Revised Factual ERA15FA340

HISTORY OF FLIGHT

On September 7, 2015, about 1203 eastern daylight time, N36HT, a Beech A36, was destroyed when it impacted terrain near Kernersville, North Carolina. The private pilot and the two passengers were fatally injured. The airplane was registered to Central Penn Aviation Academy Inc., Paxinos, Pennsylvania and operated by the pilot. An instrument flight rules (IFR) flight plan was filed for the flight that departed Sarasota-Bradenton International Airport (SRQ), Sarasota, Florida, about 0819, under the provisions of a 14 Code of Federal Regulations Part 91 personal flight. Instrument meteorological conditions (IMC) prevailed at the time of the accident.

According to radar and voice communication data provided by the Federal Aviation Administration (FAA), the airplane was being radar vectored by air traffic control for the ILS RWY 5R instrument approach to the Piedmont Triad International Airport (GSO), Greensboro, North Carolina, following a previous unsuccessful ILS approach to the same runway.

The pilot contacted GSO approach at 1132:54 and reported that he was descending through 5,700 ft. A controller replied that automated terminal information system (ATIS) information Delta was current, the altimeter setting was 30.19, and the pilot should expect to land on runway 5R. The pilot read back the runway assignment, and then asked if he should expect a visual approach. The controller stated that the pilot should expect the ILS approach, and asked the pilot to report when he had received information Delta. The pilot confirmed that he had information Delta, and then asked if the assigned runway was 5L. The controller reconfirmed the original assignment, runway 5R.

At 1133:51, the pilot asked the controller to confirm that he was cleared to descend to 5,000 ft. The controller responded that if 5,000 was the altitude assigned by the previous controller, it was correct, and also noted that he had not issued any other altitude instructions. The pilot acknowledged.

At 1135:14, the pilot again asked the controller to confirm whether he should expect runway 5R or 5L.The controller responded, "The right side – R I G H T." The pilot read back, "Five right 36HT."

At 1140:44, the controller instructed the pilot of N36HT to fly heading 360 for sequencing into GSO, and the pilot acknowledged. At 1143:26, the controller instructed the pilot to contact another controller on frequency 124.35.

The pilot contacted the controller at 1144:00 while the airplane was level at 5,000 ft. The controller provided the GSO altimeter setting, 30.19. At 1145:24, the controller cleared the pilot to descend to 3,000 ft. At 1148:01, the controller advised the pilot of potentially conflicting traffic ahead, type and altitude unknown. The pilot responded, "Roger – 36HT is about to go IMC." The airplane was descending through 3,600 ft at the time.
At 1148:38, the controller advised the pilot that traffic was no longer a factor and instructed him to turn right heading 010 degrees. The pilot correctly read back the heading. At 1149:04, the pilot reported level at 3,000 ft, and then asked if the controller wanted him to remain at 3,000 ft. The controller responded, "Affirmative."

At 1150:35, the controller transmitted, "N36HT niner miles from Pagan, turn right heading 020, maintain 3,000 until established on the localizer, cleared ILS runway 5R approach. The pilot responded, "Turning right heading 020 for Pagan." The controller restated the altitude restriction and the approach clearance, and the pilot correctly read it back.

At 1152:48, the pilot asked, "How do you like this route of flight?" The controller responded, "You look just a little bit right of course for the ILS, turn left heading 0…make that 360 for the ILS, report established." The pilot then asked, "Turning left or turning right for 360?" The controller replied, "left to 360," and the pilot acknowledged.

At 1153:59, the controller asked the pilot, "…are you established? [on the localizer]" The pilot responded, "Established if I could have vectors to final, please." The controller then asked, "…Are you established on the localizer?" The pilot stated, "I believe I am, 36HT." The controller continued, "Now you look like you just actually went

through the localizer." The pilot replied, "Roger – request a vector for final for 36HT." The controller issued an instruction to another airplane, then at 1154:30 transmitted, "N36HT cancel your clearance, maintain 3,000, turn left heading 320 for sequencing." The pilot read back, "Left 320."

At 1156:42, the controller instructed the pilot to turn left heading 230 degrees for vectors to the ILS runway 5R approach. The pilot correctly read back the instruction.

