Aviation Investigation Final Report

Location:	Reno, Nevada	**Accident Number:**	LAX02FA108
Date & Time:	March 13, 2002, 19:40 Local	**Registration:**	N948CC
Aircraft:	Beech E90	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Serious, 5 Minor
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

During an instrument approach, upon descending to the prescribed minimum descent altitude, about 1/2 mile from the missed approach point, the pilot failed to maintain flying airspeed. The airplane stalled, rolled left, and in an uncontrolled descent collided with a commercial building 0.96 nm from the runway's displaced threshold. The accident occurred during the return portion of a round trip flight, while on final approach to the pilot's alternate airport due to a weather-induced diversion. Moderate intensity snow showers and freezing fog existed. During the initial approach, the reported visibility was 1 1/2 miles. About the time the pilot passed the final approach fix, the visibility decreased to 1/2 mile, but the pilot was not informed of the decrease below his 1-mile minimum requirement. The pilot had maintained the recommended 140-knot approach speed in the icing conditions until about 3 1/2 miles from the runway. Thereafter, the airplane's speed gradually decreased until reaching about 75 knots. After the airplane started vibrating, the pilot increased engine power, but his action was not timely enough to avert stalling. Company mechanics maintained the airplane. On previous occasions overheat conditions had occurred wherein the environmental ducting melted and heat was conducted to the adjacent pneumatic tube that provides deice air to the empennage boots. During the accident investigation, the deice tube was found completely melted closed, thus rendering all of the empennage deice boots dysfunctional.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate approach airspeed for the existing adverse meteorological conditions followed by his delayed remedial action to avert stalling and subsequent loss of airplane control. Contributing factors were the pilot's reduced visibility due to the inclement weather and the icing conditions.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

Findings
1. WEATHER CONDITION - LOW CEILING
2. (F) WEATHER CONDITION - ICING CONDITIONS
3. (F) WEATHER CONDITION - SNOW
4. (C) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
5. (C) REMEDIAL ACTION - DELAYED - PILOT IN COMMAND
6. (C) AIRSPEED(VS) - NOT MAINTAINED - PILOT IN COMMAND
7. STALL/MUSH - INADVERTENT - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

Findings
8. OBJECT - BUILDING(NONRESIDENTIAL)

Factual Information

HISTORY OF FLIGHT

On March 13, 2002, about 1940 Pacific standard time (PST), a Beech E90, N948CC, descended into an unoccupied commercial building during an in-flight loss of control, about 1 mile south-southeast of the Reno/Tahoe International Airport, Reno, Nevada. Pilot Services Corporation, d.b.a. Regent Air Service, Inc., Truckee, California, operated the airplane. The accident occurred during a nighttime instrument approach in instrument meteorological conditions. The airline transport certificated pilot and four passengers sustained minor injuries, and a fifth passenger sustained a serious injury. The airplane was destroyed. The flight was operated under the provisions of 14 CFR Part 135 as an on-demand air taxi flight, which departed from Durango, Colorado, about 1625 mountain standard time (1525 PST).

Earlier in the day, about 0518 PST, the pilot and passengers had departed from the Truckee-Tahoe Airport, Truckee, California, for the planned round trip flight to Durango. The pilot landed in Durango about 0850 mountain standard time (0750 PST).

The pilot reported to National Transportation Safety Board investigators that thereafter, he ate lunch and retired at the prearranged crew-rest hotel. The pilot further indicated that the airplane was refueled, and he did not observe any discrepancies with the airplane during his preflight inspection for the planned nonstop return flight.

According to the pilot, the flight was uneventful until he attempted to land at the Truckee-Tahoe Airport, his home base. At 1905 PST, the pilot received a clearance to perform an instrument approach to the Truckee-Tahoe Airport. Prior to commencement of the approach, the pilot activated the airplane's anti-ice systems, and they remained on throughout the remainder of the flight. The pilot activated the pneumatic wing deice boots prior to reaching the final approach fix.

The pilot indicated that he initiated the approach but could not land because of his inadequate visibility; it was snowing. The pilot executed a missed approach at 1919. Thereafter, he requested and received a clearance with radar vectors to proceed to the Reno/Tahoe International Airport.

