National Transportation Safety Board

Washington, DC 20594

Response to Petition for Reconsideration

Date: January 16, 2014

Mr. Yatish Joshi, Petitioner
c/o Mr. Timothy J. Maher
Barnes and Thornburg LLP
600 First Source Bank Center
100 North Michigan Street
South Bend, Indiana 46601

In accordance with 49 *Code of Federal Regulations* (CFR) 845.41, the National Transportation Safety Board (NTSB) has reviewed the April 19, 2013, petition for reconsideration and modification of the probable cause for the aircraft accident involving a Cessna 206, N120HS, on April 20, 2006, near Bloomington, Indiana (CHI06FA117). On the basis of this review, the NTSB hereby denies the petition in its entirety.

On April 20, 2006, about 2345 eastern daylight time, a Cessna 206, N120HS, impacted trees and terrain while on approach to runway 35 at Monroe County Airport (BMG), near Bloomington, Indiana. The instrument-rated private pilot and the four passengers died as a result of their injuries, and the airplane was destroyed. The flight was operating under the provisions of 14 CFR Part 91. An instrument flight rules (IFR) flight plan was filed. Night instrument meteorological conditions prevailed at the time of the accident.

The findings and probable cause of the accident, which were adopted on June 27, 2007, were as follows:

Occurrence #1: In flight collision with object
Phase of operation: Approach—Final approach fix/outer marker to threshold (IFR)

Findings

1. Object—Trees
2. Decision height—Continued below–Pilot in command (Cause)
3. Light condition—Night—Pilot in command (Factor)
4. Altitude/clearance—Not maintained—Pilot in command (Cause)
5. Weather condition—Drizzle/mist (Factor)

Occurrence #2: In-flight collision with terrain/water
Phase of operation: Descent—Uncontrolled

Findings

6. Terrain condition—Ground

The NTSB determined that the probable cause of this accident was "the pilot's continued descent below decision height and not maintaining adequate altitude/clearance from the trees while on approach. Factors were the night lighting conditions, and the mist."

The petitioner is the executor of the estate of the accident pilot and the owner of the accident airplane. He disagreed with the probable cause for this accident, stating that "there is no indication that N120HS descended to or below the decision height in controlled flight" and that "all of the available flight data indicates the opposite." The petitioner also presented new evidence to demonstrate that "the current [probable cause] determination is erroneous." The petitioner stated that this evidence was not available to the NTSB at the time that it released the probable cause for this accident.

Background

The NTSB's investigation of this accident found that the flight originated from Purdue University Airport, near Lafayette, Indiana, about 2245. Radar data for the flight were consistent with an airplane being vectored for an instrument landing system (ILS) approach to BMG runway 35. The radar track depicted the airplane flying above the glidepath and to the right of course until radar coverage was lost at an altitude of 2,000 feet; at that time, the airplane was about 2½ miles from the approach end of the runway.[1] The airplane crashed into trees about ½ mile from the approach end of the runway. Witnesses to the accident heard an engine acceleration and then a "thud," after which no additional engine sounds were heard.[2]

A postaccident inspection of the ILS determined that it was operating normally. An on-scene examination of the airplane wreckage revealed no preimpact anomalies. A review of data from the airplane's engine data management system showed a reduction in fuel flow, consistent with a descent, followed by an increase in fuel flow, consistent with full power.

Petitioner's Claims

Possibility of Second Aircraft Near Airport

The petitioner stated that, during the investigation of this accident, the NTSB did not consider the possible involvement of another airplane operating near BMG at the time of the accident and assumed that all of the airplane sounds reported by the witnesses were from the

[1] Unless otherwise indicated, all altitudes are expressed as mean sea level (msl), and all miles are expressed as nautical miles.

[2] These witness accounts were based on the information reported during 911 calls to the Indiana State Police on the night of the accident.

accident airplane. The petitioner believes that another airplane was banking toward the accident airplane during its final approach. The petitioner also believes that this other airplane "would have interfered with the approach of N120HS by attempting to land on either of the runways at BMG from the east" and that the airplane "would have been invisible to N120HS due to the weather conditions."[3] The petitioner provided new evidence to support this position, as discussed below.

After the NTSB issued the probable cause for this accident, the petitioner retained Engineering Systems, Inc. (ESI), of Colorado Springs, Colorado, to review the available evidence and further investigate the accident. The petitioner asked ESI to (1) analyze radar data, air traffic control (ATC) transmissions, witness statements, NTSB reports, and other relevant information and (2) reconstruct the flightpath of the accident airplane. In September 2010, ESI issued the first of two reports for the petitioner. On the basis of its review of the available information and the reconstruction of the accident flightpath,[4] ESI determined the following:

> Based on the approach flown by [the accident pilot] there is no evidence to conclude that the accident resulted from pilot error as opposed to some other external factor. One possible external factor could have been evasive actions by N120HS resulting from a potential conflict with a second low-flying aircraft in the vicinity.

