National Transportation Safety Board
Aviation Accident Final Report

Location:	Mount Airy, NC	**Accident Number:**	NYC08MA090
Date & Time:	02/01/2008, 1128 EST	**Registration:**	N57WR
Aircraft:	RAYTHEON AIRCRAFT COMPANY C90A	**Aircraft Damage:**	Substantial
Defining Event:	Aerodynamic stall/spin	**Injuries:**	6 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

While flying a nonprecision approach, the pilot deliberately descended below the minimum descent altitude (MDA) and attempted to execute a circle to land below the published circling minimums instead of executing the published missed approach procedure. During the circle to land, visual contact with the airport environment was lost and engine power was never increased after the airplane had leveled off. The airplane decelerated and entered an aerodynamic stall, followed by an uncontrolled descent which continued until ground impact. Weather at the time consisted of rain, with ceilings ranging from 300 to 600 feet, and visibility remaining relatively constant at 2.5 miles in fog. Review of the cockpit voice recorder (CVR) audio revealed that the pilot had displayed some non professional behavior prior to initiating the approach. Also contained on the CVR were comments by the pilot indicating he planned to descend below the MDA prior to acquiring the airport visually, and would have to execute a circling approach. Moments after stating a circling approach would be needed, the pilot received a sink rate aural warning from the enhanced ground proximity warning system (EGPWS). After several seconds, a series of stall warnings was recorded prior to the airplane impacting terrain. EGPWS data revealed, the airplane had decelerated approximately 75 knots in the last 20 seconds of the flight. Examination of the wreckage did not reveal any preimpact failures or malfunctions with the airplane or any of its systems. Toxicology testing detected sertraline in the pilot's kidney and liver. Sertraline is a prescription antidepressant medication used for anxiety, obsessive-compulsive disorder, panic disorder, posttraumatic stress disorder, and social phobia. The pilot's personal medical records indicated that he had been treated previously with two other antidepressant medications for "anxiety and depression" and a history of "impatience" and "compulsiveness." The records also documented a diagnosis of diabetes without any indication of medications for the condition, and further noted three episodes of kidney stones, most recently experiencing "severe and profound discomfort" from a kidney stone while flying in 2005. None of these conditions or medications had been noted by the pilot on prior applications for an airman medical certificate. It is not clear whether any of the pilot's medical conditions could account for his behavior or may have contributed to the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain control of the airplane in instrument meteorological conditions. Contributing to the accident were the pilot's improper decision to descend below the minimum descent altitude, and failure to follow the published missed approach procedure.

Findings

Aircraft	Performance/control parameters - Not attained/maintained (Cause)
Personnel issues	Aircraft control - Pilot (Cause) Decision making/judgment - Pilot (Factor) Use of medication/drugs - Pilot Use of policy/procedure - Pilot (Factor)
Environmental issues	Low ceiling - Decision related to condition Low visibility - Decision related to condition Drizzle/mist - Decision related to condition

Factual Information

HISTORY OF FLIGHT

On February 1, 2008, about 1128 eastern standard time, a Raytheon Aircraft Company C90A, N57WR, was substantially damaged when it impacted terrain during a missed approach following an instrument approach to the Mount Airy/Surry County Airport (MWK), Mount Airy, North Carolina. The certificated commercial pilot, pilot rated passenger, and four passengers were fatally injured. Instrument meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan had been filed for the flight, which departed Polk County Airport/Cornelius Moore Field (4A4), Cedartown, Georgia. The personal flight was conducted under 14 Code of Federal Regulations (CFR) Part 91.

According to witness statements, rain, low ceilings, and fog were present in the local area. The pilot was first heard to check in on the MWK common traffic advisory frequency (CTAF), and announce "final 36, Mount Airy." The airplane was then observed to "break out of the clouds" at approximately 500 feet above ground level (agl), in close proximity to the airport, and then descend "rapidly" for about 200 feet. It was then observed to "side step" to the left of the runway, and fly parallel to it for its entire length. The airplane then made a "hard" left turn at the end of the runway and climbed into the "fog." A few minutes later, it came out of the bottom of the clouds in a nose down attitude, disappeared behind trees east of the airport and the sound of impact was heard.

