



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: October 7, 2002

In reply refer to: A-02-33 through -35

Honorable Marion C. Blakey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Flat light is “the diffuse lighting that occurs under cloudy skies especially when the ground is snow covered. Under flat light conditions, there are no shadows cast, and the topography of snow-covered surfaces is impossible to judge.”¹ Flat light² greatly impairs a pilot’s ability to perceive depth, distance, altitude, or topographical features when operating under visual flight rules (VFR). Whiteout³ is a similar phenomenon. Under these conditions, pilots may become spatially disoriented, unable to maintain visual reference with the ground, and unaware of their actual altitude.

Accidents Involving Flat Light Conditions

On June 9, 1999, about 1050 Alaska daylight time, a Eurocopter AS-350BA helicopter, N6099S, was destroyed when it crashed on the Herbert Glacier (part of the Juneau ice field) near Juneau, Alaska. The helicopter was being operated by Coastal Helicopters as a VFR, on-demand sightseeing flight under 14 *Code of Federal Regulations* (CFR) Part 135. The certificated commercial pilot and six passengers were killed. The accident pilot was not instrument rated.

The accident site was a level glacier surface covered by unbroken snow and located in a mountainous bowl surrounded by snow-covered peaks. The nose-down attitude and velocity of the helicopter at impact were consistent with a loss of control in flight and spatial disorientation. Two other pilots in the vicinity at the time of the accident reported VFR conditions but noted that the snow-covered glacier was featureless and that the overcast ceiling was difficult to distinguish from the snow. Accident site photographs taken by rescue personnel and Alaska state troopers about 1 hour after the accident revealed no discernible horizon.

¹ Sandia National Laboratories, *Project ES&H Plan for NSA/AO Climate Project*, SP473406, page 11.

² Flat light conditions also may occur under similar circumstances over broad expanses of water.

³ Federal Aviation Administration (FAA) Advisory Circular AC-00-61 describes “whiteout” as a “visibility-restricting phenomenon that occurs in the Arctic when a layer of cloudiness of uniform thickness overlies a snow or ice covered surface. Parallel rays of the sun are broken up and diffused when passing through the cloud layer so that they strike the snow surface from many angles. The diffused light then reflects back and forth countless times between the snow and the cloud eliminating all shadows. The result is a loss of depth perception.”

The National Transportation Safety Board determined that the probable cause of this accident was as follows:

The pilot's continued VFR flight into adverse weather, spatial disorientation, and failure to maintain aircraft control. Factors associated with the accident [included] . . . "flat" lighting leading to whiteout conditions. Additional factors were the pilot's lack of instrument experience, inadequate certification and approval of the operator by the [Federal Aviation Administration], and the FAA's inadequate surveillance of the emergency instrument procedures in use by the company.

On September 10, 1999, about 1204 Alaska daylight time, a Eurocopter AS-350B-2 helicopter, N6007S, was destroyed when it crashed on the Juneau ice field near Juneau, Alaska. The helicopter crashed on a level surface while flying near cruise speed, in a level attitude. The helicopter was being operated by TEMSCO Helicopters (TEMSCO) as a VFR, on-demand sightseeing flight under 14 CFR Part 135. The certificated commercial pilot and four passengers received minor injuries. The remaining passenger received serious injuries. The pilot was not instrument rated.

The pilot said that, during a gradual descent over a large, featureless, snow-covered ice field, a localized light snow shower momentarily reduced his forward visibility. He also stated that he was "unable to discern any topographic features, only a dark shape on the horizon." He stated that immediately before impact, he believed the helicopter was 500 feet above the surface. Three pilots who were in the area at the time of the accident all stated that overcast conditions, localized snow showers, and flat light conditions hindered their ability to discern the surface of the glacier. They added that weather reports and forecasts from Juneau often did not represent the actual weather in the mountains and over the ice field.

