



National Transportation Safety Board Aviation Accident Final Report

Location:	Denver, CO	Accident Number:	DEN03MA035A
Date & Time:	01/24/2003, 1721 MST	Registration:	N360LL
Aircraft:	Piper PA-31T	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	2 Fatal, 6 Minor
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

A Piper PA-31T "Cheyenne" and a Cessna 172P "Skyhawk" collided in midair during cruise flight at dusk and in visual meteorological conditions. The Cheyenne departed under visual flight rules (VFR) from a local airport northwest of Denver, and was proceeding direct at 7,800 feet to another local airport south of Denver. Radar indicated its ground speed was 230 knots. Its altitude encoder was transmitting intermittently. The Skyhawk departed VFR from the south airport and was en route to Cheyenne, Wyoming, at 7,300 feet. The pilot requested and was cleared to climb to 8,500 feet and penetrate class B airspace. Radar indicated its ground speed was 110 knots. The Skyhawk was flying in the suggested "VFR flyway"; the Cheyenne was not. When the controller observed the two airplanes converging, he asked the pilot of the Cheyenne for his altitude. He replied he was at 7,600 feet. The controller immediately issued a traffic advisory, but the pilot did not acknowledge. Both airplanes departed controlled flight: the Skyhawk struck a house, and the Cheyenne fell inverted into the backyard of a residence. Wreckage was scattered over a 24 square block area in west Denver. At the time of the accident, the controller was handling low altitude en route, arrival and departure traffic for both airports. Wreckage examination disclosed four slashes, consistent with propeller strikes, on top of the Cheyenne's right engine nacelle, the cabin above the right wing trailing edge, the empennage at the root of the dorsal fin, and at the tail cone. The Cheyenne was on a similar flight three days before the collision when the pilot was informed by air traffic control that the transponder was operating intermittently. According to recorded radar and voice communications from that flight, the transponder/encoder operated intermittently and the pilot was so advised. Examination of the Cheyenne's altimeter/encoder revealed a cold solder connection on pin 8 of the 15-pin altimeter connector. When the wire was resoldered to the pin, the information from the altimeters, encoder, and altitude serializer was normal.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Both pilots' inadequate visual lookout. A contributing factor was the Cheyenne pilot operating the airplane with a known transponder deficiency.

Findings

Occurrence #1: MIDAIR COLLISION

Phase of Operation: CRUISE - NORMAL

Findings

1. (C) VISUAL LOOKOUT - INADEQUATE - PILOT IN COMMAND
2. (C) VISUAL LOOKOUT - INADEQUATE - PILOT OF OTHER AIRCRAFT
3. COMM/NAV EQUIPMENT, TRANSPONDER - ERRATIC
4. (F) OPERATION WITH KNOWN DEFICIENCIES IN EQUIPMENT - INTENTIONAL - PILOT IN COMMAND
5. FLIGHT ADVISORIES - ISSUED - ATC PERSONNEL(DEP/APCH)

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Findings

6. TERRAIN CONDITION - RESIDENTIAL AREA

Factual Information

HISTORY OF FLIGHT

On January 24, 2003, at 1720:36 mountain standard time, a Piper PA-31T, N360LL, registered to and operated by Lee Larson Aircraft Sales of Northglenn, Colorado, and a Cessna 172P, N52241, registered to EDB Air, Inc., and doing business as Key Lime Flights of Englewood, Colorado, collided in midair over Denver, Colorado. The commercial pilot-in-command and the commercial certificated pilot-passenger aboard N360LL and the private pilot and two passengers aboard N52241 were fatally injured. The Denver Police Department (DPD) reported that six persons on the ground, including a 15-year old boy and a 2-year old girl, received minor injuries from falling debris. Visual meteorological conditions prevailed, and neither pilot had filed flight plans. Both flights were being operated under Title 14 CFR Part 91. N5224's flight originated at Centennial Airport, Englewood, Colorado, at 1708, and was en route to Cheyenne, Wyoming. N360LL's flight originated at Jeffco Airport, Broomfield, Colorado, at 1716, and was en route to Centennial Airport.

