



Memorandum


**U.S. Department of
Transportation**

Office of the Secretary
Of Transportation

Office of Inspector General

Subject: ACTION: Observations on the Automated
Surface Observing System
AV-2001-073

Date: July 26, 2001

From: Alexis M. Stefani 
Assistant Inspector General for Auditing

Reply to
Attn of: JA-10:x60500

To: Federal Aviation Administrator

At the request of Senator Olympia J. Snowe, we conducted a limited review of the Federal Aviation Administration's (FAA) Automated Surface Observing System (ASOS) that focused on the status of the automated system, its performance, and planned improvements. ASOS provides pilots with weather information and has replaced human weather observers at many small, rural airports. FAA has invested over \$230 million in ASOS for 569 sites since the effort began in 1993. A copy of our letter to Senator Snowe is attached for your information and use. Our concerns focus on ASOS visibility and ceiling observations, time allotted to make repairs, the need to replace system hardware and software, and the need to coordinate improvements among Federal agencies. Based on this review, we are making a recommendation aimed at improving ASOS.

ASOS has been the subject of considerable debate because it replaced human weather observers with automated systems at many locations in the United States. However, studies conducted over the years have found that ASOS systems generally perform as well as the observers they replaced, and FAA recently certified ASOS as a sufficiently reliable, accurate weather system.

Additionally, the studies noted that ASOS performance lags when weather conditions change rapidly and unexpectedly. The system has difficulty providing accurate information in the transition period between visual and instrument flight rules. The primary concerns with ASOS focus on *visibility* and *ceiling* observations. These problems were highlighted by pilots we interviewed who rely on the system and in FAA and Air Force evaluations of ASOS. Correcting these problems will require changes to ASOS hardware and

software. Progress has been slow in making these improvements and more work remains.

FAA is contributing \$53 million to the joint product improvement program with the Department of Defense and National Weather Service to upgrade ASOS, over and above the \$236 million it has already invested. The improvement program is slated for completion in 2009, but confusion exists about how it will be executed. We note that funding priorities have shifted from correcting shortfalls and bringing new capabilities on line to keeping the system operational, and it is unclear if the \$53 million identified thus far by FAA for improvements will be sufficient. FAA needs a clear-cut roadmap for improving ASOS -- without it, concerns about the automated weather system will persist.

Therefore, we recommend that FAA revisit and finalize plans for improving ASOS (which include both hardware and software upgrades to improve ceiling and visibility observations), set realistic milestones for improvements, and provide the needed resources. These improvements need to be coordinated with the National Weather Service and the Department of Defense.

We discussed these issues with officials from the Weather and Flight Service Systems Integrated Product Team, and they concurred with our analysis. In accordance with Department of Transportation Order 8000.1C, we would appreciate receiving your response within 30 days. If you concur with our recommendation, please indicate the specific actions taken or planned and target dates for completion. If you do not concur, please provide your rationale. Furthermore, you may provide alternative courses of action that you believe would resolve the issues presented in this report.

We appreciate the courtesies and cooperation extended by your staff. If we can answer questions or provide additional information, please call me at (202) 366-1992, or David A. Dobbs, Deputy Assistant Inspector General for Aviation, at (202) 366-0500.

Attachment



**U.S. Department of
Transportation**

Office of the Secretary
of Transportation

The Inspector General

Office of Inspector General
Washington, D.C. 20590

The Honorable Olympia J. Snowe
United States Senate
Washington, DC 20510-1903

Dear Senator Snowe:

As you requested, we conducted a limited review of the Federal Aviation Administration's (FAA) Automated Surface Observing System (ASOS). ASOS provides pilots with weather information and has replaced human weather observers at many small, rural airports. FAA has invested over \$230 million in ASOS for 569 sites since the effort began in 1993.

As agreed with your office, we focused our work on the status of ASOS, system performance, and planned improvements. Our concerns focus on ASOS visibility and ceiling observations, time allotted to make repairs, the need to replace system hardware and software, and the need to coordinate improvements among Federal agencies. We are forwarding a copy of this letter and our recommendation to the FAA Administrator.