The Safety Board determined that the probable cause of this accident was as follows:

The pilot's continued flight into instrument meteorological conditions (IMC), and inadequate altitude/clearance. Factors associated with the accident were flat light and whiteout conditions, snow, and snow-covered terrain. An additional factor was the FAA's inadequate certification/approval of the operator's training manual, which did not require the operator to provide instrument training or instrument flight proficiency checks to its pilots.

On September 10, 1999, about 1445 Alaska daylight time, a Eurocopter AS-350B-2 helicopter, N6052C, sustained substantial damage when it crashed on the Juneau ice field near Juneau, Alaska. The helicopter was being operated by TEMSCO as a VFR search and rescue flight under 14 CFR Part 91. (The crew of N6052C was searching for N6007S when it crashed.) The certificated commercial pilot and the one passenger were not injured. The accident pilot was not instrument rated.

The pilot said that, while searching the upper portion of the ice field, deteriorating weather conditions to the north and east required him to proceed south, down the ice field. He stated that he slowed the helicopter to 15 knots and attempted to use a mountain ridge to the right of the helicopter (that is, west) for visual reference. He said, "Visibility in front was enough to see all the way to the top of the Herbert (greater than 3 miles). The ceiling sloped down to the

east 45° with a height at the ridge of approximately 700 feet.” The pilot added that just seconds before the impact, he thought the helicopter was at least 500 feet above the surface. He stated that flat light conditions made it difficult to see the ice field below.

The Safety Board determined that the probable cause of this accident was as follows:

The pilot’s failure to maintain altitude/clearance. Factors associated with the accident were flat light conditions, snow-covered terrain, and self-induced pressure to continue the search.

On September 10, 1999, about 1630 Alaska daylight time, a Eurocopter AS-350B-2 helicopter, N6099Y, sustained substantial damage when it crashed on the Juneau ice field near Juneau, Alaska. The helicopter was being operated by TEMSCO as a VFR search and rescue flight under 14 CFR Part 91. (Like the crew of N6052C, the crew of N6099Y was searching for N6007S when it crashed.) The certificated commercial pilot and the three passengers were not injured. The accident pilot was instrument rated but did not meet instrument currency requirements and had not been tested for instrument proficiency on his last 14 CFR Part 135 helicopter flight check.

The pilot of N6099Y stated that he was able to locate the downed helicopter (N6007S) about 2 miles in front of him. He said that he slowed the helicopter to about 30 knots in an attempt to gain visual reference by using a mountain range to the left of the helicopter and the debris field associated with the N6007S accident site to the front of the helicopter. He said that the ceiling at this location was at least 1,000 feet above ground level, and visibility in the direction of N6007S was more than 6 miles. He added that just before impact, he thought he was at least 500 feet above ground level. The pilot said that flat light conditions hampered his ability to see the topographical features of the ice field below.

The Safety Board determined that the probable cause of this accident was as follows:

The pilot’s failure to maintain altitude/clearance. Factors associated with the accident were flat light conditions, snow-covered terrain, and self-induced pressure to continue the search.

On May 1, 2000, about 1230 Alaska daylight time, a Bell 206B helicopter was destroyed when it crashed into snow-covered terrain about 21 miles northeast of Homer, Alaska. The helicopter was being operated by Maritime Helicopters, Inc., as a VFR, on-demand charter flight under 14 CFR Part 135. The airline-transport certificated pilot and the two passengers were not injured. The pilot stated that sky conditions at the accident site were about 500 feet overcast, and the visibility was about 1 mile. He said that flat light conditions existed, and that light drizzle was falling. He stated further that he was using a building as a landing reference, but when he flew past the building during the landing approach, he had no other visual references. The left landing gear skid of the helicopter contacted the snow, and the helicopter rolled onto its left side. The accident pilot was instrument rated but did not meet instrument currency requirements and had not been tested for instrument proficiency on his last 14 CFR Part 135 helicopter flight check. In answer to

the question, “How could this accident have been prevented?” on the *Pilot/Operator Aircraft Accident Report*, the pilot responded, “additional white-out training.”