At 1708, the pilot of N52241 was cleared for takeoff from Centennial Airport's runway 17L, and to proceed VFR (visual flight rules) "on course." At 1716, the pilot of N360LL was cleared for takeoff from Jeffco Airport's runway 29R, VFR, with a southbound departure. At 1717:52, the pilot of N360LL contacted Denver Terminal Radar Control (TRACON) and advised "We're just off Jeffco, down to Centennial." [At this point, radar data indicated N52241 was about 10 miles northwest of Centennial, its transponder transmitting a beacon code of 1200 (VFR)]. At 1718:04, the controller assigned the pilot a transponder beacon code of 5250. At 1718:26, he identified the airplane on radar: "Cheyenne Zero Lima Lima, radar contact, four (miles) south of Jeffco. Proceed as requested. [Note: According to NTSB's Operational Factors Division (AS-30), "proceed as requested" does not constitute an ATC clearance, which requires an aircraft to proceed under conditions specified by ATC, nor was one required because the pilot was operating in Class E airspace under visual flight rules.] I'm not getting any mode C on you. You squawking altitude?" The pilot replied, "Ah, yes, sir, we are." [At this point, radar data indicated N360LL was 10.73 miles from N52241]. At 1718:34, the controller asked the pilot for his altitude. He replied he was at 7,800 feet. [Radar data indicated the N360LL's mode C was still inoperative and it remained so throughout the flight. The radar-computed ground speed indicated "23," or 230 knots.]

At 1718:58, the pilot of N52241 contacted Denver Terminal Radar Control (TRACON): "Denver, Cessna Five Two Two Four One is over Denver at seven thousand, three hundred feet, with a request." The controller issued the pilot a transponder beacon code of 5251. The pilot acknowledged the instruction and requested clearance to climb to 8,500 feet, which would place the airplane in Class B airspace. He also advised he was en route to Cheyenne. [At this point, Centennial tower called the controller with a request for another aircraft's IFR departure release. The controller issued the release and assigned a departure heading of 050 degrees, then coordinated the departure with the south sector controller]. At 1720:04, the controller identified the airplane on radar when it was 15 miles southeast of Jeffco Airport, and asked the pilot to repeat his requested altitude. He repeated his request for 8,500 feet. [At this point, separation between N360LL and N52241 had closed to 2.91 miles. N52241's radar-computed ground indicated "11," or 110 knots. At about this time, the controller made a transmission to an aircraft that was on the downwind leg at Centennial Airport. He then vectored another airplane onto the NDB (nondirectional beacon) approach to Centennial Airport. The controller

was also monitoring other aircraft that were getting close to a restricted area and the airport traffic area]. At 1720:16, the controller cleared N52241 to enter class B airspace and climb to 8,500 feet. Two seconds later, radar showed target separation as 1.64 miles. At 1720:22, target separation was 1.20 miles. At 1720:27, target separation was 0.80 miles.

At 1720:28, the controller asked the pilot of N360LL to report his altitude. The pilot replied, "(Unintelligible) six." The controller said, "Say again." At 1720:31, target separation had reduced to 0.29 miles. The pilot said, "Seven thousand, six hundred." At 1720:33, the controller issued the pilot a traffic advisory: "Traffic is at twelve o'clock and a mile at seventy seven hundred, a Cessna." The pilot did not acknowledge this transmission. At 1720:36, the two airplanes were 0.06 miles apart. Immediately thereafter, radar data indicated both targets had entered "coast" mode (i.e. computer-generated projection of targets' tracks and positions). At 1720:47, the controller advised N360LL that the previously reported traffic was no longer a factor and issued another advisory for traffic 4 miles away. Receiving no reply from the pilot, the controller attempted several times to contact both airplanes. The controller then contacted a traffic patrol pilot and asked him to fly over the area where radar contact was lost. Shortly thereafter, the traffic patrol pilot reported that it appeared there had been an accident. The TRACON controller initiated search and rescue procedures.

The collision occurred 2 minutes, 43 seconds and 1 minute, 35 seconds after the pilots of N360LL and N52241 made initial contact with Denver TRACON, respectively.

