

Advisory Circular

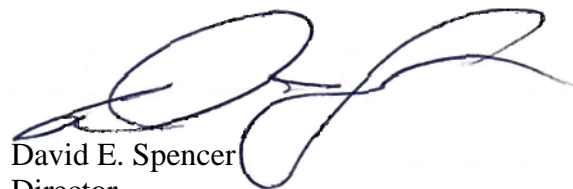
U.S. Department
of Transportation

**Federal Aviation
Administration**

Subject: AUTOMATED WEATHER OBSERVING SYSTEMS (AWOS) FOR NON-FEDERAL APPLICATIONS **Date:** 01/31/2019 **AC No:** 150/5220-16E
Initiated by: AJW-144 **Change:** 1

1. **PURPOSE.** This change contains updates that provide additional clarification and flexibility regarding technician training and responsibilities. These changes expand on the use of on site training or on the job training (OJT), based on statements regarding equivalent performance and maintenance standards in FAA Order 6700.20, Non-Federal Navigational Aids, Air Traffic Control Facilities, and Automated Weather Systems and discussion of on the job training in FAA Order 3000.57, Air Traffic Organization Technical Operations Training and Personnel Certification Programs.
2. **PRINCIPAL CHANGES.** Changed text is indicated by vertical bars in the margins. The primary revisions are contained in chapter 2, chapter 4 and the addition of appendix 2.

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Initiated by: AJW-144 **Change:**

1. **PURPOSE.** This advisory circular (AC) contains the Federal Aviation Administration's (FAA) standard for the non-Federal AWOS. This AC applies to anyone proposing to design, manufacture, procure, install, activate or maintain non-Federal AWOS for aviation purposes.

This advisory circular also contains site location and implementation criteria that must be met before the installed system can be commissioned and become an approved source of aviation weather information. It also contains maintenance and annual inspection criteria that must be met throughout the system's life cycle in order for the system to continue to be an approved source of aviation weather information.

2. **CANCELLATION.** AC 150/5220-16D, Automated Weather Observing Systems (AWOS) for Non-Federal Applications, dated 04/28/2011, is canceled.

3. **DEFINITION.** An AWOS is defined to be an "air navigation facility" distributing weather information, in Title 49 USC Section 40102, and consists of a computerized system that automatically measures one or more weather parameters, analyzes the data, prepares a weather observation that consists of the parameter(s) measured, provides dissemination of the observations and broadcasts the observation to the pilot in the vicinity of the AWOS, typically using an integral very high frequency (VHF) radio, an existing navigational aid (NAVAID), or Automatic Terminal Information Service (ATIS). Observations may also be available by telephone dial-up service. In addition, a Non-Federal AWOS is a Non-Federal facility as defined in the latest edition of FAA Order 6700.20, Non-Federal Navigational Aids, Air Traffic Control Facilities, and Automated Weather Systems.

4. **APPLICATION.** The provisions of this AC are effective immediately for all non-Federal AWOS systems, or portions thereof, that are submitted for type certification or for previously type-certified systems that are submitted for modification of their type certification certificate.

The Federal Aviation Administration recommends the guidance and specifications in this AC as it relates to non-Federal AWOS including but not limited to the design, manufacture, procurement, installation, activation, use and maintenance of such systems. This AC does not

constitute a regulation and is not mandatory. It provides one, but not the only, acceptable means of meeting the requirements of complying with the pertinent regulations.

Use of these guidelines is mandatory for projects that are funded under Federal grant assistance programs, including the Airport Improvement Program (AIP). It is also mandatory, as required by regulation, for projects funded by the Passenger Facility Charge program. See 14 C.F.R. part 158.25(b)(16). Mandatory terms such as “must” apply only to those proposing to design, manufacture, procure, install, activate, use or maintain an AWOS system using Federal grant funds or passenger facility charge (PFC) revenue or those who seek to demonstrate compliance by use of the specific method described by this AC.

5. USE IN THE NATIONAL AIRSPACE (NAS). An AWOS that has been manufactured, installed, and maintained according to the criteria in this AC may constitute an FAA approved source for weather information; may be approvable as a source of weather information that partially satisfies aviation regulations as identified in Title 14 of the Code of Federal Regulations (14 CFR); may be eligible to receive a broadcast frequency assignment or permission to broadcast over a NAVAID and may be eligible (subject to additional criteria) to transmit its weather information indirectly to the FAA for subsequent national dissemination.

6. CONTENT OF THIS AC. This AC provides guidance regarding the program elements that relate to a non-Federal AWOS.

7. PRINCIPAL CHANGES. Adds information for accessing a list of certified non-Federal AWOS systems and manufacturers. Updates the office of primary responsibility name and routing code. Makes content changes to clarify sentence meanings. Removes taking the entire system out of service when the altimeter is out of service. Clarifies the statutory basis of this advisory circular and the importance of commissioning and inspecting a system for the purposes of instrument approach procedures. Removes references to the FAA Concepts Bypass exam. Revises humidity, UHF radio and tri-annual scheduling criteria to be consistent with FAA AWOS criteria. Incorporates National Transportation Safety Board (NTSB) recommendations regarding present weather precipitation identification.