According to Federal Aviation Administration (FAA) air traffic control (ATC) voice and radar data, the airplane departed 4A4 at approximately 1024 and arrived in the vicinity of MWK approximately 50 minutes later.

After arrival in the local area, the pilot contacted Greensboro Approach (GSO) and advised the controller that he was level at 4,000 feet above mean sea level (msl) on a northeast-bound track toward MWK. The GSO controller then instructed the pilot to maintain 4,000 feet msl until crossing the EDLIF waypoint, fly the Global Positioning System (GPS) approach to runway 36 at MWK, and switch to the CTAF for the airport.

Radar data obtained from the terminal radar approach control facility at GSO contained recorded radar targets for the accident airplane from 1112 until 1128. During the GPS approach to runway 36, the airplane was recorded tracking inbound to the airport. The last radar target on final approach was recorded at 1125:40, at 2000 feet, approximately 1.25 nautical miles (nm) from the runway 36 threshold. No more radar targets were recorded until 1127:49, when the target representing the airplane reappeared on radar on a left base leg at 2300 feet. The target continued to turn left to about a 020-degree heading, overfly the threshold of runway 36 at 2300 feet, and continue on a 020-degree heading for another 14 seconds. The last target was recorded to the east of the airport, .6 nm south of the accident site, at 2,700 feet.

The accident occurred during the hours of daylight. The wreckage was located at 36 degrees, 27.797 minutes north latitude, 80 degrees, 33.042 minutes west longitude, at an elevation of 1,219 feet msl.

PERSONNEL INFORMATION

According to FAA records, the pilot held a commercial pilot certificate with ratings for airplane multiengine land, airplane single engine land, and instrument airplane. He reported 780 total

hours of flight experience on his most recent application for a FAA second-class medical certificate, dated August 6, 2007.

According to FAA records, the pilot-rated passenger held a private pilot certificate with ratings for airplane single engine land and instrument airplane. According to pilot records, he had accrued 1082.8 total hours of flight experience. His most recent application for a FAA second-class medical certificate was dated November 9, 2006.

AIRCRAFT INFORMATION

According to FAA and maintenance records, the airplane was manufactured in 2005. The airplane's most recent manufacturer's recommended inspection program, phase inspection, was completed on November 9, 2007. At that time the airplane had accrued 799.7 total hours of operation.

METEOROLOGICAL INFORMATION

According to National Weather Service (NWS) analysis charts, a surface occluded/cold front was moving eastward across western North Carolina during the late morning of February 1. Also, the charts indicated that a warm front over southern/eastern North Carolina was moving northward. A low-level cold wedge was situated between the fronts over north-central North Carolina (including MWK). The cold wedge was characterized by light easterly/northeasterly low-level flow near the surface and a strong inversion at about 5,000 feet. At and above the inversion, strong southerly-south southwesterly winds with speeds exceeding 50 knots were indicated over central North Carolina.

Widespread IFR conditions with scattered rain and drizzle were prevalent in the cold wedge.

Cloud Conditions on Approach

Infrared satellite images for the nominal times of 1110 and 1132 indicated cloud-top radiative temperatures in the vicinity of MWK ranged between +4 and –6 degrees Celsius (C). Upper air data implied cloud tops in this temperature range were 7,200 and 13,000 feet msl.

Surface Weather Conditions

An Automated Weather Observing System-3 (AWOS-3) recorded and disseminated official weather observations at MWK.

A weather observation taken about 3 minutes before the accident included: calm winds, visibility 2 and 1/2 miles in drizzle, overcast clouds at 600 feet, temperature 1 degrees C, dew point 0 degrees C, and an altimeter setting of 29.90 inches of mercury.