DPD took written statements from 113 witnesses, three of whom were pilots. Of those witnesses, 32 were interviewed and those interviews were videotaped. The majority of the witnesses reported hearing a loud noise, variously described as a bang, pop, or explosion. Looking up into the sky, they saw a wing(s) falling to the ground and a twin engine airplane enter an inverted flat spin and fall straight down. A small, single-engine airplane was seen to nosedive into a house, trailing debris. Five witnesses made note of the light conditions: either the sun was setting or had gone below the horizon. "There was still light out," wrote one witness. There was "no trouble seeing," said another. Seventeen witnesses reported hearing an engine "stalling" or "sputtering." Some described it as "revving up." Three witnesses said the engine restarted. Several witnesses noted that the twin engine airplane was traveling "quite fast." One witness said he saw "white streak in the sky." Another said one airplane was on fire, and 12 other witnesses said one or both airplanes trailed smoke as they plummeted to the ground.

Of the 113 known witnesses, NTSB contacted 17 who actually saw the airplanes prior to or at the time of the collision. One witness saw "both airplanes heading toward each other" at "low altitude." He wrote, "...the two planes were trying to avoid each other, both in a heavy right bank." Then, "the smaller plane hit the left wing of the twin engine, severing it from the fuselage." Through an interpreter, another witness wrote: "I see two planes doing a hard right turn...and they hit." A third witness wrote, "I see the two planes coming together. The plane heading south started to bank turn away when it clip the wing" (sic). Two witnesses reported seeing the Cessna at about 1,000 feet and banking to the right at the last instant. Still another witness said the Piper pulled up and banked to the right just before the collision. One witness said he saw the "two planes veering away from each other and the wings clipped each other...The planes seemed to be coming from the north and south and when they hit, they seemed to hit wing to wing at a 45 degree angle." Two other witnesses who claim to have seen the actual collision said that neither airplane made any evasive maneuver.

Of those witnesses who saw the collision, most did not notice any lights on either airplane. One witness wrote, "The Cessna 172 Skyhawk did have his or her landing lights on, wing tips, tail." Another witness said she "definitely saw strobe lights" on one of the Cheyenne's wings.

OTHER DAMAGE

N360LL was found inverted in the backyard of a residence at 3221W. 26th Avenue. Nearby were a toppled utility shed and a section of downed wooden fence. N52241 struck a house at 3421 W. Moncrieff Place in the Highland neighborhood. The impact ruptured a natural gas line and caused an explosion, blowing out the walls and collapsing a portion of the roof. After the wreckage was removed, building engineers determined the house was not safe for occupancy and it was razed. N350LL's horizontal stabilizer struck a parked automobile at 26th Avenue and Julian Street, breaking out its windshield and damaging the hood. N360LL's right engine fell into the front yard of a house at 3126 W. 25th Avenue.

PERSONNEL INFORMATION

The 57-year-old pilot of N360LL held a commercial pilot certificate with airplane single/multiengine land and instrument ratings, dated December 19, 1982; a flight instructor certificate with airplane single/multiengine and instrument ratings, dated April 14, 2002; and a ground instructor certificate with a basic rating, dated May 8, 1982. His second class airman medical certificate, dated August 20, 2002, contained the restriction, "Holder shall wear lenses that correct for distant vision and possess glasses that correct for near vision while exercising the privileges of his airman certificate." He also held a Statement of Demonstrated Ability, Waiver No. 10D07725, dated October 31, 1977. It required the wearing of corrective lenses due to "defective distant vision 20/200, corrected to 20/15 bilaterally." According to documents submitted by his insurance company, the pilot had satisfactorily completed FlightSafety International's Cheyenne I/IA/II/IIXL pilot recurrent course on May 22, 1998; a flight review and instrument proficiency check on May 24, 2000, and SimCom Training Center's turbine multiengine instrument refresher course on May 9, 2001. A photo static copy of the pilot's logbook VII, containing entries from May 24, 2000, to January 21, 2003, was also provided by the insurance company and revealed the following:

