National Transportation Safety Board

Washington, DC 20594

Safety Recommendation

Date: August 15, 2013

In reply refer to: A-13-025 through -027

The Honorable Michael P. Huerta
Administrator
Federal Aviation Administration
Washington, DC 20590

We are providing the following information to urge the Federal Aviation Administration (FAA) to take action on the safety recommendations issued in this letter. The recommendations address the need for an aviation weather camera program in Hawaii and the continental United States (CONUS).[1] These recommendations are derived from the National Transportation Safety Board's (NTSB) investigations of numerous weather-related aircraft accidents in Hawaii and CONUS. As a result of these investigations, the NTSB has issued three safety recommendations, all of which are addressed to the FAA. Information supporting these recommendations is discussed below.

Benefits of weather cameras in Hawaii

Since 1997, the NTSB has investigated numerous accidents[2] in Hawaii involving aircraft that encountered instrument meteorological conditions (IMC) and/or other adverse weather phenomena while operating under daytime visual flight rules (VFR) under the provisions of 14 *Code of Federal Regulations* (CFR) Part 135 or Part 91. These accidents, nine of which involved helicopters and four of which involved single-engine airplanes, resulted in 48 fatalities and 4 minor injuries and in substantial damage to the aircraft. Seven of the accidents were sightseeing air tour flights. Generally, the pilots flew into IMC or other adverse weather phenomena, such as rain showers, rain squalls, mist, fog, heavy clouds, and areas of low visibility. In addition, the aircraft were operating in areas of variable terrain, such as mountains, ridges, craters, and volcanos, and the pilots were unable to maintain clearance with that terrain. More information about these accidents can be found in the appendix to this letter.

Pilots in Hawaii can face challenging weather scenarios when operating near variable terrain. Currently, aircraft operators can obtain weather information from sources such as ground

[1] An aviation weather camera program already exists in Alaska, as described later in this letter.

[2] More information about NTSB case numbers WPR12MA034, WPR10FA107, LAX08FA190, SEA05MA199, LAX04FA329, LAX04LA256, LAX03LA297, LAX03FA241, LAX03FA077, LAX00MA273, DCA99MA088, LAX98FA211, and LAX97LA185 is available at http://www.ntsb.gov/aviationquery/index.aspx and in the appendix to this letter. One of these accidents (NTSB case number WPR12MA034) is still under investigation.

observing systems like automated surface observing systems and automated weather observing systems, forecast and advisory products from the National Weather Service (NWS), and real-time reports from pilots in the area (pilot reports). With the exception of some company pilot reports, this information can be briefed by FAA flight services. However, automated ground observing systems' detection and pilots' reporting of adverse weather requires the physical presence of equipment or aircraft. To benefit pilots who are not monitoring a particular radio frequency, pilot reports must be specifically relayed to an appropriate facility for public dissemination. In addition, the weather can vary greatly from location to location in Hawaii. In its discussion of Hawaii-specific weather challenges in the report regarding a September 24, 2004, accident,[3] the NTSB indicated that local tour pilots stated that "helicopter operations [on the island of Kauai] could be particularly challenging because of the terrain, mountain winds, and rapidly changing cloud conditions" and that "because weather conditions…changed so rapidly, traditional sources of pilot weather information, such as automated reporting stations, automated terminal information service (ATIS), and FSS [flight service station] briefings, were not very useful for flight planning." The NTSB's analysis stated that it was "…highly unlikely that the accident pilot would have decided to continue into the area of deteriorating weather conditions and attempted to cross in the vicinity of the accident site if he had accurately assessed the changing weather and had appreciated how it would likely affect flight visibility in those areas."

The dangers of operating in and near adverse weather amidst challenging terrain have also been well documented in Alaska. In 1995, the NTSB conducted a safety study of Alaska's aviation environment to identify risk factors and safety deficiencies and recommend practical measures for managing the risks to flight operations.[4] Of the 23 recommendations issued as a result of this safety study, Safety Recommendations A-95-128 and -140, which were addressed to the FAA and the NWS, respectively, sought to determine the technical feasibility and safety benefit of remote color video weather observing systems in Alaska.[5] In 1999, the FAA began the Alaskan Aviation Camera Program after determining that "pilots [in Alaska] operating under [VFR] would benefit from actual views of current weather conditions."[6] Further, on July 31, 2008, the NTSB issued Safety Recommendation A-08-59, which asked the FAA to "install and maintain weather cameras at critical areas of air tour routes within the Misty Fjords National Monument and other scenic areas in Southeast Alaska that are frequently traveled by air tour operators."[7] As of September 2012, aviation weather cameras have been installed in 185 locations in Alaska under the program, with a total of 221 locations scheduled to be completed by 2014.[8] Each aviation weather camera site may contain up to four individual cameras positioned to provide a near-complete view of an area (see figure 1). Camera images, both live (which are

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[3] National Transportation Safety Board, *Weather Encounter and Subsequent Collision into Terrain, Bali Hai Helicopter Tours, Inc., Bell 206B, N16849, Kalaheo, Hawaii, September 24, 2004*, AAR-07/03 (Washington, DC: National Transportation Safety Board, 2007), www.ntsb.gov/doclib/reports/2007/AAR0703.pdf.