A weather observation taken about 13 minutes after the accident included: calm winds, visibility 2 and 1/2 miles in heavy drizzle, broken clouds at 300 feet, overcast at 600 feet, temperature 1 degrees C, dew point 0 degrees C, and an altimeter setting of 29.90 inches of mercury.

A review of surrounding weather observations by a NTSB meteorologist and post-accident certification of the equipment indicated that the AWOS-3 was reporting current weather conditions within the design specifications of the system.

AIRPORT INFORMATION

According to the Airport Facility Directory, MWK was a public use airport. It had one runway, oriented in an 18/36 configuration. Runway 36 was asphalt, in good condition. It was 4,300 feet long by 75 feet wide. The runway had non-precision markings that were in good condition. It was equipped with runway end identifier lights, medium intensity runway edge lights, and a 2-light precision approach path indicator.

FLIGHT RECORDERS

During examination of the wreckage, it was discovered that the airplane was equipped with an L-3 Communications FA 2100-1010 Cockpit Voice Recorder (CVR). Examination of the recorder by the NTSB's vehicle recorders laboratory revealed that the CVR had recorded 31 minutes and 3 seconds of useable audio.

The following is a summary of the recorded events:

The recording began at 10:57:23, prior to the pilot being cleared for the approach. Review of the audio revealed that the private pilot passenger who was seated in the front right seat of the airplane was assisting the pilot during the flight.

At 10:57:49, a discussion ensued between the pilot and pilot-rated passenger regarding a possible diversion if needed to another airport that was 25 miles from MWK. At that time the pilot asked the pilot-rated passenger if he remembered how to shoot an instrument landing system (ILS) approach in “this thing.”

At 10:58:08, the pilot rated passenger advised him that he thought he could.

At 11:00:58, the pilot began to sing to the passengers, "Save my life I'm going down for the last time." This continued until 11:01:22, when the pilot began a commentary to the passengers stating, "If anybody back there believes in the good Lord, I believe now would be a good time to hit your knees."

Shortly after, the pilot began a descent to 11,000 msl.

At 11:03:32, the pilot commented to the pilot-rated passenger, “let’s slow down a little bit.” This was followed by the pilot advising the pilot rated passenger that if he reduced power anymore, it would scare his passengers.

At 11:05:40, the pilot and pilot-rated passenger received the weather via the AWOS. The weather they received at that time was: wind calm, visibility 3 miles in heavy drizzle, overcast ceiling at 600 feet, temperature 1 degree C, dewpoint –1 degree C, and altimeter 29.91 inches of mercury.

At 11:06:25, the pilot stated, “you watch ‘em – you watch this ice for me,” as the windshield was beginning to accrete ice.

At 11:06:47, the pilot-rated passenger reminded the pilot to set his altimeter to the reported barometric pressure.

At 11:06:58, the pilot advised the pilot-rated passenger that the ice was melting off the airplane.

Moments later, the pilot was instructed by ATC to descend at pilot’s discretion to 6,000 feet.

At 11:09:08, the pilot requested the pilot-rated passenger to help “make sure we’re set up,” and to “read me off.”

At 11:09:13, the pilot-rated passenger began to brief the GPS runway 36 approach procedure.

At 11:11:28, the pilot-rated passenger asked the pilot, “Do you want to go ahead and slow down a little bit?” The pilot replied that he was at 160 knots and that he did not want to slow further do to ice.

Shortly after, the pilot was cleared to descend to 4,300 feet.

At 11:15:58, the pilot began to talk about the simulator and ground training he received. This continued until 11:17:03 at which time the pilot was cleared to descend to 4,000 feet.

At 11:17:37, the pilot was cleared for the “GPS runway three six approach, Mount Airy.”

At 11:17:57, a conversation between the two pilots began regarding the approach and what altitudes they could descend to as they reached each designated navigational fix on the approach.

At 11:22:17, the pilot advised the pilot rated passenger to “have that missed approach thing ready.”