Total Time: 9,365.3

Airplane Single-Engine Land: 7,221

Airplane Multiengine Land: 2,018.1

Pilot-in-Command: 9,067.0

Night: 792.3

Cross-Country: 7,768.4

Dual Instruction Received: 179.8

Actual Instruments: 1,210.8

Simulated Instruments: 117.1

The 51-year-old pilot certificated-passenger aboard N360LL held a commercial pilot certificate with airplane single/multiengine land and instrument ratings, dated December 29, 1996, and a mechanic certificate with airframe and powerplant ratings, dated September 12, 1986. He also held a first class airman medical certificate, dated October 1, 2001, with no restrictions or

limitations. According to documents submitted by his insurance company, the pilot had satisfactorily completed SimCom Training Center's high altitude ground/flight instruction and a Cheyenne II recurrent course on November 1, 2000; instrument and pilot proficiency checks on June 9, 1999, and November 1, 2000, and In Flight Review's Cheyenne I recurrent ground and flight training on January 21, 2002. Additional endorsements found in his logbook included a satisfactory FAR 61.56(a) flight review taken in a Piper PA-34-200T, dated June 29, 2002. A photostatic copy of the pilot's logbooks 1, 2, and 3, containing entries from March 11, 1979, to September 8, 1992; September 14, 1992, to June 4, 1999; and June 5, 1999, to December 1, 2002, respectively, was also provided by the insurance company, and revealed the following:

Total Time: 1,944.2

Airplane Single-Engine Land: 1,094.0

Airplane Multiengine Land: 850.2

Pilot-in-Command: 1,696.6

Night: 57.6

Cross-Country: 1,232.3

Dual Instruction Received: 263.4

Actual Instruments: 103.2

Simulated Instruments: 59.1

The 20-year-old pilot of N52241 held a private pilot certificate with an airplane single-engine land rating, dated June 19, 2002. The private pilot practical test constituted his mandatory flight review [FAR 61.56(c)(d)]. His third class airman medical certificate, dated April 12, 2001, contained the restriction, "Holder shall wear lenses that correct for distant vision and possess glasses that correct for near vision." His logbook, found by Denver police, contained entries from December 21, 1995, to January 19, 2003, and revealed the following:

Total Time: 127.5

Airplane Single-Engine Land: 127.5

Pilot-in-Command: 58.5

Cessna 172: 123.7

Piper PA-28: 3.8

Night: 14.6

Cross-Country: 24.0

Dual Instruction Received: 70.0

Simulated Instruments: 4.9

According to FAA records, none of the passengers aboard N52241 were certificated pilots.

The SR1 (satellite radar) TRACON controller was hired by the Federal Aviation Administration on February 9, 1990. He transferred to the Denver TRACON on January 3, 1999, after having served in control towers at Vero Beach, Florida; Centennial and Denver International Airports.

He was fully rated at the TRACON on November 26, 2000. The controller holds an airline transport pilot certificate with an airplane multiengine rating and a Beech 1900 type rating, and commercial pilot privileges in airplanes single-engine land. His second class airman medical certificate, dated April 30, 2002, contained no restrictions or limitations.

At the time of the accident, the SR1 controller's position had been combined with JEFCA Low Altitude radar (LR). In addition to en route traffic at and below 9,000 feet, the controller was responsible for arrival and departure traffic from Jefferson County Airport (BJC) and Centennial Airport (APA).

AIRCRAFT INFORMATION

N360LL (s/n 31T-7520036), a pressurized model PA-31T, was manufactured by the Piper Aircraft Corporation and issued an airworthiness certificate on June 20, 1975. It was equipped with two Pratt & Whitney PT6A-28A-28 engines (s/n PCE-50375, left; PCE-50393, right), rated at 620 shaft horsepower, and two Hartzell 3-blade, all-metal, constant speed, and full-feathering propellers (m/n HC-B3TN-3B). Its maximum certificated gross weight was 9,000 pounds.

The airframe was maintained following the Piper Progressive Inspection 100 Hour Cycle Program. A review of the maintenance records revealed the following:

Airframe Total Time: 6,478.2 hours.

Last 100-hour Inspection (Events I and II): 6,478.2 hours.