The Safety Board determined that the probable cause of this accident was “the pilot’s misjudging the landing flare in whiteout/flat light conditions. Factors associated with the accident are the whiteout and flat lighting conditions.”

For each of these five accidents, visual meteorological conditions prevailed at the time of the helicopters’ departure. None of these helicopters were equipped with radar altimeters, nor were they required to be.

Safety Issues

Since January 1997, flat light conditions have been mentioned in the probable cause for 23 aviation accidents investigated by the Safety Board, including the five helicopter accidents described in this letter. In addition, whiteout conditions have been mentioned in another 13. Nearly all of these accidents occurred in Alaska. Although all but eight of the accidents involved fixed-wing aircraft, it is clear that flat light conditions occur relatively frequently in Alaska and create hazards for aircraft. The Board is concerned that, with the increasing popularity of helicopter tours in Alaska, additional safety measures are warranted for commercial helicopter operations there, where flat light and whiteout conditions are likely to occur. (According to a draft Environmental Impact Statement prepared by U.S. Forest Service,⁴ the total number of landings on the Juneau ice field increased from approximately 2,000 in 1985 to approximately 16, 500 in 2000.)

Evidence gathered during the investigation of the five accidents described in this letter raises the following concerns about commercial helicopter operations during flat light and other IMC: (1) commercial helicopter pilots who operate in areas where flat light or whiteout conditions routinely occur are not required to be instrument rated or to demonstrate instrument competency during Part 135 evaluation check flights; (2) commercial helicopter operators in these areas do not provide their pilots with the training necessary to operate safely in flat light conditions; and (3) radar altimeters that might aid pilots in recognizing proximity to the ground in flat light and whiteout conditions are not required for helicopters.

Instrument Flight Rating and Competency

Helicopters may legally operate in visibility less than that prescribed for airplanes (see 14 CFR 135.205(b) and 135.207). Title 14 CFR 135.207 reads, “No person may operate a helicopter under VFR unless that person has visual surface reference or, at night, visual surface light reference, sufficient to safely control the helicopter.” However, the accidents described in this letter demonstrate that flat light and whiteout conditions may arise without warning, thus creating the potential for losing sight of terrain. Further, the accidents demonstrate that, in such conditions, helicopters may not always operate at airspeeds slow enough to avoid obstructions and terrain.

⁴ *Helicopter Landing Tours on the Juneau Icefield, 2002 - 2006, Draft Environmental Impact Statement, July 27, 2001.*

During its investigation of the June 9, 1999, helicopter accident on the Juneau ice field, Safety Board staff interviewed pilots from different helicopter companies. All confirmed that weather conditions reported at the Juneau airport often vary significantly from conditions on the various glaciers flowing from the Juneau ice field. These pilots also stated that weather conditions tend to be local in nature due to mountainous terrain, wind, and temperature variations associated with the large mass of ice. Pilots interviewed during investigation of the September 10, 1999, accidents stated that weather reports and forecasts from Juneau often do not represent the actual weather conditions in the mountains and over the ice field.

Safety Board investigators also asked Coastal Helicopters' chief pilot if he conducted any training for emergency use of basic flight instruments. He replied that he did not and emphasized that company policy was to "go down, and slow down, but never go into instrument meteorological conditions." When asked what he would do personally if he found himself in whiteout or IMC, he replied that he never intended to be in that situation. The company's president, who also served as director of operations, stated that company policy was that a pilot does not fly into instrument conditions. Regardless of the views of the chief pilot and the president of Coastal Helicopters, the Safety Board doubts that pilots who routinely operate in areas where flat light or whiteout conditions routinely occur will always be able to avoid operating in such conditions, as the accidents described in this letter demonstrate.

