 Code of Federal Regulations Part 91 instructional flight. The local flight originated from Centennial Airport, Englewood, Colorado, at 0930.

One witness observed the airplane from her driveway. She stated that she heard the airplane's engines and turned to look at it. She added that as "the [engine] noise was getting louder and louder, I spotted it spiraling downward." The witness did not remember hearing any sputtering. The witness thought that the airplane was performing aerobatics; however, the airplane was getting too close to the ground. Just prior to the airplane impacting the ground, the witness turned her head so she would not see the impact, but she heard a loud thud. Approximately 3 seconds later, she heard a loud boom and saw black smoke billow up.

Another witness observed the airplane from her yard. She stated that she saw the airplane "going nose first straight down and spinning...counterclockwise." She thought the airplane was performing aerobatic maneuvers; however, the airplane did not stop descending. The airplane disappeared behind trees and the witness heard a loud explosion and saw smoke. She added that she did not observe what the airplane was doing prior to seeing it in a "downward spiral."

Radar data depicted the airplane at 8,400 feet msl for the last 2 minutes and 26 seconds of the flight. The recorded aircraft ground speed during that time period fluctuated between 75 and 59 knots. The final radar returns depicted the aircraft making a 180 degree turn before radar contact was lost. No mayday calls were received from the accident airplane.

PERSONNEL INFORMATION

The flight instructor held an airline transport pilot certificate with an airplane multi-engine land rating. In addition, he held a commercial certificate with an airplane single-engine land rating, and a flight engineer certificate for turbojet and turbopropeller powered aircraft. The pilot also held a flight instructor certificate for airplane single-engine land and instrument airplanes, which was scheduled to expire on September 30, 2000. He was issued a first class medical certificate on February 28, 2000, with no limitations. According to company records, dated September 11, 1999, the instructor had accumulated a total of 3,900 flight hours. On June 13, 1999, the instructor completed 6.9 hours of flight training required to serve as pilot-in-command (PIC) in PA-31 aircraft, and on June 15, 1999, he completed the required 41.0 hours of ground training for the PA-31. On October 9, 1999, the pilot completed the company's required ground (2.0 hours) and flight (3.0 hours) training to serve as a flight instructor in PA-31 aircraft.

The pilot, who was receiving instruction at the time of the accident, held a commercial pilot certificate with airplane multi-engine land and instrument airplane ratings that was issued on May 13, 1999. He was issued a first class medical certificate without limitations on March 28, 2000. According to a resume provided by the operator, the pilot had accumulated a total of

276.7 hours of flight time, of which 42.4 hours were accumulated in multi-engine airplanes. The pilot had completed 40 hours of ground training to serve as second-in-command (SIC) in PA-31 aircraft on April 8, 2000. The operator's president stated that the pilot was to receive SIC flight training from the instructor. A review of the Key Lime Air Piper PA-31-350 Pilot Training Manual revealed that SIC flight training was to consist of a minimum of 4 hours of flight training to include "Lessons 1, 5, 6, 7, 11, 12, 16, 24, 34, 47, 48, 55, 60, 61, 62, 64, 66, 67" The training manual listed the aforementioned lessons as follows:

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| Lesson 1 | Preflight Inspection |
| Lesson 5 | Powerplant Start |
| Lesson 6 | Taxiing |
| Lesson 7 | Pretakoff Checks |
| Lesson 11 | Normal Takeoff |
| Lesson 12 | Crosswind Takeoff |
| Lesson 16 | Powerplant Failure During Takeoff |
| Lesson 24 | Approaches to Stalls |
| Lesson 34 | ILS/LOC-DME Approaches |
| Lesson 47 | Normal Approach and Landing |
| Lesson 48 | Crosswind Approach and Landing |
| Lesson 55 | Landing from a Contact Approach |
| Lesson 60 | Normal Procedures |
| Lesson 61 | Abnormal Procedures |
| Lesson 62 | Reserved |
| Lesson 64 | Emergency Procedures |
| Lesson 66 | After Landing |
| Lesson 67 | Parking and Securing |

The approaches to stalls section of the training manual specified that the student was to practice the maneuver at an altitude no lower than 3,000 feet agl. According to the manual, "Three approaches to stalls are required and are as follows: One in a takeoff configuration or approach configuration (15 flaps, gear down), one in a clean configuration, and one in a landing configuration (full flaps, gear down). One of these approaches to stall must be accomplished while in a turn using a bank angle of 15 to 30 degrees."

The flight instructor was reportedly seated in the right seat and the commercial pilot was in the left seat. It is unknown who was flying the airplane at the time of the accident.