On December 10, 2001, maintenance on the engines and propellers were transferred to the M.O.R.E. (Maintenance On Reliable Engines) program, where time and numbers (not dates) determined maintenance events:

Left Engine Total Time: 7,093.6 hours

Total Cycles: 7,094

Time Since Major Overhaul: 3,809.3 hours

Cycles Since Major Overhaul: 3,811

Right Engine Total Time: 8,183.8 hours

Total Cycles: 8,184

Time Since Major Overhaul: 3,811.3 hours

Cycles Since Major Overhaul: 3,811

Left Propeller Total Time: 6,478.2 hours

Major Overhaul: December 10, 2001

Right Propeller Total Time: 6,478.2 hours

Major Overhaul: December 10, 2001

Avionics

Last IFR Certification: June 14, 2001 at 295.8 hrs.

N52241 (s/n 17274452), a model 172P, was manufactured by the Cessna Aircraft Company in

1981. Modified by Supplemental Type Certificate SA2196CE, it was equipped with a Lycoming O-360-A4M engine (s/n L-12931-36A), rated at 180 horsepower, and a Sensenich 2-blade, all-metal, fixed pitch propeller (m/n 76EM8SPY-O-60). Its maximum certificated gross weight was increased from 2,400 pounds to 2,550 pounds. A review of the maintenance records revealed the following:

Airframe

Last 100-Hour Inspection: January 8, 2003

Tachometer: 2,875.6 hrs.

Airframe Total Time: 12,872.9 hrs.

Last Annual Inspection: July 25, 2002

Engine

Last 100-Hour Inspection: January 8, 2003

Tachometer: 2,875.6 hrs.

Time Since Major Overhaul: 201.0 hrs.

Major Overhaul: July 25, 2002

Engine Total Time: 12,673.2 hrs.

Propeller

Last 100-Hour Inspection: January 8, 2003

Tachometer: 2,875.6 hrs

Propeller Total Time: 6,538.3 hrs.

Last Annual Inspection: October 23, 2001

Propeller Total Time: 6,140.4 hrs.

Avionics

Last IFR Certification: October 16, 2001

Tachometer: 2,675.8 hrs.

METEOROLOGICAL INFORMATION

The following METAR (Aviation Routine Weather Report) observations were recorded at Jeffco Airport (BJC), Centennial Airport (APA), and Denver International Airport (DEN), located 7 n.m. south-southeast, 18 n.m. southwest, 23 n.m. east of the accident site, respectively:

BJC (1746): Wind, calm; visibility, 10 statute miles (or greater); scattered clouds, 8,000 feet; broken clouds, 20,000 feet; temperature, -04 degrees C. (25 degrees F.); dew point, -10 degrees C. (14 degrees C.); altimeter, 29.93 inches.

APA (1753): Wind, 170 degrees at 8 knots; visibility, 10 statute miles (or greater); few clouds, 8,000 feet; scattered clouds, 12,000 feet; broken clouds, 22,000 feet; temperature, 4 degrees C. (39 degrees F.); dew point, -5 degrees C. (23 degrees F.); altimeter, 30.12 inches.

DEN (1746): Wind, 120 degrees at 11 knots; visibility, 10 statute miles (or greater); few clouds, 8,000 feet; scattered clouds, 13,000 feet; broken clouds, 22,000 feet; temperature, 3 degrees C. (37 degrees F.); dew point, -5 degrees C. (23 degrees F.); altimeter, 30.13 inches.

According to U.S. Naval Observatory data, sunset occurred at 1710 and civil twilight ended at 1739. At the time of the accident, the moon had not risen.

WRECKAGE AND IMPACT INFORMATION

Wreckage and debris from both airplanes covered an area of approximately 24 city blocks. N52241 impacted the northeast corner of a house at 3421 W. Moncrieff Place. When examined inside the house, the airplane was in a vertical attitude. The wreckage consisted of the fuselage, both wings with control surfaces and lift struts still attached, the vertical and horizontal stabilizers with both elevators and rudder attached, and the engine and detached propeller. Smaller pieces of debris --- pieces of the engine and cowling; nose landing gear strut, wheel and tire; left main landing gear strut, wheel, and tire, and right main landing gear wheel and tire --- were scattered over the area in a generally south-to-north direction.