At 1157:30, the controller asked the pilot to verify that he was flying heading 230. The pilot replied, "Negative, and 36HT is close to..." The transmission ended incomplete. The controller then took a coordination call from another facility. During that call, the pilot called again in a strained tone, stating, "N36HT request vectors," and the controller also noticed that the airplane's altitude was below 3,000 ft. He ended the call and at 1157:57 responded to the pilot, "Bonanza 36HT you need to be level at 3,000, altitude shows you 2,500, Greensboro altimeter 30.19." The pilot responded, "6HT climbing to three." The controller asked the pilot to verify that he was on a 230 heading. The pilot did not respond.

At 1158:40, the controller asked the pilot to verify the airplane was at 2,900 ft. The pilot did so. At 1159:16, the controller asked the pilot to verify the airplane's heading. The pilot responded that the airplane was heading 166. The pilot continued, "We need a descent, we are almost disoriented, N36HT…2,700." In the background of the transmission, a female voice said, "Turn something off."

At 1159:43, the controller instructed the pilot to start a left turn and 16 seconds later told him to maintain 2,500 ft. The pilot did not acknowledge the turn, but radar data indicated the pilot initiated a left turn. At 1200:16, the controller instructed the pilot to start a right turn. The pilot responded, "Right turn, 36HT leveling off 2,500." At 1200:47, the controller transmitted a low altitude alert to N36HT along with the altimeter setting, and asked the pilot to say altitude. The pilot did not acknowledge the transmission, and radar data showed that during the next minute the airplane initially turned right but then entered and completed a 360-degree left turn.

At 1201:25, the controller transmitted, "N36HT climb and maintain 4,000, I can see if I get you back up into the uh above the clouds." At 1201:35, the controller continued, "N36HT Greensboro approach you up? Last altitude showed 2,100." At 1201:41, the pilot transmitted "N36HT" in an agitated voice. The controller replied, "N36HT just climb and maintain 4,000, I'll block altitude for you."

At 1202:06, the controller asked the pilot of N36HT, "… if he was able to take the climb", and continued, "Last tops were reported at 3,500, if I can get you up to 4,000 maybe you can square it back off." At 1202:18 a short sound was heard, possibly from the pilot. At 1202:39, the controller advised the pilot that his altitude was 2,100 ft.

At 1202:44, an unidentified transmission of what sounded like breathing was heard on the frequency. At 1202:54, the pilot asked, "Is there a nearby field for 36 ho-." The controller responded, "…the nearest airport is Greensboro airport, off your left wing and off your current heading 7 miles. Right now showing 1000 overcast for the ceiling."

At 1203:21, the controller asked the pilot for his altitude. At 1203:34, screams were heard on the frequency. There were no further communications with the pilot.

Several witnesses observed the airplane just prior to the accident. One witness stated that when he first saw the airplane, it was "very low" in the sky and was in a "sharp left turn" toward the west. He said the airplane was banking so sharply that the wings appeared to be vertical to the ground. A second witness stated that the airplane was flying low and was beneath the "low clouds." She said the airplane, "...looked as if it were a trick plane practicing stunts or else someone trying to stabilize the plane but continuing to overcorrect as the nose would go down then up and the wings would go from right to left and back, but it never stabilized." She also said the airplane was going "very slow." She last saw the airplane descend behind a tree line and out of her view, but she could still hear its engine. She described the sound being similar to when a lawn mower engine "quits right before it runs out of gas." She said the engine revved up and then slowed, revved up and slowed, and then about 5 to 10 seconds later she heard a loud pop similar to a bottle rocket.

A third witness was in his front yard when he saw the airplane flying from right to left away from the airport. He said the airplane appeared to be flying normally and the engine was operating as if "everything was normal." A few minutes later the airplane turned back toward the airport. The witness said that before the airplane's wings leveled, the left wing dropped, followed by the right wing in a swaying motion. The witness said that as the right wing was coming back up to level, the airplane descended below the tree line and disappeared from view followed by the sound of an impact.

A fourth witness was in her front yard when she observed the airplane in a "severe" bank to the right heading toward the southeast. She said the airplane made a sharp right turn and "spiraled downward making 3 to 4 rotations" before it disappeared from view behind trees. Shortly after, the witness observed black smoke coming up from behind the trees where she last saw the airplane.