To determine if the witnesses to the accident had heard N120HS or another aircraft, ESI conducted flight tests during which an exemplar Cessna 206 followed the flightpath of the accident airplane (referred to as scenario A).[5] The exemplar airplane then flew two "flight path scenarios" that "were thought to represent" the possible flightpaths of another airplane that could have been near BMG when N120HS was on final approach. One flightpath scenario was an aborted landing on runway 24 that crossed the accident flightpath (referred to as scenario B), and the other flightpath scenario was a flight heading from north to south, turning east, and crossing the runway 35 ILS at a location south of runway 6/24 (referred to as scenario C).[6] Acoustic measurements of these flights were taken at the location of seven "key" witnesses[7] to quantify

[3] BMG has two runways, 17/35 and 6/24. At 2340, the automated surface observing system (ASOS) at BMG was reporting a visibility of 1 mile, mist, and an overcast ceiling at 100 feet. Visibility is expressed in statute miles, and cloud cover is expressed in feet above ground level (agl).

[4] To determine the accident airplane's flightpath, altitude history, and specific flight parameters (including airspeed and bank angle), ESI obtained from the FAA (1) a continuous data recording (CDR) airplane radar track data file (which the NTSB used during its investigation) and (2) a national track analysis program (NTAP) data listing that contained radar returns from the accident airplane. The CDR data ended at 2338:34, and the last radar return showed the airplane at an altitude of 2,000 feet. The NTAP data ended at 2339:13 and included radar returns until the airplane reached an altitude of 1,600 feet. ESI used the NTAP data as the primary data source for its study. Radar plots developed by ESI showed that the CDR and NTAP data were "in excellent agreement, providing confidence in the accuracy of the flight path."

[5] According to ESI, radar data from one of the scenario A flight tests were obtained from the FAA and compared with data from an onboard GPS receiver to ensure consistency among the data.

[6] ESI stated that the altitudes of these two scenarios were below 1,500 feet, which "would have placed the aircraft below radar detection as would have been the case on the night of the accident if another aircraft was in the area at that time."

[7] ESI indicated that, for its study, 15 witnesses came forward to report what they had heard on the night of the accident. (One of the documents that ESI used in its study was titled "Responses to Newspaper Request for

"the relative level of aircraft noise for different flight path scenarios."[8] The acoustic measurements were then analyzed to determine if any of the scenarios matched what the witnesses reported hearing on the night of the accident.

During the flight testing, only scenario A sounds were measured at the witness location that was "far north" of BMG. ESI indicated that, during this scenario A flight, the "Sound Level from the aircraft was below ambient noise. The low level aircraft noise was briefly heard for only a second." For the six other witness locations, the sound levels measured for the scenario A flights were compared with the sound levels measured for the scenario B and C flights. The scenario B sound levels were between 3.5 and 19.2 decibels higher than the scenario A levels. The difference between scenarios C and A at four of the six witness locations was less than 2.5 decibels.[9] ESI indicated that this finding suggested that "a portion of [the] Scenario 'C' flight path is not representative of what people heard" on the night of the accident because all of the sound levels from scenario B were "significantly higher" than scenario A and would have been "definitely noticeable."

ESI stated that, according to the seven witnesses' observations from the night of the accident, one witness might have heard the accident airplane, but the other six witnesses had likely heard another airplane. Among the observations made by these six witnesses were reports of an airplane that was "loud," "flying low," and "sputtering." ESI indicated that some of these witnesses also reported hearing an airplane traveling in a different direction than the flightpath of the accident airplane. ESI asserted that "there is no way one aircraft could have been the source of all those reports." The ESI report concluded the following:

> The acoustic analysis of the sounds from the three flight path scenarios ('A', 'B', and 'C') coupled with the witness statements indicate that there clearly had to be another aircraft in the vicinity of the ILS approach to BMG runway 35 at the time of the accident involving N120HS.

In addition to the ESI report, the petitioner provided a copy of the incident report prepared by the Van Buren Township Fire Department, which organized the search for the accident airplane after 911 calls were received. (The incident report was not provided to the NTSB during its investigation of the accident.) The incident report included the following account of a witness who reported seeing an airplane immediately before hearing the accident:

Information.") ESI selected 7 of the 15 witness positions for acoustic measurements "as a result of [the witnesses'] locations and observations." ESI explained that six of these locations were near the south end of BMG and that one location was "far north" of the airport. ESI further explained that four of the seven locations were "quite close" to the accident site and that the other three locations were farther away. In addition, 4 of the 15 witnesses identified by ESI had called 911 on the night of the accident, and two of the 911 callers were among the seven key witnesses included in ESI's study.

[8] Two measurement stations were used to collect acoustic data captured by a microphone and digital recorder mounted near each of the seven witness locations. According to ESI, the frequency response of the recording system was beyond the range of the noise made by a Cessna 206. As a result, the primary sources of noise measured by ESI's equipment were from the airplane's propeller blades; its exhaust pipe; and the air flowing over the airplane's landing gear, flaps, and struts.

[9] At the other two witness locations, the difference between scenarios C and A was 18.0 and 6.2 decibels.

> [An] eye witness . . . came to the staging area and stated that he lived at [street address of an apartment complex] and was out side [*sic*] and hear[d] the plane saw the plane very low to the west of the apartment complex and looked like it was banking toward the airport, then heard the crash.[10]

The petitioner indicated that the witness, from his location about 1½ statute miles due east of the accident site, would have observed an airplane banking toward BMG from the east. The petitioner believes that this witness saw another airplane and not N120HS because of "the approach that N120HS is known to have flown."[11] The petitioner also stated that the conditions reported by the ASOS at BMG immediately before the accident (ceiling of 100 feet and visibility of 1 mile) would have precluded the witness from seeing the accident airplane at his reported location.