Studies show that ASOS generally performs as well as the human weather observers the system replaced. The system updates every minute, but performance lags at airports where weather conditions can change rapidly and unexpectedly. Specifically, ASOS has difficulty providing accurate information in the transition period between visual and instrument flying conditions. However, there are improvements under consideration that could enhance ASOS performance. FAA needs to prioritize these improvements in a way that will best serve the flying public, set milestones for these improvements, and provide the resources needed for system enhancements.

In conducting our work, we visited Augusta State and Houlton International Airports and discussed ASOS performance with contract weather observers, airport managers, air taxi operators, and pilots. We also discussed ASOS with a wide range of user groups, namely the Aircraft Owners and Pilots Association, Experimental Aircraft

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Association, National Business Aircraft Association, Air Transport Association, Cargo Airline Association, and Helicopter Association International.

ASOS is designed to provide pilots and other users information on airport weather conditions, which include temperature, dew point, wind direction and speed, altimeter setting, visibility, sky condition, and precipitation. We note that ASOS only provides a portion of the weather information a pilot must have before conducting a flight. The pilot's preflight weather briefing contains information such as adverse conditions, a recommendation whether the flight can be conducted visually, a synopsis of weather systems and air masses that might affect the flight, current weather conditions, forecast of enroute and destination weather, and wind speed and direction at altitude.

ASOS was intended to replace human weather observers as a "sole means" system at low activity airports and complement weather observers at all other airports. FAA's policy for providing weather observers at airports is predicated on activity, airport and airspace complexity, and instances of severe weather.

Pilots and air taxi operators we spoke with in Augusta told us they are generally satisfied with the performance of ASOS. However, they noted problems with ASOS visibility and ceiling observations and commented on the need to address them.

Previously, on behalf of Congressman Wu, we reviewed the ASOS in Astoria, Oregon. Weather observers at Astoria voiced complaints similar to those voiced by the observers in Houlton and Augusta. However, the U.S. Coast Guard aviation unit stationed at the Astoria airport felt the system performed well and was adequate for their needs. Astoria no longer has contract weather observers.

BACKGROUND

The ASOS program is a joint effort of FAA, the National Weather Service (NWS), and the Department of Defense (DoD). This system is the primary surface weather observing system in the United States, which supports aviation observation programs of FAA, NWS, and DoD. ASOS provides observations to the flying community that measure critical weather parameters, such as sky condition and visibility, at the aircraft touchdown zone on the runway. FAA has invested over \$230 million in ASOS at 569 sites since the effort began in 1993. ASOS funding is shown in the following table.

Agency	Total Sites	Commissioned Sites	Total Cost (in millions)
FAA	569	561	\$236
NWS	314	314	\$122
DoD	110	110	\$44
Total	993	985	\$402

Source: FAA & NWS ASOS Program Offices

The ASOS data are updated once each minute and transmitted directly to forecasters, air traffic controllers, and pilots. ASOS data are accessible through a variety of media such as video screen displays at the airport for the pilots to view weather information prior to their departure. Additionally, computer-generated voice messages are provided by ASOS for local FAA radio broadcast to pilots and for general aviation pilot use through a dial-in telephone number for each location. The normal pilot reception range of ASOS information is approximately a 25-mile radius from its location and up to a 10,000-foot altitude.

The array of sensors that makes up ASOS continuously samples and measures the environment. The automated system measures only the weather that passes through the sensors. The following table provides a general summary of the area around an ASOS site where the data provided by the sensors are considered valid.

Parameter	Radius in Miles Surrounding Sensor Site
Sky Conditions	3-5 miles
Visibility	2-3 miles
Precipitation	1-2 miles
Freezing Rain	2-3 miles
Temperature/Dew Point	5 miles
Wind	1-2 miles
Pressure	5 miles

Source: FAA ASOS Program Office

In contrast, human observers rely on their ability to see the entire atmosphere near an airport, horizon-to-horizon, to complete a weather observation. The observer's perception of weather also has a marked influence on the weather assessment. ASOS

is designed to create a representative observation through a set of standardized formulas based on weather passing through the sensors 24 hours a day.

OBSERVATIONS

ASOS has been the subject of considerable debate because it replaced human weather observers with automated systems at many locations in the United States. Studies conducted over the years have found that automated weather systems generally perform as well as the observers they replaced.

