NATIONAL WEATHER SERVICE INSTRUCTION 30-2111
JANUARY 1, 2025
Maintenance, Logistics, and Facilities
Systems Maintenance, NWSPD 30-21

ASOS MAINTENANCE

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SUMMARY OF REVISIONS: This directive supersedes National Weather Service (NWS) Instruction 30-2111, *"ASOS Maintenance"*, dated October 17, 2023.

- In section 3.2, an explanation of the maintenance flag for TSNO and maintenance actions for erroneous sensor reports is added.
- In sections 4.1 and 5.2, update maintenance actions
- In Appendix A, Update the maintenance plan
- In Appendix B, Update the outage timeline
- In Appendix D. Update terms of reference

Emergency review for satisfying NTSB Inquiries dated 29 August 2024

This will be the first of several rewrites to align SUAD Fielded Systems Maintenance philosophies with national and international best practices standards.

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ASOS Maintenance

Table of Contents **Page**

1. Introduction

This instruction sets specific maintenance functions and procedures for the National Weather Service's (NWS) Automated Surface Observing System (ASOS) and defines roles, responsibilities, and delegations for Headquarters personnel, field activities, and regional participation.

2. Procedures

This Instruction underpins and supports the activities in the following NWS Instructions:

- NWS Instruction 30-2101 System Maintenance and Management

- NWS Instruction 30-2104 Maintenance Data Documentation in Engineering Management Reporting System (EMRS).
- NWS Instruction 30-2112 Reporting Systems, Equipment Maintenance, and Communication Outages (USOS)

NWS field personnel support both ASOS sites owned by the NWS and the Federal Aviation Administration (FAA). The number of sites that the NWS will be maintaining for the FAA is intended to be flexible over the next five (5) or so years, and is noted for reference in this instruction. For purposes of this Instruction, there is no distinction made for ownership. Any ASOS unit that is under the maintenance management of NWS, whether owned by the NWS or the FAA, is to follow and utilize this Instruction. Field personnel are required to fill out the fields within the Un-Scheduled Outage System (USOS) for all out of service locations, and Headquarters is required to publish the USOS daily for field reference as found in NWS Instruction 30-2112, Reporting Systems, Equipment and Communications Outages and all other subsequent Instructions for operating, maintaining and reporting NWS Fielded Assets.

3. Organization

All maintenance is performed as defined in NWS Directive 30-21 System Maintenance. There are some unique characteristics and systems that are utilized within the ASOS Network and specific to this NWS Instruction 30-2111.

3.1 ASOS Operations and Monitoring Center (AOMC)

The ASOS Operations and Monitoring Center (AOMC) is part of the ASOS Program under the Office of Observations. The Parties in the ASOS Tri-Agency agreement fund the center to provide 24/7/365 monitoring of the ASOS Fielded Network. It provides operations, maintenance and other support services for the entire ASOS network in a methodical, step by-step process to ensure any unit that encounters errors will be restored in the shortest amount of time.

3.2 AOMC Maintenance Notification Functions

The maintenance notification includes the following functions:

- Near real-time monitoring of ASOS system products
- Single point -of -contact for ASOS maintenance status
- Initiation of corrective maintenance action
- Remote maintenance diagnostic capability
- A trouble desk for tracking and documenting ASOS malfunctions

The Acquisition Control Unit (ACU) of an ASOS automatically generates the maintenance flag when a fault is detected or other maintenance is required. The maintenance flag alerts the AOMC that maintenance support is required. The AOMC observation monitoring process identifies ASOS sites whose hourly observations do not reach the OBS monitoring application by a given time (currently H+15 minutes), and observations received with the maintenance flag are appended. The AOMC team monitoring computers compile these data into two files: one with surface meteorological reports (METAR) containing a maintenance flag and the other containing sites that did not send a METAR by

the search time. These files are available to the AOMC in near real-time and immediately after the search time, respectively.

