



# National Transportation Safety Board

Washington, DC 20594

## Safety Recommendation

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**Date:** March 27, 2014

**In reply refer to:** A-14-002 and -003

The Honorable Michael P. Huerta  
Administrator  
Federal Aviation Administration  
Washington, DC 20591

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We are providing the following information to urge the Federal Aviation Administration (FAA) to take action on the safety recommendations issued in this letter. These recommendations address the potential misrepresentation of precipitation type in data reported by some FAA-certified automated weather observing systems (AWOS) under certain conditions.<sup>1</sup> The recommendations are derived from the National Transportation Safety Board's (NTSB) investigation of a December 10, 2012, fatal accident near Compton, Illinois, involving a Messerschmitt Bölkow-Blohm BK117-A3 helicopter operated by Air Methods Corporation.<sup>2</sup> As a result of this investigation, the NTSB has issued two safety recommendations addressed to the FAA. Information supporting these recommendations is discussed below.

The NTSB's ongoing investigation found that the nearest AWOS-3 P/T equipment (about 9 miles north of the accident site, at Rochelle Municipal Airport [KRPJ]) reported visual flight rules (VFR) or near-VFR surface conditions, with light snow, around the time of the accident.<sup>3</sup> However, data from a Weather Surveillance Radar-1988 Doppler (WSR-88D) installation about 46 miles east of the accident site show that the accident flight likely encountered lower ceilings and visibility than reported at the surface, as well as freezing drizzle and other mixed precipitation.<sup>4</sup> The extent to which these conditions caused or contributed to the accident remains to be determined; however, analysis of the weather radar information identified the repeated

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<sup>1</sup> Automated weather observing systems continuously measure weather information, including wind speed and direction; visibility (reported in statute miles); precipitation; cloud cover and ceiling up to 12,000 feet above ground level; temperature; dew point; and altimeter setting, and transmit an official report each hour. According to the FAA's website, AWOS is a suite of weather sensors of many different configurations that were either procured by the FAA or purchased by individuals, groups, or airports that are required to meet FAA standards.

<sup>2</sup> Further information about this accident, NTSB case number CEN13FA096, is available at <http://www.nts.gov/aviationquery/index.aspx>.

<sup>3</sup> The P/T designation for AWOS-3 installations indicates sensors for precipitation identification and intensity and thunderstorm reporting. The present-weather sensor on AWOS-3 P/T equipment reports precipitation types such as drizzle, rain, and snow.

<sup>4</sup> WSR-88D provides a three-dimensional volume scan of the atmosphere at varying degrees of elevation. The WSR-88D data from around the time of the accident indicated 10 to -10 decibel values along the accident helicopter's flight track, which corresponds to either very small hydrometeors or a small amount of hydrometeors (hydrometeors are any product of condensation or sublimation of atmospheric water vapor, as well as any water particles blown by the wind from the earth's surface). The data also indicated that the hydrometeors were more horizontal than vertical as they fell, which is characteristic of freezing drizzle and supercooled liquid water.

inaccurate reporting of precipitation by the AWOS over a period of about 4 hours following the accident, which is also of concern.

Specifically, analysis of the AWOS observations at KRPJ indicates that light rain was incorrectly reported several times when the official surface temperature was below 28°F, a temperature at which the precipitation would be freezing rain or snow. The FAA standard for non-federal AWOS installations, which is contained in Advisory Circular (AC) 150-5220-16D, states that FAA-certified present-weather sensors should “identify precipitation correctly as snow in 99 percent of the cases” when the air temperature is below 28°F.<sup>5</sup> Maintenance records for the AWOS installation at KRPJ indicate that the equipment was functioning normally at, around, and after the accident time.