[4] National Transportation Safety Board, *Aviation Safety in Alaska*, SS-95/03 (Washington, DC: National Transportation Safety Board, 1995), http://libraryonline.erau.edu/online-full-text/ntsb/safety-studies/SS95-03.pdf.

[5] Safety Recommendations A-95-128 and -140 were classified "Closed—Acceptable Action" on July 14, 1997, and January 5, 2001, respectively.

[6] Federal Aviation Administration, Press Release, *FAA Installs 150th Alaska Weather Camera*, March 25, 2011, http://www.faa.gov/news/press_releases/news_story.cfm?newsId=12579.

[7] Safety Recommendation A-08-59 was classified "Closed—Acceptable Action" on June 7, 2011.

[8] Federal Aviation Administration, FY 2014 President's Budget Submission, http://www.dot.gov/sites/dot.dev/files/docs/FAA_FY2014_Budget_Estimates.pdf.

updated every 10 minutes) and "clear day,"[9] are available on the FAA's website at http://akweathercams.faa.gov (see figure 2).

Figure 1. Photographs of aviation weather camera installations in Alaska.

[9] The "clear day" image is not live but is a canned image used for reference when looking at the live image.

Figure 2. "Clear day" (A) and live (B) imagery from the Dillingham, Alaska, southwest-facing camera.

These aviation weather cameras provide real-time images of weather conditions at remote airports and mountain passes in Alaska. One benefit of the camera images is to supplement preflight weather briefings to help pilots and flight dispatchers make more informed decisions regarding weather and provide enhanced situational awareness of destination weather

conditions.[10] Pilots and flight dispatchers can review aviation weather camera images and cancel a flight based on information regarding possible poor weather conditions en route or at their destination, helping the pilot avoid a potentially hazardous situation or to avoid starting on a mission that the pilot will not be able to complete. Further, near real-time weather camera information can provide company flight operations personnel and flight dispatchers with information to help maintain operational control while the flight is en route and potentially redirect a flight based on information about possible poor weather conditions.

In addition, aviation weather camera imagery can improve NWS weather hazard advisory issuance. In Alaska, the NWS uses this information in real time to help identify hazardous conditions where no other instrumentation may be available, as well as validating forecasts it makes for a certain area. According to a forecaster at the NWS Weather Forecast Office in Honolulu, Hawaii, aviation weather cameras can provide the necessary in-situ information needed to support issuing advisories for mountain obscuration. Currently, NWS forecasters in Hawaii often rely on remote instrumentation and surface observations that may or may not be collocated with the mountainous terrain. Aviation weather camera imagery would also help to assess and hone the current local forecasting techniques for identifying mountain obscuration, which would still be required during night conditions and when or where aviation weather camera imagery is not available.

The Alaskan Aviation Camera Program has yielded positive results. According to the FAA,[11] the installation of aviation weather cameras has coincided with and contributed to a 53% decrease in the weather-related aviation accident rate in Alaska, with the (baseline) accident rate going from 0.28 accidents per 100,000 operations before 2008 to 0.13 accidents per 100,000 operations in 2011. In addition, the FAA reports that during the same time period, unnecessary flight hours due to the lack or unreliability of weather information decreased 64% from 15,374 hours (baseline) to 5,533 hours, providing benefits in addition to increased safety. Further, direct feedback from operators in Alaska on the utility of aviation weather cameras has been positive. In a 2012 FAA survey of 14 CFR Part 135 operators in Alaska used to help determine the effectiveness of the aviation weather camera system, the FAA received strong support for the camera program. In a letter to the FAA regarding the 2012 survey, a well-established Part 135 operator indicated that "The aviation weather cameras form the core of our weather related decisions….The information provided by the cameras is critical to our decision to dispatch, delay, postpone or cancel a flight. When flights have not been dispatched due to weather the cameras become our sole means of determining our ability to conduct operations with the margin of safety that our passengers demand from our operation."[12]

The NTSB concludes that aviation weather cameras can enhance traditional sources of weather information and provide essential new weather information to pilots preflight and en route to aid in situational awareness and decision-making. Given the effectiveness of the weather camera program in Alaska, a similar program would greatly benefit operators and significantly improve aviation safety in Hawaii. Therefore, the NTSB recommends that the FAA

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[10] In addition, because increased awareness of destination and en route weather can discourage flight before it begins, aviation weather cameras can also help reduce flight hours and fuel consumption.