The pilot further reported that snow showers also existed at Reno, and on only one occasion did he activate the deice boots during the approach. That occurred while on a vector to intercept the localizer, distance measuring equipment (DME), back course instrument approach to runway 34L. The pilot stated that he never observed an appreciable amount of ice on the leading edge of the wing, but he felt that there was enough to activate the boots. The pilot stated that when he activated the boots, "a little (ice) came off." He could see ice on the

side of the wing's stall strip. There was some thin ice on the boot, but it did not extend beyond the boot.

At 1925:27, the pilot was cleared to perform the instrument approach. During the Safety Board investigator's subsequent interview with the pilot, he indicated that it was his belief that, upon reaching the final approach fix, the airport's reported weather was at or above his landing minimums. At 1936:44, the pilot made his last recorded radio transmission during which he acknowledged being cleared to land.

The pilot stated that everything on the approach was normal outside of the 2-mile DME fix. However, control of the airplane became difficult inside the 2-mile DME fix.

The pilot further reported to Safety Board investigators that the airplane's approach was initially stabilized upon reaching the minimum descent altitude (MDA). At the MDA, he increased engine torque (power) to 800 foot-pounds per engine in order to maintain altitude. According to the pilot, a torque value between 700 and 900 foot-pounds is normal.

The pilot indicated that some ice was visible on the wing's leading edge stall strip, but opined it was "way less than 1/4-inch" in depth. He stated that the ice did not extend beyond the aft portion of the wing's deicing boot.

According to the pilot, during the final seconds of flight, the controls started vibrating and he felt a yawing moment. The pilot said that he instantly looked at the indicated airspeed, which was between 111 and 115 knots. Thereafter, the airplane started to shake. Previously, the airplane had been flying at 140 knots, the recommended approach speed for icing conditions. The pilot said that he applied full engine power; however, the airplane still shook and yawed. He recalled that the rudder pedals appeared to move freely. Although the vibration varied in intensity, once it started it never stopped.

The pilot further reported that he pitched forward on the yoke, and he did not believe the airplane was stalling because the indicated airspeed was still near the "blue line." The pilot reported that he felt the airplane sink. While the airplane was sinking he noticed that the stall warning light was illuminated, and he attempted to stop the airplane's descent. He did not "yank back or push forward" on the yoke; he just maintained a level attitude. The pilot looked outside and saw buildings "coming up." The engine power was full, but the airplane was not climbing. The pilot reported thinking that he was going to hit the building and that he had to reduce the impact. Therefore, he pulled the yoke full back. The left wing stalled, and the airplane banked left.

The pilot stated that there might have been ice on the tail because the tail "felt really weird." He said "something made the airplane go down when it shouldn't have."

The airplane's last recorded radar position was at 1939:53. At this time, the airplane had descended to about 4,500 feet, as indicated by its Mode C altitude reporting transponder. The

accident site's elevation is approximately 4,470 feet msl.

PERSONNEL INFORMATION

Certification and Experience.

The pilot held an airline transport pilot certificate with an airplane multiengine land rating. He had commercial privileges in single engine land and sea airplanes. The pilot also possessed a certified flight instructor certificate with airplane single engine, multiengine, and instrument airplane privileges. He possessed advanced ground school instructor and aircraft dispatcher certificates. The pilot's last first-class aviation medical certificate was issued without limitations on May 14, 2001.

The pilot's total flight time was 1,610 hours, of which 608 hours were flown in the model of the accident airplane. During the 30- and 90-day periods preceding the accident, the pilot had flown the accident model of airplane as pilot-in-command for 40 and 105 hours, respectively, of which 8 and 22 hours were in actual instrument meteorological conditions.

Regent Air, Inc., hired the pilot in August 2000. In July 2001, he began flying the Beech E90 as pilot-in-command. The pilot's last FAR Part 135 competency, instrument proficiency, and line checks were performed by a Federal Aviation Administration (FAA) inspector in February 2002. All of the checks were completed satisfactorily.

AIRCRAFT INFORMATION

The Beech Aircraft Company began manufacturing the model E90 series of airplanes in 1972, with serial number LW-1. The accident airplane, serial number LW-236, was manufactured in 1977. Beech discontinued production of this model of airplane in 1981, with serial number LW-347. According to the Raytheon Aircraft Company participant, the interior configurations of these airplanes varied. As of April 2, 2002, FAA registration records indicated that 247 E90s were registered.