However, ASOS performance lags when weather conditions change rapidly with little warning. During rapidly changing conditions, the automated observations are known to lag slightly behind the actual weather as stated in the 1999 Air Force Operational Test and Evaluation Center (AFOTEC) Final Assessment Report on the Automated Surface Observing System. For instance, if visibility suddenly drops (in one minute) from 7 miles to 1 mile, ASOS needs to gather the data and perform the calculation in order to provide representative data. A total of 9 minutes may pass before ASOS will report the 1-mile visibility. When visibility rapidly improves, the ASOS generates a “special observation” while internally calculating the rise in visibility. In 10 to 12 minutes, the ASOS will report the improved visibility.

As required by the *Wendell H. Ford Aviation Investment and Reform Act for the 21st Century* (commonly referred to as AIR-21), FAA recently certified ASOS as a sufficiently reliable, accurate weather system. Notwithstanding this certification, there are a number of issues that require the agency’s attention.

- First, the primary concerns with ASOS are that *visibility* and *ceiling* observations lag behind the true weather during rapidly changing severe weather conditions. These deficiencies were highlighted in FAA’s 120-day Re-Assessment and the Air Force’s evaluation of ASOS.¹ Over 2 years ago, the Air Force recommended that FAA investigate problems with visibility and ceiling observations. The modifications to correct these problems would focus primarily on software changes. However, FAA has not made sufficient progress on these issues and more work remains.
- Second, system outages, which are often associated with power outages and reduced service problems with the dew point sensor, raised concerns with airport managers and Fixed Base Operators (providers of aircraft fuel, maintenance, and other aircraft services at the airport) at Augusta and Houlton airports. The ASOS

¹ ASOS Operational Assessment (120-Day Re-Assessment) dated March 30, 1998, and the U.S. Air Force Operational Test and Evaluation Center Final Assessment of ASOS dated January 1999.

dew point sensor, which indicates the potential for fog in the area, requires considerable monitoring and repair.

NWS, who maintains ASOS units at over 900 sites, reported 98.5 percent availability of its systems in FAA's Eastern Region. Nevertheless, the Memorandum of Agreement between NWS and FAA allows NWS between 36 and 48 hours to fix the system at airports where ASOS is the sole provider of weather data. Airport officials we talked to noted that because FAA regulations require that an airport have a functioning weather reporting capability to conduct air carrier operations, air carrier operations stop during ASOS outages. To be proactive, pilots and airport officials felt that FAA should provide greater guidance for obtaining alternate weather sources in the event outages occur.

- Third, the ASOS central processing unit, the nerve center of the system, has reached its maximum capacity and must be replaced *before* any additional improvements are made to the system. FAA needs to follow through on plans to make improvements to the ASOS central processing unit over the next several years. It is unlikely that improvements can be made with respect to visibility and ceiling observations until the processing unit is replaced.
- Finally, coordination among FAA, DoD, and NWS regarding ASOS improvements is important. The problems we identified in our review need to be addressed because they will add value and address long-standing concerns about the system. FAA, DoD, and NWS need to coordinate budgets for program improvements and set expectations for the ASOS program.

FAA is contributing \$53 million to the joint product improvement program to upgrade the ASOS over and above the \$236 million it has already invested. The improvement program is slated for completion in 2009, but there is confusion about how it will be executed. We note that funding priorities have shifted from correcting shortfalls and bringing new capabilities on line to keeping the system operational. It is uncertain if the \$53 million identified thus far by FAA for improvements will be sufficient.

FAA needs to revisit and finalize its plans for improving ASOS (including addressing problems with ceiling and visibility observations), set realistic milestones for these improvements, and provide the needed resources that will ensure rapid deployment of these system enhancements. Once these decisions are made, FAA should clearly articulate its plans to the user groups that depend on ASOS. We discussed these issues with the FAA Weather and Flight Service Systems Integrated Product Team, and will forward a copy of this letter to Administrator Garvey.

If we may be of further assistance in this or any other matter, please contact me at (202) 366-1959, or my Acting Deputy, Todd J. Zinser, at (202) 366-6767.

Sincerely,

A handwritten signature in black ink, appearing to read "K. M. Mead". The signature is written in a cursive style with a large initial "K" and a distinct "M".

Kenneth M. Mead
Inspector General

cc: FAA Administrator