[11] Federal Aviation Administration, *Post-Implementation Review Report, Aviation Weather Camera*, 2012.

[12] Part 135 operator in Alaska, letter to the FAA, 2012. This letter is in the docket for NTSB case number ANC12IA024.

initiate an aviation weather camera program in Hawaii that includes the installation and maintenance of aviation weather cameras at critical locations in Hawaii. The FAA should also establish public access to these aviation weather cameras' real-time imagery.

Benefits of weather cameras in CONUS

While the addition of aviation weather cameras will benefit pilots in Hawaii, the NTSB also believes that aviation weather cameras can significantly improve aviation safety in CONUS. As in Alaska, immediate benefit may be realized by positioning aviation weather cameras in mountain passes. Since 1997, the NTSB has investigated numerous general aviation accidents in CONUS[13] involving airplanes that encountered IMC and/or other adverse weather conditions in or near mountain passes while operating under daytime VFR under the provisions of 14 CFR Part 91. As in the Hawaii accidents, pilots entered IMC and/or adverse weather conditions, such as thunderstorms, clouds, and rain, while in areas of variable terrain. More information about these accidents can be found in the appendix to this letter.

The NTSB notes that in fiscal year 2014, the FAA plans to start research to identify the highest risk mountain passes in CONUS to prioritize locations for the permanent deployment of aviation weather cameras and weather observing equipment. The project is intended to include a year-long meteorological study of high accident rate mountain passes that identifies and documents prevailing seasonal conditions and weather trends that affect flight safety. The NTSB is pleased that the FAA has recognized aviation weather cameras as an essential source of weather information and their applicability to enhancing situational awareness for pilots in CONUS. However, no specific plan to install and maintain aviation weather cameras in CONUS when that research is completed has been communicated to the NTSB. The NTSB concludes that the effort that the FAA has initiated must result in the installation and maintenance of real-time aviation weather cameras in CONUS to ensure flight safety. Therefore, the NTSB recommends that the FAA install and maintain aviation weather cameras in those mountain passes in CONUS identified in its research as being high risk. The FAA should also establish public access to these aviation weather cameras' real-time imagery.

The NTSB issues safety recommendations based on the need to address safety issues and does not perform any cost-benefit analyses (CBA) of our recommendations. The FAA is required to perform CBAs as part of its decision-making process associated with NTSB safety recommendations. In most cases, the benefits considered in the CBA derive from fatalities and injuries avoided as a result of reduced accidents. However, with these aviation weather camera recommendations, there are additional economic benefits derived from the avoidance of unnecessary flight hours (and fuel consumption) due to the lack or unreliability of weather information, as documented in the FAA's study of benefits of the aviation weather camera program in Alaska. We urge the FAA to include these additional benefits when performing any CBAs associated with Safety Recommendations A-13-025 and A-13-026.

[13] More information about NTSB case numbers DEN08FA141, LAX08FA058, LAX06FA131, and LAX97FA089 is available at http://www.ntsb.gov/aviationquery/index.aspx and in the appendix to this letter.

Ground support to relay essential weather camera information

Because weather conditions in some areas can change rapidly (often the catalyst for deploying an aviation weather camera to a specific location) and aviation weather camera images obtained preflight may change once en route for a certain length of time, the ability to monitor the situation ahead while airborne is essential. Ground support, such as FSS specialists in Alaska, can provide descriptions of aviation weather camera images to pilots en route via the specialists' access to the Operational and Supportability Implementation System. FSS specialists in Alaska ask pilots if they want weather camera image information any time current conditions are provided and when weather camera information is available. When pilots request such weather camera information, FSS specialists can access the camera images and then interpret, summarize, and/or provide specific camera image information to the pilots. For example, an FSS specialist might say to the pilot, "Weather camera images thru Lake Clark Pass appear to show clouds higher than 5,000 and visibilities better than 8."[14] FSS specialists can also tell the pilot the direction a camera is facing and the age of the image. FSS specialists do not provide definitive cloud heights and obstructions to visibility from camera images alone unless additional authoritative weather information is available (for example, an aviation routine weather report).

The NTSB concludes that once aviation weather cameras are operational in Hawaii and CONUS as requested in Safety Recommendations A-13-025 and A-13-026, the weather information available from these images would benefit all pilots while flying in these areas. The NTSB recognizes that an appropriate long-term solution for en route monitoring that is applicable to all modes of operation may likely include the dedicated dissemination of aviation weather camera images in real time to the cockpit via satellite or ground-based services (such as flight information service broadcast or an Internet portal). Because the need for en route accessibility of weather camera images is critical due to changing weather conditions, it is imperative that currently established ground support is able to relay essential information to pilots regarding the aviation weather camera imagery immediately upon the first operational camera's deployment in Hawaii or CONUS. Therefore, the NTSB recommends that the FAA equip FSS specialists responsible for Hawaii and CONUS with the technical capabilities and training to provide verbal preflight and en route briefings using aviation weather camera imagery.