Flight Manual and Check List Information.

The FAA approved Airplane Flight Manual (AFM) contained the following statements regarding flight in icing conditions:

"CAUTION Stalling airspeeds should be expected to increase when ice has accumulated on the airplane due to the distortion of the wing airfoil. For the same reason, stall warning devices are not accurate and should not be relied upon. Keep a comfortable margin of airspeed above the normal stall airspeed with ice on the airplane. Maintain a minimum of 140 knots during sustained icing conditions to prevent ice accumulation on unprotected surfaces of the wing...."

A 6-inch by 12-inch spiral binder entitled "Beechcraft King Air E90 PILOT'S CHECK LIST" was

recovered from the accident airplane. The binder's cover was imprinted with the name "Raytheon Aircraft Company," and all of the pages within were printed with "P/N 90-590012-7," and were dated "5/8/72." In part, the checklist identified actions the pilot should take in preparation for departure. Checking the functionality of the deice boots on the tail after the engines are started was not mentioned in the checklist.

Airplane Certification, Equipment, and Instrument Markings.

The pressurized, turboprop airplane was certificated by the FAA for flight into known icing conditions. The airplane was equipped with deice boots on its wings, and on the vertical and horizontal stabilizers. Unlike the wing mounted boots, from the cockpit the pilot cannot see all of the boots on the tail. The airplane is not equipped with an annunciator light or indicator gauge that shows the functionality of the tail-mounted boots.

The airplane had been modified by installation of a Raisbeck Engineering conversion, and its AFM had been amended. The airplane's maximum gross weight was increased to 10,500 from its previous 10,100 pounds. According to Raisbeck personnel, the modification did not change the airplane's stall speed.

Regarding the airspeed indicator, a blue radial line is present on the airspeed indicator. The line represents the best rate-of-climb airspeed (Vyse) with one engine inoperative. The placarded airspeed is 111 knots.

Maintenance and Inspections.

The pilot reported that, to the best of his knowledge, during the accident flight none of the installed equipment became dysfunctional. Moreover, no maintenance items had been deferred pursuant to a minimum equipment list. The pilot personally performed the pretakeoff, walk-around inspection of the airplane.

The accident airplane had been on Regent Air's Part 135 certificate since July 1994. Regent Air's personnel reportedly maintained the accident airplane pursuant to the manufacturer's (Raytheon) recommended maintenance program. Maintenance inspections were reportedly accomplished in accordance with Raytheon Aircraft's Beech King Air 90 Maintenance Manual.

This inspection program utilizes "Phase Inspections" and is accomplished at 200-hour intervals, identified as Phase 1 through 4. The complete program is scheduled to be accomplished at least one time every 24 calendar months.

Each Phase Inspection is accomplished using a checklist. The Safety Board's Maintenance Group Chairman reviewed the checklists to identify the frequency of inspections to the environmental and pneumatic systems. The review noted that all four Phase Inspections checked the heating system. In part, the inspection included actions to check all ducts for damage and deterioration and to check the bleed ducts for damage. During all four

inspections, the surface deice system was to be checked for proper operation and cycling, and the environmental system was to be checked for proper operation.

The last Phase Inspection accomplished on the airplane prior to the accident was a Phase 4 Inspection. It was accomplished on February 28, 2002. At that time, the airplane's total time was 8,748.7 hours. At the time of the accident, the airplane's total time was 8,772.75 hours.

A review of Regent Air's maintenance records revealed that between 1999 and 2001, the environmental air and pneumatic deice system had undergone maintenance. In part, in January 1999, tubing was replaced. In December 2000, new boots were installed. In 2001, holes in the vertical stabilizer were repaired, the cabin temperature controller was replaced, and static air pneumatic tubing located near the aft lavatory, which was found melted, was repaired.