The AOMC indicates corrective maintenance action whenever:

a. The AOMC monitoring app does not receive a METAR from a high priority site during the search time or a METAR from a lower priority site is missing over two search times. (Note: The number of consecutive missing observations is a user input parameter in the AOMC database. The AOMC adjusts this parameter based on experience.); or

b. A site sends its observation with a maintenance flag ($) attached.

c. A site sends its observation without a maintenance flag and the remarks section contains "TSNO" indicating Thunderstorm Information Not Available.

When an ASOS malfunction is reported via the toll-free trouble reporting telephone numbers, the AOMC opens a trouble report. The AOMC determines whether and what type of corrective action is needed. If requested by the caller, the AOMC will advise when the repair is scheduled to be completed.

The AOMC tracks and documents all reported or detected ASOS malfunctions. When an ASOS site malfunctions, the AOMC investigates by remote dial access to the site. Under certain conditions, the AOMC remotely clears low priority faults. Otherwise, the AOMC notifies the regionally-designated maintenance point-of-contact of the malfunction.

The AOMC provides a projected restoration time based on established criteria (site class and type of failure). When the project technician notifies the AOMC that the repair is complete, the AOMC closes the trouble report.

The AOMC will sometimes receive notification of TSNO without a maintenance flag. Upon notification, the AOMC will verify, dial into the site, and enable Automated Lightning Detection and Reporting System (ALDARS) report processing if necessary.

Many communication failures of FTI lines or ADAS systems must be resolved through communication with FAA's National Enterprise Management Center (NEMC), System Operations Center (SOC). Their phone number is 855-322-6363 (FAA-NEMC). The call tree for this number, select #1 for the Center and then #3 to direct your call to the appropriate NEMC SOC Team lead. AOMC will coordinate with FAA NEMC Team Leads to open tickets and elevate FTI and ADAS issues.

WFOs and/or FAA Contract Weather Observers (CWOs) may determine that an ASOS sensor is reporting erroneous or questionable data without generating a maintenance flag and are able to disable sensors that are non-representative. When this occurs, the WFO will notify the AOMC and request that a trouble report is opened and ensure all WFO personnel and any on-duty FAA observers are aware of the erroneous data.

If the WFO or CWO is unable to disable the sensor, WFO personnel, CWOs, or other weather observers certified by the FAA may contact the AOMC to request that they disable a sensor. The AOMC will then

dial into the site to investigate the sensor, disable it, open a trouble report, and ensure both the responsible WFO and any on-duty FAA observers are aware of the erroneous data.

3.3 Site Database Support Functions

The AOMC manages ASOS site-specific parameter files. The parameter files consist of 11 data files required by each ASOS site to function. The AOMC also operates a software configuration management system capable of recreating a version of a site's master files upon request. The uploading and downloading of an ASOS site's parameter files are automated as much as possible. If any change(s) occurs to any element of a site's 11 data files, the ASOS automatically dials the AOMC to upload the new configuration for storage in the AOMC's database.

An ASOS site's software requests a time update every 60 days during normal operation. After a system reset/crash has occurred, a new time update is immediately requested. During the next 60 days several updates are obtained.

3.4 Regional Maintenance Specialist

The Regional Maintenance Specialist reports to the Systems and Facilities or Systems Operations Divisions at each Regional Headquarters, who in-turn, functionally reports to the ASOS Program Manager, at the ASOS Management Office located at the Silver Spring Campus, who will designate a point of contact for maintenance, projects, finance, and other activities. This specialist provides a regional focus for the program and aids field maintenance personnel.

3.5 ASOS Electronics Technician

The ASOS Electronics Technician (ET) is a member of a field office maintenance staff. Each Weather Forecast Office (WFO) will have one or more technicians available for ASOS maintenance. These technicians have the prime responsibility for the ASOS located within their county warning area (CWA). ETs backup each other within an office when non-ASOS maintenance is being completed.

4. Responsibilities

The following subtopics are areas of responsibilities attached to this directive:

4.1 AOMC

The AOMC, upon learning of a missed METAR or a maintenance flag generating event in an ASOS, informs the maintenance point of contact. If possible, the AOMC determines the priority of restoration by airport class and failure type (see Appendix B).