At 11:22:32, a sound similar to flap handle movement and flap extension was recorded.

At 11:22:38, conversation once again ensued regarding what altitudes they could descend to as they reached each designated navigational fix on the approach.

At 11:23:07, the pilot-rated passenger stated, “get it down.”

At 11:23:39, conversation once again ensued regarding what altitudes they could descend to as they reached each designated navigational fix on the approach.

At 11:24:10, a sound similar to landing gear extension was recorded.

At 11:24:24, the pilot-rated passenger stated “sixteen hundred not fifteen.” Moments later the pilot responded, “I know but I’m gonna bust it.” The pilot-rated passenger replied “uh no were not.”

At 11:24:30, the pilot stated “I mean I don’t wanna – I’m gonna bust it this way. I’m not gonna – I’m not going to uh.”

At 11:25:28, the pilot-rated passenger stated “come on down.” Moments later he reiterated, “keep bringing her on down.”

At 11:26:07, the pilot advised the pilot-rated passenger that they “we’re way high” and that “we’re gonna have to circle.” The pilot-rated passenger replied, “keep bringing it.” The pilot then stated, “we can’t – we can’t land.”

At 11:26:18, “sink rate. sink rate” was recorded from the enhanced ground proximity warning system (EGPWS).

At 11:26:25, a sound similar to flap handle movement and flap retraction was recorded.

At 11:26:36, the pilot stated, “we’re low.” Moments later the pilot-rated passenger stated, “fourteen hundred.”

At 11:26:44, the pilot stated, “I don’t know how safe this is.”

At 11:27:14, the pilot-rated passenger stated, “circle to land is seventeen hundred, stay at eighteen hundred.”

At 11:27:14, the pilot asked the pilot-rated passenger if he could see the airport. The pilot-rated passenger stated that he could but that “you need to circle around and go missed.”

At 11:27:24, the pilot-rated passenger repeated that the pilot needed to “go missed,” and moments later advised him that he could no longer see the ground.

At 11:27:42, the pilot stated that he did not know which way he was going. The pilot-rated passenger then advised him to “turn back to a heading of three six oh.”

At 11:27:48, a sound similar to a stall warning horn was recorded. This sound was repeated multiple times throughout the remainder of the recording.

At 11:28:17, the sound of increasing engine noise along with a sound similar to autopilot disconnect was recorded.

At 11:28:23, “sink rate. pull up” was recorded from the EGPWS.

The recording ended at 11:28:26.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest in a residential area, upright on a magnetic heading of 200 degrees. Its angle of impact was approximately 45 degrees nose down. The fuel system was compromised in multiple locations and the ground around the wreckage was fuel-soaked. No debris path existed, and the initial impact point coexisted with the remains of the airplane. All major components of the airplane were accounted for at the accident site.

Examination of the wreckage revealed no evidence of any preimpact malfunctions, structural failures, or in-flight fire. The landing gear was in the extended position prior to impact, and both propellers revealed evidence of propeller blade S-bending. No evidence of mechanical failure of the propellers or engines was discovered.

The wreckage displayed crush, fragmentation, and compression damage. Ground scars corresponding to the leading edges of the wings were also evident. All doors exhibited evidence of being closed on impact and the fuel filler caps were found to be in the closed and locked position, with the exception of the left wing fuel filler cap, which was still attached by its lanyard to the filler port and was impact damaged.

The nose section had been crushed, the windscreen was partially buried below ground level, and the copilot’s side window had been displaced inward. The right-hand side of the fuselage sidewall was fractured forward of seat 4B, and the right wing had been displaced from its mounting position at both aft attach fittings but remained attached by the center wing attach point. The rear fuselage from the aft pressure bulkhead to the horizontal stabilizer was crushed and the skin torn nearly circumferentially, with the right side of the fuselage skin separated from the trailing edge of the wing to the leading edge of the horizontal stabilizer.