The petitioner sent this witness' location information and observations to ESI for further analysis. ESI considered the relationship between the witness' location and the scenario A and B flightpaths. ESI issued a second report, dated September 2012, that concluded, "due to the location of this witness relative to the flight path of N120HS and the very foggy conditions that existed that night . . . it is extremely unlikely that the very low flying aircraft observed and heard by the witness was the accident aircraft." ESI also concluded that "the witness most likely saw a second aircraft flying a 'Scenario B' flight path, or some variation of it."[12] ESI stated that these conclusions supported those in the company's September 2010 report.

Air Traffic Control Issues

The petitioner asserted that "there were significant problems with the way in which air traffic control handled the final flight of N120HS." The petitioner explained that "some of those problems [were] peculiar to the controller who was assigned this duty" and that "some [were] systemic problems resulting from improperly implemented changes in the air traffic system."

According to the petitioner, the Terre Haute Terminal Radar Approach Control (TRACON) facility had previously been closed for the overnight shift because the number of qualified personnel at the time did not allow for at least two qualified approach control specialists during that shift, per Federal Aviation Administration (FAA) policy. As a result, the FAA had transferred approach control responsibility during the overnight shift to the Indianapolis Air Route Traffic Control Center (ARTCC). The petitioner indicated that this

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[10] Although the incident report included the address of the apartment complex, the report provided no information (other than gender) from which this witness could be identified. According to the petitioner, the witness provided his statement about 0400 on April 21, 2006.

[11] The petitioner stated that, although witnesses indicated "seeing or hearing a low flying plane to the east of the airport," at that time "N120HS was visible on radar at an altitude between 5,000 and 2,500 feet agl [5,846 and 3,346 feet msl, respectively] and on approach from the west side of the airport." (BMG has an airport elevation of 846 feet msl.) The NTSB notes that, during the time that the accident airplane was visible on radar, the airplane would have been traveling to the west of BMG during the downwind leg and then to the east of the airport during the final leg. Radar data showed that the airplane had completed the turn onto the final leg at an altitude of 4,200 feet msl.

[12] ESI found that "the banking of the aircraft back toward the airport could have been the low flying 'Scenario B' aircraft veering to the north as it approached the apartment complex."

transfer of approach control services "replaced a specially trained controller who had access to the appropriate radar and weather information with a controller who had no real training in approach control."[13]

The petitioner believes that the Indianapolis ARTCC controller who handled the accident airplane placed it "into an unstable approach." The petitioner explained that the accident airplane "was kept at too high an altitude for too long and [was] turned in to the approach gate at the minimum allowable distance," which required the airplane to descend an additional 800 feet between the final approach fix/outer marker and the runway while the pilot managed "the remaining steps of an IFR night landing."[14]

The petitioner stated that the controller provided the pilot with the incorrect common traffic advisory frequency (CTAF) for BMG.[15] Instead of providing the pilot with a frequency of 120.77 megahertz (MHz), the controller provided the pilot with a frequency of 128.02 MHz, which is the frequency for the Terre Haute ATC tower. As a result, the pilot "had to determine that she had been given the wrong frequency, input the correct frequency, and reissue her landing advisory on the correct frequency while descending from an improperly high altitude."

According to the petitioner, after the pilot had been instructed to contact the CTAF on the incorrect frequency, the ASOS at BMG issued "several Special Weather Observations" that indicated that the conditions at BMG were "deteriorating rapidly." The petitioner stated that the Indianapolis ARTCC controller did not have "automated access to weather information" and that it is unknown whether the pilot became aware that the cloud ceiling (overcast at 100 feet) was below minimums for the approach (decision height 200 feet).[16]

The petitioner also stated that, because BMG did not record after-hours CTAF transmissions, there is no way to know whether the accident pilot "made any distress call or other transmission indicating the cause of the accident" after she received the correct CTAF from the Terre Haute ATC tower. The petitioner further stated that it is not possible to know whether the accident pilot might have missed an announcement from another aircraft near BMG while the accident airplane's radio was tuned to the Terre Haute ATC tower frequency.

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[13] The controller who handled the accident flight was working a radar control position. The petitioner indicated that the controller "had only 10 minutes of final approach control training," but the NTSB is not aware of any approach control training that can be completed in 10 minutes. The controller's training is addressed later in this response.

[14] Radar data showed that the airplane reached the final approach fix/outer marker at an altitude of 3,300 feet. The crossing altitude was 2,533 feet.

[15] The BMG ATC tower was staffed from 0630 to 2130. After-hours local traffic communications were accomplished via the CTAF. The tower did not record CTAF transmissions made after hours.

[16] The petitioner claimed that, after the accident, the FAA's Air Traffic Safety Oversight Service (AOV) investigated the circumstances of this accident and found that "Automated Surface Observation System (ASOS) information available to approach controllers is not available to en route controllers providing approach control." The petitioner also claimed that AOV "expressed concerns about the currency and proficiency of the ZID [Indianapolis ARTCC] controllers tasked with providing approach control services." However, the petitioner did not provide any evidence supporting these claims.

In addition, the petitioner claimed, "the FAA has admitted that its air traffic controllers contributed to the cause of this accident. That admission should be reflected in the fault allocation of the Probable Cause Report." To support this claim, the petitioner provided, as new evidence, a July 20, 2010, letter that was signed by a trial attorney from the Torts Branch, Civil Division, Department of Justice, and sent to the family of the accident pilot after a civil lawsuit arising from this accident had been settled. The letter indicated that, according to the petitioner's attorneys, the controller who handled the accident airplane was negligent by doing the following:[17]

- Vectoring the airplane too close to the final approach fix, which resulted in an unstabilized approach.