Therefore, the National Transportation Safety Board makes the following recommendations to the Federal Aviation Administration:

> Initiate an aviation weather camera program in Hawaii that includes the installation and maintenance of aviation weather cameras at critical locations in Hawaii. Establish public access to these aviation weather cameras' real-time imagery. (A-13-025)

[14] This example does not include definitive cloud heights and visibilities. Elevation markers and distance markers have been used to describe clouds that are higher than the known elevations and visibility up to the greatest common marker in all views.

Install and maintain aviation weather cameras in those mountain passes in the continental United States identified in its research as being high risk. Establish public access to these aviation weather cameras' real-time imagery. (A-13-026)

Equip flight service station specialists responsible for Hawaii and the continental United States with the technical capabilities and training to provide verbal preflight and en route briefings using aviation weather camera imagery. (A-13-027)

Acting Chairman HERSMAN and Members SUMWALT, HART, ROSEKIND, and WEENER concurred in these recommendations.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate receiving a response from you within 90 days detailing the actions you have taken or intend to take to implement them. When replying, please refer to the safety recommendations by number. We encourage you to submit your response electronically to correspondence@ntsb.gov.

By:

Appendix

Accidents in Hawaii

Pukoo, Hawaii (five fatalities)

On November 10, 2011, about 1214 Hawaii-Aleutian standard time (HST), a Eurocopter EC130 B4 helicopter, N11QV, collided with mountainous terrain near Pukoo on the island of Molokai, Hawaii. The commercial pilot and all four passengers were fatally injured, and the helicopter was substantially damaged. The helicopter was registered to Nevada Helicopters Leasing and operated by Blue Hawaiian Helicopters under the provisions of 14 CFR Part 135 as a local air tour flight. The flight originated from the Kahului Airport, Kahului, Hawaii, about 1144 HST. All witnesses reported rain showers in the area during the time frame of the accident. Several witnesses reported that the accident occurred between rain "squalls" and one reported that it occurred during a heavy rain "squall." This accident is currently under investigation.[15]

Honolulu, Hawaii (two fatalities)

On January 10, 2010, about 1345 HST, a Piper PA-32-300 airplane, N8934N, impacted the southeast side of a ridge while approaching the Honolulu International Airport, Honolulu, Hawaii. The noninstrument-rated private pilot and the passenger were fatally injured, and the airplane was substantially damaged. The airplane was registered to and operated by a private pilot under the provisions of 14 CFR Part 91 as a personal flight. No flight plan had been filed, but the pilot was receiving VFR flight-following services. One witness stated that in "very cloudy, poor visibility" conditions, he heard an airplane crash into a ridge about 50 yards away. Another witness reported that the ridge was obscured by clouds, and a third witness stated that she heard an airplane flying low and briefly observed it pass by before it disappeared in the cloud layer. A fourth witness stated that when the airplane impacted, there were "heavy clouds and the mountain was hard to see." The investigation also revealed that along with reduced visibility, the airplane also would have encountered light to moderate rain showers. The NTSB determined that the probable cause of this accident was the pilot's continued visual flight into IMC at an altitude insufficient to ensure adequate terrain clearance.[16]

Pahala, Hawaii (three fatalities)

On June 17, 2008, about 1205 HST, a Cessna 172M airplane, N13713, impacted terrain near Pahala, Hawaii. The commercial pilot and the two passengers were fatally injured, and the airplane was substantially damaged. The airplane was registered to PAP, LLC, and operated by Above It All, Inc., doing business as Island Hoppers, under the provisions of 14 CFR Part 135 as an air taxi flight. Visual meteorological conditions (VMC) prevailed for the flight's departure from Kailua-Kona, Hawaii, about 1020 HST, and a VFR flight plan had been filed. The investigation revealed that the pilot likely deviated from his planned route of flight along the

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[15] More information about this accident, NTSB case number WPR12MA034, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[16] More information about this accident, NTSB case number WPR10FA107, is available at http://www.ntsb.gov/aviationquery/index.aspx.

shoreline, inadvertently entered IMC, and collided with the rising mountainous terrain. A witness on the ground about 1 mile away from the path of the accident airplane about 5 minutes before the accident reported that the weather was foggy, misting, and rainy. The NTSB determined that the probable cause of the accident was the pilot's continued visual flight into IMC and his failure to remain clear of rising terrain while deviating from his planned route of flight. Contributing to the accident were clouds and mountainous terrain.[17]