The updated operator terminal, environmental and present weather reporting criteria apply effectively to all new systems or systems that are submitted for modification. The updated annual inspection criteria and table, triannual maintenance check timing criteria and barometer verification methodology apply effective immediately to all systems that have been type-certified in the past.

8. HISTORICAL INFORMATION ABOUT THE PREVIOUS CHANGE DATED 04/28/11. Changed the minimum preventative maintenance interval from 90 days to tri-annual (120 days). Clarified information about connectivity to the FAA for national dissemination of AWOS data. Changed the Office of Primary Responsibility (OPR) for type certification from the Washington DC program office to the Oklahoma City Weather Processors and Sensors Team (AJW-14A). Made word changes to clarify sentence meanings. Changed the precipitation occurrence and measurement from one category into two distinct categories: 1) Present Weather Detector/Sensor and 2) Rain Gauge. Adds criteria for Ultrasonic Wind sensors and an AWOS to Automatic Terminal Information System (ATIS) switch.

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c. FAA Inspections. Finally, in addition to the annual revalidation inspection, there will be periodic visits to the operational AWOS by the FAA and other technical representatives to verify that the system continues to operate correctly. Guidance for these visits may be found in paragraph 2.10, Ongoing System Validation, and Chapter 4, AWOS System Maintenance and Operating Requirements, of this AC, the facility MOA/OMM, and the latest edition of FAA Order 6700.20. A site must be physically inspected by the non-Federal technician as witnessed by the FAA inspector annually to maintain the airport's instrument approach procedures, and, for AWOS III and IV systems, provide information to the national weather network.

2.2. SUBMITTALS FOR TYPE CERTIFICATION APPROVAL.

a. The AWOS Non-Federal Engineering Office at the address provided in paragraph 1.3.b will grant the appropriate approvals after review and approval of various submittals from the various providers.

These submittals should include:

(1) Test procedures and data sheets that demonstrate that the proposed AWOS sensors and system configuration meets the criteria of this AC. This submittal should include a matrix showing each specific requirement from this AC, cross-referenced to the specific location (e.g., paragraph, page, etc.) within the provider's documentation where the requirement has been addressed.

(2) System user and maintenance documents intended to support the AWOS system owner, the system user, the owner's local maintenance technician and the maintenance technician holding FAA verification authority.

(3) The warranty.

(4) A configuration control plan that identifies the components and options approved for use with the system.

(5) Technician training programs and materials as described in paragraph 2.4.f and designed to train the technician to assume the duties and responsibilities of the maintenance technician holding FAA verification authority.

b. Requests for type certification approval should be sent to the AWOS Non-Federal Engineering Office at the address provided in paragraph 1.3.b.

c. Product approval (including type certification, commissioning, or annual revalidation) may be revoked or an individual site may be removed from service if:

(1) The equipment is not maintained or inspected in accordance with this AC.

(2) The equipment has an unacceptable failure rate.

(3) There is a deficiency that precludes or hampers valid performance verification of the system operation.

(4) Changes are made to the software, firmware or hardware without FAA approval.

(5) Transmitted data does not conform to the latest editions of the Federal Meteorological Handbook (FMH-1) or FAA Order 7900.5.

maintenance technician should make a performance verification statement on this form. In all cases, the technician completing the action and making the form entry should be identified on the form. These forms also contain the date of the action, the facility name and location, and other identifying data. More information on completion of the Form 6030-1 may be found in the MOA/OMM or the latest edition of FAA Order 6700.20.

d. Installation and Checkout Manual. This document should thoroughly describe the installation and checkout procedures to be followed by the technician at the installation site.

e. Operating Instructions (i.e., an Observer Handbook). This document should provide detailed instructions for a FAA certified weather observer to operate the system. This document should describe and provide instructions for operation in each of the four modes described in paragraph 1.3.d, and it should explain the procedures when using the operator terminal to augment or to backup the AWOS, or to disseminate NOTAM information.

f. FAA Authorized Maintenance Technician Training Program.