- Vectoring the airplane to the final approach course at too great an intercept angle, which created difficulties in becoming established on the localizer.

- Delay[ing] issuance of a descent clearance, which led to difficulties in intercepting the glideslope prior to the final approach fix.

- Providing an incorrect radio frequency for the Bloomington Common Traffic Advisory Frequency (CTAF) as the airplane approached the final approach fix, resulting in an unnecessary distraction and additional workload for the pilot during an important phase of flight.

The petitioner also claimed that, "as a result of those failures, FAA concluded that a court could determine that air traffic control negligence was a cause of this unfortunate accident." However, as discussed in the next section of this response, the petitioner provided no evidence showing that the FAA had reached any such conclusion or that the allegations made by the petitioner's attorneys during the civil lawsuit were admitted by the FAA or the Department of Justice.

NTSB Response to Petitioner's Claims

The petitioner believes that another airplane near BMG, which "interfered with the approach of N120HS," and "air traffic control failures" either caused or contributed to the accident. However, the NTSB's analysis of the original case material and the subsequent information provided by the petitioner found that (1) it is unlikely that another airplane was near BMG about the time of the accident, especially given the time (just before midnight) and the poor visibility, and (2) the pilot's performance on the night of the accident was not the result of any ATC failure. The NTSB's analysis is discussed in more detail in the sections that follow.

[17] The Department of Justice letter also stated the following: "Although the United States would present a full defense to these allegations if this case were tried, we have agreed to settle this case based upon our assessment that the court could find merit in at least some of these allegations and determine that air traffic control negligence was a cause of this unfortunate crash."

Pilot Actions During the Flight

The pilot was ultimately responsible for conducting a safe approach to BMG and reaching a position for a safe landing, but she did not maintain situation awareness during this segment of flight. Radar data showed that the airplane was too high and too fast[18] for the approach and that it crossed the final approach fix/outer marker to the right (east) of the runway 35 centerline. Also, the ATC transcript showed that the pilot did not relay any concerns to the controller about the airplane's position or speed or her ability to successfully perform the approach given the deteriorating weather conditions.

The air traffic controller had cleared the pilot to descend the airplane to 2,600 feet until the airplane was established on the localizer. The crossing altitude for the final approach fix/outer marker was 2,533 feet, but the airplane crossed the marker at 3,300 feet. The pilot could have performed a missed approach if she was concerned about descending the airplane an additional 800 feet between the final approach fix/outer marker and the runway while performing other tasks to prepare for a night IFR landing. Instead, the pilot continued flying the approach, and the airplane remained east of the runway 35 centerline through the last radar return (2,000 feet). In addition, the last radar return showed that the airplane was about 340 feet higher than would be expected for an airplane located about 2½ miles from the approach end of the runway. (The descent performed by the pilot is discussed later in this response.)

The ILS glideslope and localizer signals to runway 35 provided the necessary guidance for the airplane to reach the decision height.[19] When the airplane reached the decision height (200 feet), the pilot could have taken one of two safe courses of action: she could have either landed the airplane if she saw the runway environment,[20] or she could have executed a missed approach and climbed to a safe altitude. Given the weather conditions, it is unlikely that the pilot would have had the runway environment in sight at the decision height, and no evidence indicated that the pilot attempted a missed approach. Thus, the available information indicated that the pilot descended the airplane below the decision height and crashed into the trees located below the glideslope.[21]

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[18] According to the radar data used by the NTSB during this investigation, the airplane was traveling at a groundspeed of about 166 knots at the beginning of the turn from the downwind to base legs and about 154 knots at the time of the last radar return (2,000 feet in the CDR data). ESI's analysis of radar data found that the airplane's groundspeed decreased from about 125 knots when the airplane crossed the final approach fix/outer marker to about 94 knots at the time of the last radar return (1,600 feet in the NTAP data). Although the NTSB's data showed the airplane crossing the final approach fix/outer marker at a similar groundspeed (about 127 knots), these data also showed that the groundspeed increased, rather than decreased, after that time. In addition, ESI asserted that the airplane was "slowing to the appropriate approach speed," but this assertion could not be fully analyzed because no groundspeed data for the airplane before 2337 or above an altitude of 3,000 feet were included in the petition.

[19] Even though the airplane was above the glideslope and to the right of the localizer, the pilot could have used cockpit instruments to determine the airplane's position relative to the glideslope and localizer to make course corrections for the approach.

[20] Title 14 CFR 91.175, "Takeoff and Landing Under IFR," also prohibits operations below the decision height unless an airplane "is continuously in a position from which a descent to a landing on the intended runway can be made."

[21] The increase in engine power at the end of the flight, as recorded by the airplane's engine data management system, likely occurred once the pilot descended below the decision height and saw the trees. The petitioner believes that the increase in power was the result of the pilot taking "evasive action" to avoid another

The NTSB notes that, if the pilot had decided to perform a missed approach and had properly executed the missed approach procedure, radar would have captured the airplane during the climb. The pilot could then have elected to go back to the Indianapolis ARTCC frequency and asked to be directed to another airport where visual meteorological conditions prevailed,[22] or she could have made another approach to BMG.