Haena, Hawaii (three fatalities, three minor injuries)

On September 23, 2005, about 1415 HST, an Aerospatiale AS350 BA helicopter, N355NT, encountered adverse weather and crashed into the Pacific Ocean off the coast of Kailiu Point near Haena on the island of Kauai, Hawaii. Three passengers were fatally injured, and the commercial pilot and two other passengers received minor injuries. The helicopter was substantially damaged. The helicopter was registered to Jan Leasing, LLC, and operated by Heli-USA Airways, Inc., under the provisions of 14 CFR Part 135 as an air tour flight. A company VFR flight plan was filed. The pilot reported that the weather and visibility were good during the initial part of the tour and stated that he saw rain showers offshore as the flight approached Kee Beach and Kailiu Point. The pilot reported that at one point, he made a left turn to avoid another oncoming aircraft, and as he leveled his helicopter out of the turn, he was "already inside the storm" and encountered heavy rain. Two passengers stated that the helicopter made no evasive maneuver (or any maneuver) before entering what they described as "a wall of pure rain and thick clouds." The pilot stated that while the helicopter was in heavy rain, he could still see down and to the right to the coastline and that he reduced the helicopter's airspeed and initiated a descent to maintain visual reference to the beach. One passenger reported that he could not see anything in the heavy rain and that he was about to notify the pilot when the pilot announced that they were turning back. The pilot said that he started a right turn over the beach and that during the turn, the helicopter's airspeed dropped to zero and the helicopter started to rapidly descend. The NTSB determined that the probable cause of this accident was the pilot's decision to continue flight into adverse weather conditions, which resulted in a loss of control due to an encounter with a microburst.[18]

Kalaheo, Hawaii (five fatalities)

On September 24, 2004, about 1642 HST, a Bell 206B helicopter, N16849, impacted mountainous terrain near Kalaheo, Hawaii. The commercial pilot and all four passengers were fatally injured, and the helicopter was destroyed. The helicopter was registered to and operated by Bali Hai Helicopter Tours, Inc., under the provisions of 14 CFR Part 91 as an air tour flight. IMC prevailed near the accident site, and no flight plan had been filed. The flight, which was the pilot's eighth and final tour flight for the day, was scheduled to fly clockwise around the island of Kauai for a 45-minute sightseeing tour over a number of site-specific locations, including Waimea Canyon, the Na Pali Coast, Waialeale Crater, and Manawaipuna Falls. Digital, time-stamped still images recovered from a passenger's camera showed that when the helicopter

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[17] More information about this accident, NTSB case number LAX08FA190, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[18] National Transportation Safety Board, *Weather Encounter and Subsequent Crash into the Pacific Ocean, Heli-USA Airways, Inc., Aerospatiale AS350 BA, N355NT, September 23, 2005*, AAB-07/01 (Washington, DC: National Transportation Safety Board, 2007), http://www.ntsb.gov/doclib/reports/2007/AAB0701.pdf.

departed, the weather nearby appeared sunny with good visibility. Subsequent images taken during the tour showed low clouds and precipitation near some site-specific locations. The NTSB determined that the probable cause of the accident was the pilot's decision to continue flight under VFR into an area of turbulent, reduced visibility weather conditions, which resulted in the pilot's spatial disorientation and loss of control of the helicopter. Contributing to this accident was the pilot's inexperience in assessing local weather conditions, inadequate FAA surveillance of Special Federal Aviation Regulation 71 operating restrictions, and the operator's pilot-scheduling practices that likely had an adverse impact on pilot decision-making and performance.[19]

Hilo, Hawaii (one minor injury)

On July 8, 2004, about 1230 HST, a Eurocopter AS350 B2 helicopter, N196BH, landed hard in a pasture on the north slope of the Mauna Kea Volcano near Hilo, Hawaii. The commercial pilot and five passengers were not injured, and one passenger sustained minor injuries. The helicopter was substantially damaged. The helicopter was registered to and operated by Blue Hawaiian Helicopters, Inc., under the provisions of 14 CFR Part 135 as an on-demand air tour flight. A company VFR flight plan was filed. During the flight, the pilot had heard reports of poor weather conditions along the intended flightpath and chose to fly along a different flightpath to avoid the weather. The helicopter flew above a scattered, thin layer of clouds, and the weather began changing rapidly with clouds forming and closing in on the helicopter. The pilot descended through a gap in the cloud layer to try to regain visual conditions under the cloud deck. Once below the clouds, the helicopter entered IMC as weather worsened and the clouds and fog surrounded and engulfed the helicopter. The pilot attempted to reverse course and climb when the main rotor impacted a tree. A witness reported that just before the accident, weather conditions were sunny and clear, and then the fog rapidly developed and surface visibility decreased to 4 feet. The witness further stated that rapidly changing weather is common to the area. The NTSB determined that the probable causes of this accident were the pilot's inadequate planning/decision by operating his VFR flight into IMC and his failure to maintain obstacle clearance, which resulted in an in-flight collision with a tree. A low ceiling and fog were contributing factors.[20]