In September 2001, a Regent Air mechanic reported that he found melted EVA tubing near the aft pressure bulkhead. The mechanic determined that a leak was coming from a gasket at the rear of the cargo compartment, which supplies heat to the cabin (referring to the Station 277 heat vent). To stop the leak, the mechanic removed the vent cover and wrapped some aluminum tape around the gasket to seal the leak, and then he replaced the vent cover. The mechanic reported that it was not a normal practice to check the environmental tubing itself, which was wrapped inside of insulation material. Therefore, he did not check the environmental tubing during installation of the aluminum tape. He also stated that he only removed the aft floor panel to gain access to the vent. He did not remove the panel immediately forward of that location. (See the Safety Board's Maintenance Records Group Chairman's report for additional details.)

METEOROLOGICAL INFORMATION

Ground Personnel and Facility Reports.

Nineteen minutes prior to the accident, at 1921, Reno fire department personnel had responded to a medical call about 3/4 mile southwest from where the accident would occur. The personnel noted that it was snowing lightly. However, by 1931, it was snowing heavily, the wind speed had increased, and the conditions appeared like a "squall blowing into the area with whiteout conditions."

At 1930, Reno's automatic terminal information service (ATIS) was broadcasting "information Oscar." In pertinent part, the ATIS indicated that Reno's wind was from 290 degrees at 15 knots, and the visibility was 1 1/4 miles in light snow and mist. At 1932:30, the Reno south radar controller broadcast "Reno ATIS Oscar current." The controller advised the pilot, at 1933:16, that "...the last arrival seven twenty seven got the runway in sight mile and a half (unintelligible) south."

The pilot was not provided with updated visibility information during the remainder of his

approach.

At 1939, the Reno/Tahoe International Airport's surface wind was from 300 degrees at 10 knots, and the visibility was 1/2 mile. There was moderate snow and freezing fog. A broken ceiling existed at 700 feet above ground level (agl), and an overcast sky condition existed at 2,500 feet agl. The temperature and dew points were, respectively, minus 2 and minus 3 degrees Celsius. The altimeter setting was 30.04 inches of mercury.

After the accident, at 1956, Reno's visibility was also 1/2 mile in moderate snow and freezing fog. The vertical visibility was reported at 300 feet.

Pilot Observations.

According to the pilot, the first and only time he activated the deice boots going into Reno was on a radar vector to intersect the back course. This occurred less than 5 minutes before intercepting the back course. He activated the boots to get rid of the "residual" ice. Ice did deploy from the airplane. The pilot stated that he had also activated the deicing boots prior to the approach at Truckee.

Additional Ground Witness Observations.

There were five auditory witnesses to the accident. They all were located in the building next to the one with which the airplane collided. Upon hearing the collision they went outside and made the following statements regarding the weather conditions that they observed. One witness reported that the weather was a complete whiteout. It was snowing hard, and the visibility was zero. A second witness also reported it was snowing heavily and described it as a whiteout. He reported that he could see "quite a ways down the street," but visibility was poor looking up. He described the snow as being heavy and wet. A third witness also reported a storm had just come in and it was snowing heavily. He described it as a "wet, packed snow." Visibility was terrible, maybe about 40 feet. A fourth witness stated that it was snowing heavily and the snow was sticking. He could hardly see across the street. He estimated visibility at 100 yards. A fifth witness said she could not see across the street. The snow was not really wet and not really dry, but was sticking.

Airplane Passenger Observations.

The five airplane passengers reported the following information. Three of the passengers reported that it was snowing on the approach to Reno. One of these passengers recalled seeing ice fly off the wing between Truckee and Reno. A fourth passenger indicated that he held a student pilot certificate. He stated that during the approach to Reno it was snowing hard. Snow and ice was forming on the wing. He described the ice as being about 1-inch high on the wing deice boot, but it did not cover the whole boot. The fifth passenger, who held a private pilot certificate, reported that the airplane was flying just below clouds for about the last 2 miles of its flight. Approaching Reno there was 1 1/2- to 2-inches (vertically) of ice on

the wing's leading edge. There was ice on the wing that was maybe 1/4-inch thick. He had observed ice coming off the wing earlier while approaching Reno, but about the same amount of ice had accumulated on the wing again. It was snowing, but the turbulence was minimal to nonexistent. He said the airplane shuddered, and he was absolutely certain the airplane stalled.

COMMUNICATION AND FACILITIES

The FAA reported that all communications with the accident airplane pilot were normal. All navigation aids associated with the instrument approach to Reno were functioning normally.