The petitioner claimed that "there is no indication that N120HS descended to or below the decision height in controlled flight." The NTSB disagrees with this statement because the radar track, ATC transcript information (specifically, no voiced concerns about the approach and no missed approach transmissions before leaving the ARTCC frequency at 2336:43),[23] and the impact location (½ mile from the approach end of the runway) were consistent with a continued approach below the decision height. The NTSB also disagrees with this statement because the recorded engine data showed that full power was applied toward the end of the flight, which was consistent with the pilot attempting to take evasive action to avoid the trees, but the data stopped after only a few seconds, which was consistent with an in-flight collision with trees. After the airplane collided with the trees, it entered an uncontrolled descent until the impact with the ground. Tree branches near the accident site were found separated and cut through, which was consistent with an operating engine and propeller, and no preimpact malfunctions were found.[24]

In summary, we continue to believe that the accident was the result of the pilot's descent below the decision height without the airport environment in sight and her failure to maintain adequate clearance from trees.

Claim of Interference From Another Airplane in the Area

The petitioner claimed that another airplane was banking toward the accident airplane while it was on final approach and that this other airplane "would have interfered with the approach of N120HS by attempting to land on either of the runways at BMG from the east" and "would have been invisible to N120HS due to the weather conditions." The petitioner based these claims on the results of the sound testing performed by ESI (as discussed previously).

The NTSB reviewed the methodology that ESI used during its sound testing and found that the testing was flawed for several reasons, including the following:

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airplane in the area. However, the NTSB believes that no other airplane was in the area at the time of the accident, as discussed in the section that follows.

[22] The pilot did not include an alternate airport when she filed an IFR flight plan. as required by 14 CFR 91.169, "IFR Flight Plan: Information Required." The regulation states that "each person filing an IFR flight plan shall include in it . . . an alternate airport." The transcript of the pilot's weather briefing with a Terre Haute automated flight service station briefer showed that the pilot had intended to file a visual flight rules flight plan but changed her mind after receiving weather information indicating IFR ceilings at BMG.

[23] After the accident, the owner of the accident airplane (the petitioner) stated his concern that after-hours CTAF transmissions were not recorded at BMG and indicated that such a recording could have shown whether the pilot had intended to execute a missed approach.

[24] In addition, ESI derived bank angles for the airplane from the radar data and found that the "bank angles . . . provided no indication the aircraft was experiencing any difficulty."

- ESI's acoustic measurements were taken during the early fall (on September 30, 2008). Heavy tree leaf and tall grass cover tend to attenuate sounds (that is, decrease their amplitude), especially in subdivision settings such as those where the seven witnesses cited in ESI's study were located. ESI's results may not be accurate because of the tree leaf and grass cover at the time.

- ESI indicated that it was important to take acoustic measurements after dark "to achieve noise levels from traffic similar to what existed at the time of the accident." However, all but 2 of ESI's 21 flight tests were performed during daylight hours (between 1531 and 1900). The two flight tests performed after dark (at 2054 and 2058) involved only scenario A (the accident flightpath). The accident time (2345) was about 3 hours later than the time of these two scenario A flights. There would have been more traffic just before 2100 (the BMG tower was open until 2130) than just before midnight on a night with a cloud ceiling below minimums.

- ESI did not consider the prevailing wind during the some of the tests. For example, about the time of first two tests (1531 and 1535), the wind was from 310º at 5 knots with gusts to 14 knots.[25] The wind blows sounds around, so the acoustic measurements for these tests may not be valid.

- Sound propagation characteristics differ depending on the atmospheric conditions. The accident occurred during extremely foggy conditions,[26] which were not occurring during the flight testing. ESI did not compensate for the different atmospheric condition during the testing, which is noteworthy given that sound attenuation in air is directly linked to the temperature and humidity of the air mass.

- ESI indicated that the acoustic sound recordings "were made over a grass surface minimizing the impact of sound reflections from the ground," but ESI did not compensate for the noise associated with local vehicle traffic activity, which would have obscured the acoustic measurements.

The NTSB's review of ESI's sound testing found that the conclusions reached were not supported by evidence. One conclusion stated, "there is significant evidence to conclude that there was another aircraft in the area of the Monroe County Airport around the time of the accident." ESI indicated that this "significant evidence" comprised "the acoustic analysis of the sounds from the three flight path scenarios ('A', 'B', and 'C') coupled with the witness statements" from the seven "key" witnesses cited in the study.

It is important to note that the seven key witnesses in ESI's study did not provide the company with their recollections from the night of the accident until some time after June 2007 (when the NTSB issued the probable cause for this accident), which was 14 months after the accident occurred. In fact, it is likely that these witnesses provided their statements well after that date given the amount of time needed for the petitioner to identify and contract with ESI and the amount of time that ESI needed to plan its work, identify witnesses, and gather their statements.

[25] The wind at the time of the accident was from 230º at 5 knots. No wind gusts were reported.

[26] At the time of the accident, there was a 1º C difference between the temperature and the dew point.

In its report on the investigation of the TWA flight 800 accident, the NTSB cited research indicating that human memory is subject to error, people tend to be unaware of their memory errors and may be overconfident in the accuracy of their memories, and this confidence may increase over time.[27] The NTSB's report also stated that "some witnesses' recollections might [be] influenced by exposure to other witnesses' accounts; being interviewed together; engaging in conversations with other people; or hearing, watching, or reading media accounts of [a] crash." Thus, the accounts from the witnesses in ESI's study need to be considered along with other evidence from the accident.