Hilo, Hawaii (no fatalities or injuries)

On September 9, 2003, about 1200 HST, a Eurocopter AS350 BA helicopter, N5206J, collided with the ground during an uncontrolled descent while attempting to turn away from deteriorating weather conditions near Hilo, Hawaii. The airline transport pilot and all six passengers were uninjured, and the helicopter was substantially damaged. The helicopter was registered to and operated by Sunshine Helicopters under the provisions of 14 CFR Part 135 as an air tour flight. A company VFR flight plan had been filed. The helicopter was descending from 9,000 feet mean sea level (msl) through mountainous terrain when it encountered mist and low-level clouds being blown upslope from the east. Two passengers in the helicopter stated that they were flying low over the terrain, viewing the lava flows in low visibility and fog. The NTSB

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[19] National Transportation Safety Board, AAR-07/03.

[20] More information about this accident, NTSB case number LAX04LA256, is available at http://www.ntsb.gov/aviationquery/index.aspx.

determined that the probable cause of the accident was the pilot's inadvertent encounter with IMC and his failure to maintain aircraft control. Contributing factors were fog, rough/uneven terrain, and spatial disorientation.[21]

Waialeale Crater, Hawaii (five fatalities)

On July 23, 2003, about 0852 HST, a Bell 206B helicopter, N37741, descended into steep downsloping terrain in the Waialeale Crater on the island of Kauai, Hawaii. The commercial pilot and all four passengers were fatally injured, and the helicopter was destroyed. The helicopter was registered to and operated by Jack Harter Helicopters, Inc., under the provisions of 14 CFR Part 135 as an on-demand air taxi flight. A company VFR flight plan was filed. A passenger's videotape showed that the flight was initially operated in VMC; however, as the helicopter approached the crater's 5,000-foot msl rim, the videotape showed clouds both above and below the helicopter. The NTSB determined that the probable cause of this accident was the pilot's failure to maintain adequate terrain clearance/altitude while descending over mountainous terrain and his continued flight into adverse weather. Factors contributing to the accident were clouds and a low ceiling.[22]

Kalaupapa, Hawaii (one fatality)

On January 25, 2003, about 1222 HST, a Cessna 172N airplane, N911FC, impacted mountainous terrain while maneuvering about 5 miles east of Kalaupapa on the island of Molokai, Hawaii. The solo student pilot was fatally injured, and the airplane was destroyed. The airplane was registered to a private pilot and operated by George's Aviation Service, Inc., under the provisions of 14 CFR Part 91 as a solo instructional flight. IMC prevailed at the accident site, and a VFR flight plan had been filed. The student pilot and instructor each obtained weather briefings before the student's flight, which indicated weather conditions above VFR minimums throughout the planned route of flight. According to two military pilots, both of whom were flying helicopters in the opposite direction along the same route of flight as the accident pilot and one of whom observed the accident airplane, the student pilot was eventually going to encounter IMC at the elevation at which he was flying. The wreckage was located at the 1,500-foot level of a steeply rising mountain, and steep mountains separated the accident site from the closest weather reporting facility (11 miles away). The weather conditions at the reporting facility when the accident flight passed that location were a few clouds at 800 feet above ground level (agl), scattered clouds at 2,400 feet agl, and broken clouds at 5,500 feet agl, with a visibility of 10 miles, which was very different from the weather at the accident location. The NTSB determined that the probable cause of this accident was the student pilot's inadvertent VFR flight into IMC, which resulted in his in-flight collision with mountainous terrain while maneuvering. A contributing factor was the low cloud ceilings.[23]

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[21] More information about this accident, NTSB case number LAX03LA297, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[22] More information about this accident, NTSB case number LAX03FA241, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[23] More information about this accident, NTSB case number LAX03FA077, is available at http://www.ntsb.gov/aviationquery/index.aspx.