The left wing outer panel had remained attached to the center wing at 3 locations; the aft lower fitting, the forward upper fitting, and the aft upper fitting. The aft upper fitting was fractured just outboard of the faying surface.

Examination of the primary and secondary flight controls revealed that the left and right ailerons and rudder control surfaces exhibited impact damage (crushing and chord-wise buckling) and were partially separated from their mounts. Both elevator control surfaces

remained attached. Control continuity was established for all flight controls from the respective control surface to the main cabin, where crushing of the cockpit floor precluded further examination. The rudder trim tab actuatorextension was measured and the extension corresponded to a 1 to 2 degree rudder trim tab trailing edge left position. The aileron trim tab actuator extension was measured and the extension corresponded to a 7.5 degree aileron trim tab trailing edge up position. Both elevator trim actuator extensions were measured and those extensions corresponded to a 6 to 7 degree elevator tab trailing edge down position. The electric pitch trim was OFF. The cockpit flap switch was in the APPROACH (15 degree) position. The four flap actuator extensions were measured, and those extensions corresponded to the flaps being between the APPROACH FLAP and FLAP UP positions.

SURVIVAL FACTORS INFORMATION

The airplane's passenger restraint system consisted of shoulder harnesses and seat belts. These were installed by the manufacturer as standard equipment for all six seating positions.

The cockpit seats shoulder harnesses were of a "Y" configuration with the single strap being contained in an inertial reel attached to the back of the seat. The two straps were designed to be worn with one strap over each shoulder and fastened by metal loops into the seat belt. Spring loading at the inertial reel kept the harness snug, but would allow normal movement required during flight operations. The inertial reel was equipped with a locking device that would secure the harness in the event of sudden movement or an impact action.

The shoulder harnesses on the passenger seats consisted of a single strap which was routed through the top of the seatback and terminated in a triangular metal fastener. The strap was designed to be worn diagonally. It ran from the outboard shoulder to the inboard hip area, where it was secured by hooking a metal fastener around a securing stud on the male half of the seatbelt buckle. The shoulder harness strap coiled and uncoiled from an inertial reel built into the passenger seat. Spring loading at the inertial reel kept the shoulder harness snug, but allows considerable freedom of movement. However, the inertial reel also incorporated a locking device that would secure the harness strap in the event of sudden movement.

According to the King Air C90A Pilot's Operating Handbook (POH), all occupants were required to wear seatbelts during takeoff and landing. If a seat was equipped with a shoulder harness, it was also required to be worn during takeoff and landing.

According to the Surry County Medical Examiner, four of the occupants were found unrestrained near the front of the passenger cabin. Examination of the wreckage, and occupant restraint system by NTSB investigators revealed, that on four of the six seats, the passenger restraints were unfastened.

14 CFR Part 91.107

According to 14 CFR Part 91.107, "No pilot may take off a U.S.-registered civil aircraft (except a free balloon that incorporates a basket or gondola, or an airship type certificated before November 2, 1987) unless the pilot in command of that aircraft ensures that each person on board is briefed on how to fasten and unfasten that person's safety belt and, if installed, shoulder harness."

Additionally, "No pilot may cause to be moved on the surface, take off, or land a U.S.-registered civil aircraft (except a free balloon that incorporates a basket or gondola, or an airship type certificated before November 2, 1987) unless the pilot in command of that aircraft ensures that

each person on board has been notified to fasten his or her safety belt and, if installed, his or her shoulder harness."

AM-400-90/2

According to the FAA Civil Aerospace Medical Institute's publication AM-400-90/2, seat belts will only protect occupants in minor impacts; however the use of shoulder belts will reduce major injuries by 88 percent and fatalities by 20 percent.

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies were performed on the pilot and pilot rated passenger by the North Carolina Baptist Hospital, Department of Pathology on behalf of the Surry County Medical Examiner.

Toxicological testing of the pilot and pilot rated passenger was conducted at the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma.

The toxicological report for the pilot rated passenger revealed that no drugs or ethanol were detected in his liver or muscle.