AIRPORT AND INSTRUMENT APPROACH INFORMATION

The airport's elevation is 4,412 feet mean sea level (msl). Runway 34L's touchdown zone's elevation is 4,407 feet msl.

The minimum descent altitude for the localizer, DME, back course, instrument approach to runway 34L is 5,060 feet msl (653 feet agl). During the accident flight, the straight-in landing minimum visibility requirement for the pilot was 1 mile.

The final approach fix is located at an indicated DME distance of 9.7 nautical miles (nm) from Reno. The missed approach point is located at a DME distance of 0.5 nm from Reno, which is about 0.8 nm from the approach end of the runway.

WRECKAGE AND IMPACT INFORMATION

The main wreckage was imbedded in the top of a commercial building at an estimated elevation of 4,470 feet msl at the following global positioning satellite (GPS) coordinates: north 39 degrees 28.22 minutes latitude by west 119 degrees 46.11 minutes longitude. The magnetic bearing to runway 34L was about 343 degrees. The accident site was about 0.96 nm south-southeast of the runway's displaced threshold and an estimated 200 feet east of the runway's extended centerline.

The Safety Board investigator's examination of the initial point of impact revealed white paint transfer signatures and impact damage in the block wall structure of a rectangular shaped two-story building, on its southeast side. The angle of the paint signature was measured to be about 70 degrees. (A 90-degree angle would be perpendicular to the horizon.)

The airplane's separated white-colored left wing was beneath the wall outside the building near the separated left horizontal stabilizer. The left wing's leading edge was crushed in an aft direction, consistent with the shape of the block wall. The remainder of the airplane was partially penetrating the building's roof. The airplane was in an estimated 70-degree left wing low (left bank) attitude, and on a magnetic heading of approximately 315 degrees. The fuselage, which remained intact, was suspended from building structure at the mezzanine

level.

The left engine was found attached to the inboard wing structure principally by cables and skin. The right engine separated from the airframe and was inside the building at ground level. It had come to rest in the northwest corner of the building. The nose cone area of the fuselage was crushed in an aft direction.

Responding fire department personnel reported noting a strong odor of fuel in the vicinity of the main wreckage and at ground level inside the building. The left wing's fuel tank was crushed, and no fuel was noted. During the recovery procedure, fuel was draining from the impact-damaged right wing and it pooled beneath the wreckage. The propeller assemblies were attached to the engines.

Fire department and contract structural engineers reported to the Safety Board investigator that the building's integrity had been compromised due to the impact. After the building's walls were reinforced to preclude collapse and roof sections removed, the wreckage was hoisted vertically out of the building. Thereafter, Safety Board investigative personnel examined it.

MEDICAL AND PATHOLOGICAL INFORMATION

The pilot reported that he does not take any prescription or non-prescription drugs and that he does not smoke. He stated that there have been no significant changes in his health during the past year.

TESTS AND RESEARCH

Airframe Structure and Control Examination.

The airplane was initially examined on scene immediately following its extrication from the building. Thereafter, it was transported to a recovery facility where a detailed structural examination was performed.

In summary, all flight control surfaces were found in the vicinity of the main wreckage. With the exception of the separated left wing and left horizontal stabilizer, all flight controls were attached to their respective hinges. No evidence was found of any preimpact control system anomalies. The continuity of the flight control system was confirmed.

The wing flap jackscrews were examined and were found in positions corresponding to fully retracted flaps, according to the Raytheon (Beech Aircraft) participant. The rudder trim was in a neutral position.

Propeller Examination.

The propeller blades were observed attached to their hub assemblies, which were attached to the propeller shaft flanges and engines. The propeller blades were torsionally twisted, leading edge gouged, and scratched in a chordwise direction. Additionally, they exhibited an "S" bend and several tips were broken.

Engine Examination.

The Pratt & Whitney engine participant reported that its records indicated the engines installed on the accident airplane were original to the airframe. There was no history of sudden stoppage, accidents, or incidents.

The engines' fuel controls were set to the maximum power position. The air inlet screens were covered with building-related debris, the compressors ingested building-related debris, and debris exited the bleed valve assemblies. Also, the exhaust ducts were twisted and wrinkled in a manner consistent with absorption of high, propeller blade-like rotational energy. Following the Safety Board investigator's supervised examination, the participant opined the evidence indicated that "both engines had been commanded to maximum power via cockpit and engine control settings, and at the time of impact both engines were running and producing power."