Based on discussions with personnel who certify AWOS equipment, the errors in precipitation reporting likely occurred because there are two air temperature sensors on AWOS-3 P/T equipment: one reports the official air temperature value recorded in the hourly meteorological aerodrome report (METAR), and the other is located with and used by the present-weather-sensor equipment as the air temperature source for determining the precipitation type. However, due to differences in their configuration, the two air temperature sensors can report different values. In this case, while the air temperature sensor used for official reports indicated temperatures below 28°F, the air temperature data used by the present-weather sensor most likely indicated temperatures above that threshold, resulting in the precipitation after the accident being reported as rain. Such an outcome is possible with any AWOS installation equipped with a present-weather sensor.<sup>6</sup>

The NTSB is aware that the original design of automated surface observing systems (ASOS) had a similar problem in which the system’s precipitation identification sensor would sometimes mistakenly report rain during snow or ice pellet events, which led to erroneous reports of rain at 32°F and below being encoded in the METARs.<sup>7</sup> This error was addressed by the implementation in 1999 of a blowing snow algorithm that prevents rain from being reported when the temperature is 32°F and below.<sup>8</sup> According to the National Weather Service website, the algorithm was developed using 30 years of climatological data and improved over a winter season. By contrast, the 28°F threshold cited in AC 150-5220-16D and each of its previous versions has no documented scientific basis.

Although the erroneous reports noted during the Compton, Illinois, investigation occurred after the accident, the NTSB is concerned that such an error poses a safety-of-flight risk for pilots throughout the National Airspace System (NAS) who rely on AWOS reports. An unexpected encounter and rapid onset of icing conditions that are not observed or reported can be extremely hazardous to flight because pilots are not aware of the conditions they could encounter that could rapidly reduce their ability to fly safely. Given the potential hazards to flight safety associated with erroneous reporting of the precipitation type in cold weather conditions and the

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<sup>5</sup> For more information see [http://www.faa.gov/documentLibrary/media/Advisory\\_Circular/150-5220.16D.pdf](http://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5220.16D.pdf).

<sup>6</sup> For more information, see Attachment 3 to the Meteorology Group Chairman’s Factual Report for CEN13FA096 in the NTSB public docket.

<sup>7</sup> The ASOS is another system that measures, collects, and disseminates weather information. According to the FAA’s website, the basic difference between ASOS and AWOS is that ASOS generally comprises a standard suite of weather sensors that have all been procured from one contractor, and AWOS sensors can be produced by multiple contractors.

<sup>8</sup> For more information, see <http://www.nws.noaa.gov/asos/blsnexp.htm>.

lack of a documented basis for the specification in AC 150-5220-16D that 28°F is the temperature at which AWOS present-weather sensors should correctly identify the precipitation type as snow, the NTSB concludes that the specified temperature threshold for AWOS present-weather sensors is not appropriate and should be modified. Therefore, the NTSB recommends that the FAA modify all FAA-certified AWOS installations with present-weather sensors in the NAS such that they report only snow or “unknown precipitation” when precipitation is detected and the reported air temperature is 32°F or less. The NTSB notes that any software updates to AWOS algorithms could be performed during a triennial preventive maintenance check.<sup>9</sup> The NTSB also recommends that the FAA revise AC 150-5220-16D such that future AWOS installations with present-weather sensors in the NAS report only snow or “unknown precipitation” when precipitation is detected and the reported air temperature is 32°F or less.

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

Modify all Federal Aviation Administration-certified automated weather observing system installations with present-weather sensors in the National Airspace System such that they report only snow or “unknown precipitation” when precipitation is detected and the reported air temperature is 32°F or less. (A-14-002)

Revise Advisory Circular 150-5220-16D, “Automated Weather Observing Systems (AWOS) for Non-Federal Applications,” such that future AWOS installations with present-weather sensors in the National Airspace System report only snow or “unknown precipitation” when precipitation is detected and the reported air temperature is 32°F or less. (A-14-003)

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, 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 safety recommendations by number. We encourage you to submit your response electronically to [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov).

[Original Signed]

By: Deborah A.P. Hersman  
Chairman

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<sup>9</sup> For further information see page 69 of AC 150/5220-16D.