PILOT INFORMATION

The pilot held a private pilot certificate with ratings for airplane single-engine land, and instrument airplane. His last FAA third-class medical was issued on April 17, 2014. At that time, he reported a total flight experience of 750 flight hours. The pilot's most recent logbook was not recovered and his overall flight experience and currency were not confirmed.

The pilot resided in Pennsylvania and had flown down to Florida on September 4, 2015, with his wife, father-in-law, and a friend, who was also a pilot and owned a Beech A36. According to the friend, the pilot had recently purchased the airplane and wanted to have another pilot along since this was his first long flight in the airplane. The friend estimated that the pilot only had about 6 hours of flight time in the airplane before the flight. The friend said the flight to Florida was uneventful; the airplane flew well, and the weather was mostly visual flight rules (VFR). The airplane was equipped with a Garmin 530/430 GPS, autopilot and a flight director, which were new to the pilot. During the flight, the friend helped the pilot practice loading instrument approaches into the Garmin 530 and they executed a practice instrument approach. The friend said the pilot had a lot of flight experience in instrument conditions in a Piper PA-28-180 airplane, but it did not have the advanced avionics or autopilot like the A36. The friend added that the pilot was getting more comfortable with the Garmin 530 and autopilot by the time they arrived in Florida.
The friend said the pilot dropped him off in Sarasota, Florida, and then the pilot and his family flew to St. Petersburg, Florida, to visit their daughter/granddaughter. The friend did not plan to return to Pennsylvania with the family the following Monday, but did monitor their trip via FlightAware. The friend was not aware if there was any reason the family had to get home on the day of the accident.

According to the pilot's primary flight instructor, the pilot had accrued over 800 hours of total flight time and had a lot of IFR experience in a Piper PA-28-180 airplane. The instructor said he had flown IFR with the pilot in the past and felt he was "very good and conscientious." After the pilot had purchased the accident airplane in August 2015, the instructor gave the pilot a complex check-out (6 hours flight time, 1.5 hours ground), which also included a demonstration on how to use the Garmin 530 for instrument approaches. These approaches were all done in VFR conditions and the pilot was not "under the hood." After the check-out, which was completed on September 2, 2015, 5 days before the accident, the instructor was not sure if the pilot flew the airplane before going to Florida; however, he did tell him not to fly in actual IFR conditions until he gained more flight experience.

The instructor said that the pilot had invited him and his wife to fly with them to Florida, but the instructor was unable to take the time off for vacation. So the pilot asked another friend to go. The instructor mentioned that the family was returning home on the 7th because the pilot's father-in-law was having surgery the following day. However, a family member confirmed that was not the case and it was just a standard doctor's appointment.

AIRCRAFT INFORMATION

The six-seat, low-wing, single-engine airplane was equipped with a six-cylinder, horizontally opposed, fuel-injected, 285-horsepower Continental IO-520-BB engine (s/n 830171-R) that drove a three-bladed McCauley propeller (s/n EE3711B). The airplane's last annual inspection was conducted on March 6, 2015, at an airframe total time of 3,743 hours. The engine had accrued 326 hours since factory rebuild.

METEROLOGICAL INFORMATION

Weather reported at GSO, about 6 miles northeast of the accident site, at 1154, was wind from 090 degrees at 6 knots, visibility 10 statute miles, ceiling 1,100 overcast, temperature 23 degrees C, dewpoint 21 degrees C, and a barometric pressure setting of 30.19 in Hg.

According to Lockheed Martin, the pilot received two separate weather briefings through the automated flight service station (AFSS) system. The first telephone briefing was obtained before departing St. Petersburg and the other before departing Sarasota. The first briefing lasted about 3 minutes and 36 seconds. The pilot filed an IFR flight plan and reported the flight to Sarasota would take 15 minutes and he had 5 hours of fuel onboard. He requested a hazardous weather briefing and was informed that a convective SIGMET for embedded thunderstorms would be west along his route of flight. The pilot then interrupted the briefer and ended the briefing.