Only two of the seven witnesses in ESI's study heard one or more of the flight test scenarios. One of these witnesses heard scenarios A (the accident flightpath) and B (an aborted landing on runway 24 that crossed the accident flightpath) and reported that scenario A "was a normal landing" and that what he heard on the night of the accident was a "loud, low aircraft." This witness added that he "could not be exactly sure of the direction that the loud, low aircraft flew" because he was lying down inside his house at the time that the aircraft flew over the house. The other witness heard scenarios A, B, and C. This witness reported that scenario A "was a normal landing sound" and that what he heard on the night of the accident was "more like scenario 'B'." This witness went behind his house with an ESI consultant and "pointed in a direction slightly north of due east" to indicate the direction that airplane traveled when it flew over his house. The witness further indicated that the flight on the night of the accident was "almost 90 degrees from the normal landing flight path of scenario 'A'" and was "loud and flying low to the ground."

Both of these witnesses indicated that the scenario A flight test produced a "normal landing" sound, which was not what they had heard on the night of the accident. However, the accident airplane did not make a normal landing at BMG and did not follow the expected flightpath toward the runway. Both of these witnesses also indicated that the airplane that they heard on the night of the accident was flying low and producing a louder-than-normal noise. These observations are consistent with the accident airplane descending below the decision height and the pilot increasing the engine to full power to try to clear the terrain located directly below.

The other five witnesses did not hear any of the three scenarios during the flight tests. However, ESI determined that four of these five witnesses could not have heard the accident airplane because of their location relative to either the accident site or the airport. For example, one of these four witnesses, who lives on the east side of BMG runway 6/24, heard an airplane on the night of the accident that was "close and flying low from the northwest to the southeast." ESI explained that this witness "lives too far away from the crash site to hear a Cessna 206 on an ILS 35 approach to BMG that would have ended at the crash site" and that "it is most likely that what [she] heard was similar to scenario 'B'." The NTSB notes that the witness' description was consistent with the flightpath flown by the accident airplane (downwind through final leg). Also,

[27] For information about this research, see *In-flight Breakup Over the Atlantic Ocean, Trans World Airlines Flight 800, Boeing 747-131, N93119, Near East Moriches, New York, July 17, 1996*, Aircraft Accident Report NTSB/AAR-00/03 (NTSB: Washington, DC, 2000).

multiple reports indicated that the airplane heard on the night of the accident was louder than normal, so it is possible that this witness could have heard the accident airplane from her location, especially when the engine power increased.

Another of the four witnesses, who lives about 5 miles north of BMG, was outside his house on the night of the accident and heard an airplane to the west heading south and "sputtering." ESI indicated that this witness did not hear the accident airplane because "what he heard had to be louder than the Cessna 206." ESI also indicated that, because the Cessna 206 has a fuel-injected engine, the airplane does not sputter, which "tends to indicate that another aircraft other than N120HS was flying in the area." The NTSB notes that, from his location, this witness might not be able to hear a Cessna 206 making a normal approach to and landing at BMG. However, the sounds that this witness heard on the night of the accident could have been from the accident airplane, especially when its engine power increased. In addition, although the NTSB recognizes that this witness reported hearing a sound similar to sputtering, no evidence indicated that another airplane was near BMG at the time of the accident, as discussed later in this section of the response. Because engine data from the accident airplane (showing the increase in power at the end of the flight) did not match the witness' observation, it is possible that this observation might not be accurate.

Two of the seven key witnesses indicated that they did not hear any other airplanes at the time that they heard the accident airplane. (The other five witnesses did not indicate whether they heard one or two airplanes on the night of the accident.) Because human memory can be subject to error over time, the NTSB reviewed the transcripts of the 911 calls to the Indiana State Police on the night of the accident and found that none of the callers reported hearing more than one airplane during the time surrounding the accident.

The evidence presented by the petitioner also included an eyewitness account of an airplane just before the accident. The witness reported that he heard an airplane and saw it bank toward the airport at a "very low" altitude, and then he heard sounds associated with a crash.[28] The petitioner believes that this witness saw another airplane and not the accident airplane because the 1-mile visibility at the time of the accident would have precluded the witness from seeing the accident airplane at his reported location, which was about 1½ statute miles due east of the accident site.

Because this accident occurred at night during extremely foggy conditions, it is likely that this witness saw only the lights of the airplane. The NTSB notes that airplane lights can sometimes be seen from greater distances than reported visibility distances. Further, the ATC transcript did not show any evidence of another airplane being vectored to BMG

[28] The petitioner stated that the Van Buren Township Fire Department incident report contained this witness' address but "no further information by which he can be identified." As a result, the petitioner was unable to locate the witness. The NTSB's review of the 911 transcripts found one caller who might have been the witness cited in the fire department's incident report. This caller (who was not included in ESI's study) reported hearing an airplane accelerate and then a "pop." The NTSB's further review of the 911 transcript showed that the 911 operator asked the caller if he could go to the search and rescue staging area while on his way to work to report what he saw. The caller then told the operator, "I'd like to show 'em where I am talking about."

between 2314 and 2357,[29] and the petitioner did not provide any radar data showing another airplane near BMG at the time of the accident.[30] The other airplane, if it existed, would have had to remain below 1,154 feet agl during the entire flight to be undetected by radar and would have had to clear obstacles along the flightpath during the extremely foggy conditions. As a result, it is likely that no other airplane was near BMG at the time of the accident and that the witness saw the accident airplane's lights.