N360LL was located inverted in the backyard of a residence at 3221 W. 26th Avenue. The ground scar and crush lines were consistent with a left spin. Attached to the fuselage were the left wing with aileron and flap, the left engine and propeller hub with two of three attached propeller blades, and the inboard portion (to W.S. 109) of the right wing with an attached 7-foot section of flap. The third propeller blade from the left propeller assembly was found underneath the wreckage. Scattered nearby were the left tip tank, nose baggage door, and nose cone. The outboard portion of the right wing, from about W.S. 147.0 to the attached tip tank, was located in the backyard of a residence near 26th Avenue and Irving Street. The horizontal stabilizer (the right leading edge aft to the spar was missing) struck a parked automobile at 26th Avenue and Julian Street. The right engine, with attached propeller, was located in the 3100 block of W. 25th Avenue. Smaller pieces of debris --- internal wing structure, hydraulic fluid lines and fittings, engine cowling, and fuselage skin --- were scattered over the area in a generally north-to-south direction.

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies were performed on the three pilots and two passengers by the Denver Medical Examiner's Office. The Denver Police Department's Crime Laboratory and FAA's Civil Aeromedical Institute (CAMI) conducted toxicological screens. According to the CAMI reports, urine specimens taken from the two pilots aboard N360LL were negative for ethanol and drugs. Carbon monoxide and cyanide tests were not performed. Heart and muscle tissue from the pilot of N52241 tested negative for ethanol. Carbon monoxide and cyanide tests were not performed. Liver tests, however, were positive for ephedrine and phenylpropanolamine. Ephedrine is a major component of the herbal supplement, "Ma Huang" (also known as "ephedra"). Ma Huang is used as an "energy booster," stimulant, weight loss product, or decongestant in many nutritional supplements. Ephedrine is also sold as an asthma medication (trade name Primatene), available over-the-counter in tablet form. Phenylpropanolamine is a metabolite of ephedrine. It is also an over-the-counter decongestant and weight loss product. It was recently withdrawn from the market due to a very small but measurable increased risk for stroke (primarily in women using it for weight loss).

Toxicological tests performed by the Denver Police Department's Crime Laboratory revealed the presence of caffeine in both pilots aboard N360LL. Similar tests performed on the pilot of

N52241 and his two passengers produced negative results.

TESTS AND RESEARCH

Both airplanes were retrieved on January 25 and transported to the Greeley-Weld County Airport. The wreckage was laid out on a hangar floor in a 2-dimensional mockup. Impact and paint transfer marks were consistent with both airplanes being in a wings-level attitude, N52241 being slightly above N360LL, and colliding at an offset angle of approximately 20 degrees relative to each other.

Examination of N360LL revealed black rubber transfer marks on the right propeller spinner, the right wing just inboard of W.S. 147, and the right side of the fuselage forward of and below the emergency exit door. There was also a gash in the right engine cowling. Measurements of these marks were nearly identical to the dimensions of N52241's landing gear. Four slashes, consistent with propeller strikes, were noted. The first slash was on top of the right engine nacelle, extending aft from left to right, and was approximately 14 inches in length. The second slash was on the top right side of the fuselage, above and aft of the emergency exit door, and extending aft from left to right. It was approximately 17 inches in length and extended into the adjacent window. The third slash, approximately 30 inches in length, was located at the root of the dorsal fin and extended aft from left to right and continued down through the aft pressure bulkhead. The fourth slash, approximately 15 inches in length, extended from the empennage closure fairing (about 11 inches aft of the rudder pivot point) and continued up and forward through the left side of the rudder.

Examination of N52241 revealed a slash on the right side of the engine cowling that extended from just above the lap joint, down, aft, and underneath. Aligned at the end of this slash was a fracture separation of the firewall, instrument panel, and fuselage floor, terminating on the right side of the fuselage just forward and above the landing gear box at F.S. 56.

The engines from N360LL were examined. The left engine compressor turbine was not distorted, but the blades were discolored at the tips and there was metal splatter on the trailing edges. There was metal splatter on the power turbine, and the blades were bent and fractured opposite the direction of rotation. The exhaust case bore high-energy impact marks from projectiles. The left propeller blades were in the feathered position. The right engine separated from the airplane in midair, leaving the power section twisted approximately 10 degrees opposite the direction of propeller rotation. There were rub, smear, and impact marks on the compressor turbine. The power turbine blades were bent opposite the direction of rotation. The right propeller blades were in the low pitch position. There was a black rubber smear mark on the spinner.