In Sarasota, the pilot again contacted AFSS and filed an IFR flight plan direct to GSO and asked for a hazardous weather briefing. The pilot said the flight would take 3 hrs and 30 minutes and he had 5 hours of fuel onboard. The briefer informed the pilot that an AIRMET for IFR weather was issued for northern and Central Florida, Georgia, South Carolina and North Carolina. The pilot then asked about the convective weather that was approaching Sarasota and was told that the leading edge of the storm was about 12.2 miles southwest of the Sarasota airport. The pilot then tried to end the briefing so he could leave before the storm, but the briefer said he had yet to provide the adverse weather information for the requested route of flight and would not be able to consider the briefing complete. The briefer also stated that he could get in trouble for not providing the weather that the pilot had requested from him, but would end the briefing if the pilot wanted to "cut him off." The pilot told the briefer to continue, but shortly after, interrupted him and said, "Ok, I am perfect. Thank you for all the help."

COMMUNICATIONS

As part of the investigation, an NTSB air traffic control specialist conducted interviews of the controllers with GSO approach control, which included the controller who worked south-radar, west-radar, and their front line manager. The south-radar controller and the west-radar controller were both in contact with the pilot. The south-radar controller, who first handled the accident airplane as it approached GSO, said he did not think there was anything unusual about the flight, but felt it wasn't normal for the pilot to be so confused about which runway he had been assigned to land. He said it wasn't until after he had transferred the pilot to the west-radar controller that he noticed there was a problem when he saw the airplane was not properly lined up for the approach on runway 5R.

The west-radar controller said he was aware the pilot was disorientated and not maintaining headings and altitude. He said he was trying to get the accident airplane on a solid vector so the pilot could level the airplane and then later climb above the clouds to regain visual orientation. In an attempt to assist the pilot, the controller asked the pilot if he was able to accept no-gyro vectors, which is a procedure where a controller will tell the pilot when to "start turn" and "stop turn", with the expectation that the pilot will turn at standard rate, or 3 degrees per second. The pilot said he was able to accept the vectors. Though no-gyro vectors are commonly used by controllers when a pilot's gyroscopic heading indicator fails, the pilot never reported a malfunction.

In regard to no-gyro procedures, the west-radar controller said he was not familiar with standard rate turns and only knew to tell a pilot to stop the turn as he approached the desired heading. He could not recall the last time he received training on emergencies or how to determine an emergency situation. The controller said he could not recall receiving simulator training on emergencies at GSO and had no training since his initial controller certification. He described the situation involving the accident airplane as a "priority" but not an emergency. Facility management provided four summaries of training scenarios that included unusual or emergency situations, but none included no-gyro vectors or focused on identification of emergencies.

The front line manager was also aware that the accident pilot was disorientated and not responding to assigned headings or maintaining altitude. He said the west-radar controller was handling the situation well and he was helping him reduce workload so he could focus on the accident airplane. However, he did say that he "felt in his gut" that

things were not going well and the situation was "serious." The front line manager heard the west-radar controller provide a no-gyro heading to the accident airplane and it appeared that the airplane was lining up with runway 5R, but it then disappeared off radar. When the target did not reacquire, the front line manager issued an "alert 3" for a possible accident. When asked about no-gyro procedures, the front line manager said he was familiar with standard rate turns and proper procedures for using them, but had not used them in many years. He said the best way to assist a pilot who is disoriented was to get them into visual conditions or get on the ground. It was important to get the airplane level, on a single frequency and to a safe altitude.

FAA Order JO 7110.65U, "Air Traffic Control"

Review of Section 10 of the order titled "Emergencies" provides controllers with the following guidance on recognizing and handling emergency situations:

Section 10-1-1 Emergency Determinations:

An emergency can be either a distress or an urgency condition as defined in the Pilot/Controller Glossary. The section also indicates that a pilot who encounters a distress condition should declare an emergency with the word "Mayday" preferably repeated three times, or "Pan-Pan" if an urgency condition also preferably repeated three times. If "Mayday" or "Pan-Pan" are not broadcast by the pilot but you (controller) are in doubt that a situation constitutes an emergency or potential emergency, handle it as though it were an emergency. Because of the infinite variety of possible emergency situations, specific procedures cannot be prescribed; however, when you believe an emergency exists or is imminent, select and pursue a course of action which appears to be most appropriate under the circumstances and which most nearly conforms to the instructions in this manual.