Kahului, Hawaii (seven fatalities)

On July 21, 2000, about 1020 HST, an Aerospatiale AS355 F1 helicopter, N510TG, collided with mountainous terrain while descending in the Iao Valley near the Kahului Airport on the island of Maui, Hawaii. The noninstrument-rated commercial pilot and all six passengers were fatally injured, and the helicopter was destroyed. The helicopter was registered to and operated by Helicopter Consultants of Maui, Inc., doing business as Blue Hawaiian Helicopters, under the provisions of 14 CFR Part 135 as an air tour flight. IMC prevailed at the accident site, and a company VFR flight plan was filed. The investigation revealed that the pilot encountered IMC in the vicinity of the accident site and likely became disoriented regarding his location relative to terrain. According to other company pilots, the weather conditions in that area typically changed rapidly. The NTSB determined that the probable causes of the accident were the pilot's inadequate decision by which he continued VFR flight into IMC and his failure to maintain terrain clearance, resulting in a collision with mountainous terrain. A contributing factor was the low cloud ceiling.[24]

Volcano, Hawaii (ten fatalities)

On September 25, 1999, about 1726 HST, Big Island Air flight 58, a Piper PA-31-350 (Chieftain) airplane, N411WL, crashed on the northeast slope at the 10,100-foot level of the Mauna Loa Volcano near Volcano, Hawaii. The pilot and all nine passengers were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by Big Island Air under the provisions of 14 CFR Part 135 as an on-demand air taxi operation. VMC existed at the Keahole-Kona International Airport, Kona, Hawaii, from which the airplane departed about an hour earlier; however, the investigation determined that IMC prevailed in the vicinity of the accident site near 10,000 feet msl. A VFR flight plan had been filed. The NTSB determined that the probable cause of the accident was the pilot's decision to continue visual flight into IMC in an area of cloud-covered mountainous terrain.[25]

Mt. Waialeale, Hawaii (six fatalities)

On June 25, 1998, about 0932 HST, a Eurocopter AS350 BA helicopter, N594BK, impacted the 80-degree upsloping face of a mountain near Mt. Waialeale on the island of Kauai, Hawaii. The commercial pilot and all five passengers were fatally injured, and the helicopter was destroyed. The helicopter was registered to and operated by Ohana Aviation, doing business as Ohana Helicopter Tours, under the provisions of 14 CFR Part 135 as an on-demand air tour flight. IMC prevailed for the flight, which operated on a company VFR flight plan. The tour was to circumnavigate a mountainous area on the island and visit an extinct volcanic crater in a mountain valley. The investigation revealed that during the flight, the accident pilot encountered lowering ceilings, heavy rain showers, and reduced flight visibility. Just before the collision with terrain, the accident pilot transmitted on the radio that the weather was getting worse and stated, "I can't see!" The NTSB determined that the probable cause of the accident was the pilot's

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[24] More information about this accident, NTSB case number LAX00MA273, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[25] National Transportation Safety Board, *Collision with Terrain of Big Island Air Flight 58, September 25, 1999*, AAB-01/02 (Washington, DC: National Transportation Safety Board, 2001), http://www.ntsb.gov/doclib/reports/2001/AAB0102.pdf.

decision to continue VFR flight into deteriorating weather conditions of lowering ceilings and visibility in mountainous terrain, which resulted in the inadvertent entry into IMC and collision with a mountainside.[26]

Hilo, Hawaii (one fatality)

On May 18, 1997, about 1145 HST, a Bell 206B helicopter, N98AW, collided with mountainous terrain at the 6,500-foot level on the eastern slope of the Mauna Kea Volcano near Hilo, Hawaii. The solo commercial pilot was fatally injured, and helicopter was destroyed. The helicopter was registered to and operated by Kanai Air Hawaii under the provisions of 14 CFR Part 91 as an on-demand air taxi flight. Meteorological conditions along the intended route of flight were variable from VMC to IMC with a 7,000-foot overcast ceiling overlaying the destination and the eastern portion of the route of flight. The pilot had filed a company VFR flight plan but obtained no preflight weather briefing and was not rated for instrument flight. The NTSB determined that the probable causes of the accident were the noninstrument-rated pilot's flight into instrument conditions and his failure to maintain adequate terrain clearance while attempting to descend through an overcast cloud layer. The adverse weather conditions and mountainous terrain were related factors.[27]

Accidents in CONUS

Georgia Pass, Colorado (four fatalities)

On August 15, 2008, about 0915 mountain daylight time, a Cessna 182T airplane, N487TC, impacted terrain on Mount Guyot near Georgia Pass in Park County, Colorado. The instrument-rated pilot and all three passengers were fatally injured, and the airplane was destroyed. The airplane was registered to a private pilot and operated by Anson Air, LLC, under the provisions of 14 CFR Part 91 as a cross-country personal flight. IMC prevailed at the time of the accident, and no flight plan was filed. The flight originated at Steamboat Springs, Colorado, and was destined for Brenham, Texas. The airplane was instrument flight rules (IFR)-equipped, and the pilot was familiar with the airplane. No evidence exists that the pilot obtained a preflight weather briefing. Weather near the accident site deteriorated rapidly after departure, and the pilot likely encountered a thunderstorm and lost control of the airplane, impacting terrain. The NTSB determined that the probable cause of this accident was the pilot's failure to maintain control after inadvertently encountering IMC. Contributing to the accident were the pilot's failure to obtain a weather briefing and the severe weather conditions.[28]

Cabazon, California (four fatalities)

On February 2, 2008, about 1340 Pacific standard time (PST), a Cessna 340A airplane, N354TJ, collided with upsloping mountainous terrain in a mountain pass near Cabazon,

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[26] More information about this accident, NTSB case number LAX98FA211, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[27] More information about this accident, NTSB case number LAX97LA185, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[28] More information about this accident, NTSB case number DEN08FA141, is available at http://www.ntsb.gov/aviationquery/index.aspx.