Avionics Examination.

The pilot reported to Safety Board investigators that the airplane's IFR certified GPS receiver had been turned on prior to his initiation of the instrument approach into Reno. During the accident investigation, the receiver was removed from the airplane's instrument panel and sent to Northstar Technologies, Action, Massachusetts, for examination under FAA supervision.

In summary, the receiver had a current Jeppesen Flight Card installed. The receiver was approved by the FAA for IFR usage. It was in the "approach enabled" operating mode. No "breadcrumb" flight track history was incorporated in the software. The receiver updates its recorded position at 1-second intervals. About the time the receiver lost electrical power, its last known position (LKP) was automatically recorded. The coordinates of this position were north 39 degrees 28.21 minutes latitude by west 119 degrees 46.12 minutes longitude.

Pneumatic System Examination and Deice Boots.

With the exception of the majority of the left wing's destroyed deice boot and the totally destroyed left horizontal stabilizer's deice boot, all of the boots were tested to ascertain their ability to pressurize utilizing an external air supply source. The air supply was initially directed into the airplane's pneumatic air supply lines at attachment points next to the inboard portion of each respective boot assembly at the wing roots, and from the rear side of the aft pressure bulkhead. Using pressurized air at these locations, all of the testable boots inflated.

However, further examination showed that air could not reach the tail boots when it was pumped into the pneumatic system from a location upstream of the boots. In one area of the

airplane, a blockage was noted to the pneumatic air supply line during its integrity examination. The blockage was near the bottom of the right side aft fuselage, near Station 277. At Station 277, a heat register is located just forward of the aft lavatory. In this area the "1010 EVA 5/8 Imperial" tubing that supplies pneumatic pressure to the empennage deice boots runs parallel to and approximately 2 inches away from the heat ducting. This tubing collapsed and appeared melted, from approximately 11 inches aft of Station 277 to approximately 9 inches forward of Station 277.

After finding the blockage in the pneumatic line, the adjacent environmental heat ducting was examined. This environmental heat ducting, which supplies hot air to the cabin, runs the length of the right side fuselage under the floorboards from the cockpit to the Station 277 heat register. The right side floorboard panels were removed to provide complete access to the entire hot air system. This system incorporates plastic tubular ducting, which varies in size and shape throughout the length of the fuselage, and is completely covered with insulation material. To test for leakage, smoke was blown into the ducting utilizing a smoke generator.

Smoke was applied into the insulated plastic ducting at the floor outlet that was located aft of the first officer's seat. When smoke was applied, smoke leakage was observed at various locations along the plastic ducting including the ducting vent by Station 277, near the blocked pneumatic line. The insulation material was then removed in the areas of the leakage to expose the tubing. Several locations of the tubing had suffered severe heat distress, showing evidence of collapse and of a splitting along a seam line. The heat distress was more severe in the section of the ducting where the tubing necked down to the smaller diameter necessary to connect to the floor outlets. (See the Safety Board Maintenance Group Chairman's Factual Report for additional information.)

In summary, the examination revealed that the pneumatic line that routes deice boot air, in the vicinity of the aft lavatory, had been melted and was completely collapsed in one area (see photographs). The collapse and blockage to this pneumatic line in this area precluded the deice boots on all tail surfaces from inflating during the post impact examination when the pressurized air source was connected to the pneumatic line from a location forward of the aft pressure bulkhead.

Maintenance History and Records.

A review of the operator's maintenance records revealed that there were no outstanding airworthiness directives or service bulletins on the airplane. The pilot verbally reported that there were no outstanding squawks when he departed from Truckee or Durango. In addition, the pilot stated that no malfunctions were experienced during the accident flight. At no time during the flight was there evidence of smoke in the cabin or the odor of burning material. Also, the cabin's ambient air temperature and pressure had been normal.

Preflight Inspection Procedure.

Notwithstanding maintenance procedures, in order to inflate the deice boots to perform a functionality check, a pilot is required to have an engine operating. Most of the tail-mounted boots cannot be seen from inside the cockpit.

According to Regent Air's chief pilot, it is a typical procedure to check the tail deice boots during the daytime. However, they are not typically checked during nighttime operations, nor are they checked before every flight.