AIRCRAFT INFORMATION

The accident aircraft (serial number 31-7952250) was equipped with two Lycoming TIO-540-J2BD engines and two 3-bladed Hartzell HC-E3YR-2A(L)TF/F(J)C8468-6R propellers. The aircraft underwent its last 100-hour inspection on May 12, 2000, at an aircraft total time of

11,279.2 hours and its last 50-hour inspection on May 31, 2000, at an aircraft total time of 11,325.6 hours. At the time of the last 100-hour inspection, the left engine (serial number RL-5363-61A) and right engine (serial number RL-475-68A) had accumulated 4,191.2 and 4,419.8 total hours respectively, and 197.0 and 419.8 hours since their last overhaul respectively.

According to the aircraft maintenance records, the aircraft had a Boundary Layer Research, Inc., Super Chieftain I takeoff weight increase kit installed in accordance with Supplemental Type Certificate (STC) SA 00192SE on May 16, 1995. According to the STC, the aircraft's Vs (stall speed) and Vso (stall speed in the landing configuration) were reduced from 77 and 74 knots to 71 and 67 knots respectively, and the aircraft's maximum ramp weight was increased from 7,045 to 7,448 pounds.

At the time of the accident, the airplane was configured for cargo flight operations and was equipped with the two front seats. A weight and balance calculation was conducted, and the airplane was found to be within the weight and balance limitations at the time of the accident.

WRECKAGE INFORMATION

The wreckage was located in an open grass pasture at an elevation of approximately 6,700 feet msl and at a latitude and longitude of 39 degrees 17.200 minutes north and 104 degrees and 26.100 minutes west. The accident site was approximately 4.5 miles southeast of Kiowa and 30 miles southeast of the departure airport. A 40-foot by 40-foot grass area downwind of the burnt wreckage sustained fire damage. The aircraft came to rest upright, sustaining crushing damage from the bottom side and fire damage to the entire structure, which reduced the wreckage to no higher than 2.5 feet. The wings and tail section were attached to the fuselage by molten metal and control cables. The vertical stabilizer was found laying on its right side over the horizontal stabilizer. A section of the elevator and its trim tab, and the rudder and its trim tab remained attached to the horizontal and vertical stabilizers, respectively. The rudder control cables remained attached to the rudder horn assembly. The engines remained attached to their wings; however, they were buried approximately 30 inches in soil. The wreckage was examined on scene by the NTSB investigator-in-charge and an FAA inspector, and was subsequently moved to Beegle's Aircraft Services of Greeley, Colorado, for further examination on June 6, 7, and 8, 2000.

Both ailerons and flaps remained attached to their wings, and the flap actuators were measured and found to be at a 15-degree down position. The cockpit was destroyed; however, remnants of the throttle quadrant and the fuel selector panel were identified. The right fuel selector was found in the outboard position, and the left fuel selector was found between the outboard and off positions with the outboard stop broken. The fuel shut off valves were found in the ON position, and the fuel cross feed valves were in the OFF position.

A few of the flight and engine instruments were found and the following information was gleaned from them: airspeed indicator - 90knots; vertical speed indicator - 3,000 feet/minute descent; left and right tachometers - 1,600 rpm. The landing gear position could not be determined due to thermal damage.

The left engine was examined and it was noted that the propeller hub remained attached to the engine crankshaft; however, all three propeller blades were separated from the hub. One of the blades was buried in the soil and was not recovered from the accident site. The left engine remained attached to the mounts and firewall, and was displaced downward. The bottom side of the engine and its components sustained impact damage and were shattered and/or

fractured. The left engine also sustained thermal damage destroying the fuel system components. The spark plugs were grayish in color. The #5 cylinder pushrod housing and pushrods sustained damage. The left turbocharger remained attached to the engine and sustained heat damage. The turbocharger blades appeared undamaged; however the turbine/compressor unit would not rotate. The left engine crankshaft was rotated manually through 3/4 of a revolution. During the partial rotation, compression was noted on two cylinders and continuity was noted to the accessory section.

The right engine was examined and it was noted that the propeller hub remained attached to the engine crankshaft; however all three propeller blades were separated from the hub. The engine remained attached to the mounts and firewall, and was found displaced approximately 30 degrees downward. The bottom side of the engine sustained impact damage and the oil sump and was shattered, the bottom spark plugs were broken off, and the induction pipes were crushed upward. The accessory section sustained extensive thermal damage, destroying the vacuum pump, dual magneto, and fuel and hydraulic pumps. Crankshaft rotation was not possible; however, a boroscope examination of all of the cylinders did not reveal any anomalies. The right turbocharger sustained heat damage and its ducting was burned and destroyed.