Please refer to Appendix 2, Technician Training.

g. Annual System Revalidation Plan. This plan should contain the recommended procedures to conduct an annual inspection of the facility to revalidate the system and document that it is in the approved configuration and operating within tolerance. Reference paragraph 2.10 for information on system revalidation.

h. Warranty. The manufacturer should submit to the AWOS Non-Federal Engineering Office at the address provided in paragraph 1.3.b a statement certifying the following minimum warranty for the equipment:

This equipment has been manufactured and should perform in accordance with requirements of this AC. Any defect in design, materials, or workmanship which may occur during proper and normal use during a period of 1 year from date of installation or a maximum of 2 years from date of shipment should be corrected by repair or replacement by the manufacturer.

equipment, and resources to fulfill the manufacturer's recommended scheduled maintenance and calibration procedures as defined in the manufacturer's Maintenance Manual. The maintenance program is the responsibility of the owner, but may only be performed by personnel meeting manufacturer specific, FAA and FCC requirements.

a. Maintenance Personnel. The owner should show that their maintenance program has qualified personnel available to maintain the AWOS system. This includes the owner's assigned local maintenance technician to perform the tri-annual maintenance checks and the FAA authorized maintenance technician holding verification authority. The maintenance technician seeking FAA verification authority should refer to the current edition of FAA Order 6700.20, Non-Federal Navigational Aids, Air Traffic Control Facilities, and Automated Weather Systems, for the qualifications maintenance technicians need to have in order to maintain non-Federal facilities. They should have the special knowledge and skills needed to maintain the AWOS facility and should have either completed the appropriate approved training or completed acceptable previous training and have acceptable previous experience. As part of the FAA authorized technician verification process, the FAA will administer a performance examination to any technician seeking verification authority on the system. This exam will demonstrate they have the necessary proficiency, special knowledge and skills to accomplish all commissioning, annual reverification and required maintenance procedures including troubleshooting, validation of test equipment calibration and using the specialized test equipment. The FAA will issue a site and system specific verification authority letter to the candidate maintenance person if he/she is able to meet the concepts and performance requirements of the AWOS system, and has a FCC general radiotelephone operator license (GROL) for maintenance of the system's discrete frequency (UHF or VHF) or aeronautical advisory station (Unicom) transmitter.

b. Test Equipment. The owner should have available at the facility, at the time of commissioning, all test equipment required by the approved maintenance plan for maintenance and calibration of the facility. Test equipment must be capable of accurately measuring the appropriate performance parameters to verify technical standards and tolerances needed for facility verification, and must be collocated with the AWOS. Test equipment should be calibrated to NIST traceable standards in accordance with the calibration schedule submitted to and approved by the AWOS Non-Federal Engineering Office at the address provided in paragraph 1.3.b during type certification acceptance. In case an acceptable test equipment calibration schedule was not included, test equipment will be calibrated as per the test equipment manufacturer's recommendations. Test equipment calibration should be traceable to national standards, and proof of calibration, e.g., a current calibration sticker should accompany each piece of test equipment when it is being used. The test equipment should be available when required for commissioning, scheduled system maintenance and calibration, or for repairs following system failure. All measurements should be made with test equipment collocated with the AWOS equipment being measured.

c. Annual Performance/Configuration Revalidation. The owner should plan for complying with the manufacturer's recommended and FAA approved plan for annual system revalidation. This plan should identify the appropriate FAA Tech Ops Non-Federal District Office to notify to witness the on-site revalidation and include a list of the procedures to be followed during the on-site revalidation as well as the source of the FAA qualified non-Federal technician to perform the inspection.

Table 9. Standards, Tolerances, and References (Continued)

Check	Reference or Standard	Desired Initial Tolerance	Maximum Operating Tolerance
UHF Radios (throughout system) Output Power	1.0 watt	± 0.25 watt	Same as initial
UHF Radios (throughout system) Frequency Deviation	≤ 3.0 kHz	Same as Standard	Same as Standard
UHF Radios (throughout system) VSWR (at transmitter)	1.0 : 1	3.0 : 1	Same as initial

4.4. MAINTENANCE CHECKS AND SCHEDULES.

a. Minimum Tri-Annual Preventive Maintenance (PM) Checks. The following preventive maintenance checks should be accomplished by the owner's assigned local maintenance technician in accordance with the provider's FAA approved maintenance manual at tri-annual intervals. These checks are limited to cleaning, inspecting, comparing, preventing deterioration and helping ensure reliable operation. They are not intended to include the equipment calibration tasks found in the initial and annual verification checks. Tri-annual PM is scheduled on a 4 month interval and should be accomplished at the time it is scheduled. The maximum tolerance is ± 15 days from the scheduled tri-annual preventive maintenance check. The results of these checks should be recorded in the Facility Maintenance Log.

(1) Visit facility and accomplish a visual inspection to ensure integrity of the AWOS equipment and site location.

(2) Visual check of obstruction lights.

(3) Visually inspect all sensors and AWOS assemblies. Clean all sensors, lenses, and other parts, as needed.

(4) Check all sensors for reasonableness with respect to existing conditions.

(5) Check video display terminal, keyboard, and archiving.

(6) Check system time and reset as needed.

(7) Check AWOS telephone operation.

(8) Aurally check AWOS radio transmission.