4.2 Regions

Each region develops and maintains a regional ASOS maintenance plan. This plan includes a listing of ETs, their stations, and their telephone numbers. Regions notify the AOMC promptly of any change in the points-of -contact for maintenance calls.

4.3 Field Offices

A field office, upon learning of an ASOS failure or outage, appropriately informs an available ET. Field offices will ensure a technician receives a trouble ticket and is dispatched accordingly to the trouble site. Field offices will ensure that USOS is updated and any tickets issued tracked, and closed out as "work is completed" when work is completed. Work tickets are closed out on the same day.

4.4 Electronics Technician

The ET, upon learning of a need for ASOS maintenance, restores the system to operation according to the stated priority in accordance with the S100 ASOS Site Technical Manual -Revision B. The technician contacts the AOMC to close each repair action. The technician must either close out the ticket when the repair is made or report back to the Field Office indicating why the site remains out of service. The ET will notify AOMC if a ticket must remain open beyond 24 hours. See Appendix B for Maximum Outage Times.

4.5 Ground-to-Air (GTA) Transmitter

NWS personnel maintain and support GTA transmitters for disseminating ASOS observations to in-flight aircraft. The ASOS contractor performs the initial installation and testing of the transmitters. About 460 sites nationally will receive transmitters, mostly at small airport expansion sites. Note that NWS does not maintain the FCC license required for GTA broadcast.

5. Documentation

Documentation provides the statistics required by the Tri-Agency Team, NWS Management, and key Partners. It is imperative that documentation is complete and timely filed.

5.1 Maintenance Reporting

The field office responsible for ASOS accurately documents the time and nature of equipment failures in the Engineering Management Reporting System (EMRS) using WS Form A-26 (top portion), following the instructions in NWSI 30-2104, *Maintenance Documentation*. If a repair cannot be completed within 24 hours, the Field Office must notify AOMC and make appropriate updates to EMRS through USOS in accordance with NWSI 30-2112 Reporting Systems, Equipment, and Communications Outages.

5.2 Maintenance and Technical Documents

Maintenance of ASOS equipment will be accomplished following authorized guidance (e.g., maintenance procedures, technical manuals, modification notes, maintenance notes) as contained in the Engineering Handbook (EHB)-11. Centralized web access to EHB-11 is provided at: https:/secure/ehbs/EHB11Files/ehb11toc.htm

APPENDIX A - ASOS Maintenance Plan

The NWS maintains all NWS- and FAA-sponsored systems, and a limited number of Department of Defense (DOD) sites. The NWS provides depot repair services for all systems.

Maintenance Approach

The ASOS Program maintenance approach allows that frequent periodic maintenance activities will extend the mean time between failures (MTBF) and provide for greater reliability of the overall set of measurements. Constant monitoring through the AOMC will find issues prior to operational availability being impacted. The use of electronic record keeping will permit operations and maintenance personnel to identify trends having adverse effects on availability.

Personnel Approach

The NWS has integrated the ASOS maintenance workload into the general ET staff across the Regions and down to the WFOs, where dedicated ASOS technicians are a component of the WFO maintenance staff. Each WFO is outfitted with mobile technology devices for rapid communication while on duty and several WFOs have vehicles to supplement travel requirements. Each WFO will house limited spare assemblies for onsite replacement in accordance with the most recent version of Maintenance Note 18. Only ASOS qualified NWS ET staff have access to this equipment to provide ASOS maintenance support as needed.

Facilities Support

The NOAA National Repair Center (NRC) acts as the Depot for Maintenance Engineering and Rebuilding Facility for ASOS and conducts all depot repair and quality control functions, including warranty tracking and vendor repair. The National Logistics Support Center (NLSC) provides parts, subassemblies, equipment, manuals, and any material necessary to support ASOS field and depot maintenance and acts as the Primary Inventory Control Point for the ASOS. Management for these facilities resides at NWS Headquarters. The NWS Training Center (NWSTC) conducts necessary maintenance training for field-deployed ETs.