The pilot's forensic toxicology report revealed:

" >> SERTRALINE detected in Kidney

>> SERTRALINE detected in Liver

>> DESMETHYLSERTRALINE detected in Kidney

>> DESMETHYLSERTRALINE detected in Liver"

According to the 2008 edition of Drug facts and Comparisons, Sertraline (commonly known by the trade name Zoloft), is a prescription antidepressant medication also used for anxiety, obsessive-compulsive disorder, panic disorder, posttraumatic stress disorder, and social phobia. Desmethylsertraline is a metabolite of sertraline.

On applications to the FAA for his Airman Medical Certificate, the pilot had indicated a history of "Hay fever or allergy," "Kidney stone or blood in urine," and "Admission to hospital," but the FAA records did not indicate that any details of the conditions were provided or requested. The most recent application, dated August 6, 2007, specifically indicated "No" in response to "Diabetes" and "Mental disorders of any sort, depression, anxiety, etc."

Review of the pilot's personal medical records indicated a history of symptoms of "anxiety and depression" in 1996, treated with paroxetine, and a history of "impatience" and "compulsiveness" in 2001, treated with citalopram. The records also documented that from December 4, 2006 through December 31, 2007, the pilot had filled 6 prescriptions for 30 tablets of 50 mg sertraline.

The pilot's personal medical records also indicated that the pilot had been diagnosed with diabetes in 2006, with elevated fasting blood glucose of 148 mg/dL, and elevated non-fasting blood glucose of 274 mg/dL. The records included no documentation of treatment other than a plan for a dietary consult, education, and instructions for blood sugar monitoring.

The pilot's personal medical records further noted three episodes of kidney stones, most recently experiencing "severe and profound discomfort" from a kidney stone while flying in 2005.

TESTS AND RESEARCH

Approach Information

Review of the GPS runway 36 approach for MWK revealed that the minimum descent altitude (MDA) authorized for a straight in approach was 1,680 feet msl. The MDA for a circling approach was 1,700 feet msl.

The missed approach point (MAP) was located at the runway threshold.

The missed approach was a "Climbing left turn to 4000 direct EDLIF WP and hold."

Aeronautical Information Manual (AIM)

According to the AIM, after passing the final approach fix on final approach, aircraft are expected to continue inbound on the final approach course and complete the approach or effect the missed approach procedure published for that airport.

The AIM advises that, the MAP on a nonprecision approach is not designed with any consideration to where the aircraft must begin descent to execute a safe landing. It is developed based on terrain, obstructions, navigational aid location (if one exists) and possibly air traffic considerations. Because the MAP may be located anywhere from well prior to the runway threshold to past the opposite end of the runway, the descent from the MDA to the runway threshold cannot be determined based on the MAP location. Descent from MDA at the MAP when the MAP is located close to the threshold would require an excessively steep descent gradient to land in the normal touchdown zone. Any turn from the final approach course to the runway heading may also be a factor in when to begin the descent.

The AIM also cautions that descent to a straight-in landing from the MDA at the MAP may be inadvisable or impossible, on a non-precision approach, even if current weather conditions meet the published ceiling and visibility. Aircraft speed, height above the runway, descent rate, amount of turn and runway length are some of the factors which must be considered by the pilot to determine if a landing can be accomplished.

In addition, the AIM states that, descent below the MDA, including during the missed approach, is not authorized unless the conditions stated in 14 CFR Section 91.175 exist.

14 CFR Part 91.175

According to 14 CFR Part 91.175 (Operation below decision height (DH) or MDA), where a DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DH unless—

(1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under part 121 or part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;

(2) The flight visibility is not less than the visibility prescribed in the standard instrument approach being used; and

(3) Except for a Category II or Category III approach where any necessary visual reference requirements are specified by the Administrator, at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:

(i) The approach light system, except that the pilot may not descend below 100 feet above the

touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.

(ii) The threshold.