The two recovered blades from the left propeller were examined along with the hub components. The blade arms were fractured. The preload plate for one of the blades displayed a witness mark which located the blade at approximately 10 degrees of pitch. That blade displayed light rotational scoring near the de-ice boot, the outer 1/3 of the blade was bent forward slightly, and its pitch change arm was bent aft. The other blade was bent aft, twisted toward low pitch, and displayed rotational scores on the camber side.

The right propeller's spinner was deformed around the propeller cylinder, which had been separated from the hub. All three blade arms were fractured. Two of the three preload plates displayed witness marks at the equivalent of 5 and 10 degree blade angles. Two of the blades were bent forward and the other blade displayed "S" bending and was twisted toward low pitch.

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies were conducted on both pilots at the El Paso County Coroner's Office, Colorado Springs, Colorado. According to the autopsy reports, both pilots died from severe blunt force trauma sustained in the accident. A toxicological test for drugs and alcohol was conducted on the instructor pilot with negative results.

ADDITIONAL INFORMATION

The wreckage was released to the owner's representative.

## Flight Instructor Information

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| **Certificate:** | Airline Transport; Flight Instructor; Commercial; Flight Engineer | **Age:** | 34, Male |
| **Airplane Rating(s):** | Multi-engine Land; Single-engine Land | **Seat Occupied:** | Right |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | Airplane Single-engine; Instrument Airplane | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 1 Valid Medical--no waivers/lim. | **Last FAA Medical Exam:** | 02/28/2000 |
| **Occupational Pilot:** | | **Last Flight Review or Equivalent:** | 02/28/2000 |
| **Flight Time:** | 3900 hours (Total, all aircraft) | | |

## Co-Pilot Information

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| **Certificate:** | Commercial; Private | **Age:** | 20, Male |
| **Airplane Rating(s):** | Multi-engine Land; Single-engine Land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 1 Valid Medical--no waivers/lim. | **Last FAA Medical Exam:** | 03/28/2000 |
| **Occupational Pilot:** | | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 277 hours (Total, all aircraft), 146 hours (Pilot In Command, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Piper | **Registration:** | N67BJ |
| **Model/Series:** | PA-31-350 PA-31-350 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | No |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 31-7952250 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 2 |
| **Date/Type of Last Inspection:** | 05/11/2000, 100 Hour | **Certified Max Gross Wt.:** | 7448 lbs |
| **Time Since Last Inspection:** | 50 Hours | **Engines:** | 2 Reciprocating |
| **Airframe Total Time:** | 11279.7 Hours as of last inspection | **Engine Manufacturer:** | Lycoming |
| **ELT:** | Installed | **Engine Model/Series:** | TIO-540-J2BD |
| **Registered Owner:** | EDB Air Inc. | **Rated Power:** | 350 hp |
| **Operator:** | KEY LIME AIR, INC. | **Operating Certificate(s) Held:** | On-demand Air Taxi (135) |
| **Operator Does Business As:** | | **Operator Designator Code:** | KY7A |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual Conditions | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | APA, 5883 ft msl | **Distance from Accident Site:** | 29 Nautical Miles |
| **Observation Time:** | 1053 MDT | **Direction from Accident Site:** | 300° |
| **Lowest Cloud Condition:** | Scattered / 6000 ft agl | **Visibility** | 10 Miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 5 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 360° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30 inches Hg | **Temperature/Dew Point:** | 18°C / 7°C |
| **Precipitation and Obscuration:** | | | |
| **Departure Point:** | Englewood, CO (APA) | **Type of Flight Plan Filed:** | None |
| **Destination:** | | **Type of Clearance:** | VFR |
| **Departure Time:** | 0930 MDT | **Type of Airspace:** | Class G |

## Wreckage and Impact Information

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

## Administrative Information

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| **Investigator In Charge (IIC):** | Norman F Wiemeyer | **Report Date:** | 06/04/2002 |
| **Additional Participating Persons:** | ROGER GETTIG; FAA FSDO; Denver, CO<br>Charles R Little; The New Piper Aircraft, Inc.; Chino Hills, CA<br>Jeffrey Poschwatta; Textron Lycoming; Kent, WA<br>Tom McCreary; Hartzell Propeller Inc.; Piqua, OH<br>Cliff Honeycutt; Key Lime Air; Englewood, CO | | |
| **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/. | | |