In addition, the docket for this accident included a statement from a manager at BMG. The statement indicated the following:

> About 12:10 AM the father [of the accident pilot] called me on my cell phone and asked me to go to the airport to look for his daughter, she had not reported landing. I had an employee at the airport at the time so I called him to check for her on the ramp. He said the airport lights came up about a half an hour ago but nobody landed.

If another airplane near BMG had interfered with the accident airplane's approach to the airport, as asserted by the petitioner, then the other airplane would likely have landed at BMG between 2340 on the night of the accident (when the lights "came up") and 0010 on April 21, 2006. However, this statement showed that no airplanes landed at BMG during that timeframe.

In summary, on the basis of the available evidence, we believe that no other airplane was near BMG at the time that the accident airplane was making its final approach. Even though the petitioner asserted that ESI's work demonstrated that the "aircraft noise reported by several of the witnesses could not have been made by N120HS," analysis of the available evidence showed that the engine and other airplane sounds described by the witnesses to the accident emanated from the accident airplane.

Claim of Air Traffic Control Negligence

The petitioner claimed that there were "significant problems" with the ATC services provided to the accident pilot. For example, the petitioner explained that the transfer of approach control responsibility during the overnight shift from the Terre Haute TRACON to the Indianapolis ARTCC resulted in the accident flight being handled by a controller who had "no real training in approach control."

The NTSB notes that it is routine for TRACONs to transfer approach control responsibilities to the overlying ARTCC when the TRACON facilities close at night. The NTSB also notes that ARTCC and TRACON air traffic controllers are required to provide approach

[29] Because of the reported instrument meteorological conditions, the other airplane would have been required by FAA regulations to be vectored by the Indianapolis ARTCC to BMG.

[30] The FAA retains ATC recordings and radar data for 5 years after an accident. (For this accident, the 5-year period ended April 20, 2011.) As a result, the NTSB was not able to request this information to confirm that the only airplane on approach to BMG during the 31 minutes preceding the accident (2314 to 2345) was the accident airplane.

control services in accordance with FAA Order 7110.65, "Air Traffic Control." TRACON controllers, in general, would have more opportunities to routinely provide these services compared with ARTCC controllers because of the differences between the controllers' general responsibilities. However, the NTSB's review of the controller's performance on the night of the accident indicated that he was properly trained in providing approach control services to airports within the Indianapolis ARTCC's delegated airspace.

The petitioner also claimed that the controller did not have access to "appropriate" weather radar information. The NTSB notes that ATC facilities, including the Indianapolis ARTCC and the Terre Haute TRACON, have controller displays that show precipitation derived from next-generation weather radar (commonly known as NEXRAD) along with ATC radar data. The ASOS at BMG reported no precipitation on the night of the accident.

At 2213:27, about 30 minutes before the airplane departed, the accident pilot requested a weather briefing from the Terre Haute automated flight service station. The weather briefing indicated that the conditions at BMG were ceiling broken at 800 feet with a visibility of 8 miles but that within 1 hour the ceiling could be 600 feet with scattered clouds and a visibility of 5 miles in mist. At 2320:19, the accident pilot told the Indianapolis ARTCC controller that she had received the latest ASOS report for BMG. Afterward, the pilot could have received updated ASOS information on her radio;[31] she did not need to learn this information specifically from the controller.

The ASOS at BMG generated four special weather observations as a result of deteriorating visibility. Three special weather observations issued at 2316, 2325, and 2333 indicated that the visibility had decreased from 2½ to 1½ miles. At 2333, the cloud ceiling was broken at 300 feet. At 2340, the fourth special weather observation was issued. This observation indicated that the visibility had decreased to 1 mile with an overcast ceiling at 100 feet, which was below the 200-foot decision height for the approach.

The petitioner stated that, according to the FAA's AOV office, ASOS information "is not available to en route controllers providing approach control." The NTSB could not determine whether ASOS data were available to the Indianapolis ARTCC controller at the time of the accident.[32] However, even if the controller had access to ASOS information, he would not have been able to relay the information about the 100-foot ceiling to the accident pilot because, about 3½ minutes before the fourth special observation was issued, the controller instructed the pilot to change to the CTAF, and the pilot acknowledged the controller's instruction. It is also unknown whether the pilot was aware that the cloud ceiling was below minimums for the approach, given that after-hours radio transmissions were not recorded on the CTAF, but she (and not the controller) was ultimately responsible for ensuring that the approach criteria were met and for safely executing the published missed approach procedure if the approach criteria were not met.

[31] The accident pilot would have been able to access ASOS data that were updated every 1 minute. If the Indianapolis ARTCC had the ability at the time of the accident to receive ASOS data, the controller would have received hourly observations and special weather observations.

[32] All ARTCCs currently have the ability to receive ASOS data for airports under their jurisdiction.

The petitioner believes that the Indianapolis ARTCC controller who handled the accident airplane placed it "into an unstable approach" by keeping the airplane "at too high an altitude for too long." The petitioner explained that the airplane's high position during the approach resulted in the airplane crossing the final approach fix/outer marker about 800 feet above the minimum crossing altitude for an ILS approach to runway 35 and remaining "consistently above the recommended glide slope."