WRECKAGE INFORMATION

A postaccident examination of the airplane revealed it impacted terrain in an open area adjacent to an active rock quarry that had been recently graded and packed in preparation to start construction on a new building. The airplane came to rest upright about 6 miles southeast of GSO on a heading of 051 degrees. All major components of the airplane were accounted for at the accident site. A post-impact fire consumed a majority of the cockpit, fuselage, and both wings from the root to about mid-span. The tail section remained attached to the airplane and did not sustain any fire damage. Both wings remained attached to the airplane but sustained extensive fire and impact damage. Flight control continuity was established for all flight controls to the cockpit area. The flaps and landing gear were retracted.

Examination of the terrain around the main wreckage revealed the airplane had little to no forward movement when it contacted the ground, consistent with the airplane being in a steep nose down attitude at the time of impact. The airplane's windshield was fragmented and pieces of Plexiglas and parts of some of the flight instruments were found about 20-30 ft forward of where the main wreckage came to rest.

The engine remained partially attached to the fuselage and sustained extensive impact damage. The propeller flange and crankshaft were bent upwards and the top forward section of the engine crankcase was torn off exposing the internal components associated with No. 5 and No.6 cylinders. Since the crankshaft was bent, it could not be rotated.

The three-bladed propeller was buried, spinner side down, about 12-inches-deep into the ground. The spinner was crushed and the metal was peeled back. The propeller was separated and lying partially under the engine and main wreckage, which was lying flat on its belly. All three blades were loose in the hub but remained attached to the hub. Blade No. 1 was bent aft with some leading edge scoring; Blade No. 2 was bent aft and twisted with leading edge scoring with some gouging at the tip, and Blade No. 3 was bent aft with leading edge scoring.

The propeller governor, engine-driven fuel pump, throttle body/fuel metering unit, vacuum pump, alternator, starter motor/starter adapter, and oil pump were separated from the engine. The oil sump was fractured and the oil pick-up tube/screen remained attached to the fractured oil sump segment that remained with the oil pump. The pump was disassembled and no anomalies were noted to the pump gears or housing walls.

The engine-driven fuel pump sustained impact damage. The drive coupling was bent and could not be removed. The coupling could be rotated, but would bind on the areas where the coupling impinged the base of the pump. The pump was disassembled and no mechanical anomalies were noted.

The throttle body and metering unit sustained impact damage and had separated from one another. Examination of the throttle body revealed the valve was in the full-open position; however, it had sustained impact damage and the shaft was fractured. Witness marks consistent in size and shape as the edge of the throttle valve were noted on the inside walls of the throttle body. Positioning the throttle valve in the same areas as the witness marks placed the throttle valve in a near closed (or idle) position.

The manifold valve remained partially attached to the engine via the No.6 fuel injector line. The valve was disassembled and no anomalies were noted with the spring, plunger, and screen. The fuel injector nozzles were removed and each exhibited some form of deformation from impact. No anomalies were noted.

Both magnetos were separated from their respective mounting pads. The left magneto remained partially attached to the engine via the ignition leads. The housing was fractured, exposing some of the internal components. When the magneto was manually rotated the points opened and closed and the impulse coupling snapped. The right magneto sustained impact damage and all of the leads had separated. The unit was disassembled and the distributor and block were fragmented.

The spark plugs remained secure in their respective cylinders except for the top No. 1 plug, which was found in the wreckage. The No.1 spark plug's side-electrodes were stripped from the plug and found in the No. 1 cylinder. The other plugs were removed and each exhibit normal wear when compared to the Champion Spark Plug "Check A Plug" chart.

The internal chamber of the engine was examined with a lighted borescope. No mechanical deficiencies were noted that would have precluded normal operation of the engine prior to impact.

The vacuum pump was separated from the backside of the engine and sustained impact and thermal damage. The mounting flange was fractured and the two mounting studs that separated with the pump were sheared. The pump was disassembled and the rotor was fractured into four sections. All but one of the vanes remained intact except for one section that was fractured at the tip. The fractured tip was in a position that coincided with the narrowest portion of the pump's housing. The tips of each vane were smooth and there was no evidence of gouging on the pump wall.