During the course of the investigation, the Air Traffic Control Group was made aware of a previous flight of N360LL made on January 21, 2003, just three days before the collision. According to recorded radar and voice communications from that flight, the transponder/encoder operated intermittently and the pilot was so advised. On February 13, 2003, the altimeters, encoder, altitude serializer, and wiring harness from N360LL were examined and tested. Both examinations were conducted under the supervision the FAA. A cold solder connection was found on pin 8 of the 15-pin altimeter connector. According to the inspector's report, the cold solder joint "could cause the altimeter to be totally intermittent. This is exactly the type of failure the ATC tower was seeing on their radar screens." When the

wire was resoldered to the pin, the information from the altimeters, encoder, and altitude serializer was normal.

ADDITIONAL INFORMATION

NTSB Operational Factors Division (AS-30) assisted in the investigation. Both airplanes were operating in class E airspace, outside but adjacent to Denver's class B airspace (formerly known as the terminal control area, or TCA). At the time of the accident, N360LL and N52241 were operating in airspace controlled by SR1. At the time of the accident, the position had been combined with JEFSCO Low Altitude radar (LR). The controller was responsible for arrival and departure traffic from Jefferson County Airport (BJC) and Centennial Airport (APA). This sector is a low altitude sector (9,000 feet and below). Its eastern boundary begins approximately 15 miles west of Denver International Airport and extends 12 miles west. The sector routinely handles VFR traffic transiting through the area between Denver's satellite airports. Interstate 25 runs west of APA northbound through the Denver downtown area to BJC. Interstate 70 runs east west through the center of Denver and intersects I-25 west of the city. Wadsworth Boulevard defines the western most edge of the class B airspace and runs north to south east of BJC. Both roadways are prominent VFR landmarks used by pilots and controllers as VFR reporting points. BJC is located 23 miles northwest of APA. Both aircraft were operating outside the lateral limits of the Denver class B airspace and approximately 400 feet below the shelf that extends from 8,000 feet to 12,000 feet. Both aircraft were operating in controlled airspace and the controller was providing basic radar services which includes safety alerts, traffic advisories, and limited radar vectoring when requested by the pilot.

On the day of the accident, the controller reported for duty at 1330 after being off the previous two days. He described air traffic as being "normal for a Friday afternoon," and he worked one or two radar positions before going on break. When he returned, he was assigned the SR1 position and received a standard briefing. He was handling an Aviat A-1 that was inbound to Centennial Airport from the northwest; three skywatch (traffic patrol) aircraft, one of which was in class B airspace; a Beech 36 practicing an NDB (nondirectional beacon) approach to Centennial Airport, and another Beech 36 approaching Centennial Airport from the southeast. The controller said N360LL's track to Centennial Airport was "normal." When the pilot of N52241 called and reported being "over Denver," the controller was asked what that meant. He replied the airplane could be anywhere from 2 to 20 miles from Centennial Airport, but generally within a 5-mile radius of downtown. The controller said that after returning from his break, he had been at the SR1 position for approximately 3 minutes when the collision occurred.

According to the Aeronautical Information Manual, pilots must obtain an ATC (air traffic control) clearance prior to operate in Class B airspace. Generally speaking, pilots must hold at least a private pilot certificate, and the aircraft must be equipped with an operable two-way radio capable of communications with ATC on appropriate frequencies for that Class B airspace; and unless authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment. ATC services provided to VFR pilots operating in Class B airspace include both sequencing and separation from other aircraft. Pilots, however, are not relieved of their responsibilities to see and avoid other traffic (chapter 3, section 2, paragraph 3).