APPENDIX 1. ACRONYMS USED IN THIS ADVISORY CIRCULAR

AAS	AWOS ATIS Switch
AC	Advisory Circular
AIP	Airport Improvement Program
ANSI	American National Standards Institute
ATIS	Automatic Terminal Information Service
AWOS	Automated Weather Observing System
AWPAG	All Weather Precipitation and Accumulation Gauge
CFR	Code of Federal Regulations Part 14 contains the aviation regulations. Part 47 contains the FCC regulations.
CH	Contact Height
dBm	Represents a measured power level in decibels relative to 1 milliwatt
EFAS	Enroute Flight Advisory Service
EMI	Electromagnetic Interference
FAA	Federal Aviation Administration
FC	Foot-Candles
FCC	Federal Communications Commission
FMH-1	Federal Meteorological Handbook No. 1
FMO	Frequency Management Office
FPO	Flight Procedures Office
FRD	Facility Reference Data
FRU	Field Replaceable Unit
FTP or ftp	File Transfer Protocol
GPS	Global Positioning System
GROL	General Radiotelephone Operator License
inHg	Inches of Mercury
LED	Light Emitting Diode
METAR	Aviation Routine Weather Report
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSL	Mean Sea Level
NAPRS	National Airspace Performance Reporting Service (NAPRS)
NAS	National Airspace System
NAVAID	Navigational Aid
NDB	Nondirectional Radio Beacon
NEC	National Electrical Code
NF Obs	Non-Federal Observer
NFDC	National Flight Data Center
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology

APPENDIX 1. ACRONYMS USED IN THIS ADVISORY CIRCULAR (Continued)

NM or nm	Nautical Mile
Non-Fed	Non-Federal
NOTAM	Notice to Airmen
NTSB	National Transportation Safety Board
OCC	Operations Control Center
OJT	On the Job Training
OMM	Operations and Maintenance Manual
OPR	Office of Primary Responsibility
OT	Operator Terminal
PFC	Passenger Facility Charges
PIM	Program Implementation Manager
PIREP	Pilot Report
PM	Performance Maintenance
RMM	Remote Maintenance Monitoring
RMSE	Root Mean Square Error
SM	Scheduled Maintenance
TPR	Technical Performance Record
TS	Thunderstorm
UHF	Ultra High Frequency
UL	Underwriters Laboratories
UTC	Coordinated Universal Time
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
VOR	VHF Omnidirectional Radio Range
VORTAC	VOR Tactical Air Navigation
VV	Vertical Visibility
WMSCR	Weather Message Switching Center Replacement
WS	Windspeed
WWV	National Institute of Standards and Technology Time Standard Radio Station

APPENDIX 2. TECHNICIAN TRAINING

FAA Authorized Maintenance Technician Training Program.

The FAA authorized maintenance technician training program should provide the knowledge and skills needed to service the airport's AWOS system. This program should familiarize the technician with the maintenance and operation of the entire AWOS. The training program may be conducted using a combination of means, including on-site, at the provider's facility, via home study, or by other means proposed by the training provider.

The training program, regardless of its format, should be a planned activity conducted to provide theory of operation, system concepts, safety and NAS coordination procedures, troubleshooting, test equipment usage and hands on practical experience in the work environment where the technician is required to perform his/her duties. On the job training (OJT) is an important bridge from theory-of-operations of a system to developing the requisite skills and knowledge to perform work on the AWOS. (OJT should be performed under the direct supervision of the site's FAA authorized maintenance technician holding verification authority.) Upon successful completion of the training program, the student should receive a document (letter or certificate) recognizing this accomplishment. This document should identify the training organization and/or instructor, the completion date and the system(s) the student has been trained on.

The training program will be evaluated on the organization's/instructor's capabilities and on the course material. The following documents must be submitted to the AWOS Non-Federal Engineering Office at the address provided in paragraph 1.3.b for approval by the FAA.:

- The organization and instructor credentials should demonstrate the necessary knowledge, experience, and backgrounds. These credentials will be evaluated from a technical perspective as well as from an instructor's capability perspective.
- The course materials should include a description of any necessary prerequisites, copies of the syllabus detailing classroom, lab and field/OJT exercises, copies of the materials provided to the student, student tests and a timeline for the course. The discussion of the lab and field/OJT exercises should include details regarding safety procedures to be followed as well as the actual or simulated faults to be used in the training environment. (The training provider is responsible for honoring the system provider's copyright and intellectual property rights.) The tests should consist of two equivalent, comprehensive 50-question open book tests to measure a technician's knowledge of the system, complete with answer sheets. The FAA will use the tests interchangeably to test the competence of a site's technician.

FAA online and academy training resources may be available to augment this training. Additional information can be obtained from the AWOS Non-Federal Engineering Office at the address provided in paragraph 1.3.b.

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