California. The pilot and all three passengers were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by a private pilot under the provisions of 14 CFR Part 91 as a personal flight. No flight plan had been filed, but the airplane had been receiving VFR flight-following services. The flight departed under VMC on a cross-country flight from Palm Springs, California, which was located on the east side of a mountain range, to a destination on the west side of the mountains. A weather observation station located near the departure location (elevation 477 feet) about 20 miles southeast of the accident site reported a scattered cloud layer at 10,000 feet agl. A weather observation station located about 29 miles southwest of the accident site (elevation 1,536 feet) reported a broken cloud layer at 4,000 feet agl. Another pilot who was flying westbound at 8,500 feet through the same mountain pass around the time of the accident reported overcast cloud coverage in the area of the accident site that extended west of the mountains. The pilot stated that the ceiling was about 4,000 feet msl and the tops of the clouds were 7,000 feet msl or higher throughout the area. The NTSB determined that the probable cause of this accident was the pilot's continued visual flight into IMC and failure to maintain terrain clearance while en route. Contributing to the accident were clouds and mountainous terrain.[29]

Oak Glen, California (two fatalities)

On March 28, 2006, about 1655 PST, a Cessna 208B airplane, N208WE, departed controlled flight and descended at a steep nose-down attitude into mountainous terrain near Oak Glen, California. The commercial pilot and the private pilot were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by Cessna Aircraft Company under the provisions of 14 CFR Part 91 as a cross-country business flight. Before departure, one of the two pilots on board filed an IFR flight plan for a route passing over mountainous terrain. The flight plan was not activated, and the pilots told a terminal radar approach control controller who was providing VFR advisories that they intended to continue under VFR through a mountain pass and open their IFR flight plan after reaching the other side of the pass. A review of the mode C-reported altitudes flown by the pilots and an analysis of the cloud bases and tops revealed that the airplane was likely in at least intermittent, if not mostly solid, IMC as it flew through the mountain pass. As the airplane approached the other end of the mountain pass, the controller advised the pilots that the radar showed they were heading into rising terrain. The controller asked, "Do you have the terrain in sight?" One of the pilots responded, "We're maneuvering away from the terrain right now." Radar contact was then lost. Witnesses described the weather as cold with drizzling rain and reduced visibility due to clouds. The NTSB determined that the probable cause of the accident was the pilot's continued flight into IMC weather conditions and his subsequent failure to maintain an adequate airspeed while maneuvering that led to a stall/spin.[30]

Mt. San Jacinto, California (two fatalities)

On January 13, 1997, about 1439 PST, a Beech F33A airplane, N31706, cruised at 7,600 feet msl into rising mountainous terrain on the western side of Mt. San Jacinto, California.

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[29] More information about this accident, NTSB case number LAX08FA058, is available at http://www.ntsb.gov/aviationquery/index.aspx.

[30] More information about this accident, NTSB case number LAX06FA131, is available at http://www.ntsb.gov/aviationquery/index.aspx.

The pilot and the passenger were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by a private pilot under 14 CFR Part 91 as a personal flight. IMC prevailed at the accident site, and no flight plan was filed. After takeoff from Torrance, California, the pilot requested radar VFR flight-following service for his flight from Torrance through the Banning Pass to Palm Springs, California. (Clouds were present in the Banning Pass area.) About 1435 PST, while proceeding at 7,600 feet in an easterly direction, the pilot asked the controller, "We on course through the Banning Pass?" The controller informed the pilot "…you're not through the Banning Pass but the Banning Pass is at eleven o'clock and eight miles." There was no further communication from the pilot. About 1447, the Palm Springs Airport, which was the closest official aviation weather observation station, reported a few clouds at 2,000 feet agl and a broken ceiling at 4,000 feet agl. Pilots reported clouds in the area of the accident site at the accident time. The NTSB determined that the probable cause of the accident was the continued VFR flight by the pilot into IMC and his failure to maintain proper altitude or clearance from mountainous terrain. Factors relating to the accident were the high/mountainous terrain and the adverse weather condition (low ceiling/clouds).[31]

[31] More information about this accident, NTSB case number LAX97FA089, is available at http://www.ntsb.gov/aviationquery/index.aspx.