The NTSB's review of the ATC transcript and radar data showed that the controller cleared the pilot to descend the airplane with sufficient time and distance to successfully complete the runway 35 ILS approach procedure. According to the ATC transcript, at 2333:03 the controller instructed the pilot to descend to 4,000 feet "at pilot's discretion," which provided the pilot with an initial descent before the final descent for the approach. FAA Order 7110.65 states that a discretionary descent used with altitude assignments "means that ATC has offered the pilot the option of starting climb or descent whenever he/she wishes and conducting the climb or descent at any rate he/she wishes." The order also states that the pilot "may temporarily level off at any intermediate altitude. However, once he/she has vacated an altitude, he/she may not return to that altitude." At the time of the discretionary descent clearance, the airplane was about 14.5 miles from the runway threshold and at an altitude of 5,100 feet.

At 2334:36, the controller cleared the pilot for the ILS approach to runway 35. The clearance provided the pilot with sufficient time and distance to intercept the glideslope at an altitude that could have allowed the approach to be successfully conducted. At the time, the airplane was at an altitude of 4,400 feet (3,554 feet agl).

The 50-foot agl threshold crossing height required the airplane to descend a total of 3,504 feet. The airplane was about 10.9 miles from the runway threshold when the controller cleared the pilot for the approach, which would have required the pilot to descend at a rate of about 321 feet per mile. The published 3º glideslope required pilots to descend at a rate of 318 feet per mile. Thus, the airplane was not kept at an "improperly high altitude," as claimed by the petitioner. In fact, the altitude of the airplane, when the pilot received clearance for the ILS approach, was only about 50 feet higher than the altitude that would have been expected at that point with a 3º glideslope.

After the airplane was cleared for the ILS approach, the pilot was responsible for descending the airplane at a normal rate to 2,600 feet until becoming established on the localizer. The controller told the pilot that he could see the airplane "joining up on the localizer" at 2336:15; radar data showed that the airplane was at an altitude of 3,600 feet at the time. Afterward, the pilot was responsible for descending the airplane at a normal rate until intercepting the glideslope at the final approach fix and then following the vertical guidance provided by the glideslope. However, the pilot did not descend the airplane fast enough to intercept the glideslope at the final approach fix; as a result, the airplane remained above the glideslope. Thus, the airplane's high position on the approach and the difficulties that the pilot experienced in establishing the airplane on the localizer and intercepting the glideslope were not the result of any action by or instruction from the controller.

The petitioner also stated that, because the pilot received the incorrect CTAF from the controller, her workload increased because she "had to determine that she had been given the wrong frequency, input the correct frequency, and reissue her landing advisory on the correct frequency" while conducting the approach to BMG. The NTSB recognizes that the controller instructed the pilot to "change to advisory tower frequency of one two eight point zero two" instead of providing the pilot with the correct CTAF of 120.77 MHz. However, the pilot was based at BMG and should have known the correct frequency. In addition, the correct frequency appeared on the approach chart for BMG. Most importantly, though, after contacting a controller at the Terre Haute ATC tower (at the 128.02 MHz frequency) and being advised that the CTAF for BMG was 120.77 MHz, the pilot would have diverted her attention from the cockpit gauges to the radio at a time when she should have been focused on aviating and navigating. The pilot should have executed a missed approach if she had been distracted by the incorrect frequency assignment.

As previously stated, the petitioner provided a copy of a July 2010 letter from the Department of Justice, indicating that it had agreed to settle the petitioner's case based on an assessment that "the court could find merit in at least some of [the petitioner's] allegations." The letter detailed the allegations made by the petitioner's attorneys that the controller had (1) vectored the airplane too close to the final approach fix, (2) vectored the airplane to the final approach course at too great an intercept angle, (3) delayed the issuance of a descent clearance, and (4) provided an incorrect radio frequency for the CTAF at BMG.

The NTSB notes that the petitioner mischaracterized the content and significance of the letter by claiming that it contained admissions by the FAA that "its approach control of N120HS on the night of the accident failed to meet applicable standards" and that "as a result of those failures, FAA concluded that a court could 'determine that air traffic control negligence was a cause of this unfortunate crash'." The petitioner provided no evidence indicating that the FAA made these or any other admissions related to this accident. Rather, the letter, which originated from a Department of Justice trial attorney (after the civil case had been settled) and not the FAA, merely restated the allegations that had been made and outlined some of the considerations that led to the Department of Justice's decision to settle the lawsuit. Regarding these allegations, we have determined the following after reviewing the available evidence:

- the airplane was vectored to the final approach fix at the minimum allowable distance, which was in accordance with the provisions of FAA Order 7110.65;
- the airplane was vectored to the final approach course at the maximum allowable intercept angle for the distance from the approach gate, which was also in accordance with the provisions of FAA Order 7110.65;
- the descent clearance was issued with enough time and distance for the airplane to properly intercept the glideslope; and
- the incorrect CTAF provided by the controller did not cause or contribute to the accident.

As a result, none of the allegations made by the petitioner's attorneys during the civil case and raised in the petition for reconsideration necessitates modification of the NTSB's probable cause determination.

Disposition

After review of the evidence, the petition for reconsideration of the NTSB's probable cause in connection with the aircraft accident involving a Cessna 206, N120HS, on April 20, 2006, near Bloomington, Indiana, is denied in its entirety.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in the disposition of this petition for reconsideration.