Radar and Performance Study.

The Safety Board's Washington, D.C., Office of Research and Engineering, Vehicle Performance Division, performed a study of FAA recorded radar data and analyzed the airplane's performance characteristics. The data was processed and calculations for airplane heading (yaw), pitch, roll, angle of attack, air speed, ground speed, and climb/descent rates were calculated and plotted. Profile and plan view displays were produced showing the flight altitude profile in line with the final approach course, and the ground track in reference to the accident site as well as orientation to the runway for the final portion of the flight.

In pertinent part, the data showed that the airplane was flying at a level altitude of 9,000 feet msl between 1935 and 1936, as the pilot was making his final turn toward the runway's final approach course. Between these times, the airplane's estimated calibrated airspeed (CAS) was between 160 and 175 knots. About 1936, the airplane started experiencing significant yawing motions, of up to 20 and 30 degrees to the left and right, and the airplane's estimated descent rate began to vary between 1,100 and 1,500 feet per minute (fpm). Also about this time, the airplane's estimated bank angle began to vary between 17 degrees to the right and 10 degrees to the left. Between 1936:30 and 1940:00, the airplane's estimated pitch attitude and angle of attack varied slightly being about -3 degrees and 0 degrees, respectively, until about 1938:00. At nearly 1940:00, the airplane's estimated pitch attitude and angle of attack had increased to about 8 and 14 degrees, respectively.

About 1938:30, the airplane's estimated CAS had decreased below the recommended minimum approach speed of 140 knots for icing conditions. About this time, the airplane was approximately 3 1/2 miles from the runway. The airplane's estimated CAS continued to decrease rapidly to about 75 knots just prior to 1940:00, which is the estimated time of impact. (See the Safety Board's specialist report for additional information and for constraints of the data used in the study.)

ADDITIONAL INFORMATION

On May 6, 2003, the Raytheon Aircraft Company's participant advised the Safety Board investigator that, in response to previous communications with the investigator, Raytheon had begun revising its Model 90 King Air series Pilot's Operating Handbooks and Pilot's Operating Manuals to include the following (checklist) statement: "Check both wing and both horizontal stabilizer boots visually, if possible, for inflation and vacuum hold down."

The airplane wreckage was released to the operator's insurance company representative on July 31, 2002.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	25,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	May 14, 2001
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 22, 2002
Flight Time:	1610 hours (Total, all aircraft), 608 hours (Total, this make and model), 1210 hours (Pilot In Command, all aircraft), 138 hours (Last 90 days, all aircraft), 54 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N948CC
Model/Series:	E90	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	LW-236
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	February 28, 2002 AAIP	**Certified Max Gross Wt.:**	10500 lbs
Time Since Last Inspection:	26 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	8773 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	PT6A-28
Registered Owner:	PILOT SERVICES CORPORATION	**Rated Power:**	550 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	Regent Air, Inc.	**Operator Designator Code:**	OBMA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	RNO,4412 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	19:39 Local	**Direction from Accident Site:**	343°
Lowest Cloud Condition:		**Visibility**	0.5 miles
Lowest Ceiling:	Broken / 700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	300°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	-2°C / -3°C
Precipitation and Obscuration:	N/A - Blowing - Snow		
Departure Point:	DURANGO, CO (DRO)	**Type of Flight Plan Filed:**	IFR
Destination:	Reno, CA (RNO)	**Type of Clearance:**	IFR
Departure Time:	16:25 Local	**Type of Airspace:**	Class C

Airport Information

Airport:	Reno RNO	**Runway Surface Type:**	Concrete
Airport Elevation:	4412 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:	34L	**IFR Approach:**	LOC-backcourse
Runway Length/Width:	11000 ft / 150 ft	**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Serious, 4 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 5 Minor	**Latitude, Longitude:**	39.470275,-119.768608

Administrative Information

Investigator In Charge (IIC):	Pollack, W.
Additional Participating Persons:	Reid Walburg; Federal Aviation Administration; Reno, NV Brian Cassidy; Raytheon (Beech) Aircraft Company; Wichita, KS Craig Williams; Pratt & Whitney Canada; Galt, CA
Original Publish Date:	March 2, 2004
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=54341