The cockpit area sustained extensive impact and fire damage; however, the instrument air gauge needle and airspeed indicator were in relatively good condition. The instrument air gauge needle was stopped in the green arc, about 4.6 in Hg, and the air speed indicator needle was stopped about 189 knots. The altimeter sustained some impact damage. It indicated about 960 ft and 30.15 in Hg.

The horizontal situation indicator sustained extensive impact and thermal damage. The gimbal had separated from its housing and was found forward of the main wreckage. Examination of the internal housing revealed deep rotational scoring on the housing walls. Rotational gouging was also observed on the outer diameter of the gimbal.

The throttle, propeller control and mixture were all in the full forward position.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was conducted on the pilot by the Wake Forest Baptist Medical Center, Department of Pathology, Winston-Salem, North Carolina, on September 9, 2015. The cause of death was determined to be multiple blunt force trauma injuries.

Toxicological testing was conducted by the FAA's Bioaeronautical Research Laboratory, Oklahoma City, Oklahoma. The results were negative for all items tested.

ADDITIONAL INFORMATION

According to the FAA Flight Training Handbook, Advisory Circular (AC) 61-21A, page 9, "The flight attitude of an airplane is generally determined by reference to the natural horizon. When the natural horizon is obscured, attitude can sometimes be maintained by reference to the surface below. If neither horizon nor surface references exist, the airplane's attitude must be determined by artificial means - an attitude indicator or other flight instruments. Sight, supported by other senses such as the inner ear and muscle sense, is used to maintain spatial orientation.

However, during periods of low visibility, the supporting senses sometimes conflict with what is seen. When this happens, a pilot is particularly vulnerable to spatial disorientation. Spatial disorientation to a pilot means simply the inability to tell "which way is up."

According to an FAA Instrument Flying Handbook, AC 61-27C (Section II, "Instrument Flying: Coping with Illusions in Flight"), an illusion or false impression occurs when information provided by sensory organs is misinterpreted or inadequate and that many illusions in flight could be created by complex motions and certain visual scenes encountered under adverse weather conditions and at night. It also stated that some illusions may lead to spatial disorientation or the inability to determine accurately the attitude or motion of the aircraft in relation to the earth's surface.

The AC further stated that the most hazardous illusions that lead to spatial disorientation are created by information received from motion sensing systems, which are located in each inner ear. The AC also stated that the sensory organs in these systems detect angular acceleration in the pitch, yaw, and roll axes, and a sensory organ detects gravity and linear acceleration and that, in flight, the motion sensing system may be stimulated by motion of the aircraft alone or in combination with head and body movement. The AC listed some of the major illusions leading to spatial disorientation as follows:
"The leans - A banked attitude, to the left for example, may be entered too slowly to set in motion the fluid in the 'roll' semicircular tubes. An abrupt correction of this attitude can now set the fluid in motion and so create the illusion of a banked attitude to the right. The disoriented pilot may make the error of rolling the aircraft back into the original left-banked attitude or, if level flight is maintained, will feel compelled to lean to the left until this illusion subsides.

Coriolis illusion - An abrupt head movement made during a prolonged constant-rate turn may set the fluid in more than one semicircular tube in motion, creating the strong illusion of turning or accelerating, in an entirely different axis. The disoriented pilot may maneuver the aircraft into a dangerous attitude in an attempt to correct this illusory movement....

Inversion illusion - An abrupt change from climb to straight-and-level flight can excessively stimulate the sensory organs for gravity and linear acceleration, creating the illusion of tumbling backwards. The disoriented pilot may push the aircraft abruptly into a nose-low attitude, possibly intensifying this illusion.

Elevator illusion - An abrupt upward vertical acceleration, as can occur in a helicopter or an updraft, can shift vision downwards (visual scene moves upwards) through excessive stimulation of the sensory organs for gravity and linear acceleration, creating the illusion of being in a climb. The disoriented pilot may push the aircraft into a nose low attitude. An abrupt downward vertical acceleration, usually in a downdraft, has the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up attitude...."

The AC also stated that these undesirable sensations cannot be completely prevented but that they can be ignored or sufficiently suppressed by pilots' developing an "absolute" reliance upon what the flight instruments are reporting about the attitude of their aircraft.

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