(iii) The threshold markings.

(iv) The threshold lights.

(v) The runway end identifier lights.

(vi) The visual approach slope indicator.

(vii) The touchdown zone or touchdown zone markings.

(viii) The touchdown zone lights.

(ix) The runway or runway markings.

(x) The runway lights.

(d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when—

(1) For operations conducted under paragraph (l) of this section, the requirements of (l)(4) of this section are not met; or

(2) For all other part 91 operations and parts 121, 125, 129, and 135 operations, the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.

(e) Missed approach procedures. Each pilot operating an aircraft, except a military aircraft of the United States, shall immediately execute an appropriate missed approach procedure when either of the following conditions exist:

(1) Whenever operating an aircraft pursuant to paragraph (c) or (l) of this section and the requirements of that paragraph are not met at either of the following times:

(i) When the aircraft is being operated below MDA; or

(ii) Upon arrival at the missed approach point, including a DH where a DH is specified and its use is required, and at any time after that until touchdown.

(2) Whenever an identifiable part of the airport is not distinctly visible to the pilot during a circling maneuver at or above MDA, unless the inability to see an identifiable part of the airport results only from a normal bank of the aircraft during the circling approach.

Balked Landing (Go Around/Missed Approach)

Review of the King Air C90A POH revealed that in the event of a missed approach, engine power should be increased to “MAX ALLOWABLE,” and initially airspeed of 101 knots should be maintained.

Further review revealed that not only should the flaps be retracted but the landing gear as well. When clear of obstacles, the airplane should be accelerated to normal climb airspeed.

Terrain Avoidance Warning System (TAWS)

A Honeywell/Bendix King KMH-980 Multi-Hazard Awareness System was installed and

operating on the accident airplane. The KMH-980 paired a KTA-970 traffic alert system and a KGP-860 EGPWS to meet TAWS requirements.

The EGPWS used airplane inputs including geographic position, pressure altitude, and rate of climb, combined with an internal terrain, obstacle, and airport database information to predict potential conflicts between the predicted aircraft flight path and any terrain or obstacles within the database.

The system also utilized airspeed and ground speed to provide warning of potential wind shear conditions. If the logic for any programmed warning condition was satisfied, the EGPWS would provide visual and aural warning in the cockpit.

The data extracted from the EGPWS contained flight history information for 79 parameters. Review of the data revealed an approximate 75-knot decrease in ground speed during the last 20 seconds of the flight.

The accident airplane experienced two EGPWS alerts during the accident flight. The first came at system time 1137:34:38±1 second (s) and consisted of a Mode 1 “sink rate” warning. The second alert was a simultaneous Mode 1 “sink rate” and “pull up” warning at system time 1137:36:42±1s (The ±1s uncertainty was due to the nominal one second update rate of the recorded data.).

According to the Honeywell KMH-980 Pilot’s Guide, initially the voice alert “Sink Rate” would be heard, and a yellow caution alert annunciator lamp would illuminate.

If an aircraft continued in a high rate of descent, the “Sink Rate-Sink Rate” voice alert would be repeated at an increasing frequency.

If an aircraft penetrated the warning boundary, the voice alert “Pull Up” would be heard continuously and a red warning annunciator lamp would illuminate.

In both cases, if a pilot reacted to decrease the high rate of descent and the aircraft flight path exited the alerting/warning envelope, the annunciator lamp would extinguish and the voice alerts would cease.

Stall Warning System

According to the airplane manufacturer, the airplane would stall at 88 knots indicated airspeed at maximum gross weight with the flaps up and the engines at idle power.

Indication of an impending aerodynamic stall was provided to the pilot by the stall warning system. The system consisted of a lift transducer vane on the leading edge of the left wing, a stall warning horn mounted forward of the right instrument panel, a stall warning light on the upper center of the instrument panel, a lift transducer heater element, a circuit breaker, and a transistor switch.