Radar traffic information service is provided by radar ATC facilities to assist, advise, and alert pilots when a radar target's position and track may intersect or pass in such proximity to that

pilot's intended flight path that it warrants attention. Altitude information is not provided unless the aircraft are equipped with Mode C and the radar facility is capable of displaying altitude information. Many factors, such as limitations of the radar, volume of traffic, controller workload and communications frequency congestion, could prevent the controller from providing this service. Controllers possess complete discretion for determining whether they are able to provide this service in a specific case. The controller's reason against providing the service is not subject to question nor need it be communicated to the pilot. The service is entirely dependent upon whether controllers believe they are in a position to provide it. Traffic information is routinely provided to all aircraft operating on IFR flight plans except when the pilot declines the service (chapter 4, section 1, paragraph 14).

In addition to controlling IFR traffic, all commissioned radar facilities provide safety alerts, traffic advisories, and limited radar vectoring (on a workload permitting basis) to VFR aircraft. This does not relieve the VFR pilot from his responsibility of seeing and avoiding other traffic (chapter 4, section 1, paragraph 17).

According to 91.117(c) of the Federal Aviation Regulations (FAR), the speed limit for aircraft operating in the airspace underlying Class B airspace, or in a VFR corridor through such airspace, is 200 knots (230 mph).

FAR 91.215(b)(2) states that aircraft operating within 30 nautical miles (of Denver International Airport) at altitudes from the surface up to 10,000 feet msl must be equipped with an operable transponder and automatic pressure altitude reporting equipment. However, FAR 91.215(d)(1) and (2) allows the pilot to request ATC for a deviation from this requirement at any time.

Parties to the investigation were the FAA, Cessna Aircraft Company, the New Piper Aircraft Corporation, National Air Traffic Controllers Association, and Pratt & Whitney.

The wreckage of N360LL was released to Phoenix Aviation Managers on February 27, 2003. The wreckage of N52241 was released to Kern & Wooley on February 27, 2003.

Pilot Information

Certificate:	Commercial	Age:	57, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	08/20/2002
Occupational Pilot:		Last Flight Review or Equivalent:	05/09/2001
Flight Time:	9365 hours (Total, all aircraft), 9067 hours (Pilot In Command, all aircraft)		

Pilot Information

Certificate:	Commercial	Age:	51, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	10/01/2001
Occupational Pilot:		Last Flight Review or Equivalent:	01/21/2002
Flight Time:	1944 hours (Total, all aircraft), 1697 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N360LL
Model/Series:	PA-31T	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	31T-7520036
Landing Gear Type:	Retractable - Tricycle	Seats:	8
Date/Type of Last Inspection:	AAIP	Certified Max Gross Wt.:	9000 lbs
Time Since Last Inspection:		Engines:	2 Turbo Prop
Airframe Total Time:	6478 Hours as of last inspection	Engine Manufacturer:	Pratt & Whitney Canada
ELT:	Installed, not activated	Engine Model/Series:	PT6A-28
Registered Owner:	Lee Larson	Rated Power:	620 hp
Operator:	Lee Larson	Operating Certificate(s) Held:	None
Operator Does Business As:	Lee Larson Aircraft Sales	Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Dusk
Observation Facility, Elevation:	DEN, 5431 ft msl	Distance from Accident Site:	23 Nautical Miles
Observation Time:	1753 MST	Direction from Accident Site:	64°
Lowest Cloud Condition:	Few / 8000 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 22000 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	14 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	130°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.12 inches Hg	Temperature/Dew Point:	4° C / -5° C
Precipitation and Obscuration:			
Departure Point:	Broomfield, CO (BJC)	Type of Flight Plan Filed:	None
Destination:	Englewood, CO (APA)	Type of Clearance:	VFR
Departure Time:	1717 MST	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	6 Minor	Aircraft Explosion:	None
Total Injuries:	2 Fatal, 6 Minor	Latitude, Longitude:	39.766667, -105.050000

Administrative Information

Investigator In Charge (IIC):	Arnold W Scott	Report Date:	11/25/2003
Additional Participating Persons:	Randall M Holder; FAA Flight Standards District Office; Denver, CO Michael C McClure; The New Piper Aircraft Corporation; Prosper, TX Steve Miller; Cessna Aircraft Company; Wichita, KS Ernest Patterson; Pratt & Whitney; Monument, CO Michael R Coulter; National Air Traffic Controllers Association; Denver, 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.nts.gov/pubdms/ .		

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](#).