Currently, the basic aeronautical training requirements contained in 61 CFR Part 129 require commercial and/or private helicopter pilots to receive 10 hours of instrument training in "an aircraft"; the CFR does not require instrument training for helicopter operations specifically, nor does it address the special hazards presented by flat light and whiteout conditions. Title 14 CFR 135.293(b) does require pilots to pass a competency check "to determine the pilot's competence in practical skills and techniques in that aircraft or class of aircraft [that is, helicopters]. The extent of the competency check shall be determined by the Administrator or authorized check pilot conducting the competency check." To that end, FAA Order 8400.10, *Air Transportation Operations Inspector's Handbook*, volume 3, chapter 2, section 7, paragraph 539, provides guidance for FAA principal operations inspectors (POIs) to use in reviewing and approving basic checking modules. Paragraph 539 of the order states that the minimum acceptable content of a Part 135 annual competency check for both fixed-wing and helicopter pilots should include some demonstration of "the pilot's ability to maneuver the aircraft solely by reference to instruments." Accordingly, the order specifies that competency checks for helicopter pilots (even those who conduct VFR-only operations) should include instrument approaches to demonstrate that the pilots are able to take a reasonable course of action to escape an inadvertent encounter with IMC.

Although POIs are expected to follow FAA Order 8400.10, implementation of the instrument-competency portions of paragraph 539 has occurred inconsistently and in some instances, not at all. None of the operators involved in the accidents described in this letter (that is, Coastal Helicopters, TEMSCO, and Maritime Helicopters) had included, nor had their POIs required them to include, a demonstration of IFR competency in their annual competency checks.

The Safety Board is concerned that helicopter pilots who conduct commercial, passenger-carrying flights in areas where flat light or whiteout conditions routinely occur are not required to

hold helicopter instrument ratings⁵ or to demonstrate IFR competency during initial and recurrent 14 CFR 135.293 evaluation flight checks. The accidents described in this recommendation letter might have been prevented if the pilots who were involved were instrument rated and instrument proficient. Therefore, the Safety Board believes that the FAA should require all helicopter pilots who conduct commercial, passenger-carrying flights in areas where flat light or whiteout conditions routinely occur to possess a helicopter-specific instrument rating and to demonstrate instrument competency during initial and recurrent 14 CFR 135.293 evaluation check flights.

The Safety Board also believes that the FAA should require all commercial helicopter operators conducting passenger-carrying flights in areas where flat light or whiteout conditions routinely occur to include safe practices for operating in flat light and whiteout conditions in their approved training programs.

Radar Altimeters

The helicopters described in this letter were neither equipped nor required to be equipped with radar altimeters, which indicate the aircraft's actual height above the ground and which warn pilots of their aircrafts' proximity to terrain. However, the Safety Board's position is that the helicopter accidents described in this letter, which occurred in the presence of flat light or whiteout conditions over featureless, snow-covered terrain, might have been prevented had the helicopters been equipped with radar altimeters. Therefore, the Safety Board believes that the FAA should require the installation of radar altimeters in all helicopters conducting commercial, passenger-carrying operations in areas where flat light or whiteout conditions routinely occur.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require all helicopter pilots who conduct commercial, passenger-carrying flights in areas where flat light or whiteout conditions routinely occur to possess a helicopter-specific instrument rating and to demonstrate their instrument competency during initial and recurrent 14 *Code of Federal Regulations* 135.293 evaluation check flights. (A-02-33)

Require all commercial helicopter operators conducting passenger-carrying flights in areas where flat light or whiteout conditions routinely occur to include safe practices for operating in flat light or whiteout conditions in their approved training programs. (A-02-34)

Require the installation of radar altimeters in all helicopters conducting commercial, passenger-carrying operations in areas where flat light or whiteout conditions routinely occur. (A-02-35)

⁵ Title 14 CFR 135.243(a)(2) requires helicopter pilots engaged in scheduled commercial interstate flights within the contiguous 48 states to have an instrument rating.

Acting Chairman CARMODY and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

Original Signed

By: Carol J. Carmody
Acting Chairman