Aerodynamic forces acting on the lift transducer vane would change when a stall was imminent and the vane would move. When the vane moved, the transistor switch would be activated which would complete the circuit to the stall warning horn and light; the horn would sound, and the light would be illuminated. With a standard onset rate of 1 knot per second, this would occur at 5 to 8 knots prior to the stall.

Stall Recovery

According to the Airplane Flying Handbook (FAA-H-8083-3A), a stall occurs when the smooth

airflow over the airplane's wing is disrupted, and the lift degenerates rapidly. This is caused when the wing exceeds its critical angle of attack. This can occur at any airspeed, in any attitude, with any power setting.

At the first indication of a stall, the pitch attitude and angle of attack must be decreased positively and immediately. Since the basic cause of a stall is always an excessive angle of attack, the cause must first be eliminated by releasing the back elevator pressure that was necessary to attain that angle of attack or by moving the elevator control forward. This lowers the nose of the airplane and returns the wing to an effective angle of attack.

Second, the maximum allowable power should be applied to increase the airplane's airspeed and assist in reducing the wing's angle of attack. The throttle should be promptly, but smoothly, advanced to the maximum allowable power.

Third, straight-and-level flight should be regained with coordinated use of all controls.

History of Flight

Approach-IFR final approach	Altitude deviation
Approach-IFR missed approach	Terrain avoidance alert Stall warn/stick-shaker/pusher Aerodynamic stall/spin (Defining event) Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Commercial; Private	**Age:**	50, 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 With Waivers/Limitations	**Last Medical Exam:**	08/06/2007
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	11/17/2006
Flight Time:	780 hours (Total, all aircraft), 392 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	RAYTHEON AIRCRAFT COMPANY	**Registration:**	N57WR
Model/Series:	C90A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	LJ-1678
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	11/09/2007, Continuous Airworthiness	**Certified Max Gross Wt.:**	10160 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Prop
Airframe Total Time:	800 Hours	**Engine Manufacturer:**	Pratt & Whitney Aircraft of Ca
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-21
Registered Owner:	BLUE SKY AIRWAYS INC	**Rated Power:**	550 hp
Operator:	BLUE SKY AIRWAYS INC	**Air Carrier Operating Certificate:**	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	MWK, 1249 ft msl	**Observation Time:**	1141 EST
Distance from Accident Site:		**Condition of Light:**	Day
Direction from Accident Site:		**Conditions at Accident Site:**	Instrument Conditions
Lowest Cloud Condition:	/ 300 ft agl	**Temperature/Dew Point:**	1°C / 0°C
Lowest Ceiling:	Broken / 300 ft agl	**Visibility**	2 Miles
Wind Speed/Gusts, Direction:	Calm	**Visibility (RVR):**	
Altimeter Setting:		**Visibility (RVV):**	
Precipitation and Obscuration:	Heavy - Drizzle; Fog		
Departure Point:	Cedartown, GA (4A4)	**Type of Flight Plan Filed:**	IFR
Destination:	Mount Airy, NC (MWK)	**Type of Clearance:**	IFR
Departure Time:	1024 EST	**Type of Airspace:**	

Airport Information

Airport:	Mt. Airy/Surry County Airport (MWK)	**Runway Surface Type:**	Asphalt
Airport Elevation:	1249 ft	**Runway Surface Condition:**	Wet
Runway Used:	36	**IFR Approach:**	Global Positioning System
Runway Length/Width:	4301 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	5 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	6 Fatal		

Administrative Information

Investigator In Charge (IIC):	Todd G Gunther	**Adopted Date:**	04/22/2010
Additional Participating Persons:	Michael W Harville; FAA/FSDO; Greensboro, NC Denis Rivard; TSBC; Ottawa, Canada, Paul Yoos; Hawker Beechcraft; Wichita, KS Thomas A Berthe; Pratt & Whitney Canada; Montreal, Canada, Tom McCreary; Hartzell Propeller; Piqua, OH		
Publish Date:	04/22/2010		
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/.		

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