Maintenance Process

The AOMC performs failure notification, where controllers identify system outages and anomalies by verifying data flow from ASOSs on national communications circuits. AOMC monitors a toll-free telephone number for service reports from users. Upon identifying a problem, AOMC determines the priority of the service required and calls the responsible maintenance point of contact. The point of contact dispatches the ET.

The ASOS system has extensive self-test features and maintenance monitoring capabilities. ASOS ETs can dial into an ASOS, check its status, and perform various maintenance functions without disturbing

operations. By using the remote capabilities of ASOS, the ET usually knows which field replaceable unit is malfunctioning before going to the site.
The ASOS requires quarterly preventive maintenance (PM). ETs conduct PM during repair visits whenever appropriate. ASOS sensors require minimal calibration. The FAA wants exceptions to performing scheduled PMs, namely during Air Traffic Organization (ATO) Maintenance Moratoriums for various events, holidays, or other high-volume situations during the calendar year.

Maintenance activities during the moratorium periods are restricted to the following:

Restoration of failed systems or services (Corrective Maintenance) and certification of systems or services (Calibration activities). System-wide PMs, such as quarterly, semiannual, and annual PMs are not authorized during the moratorium. Should an ASOS sensor repair or replacement be required during the moratorium, that sensor must be verified to ensure the sensor is representative. When conducting the necessary verification and certification steps, associated system checks and calibration activities are permitted as needed. Additionally, PM activities can and should be scheduled ahead of any moratorium period, no matter what duration to alleviate the possibility of required PM activities during the moratorium periods.

Area electronics supervisors, electronics technicians in charge, or regional maintenance specialists provide overall field quality control of maintenance.

Maintenance Work Order Generation

The AOMC remains the center of all maintenance activities for the ASOS Program. From this location, sites with identifiable issues are first diagnosed by AOMC controllers for the kind and type of failure or outage, verified, ticket generated, and field notified. Once corrective action is completed, AOMC will be notified, and the ticket will be closed.
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All AOMC data moves to the EMRS database for local archiving purposes and report generation. Requests for historic maintenance data would then be processed by the EMRS staff and not the AOMC staff. This also centralizes the maintenance data from other fielded systems into a single repository.

Resources

A workforce equivalent of 63 ETs maintains ASOS. All ETs provide maintenance support of the ASOS. Funds are provided for salaries, overtime, travel, transportation, supplies, and certain support equipment. A regional ASOS specialist is staffed in each regional headquarters. Additional resources are provided for the NRC, NLSC, NWSTC, AOMC, and other logistics and communications support functions as the Program deems appropriate.

APPENDIX B - Maximum Outage Times

The ASOS equipment will be restored to full operation within the times shown in the Maximum Outages Times table below, at least 95 percent of the time. The metric is time to Return to Service (RTS). The reportable metric to the FAA for their portion of the network is Operational Availability (Ao) over a 24-hour period. An outage is considered to begin when the AOMC is made aware of a failure and a Service Ticket is opened.

Priority Classification

Priority 1. These are safety-related failures. They involve the following sensors and components:

Barometer
Anemometer
Hygrothermometer
Visibility sensor
Ceilometer
Data collection package
Acquisition control unit
Freezing Rain Sensor

Priority 2. These are failures affecting flight operations and forecasting. They involve the following sensors and components:

Liquid precipitation accumulation
Operator interface devices (OID)
Video display units (VDU)

Priority 3. These are low priority failures. These priorities applies when all priority 1 and 2 elements are reported correctly, but a maintenance flag is appended to an ASOS product. Note. Errors where a sensor appears to be reporting erroneous data without an associated error code are also Priority 3 tickets.

Maximum Outage Times

TYPE AIRPORT MAXIMUM FAILURE PRIORITY OUTAGE TIMES		
Service Level A, B, and C Airports Class I	1-Safety-Related	24 hours
	2-Flight Operation/Forecasting	36 hours
	3-Low	120 hours

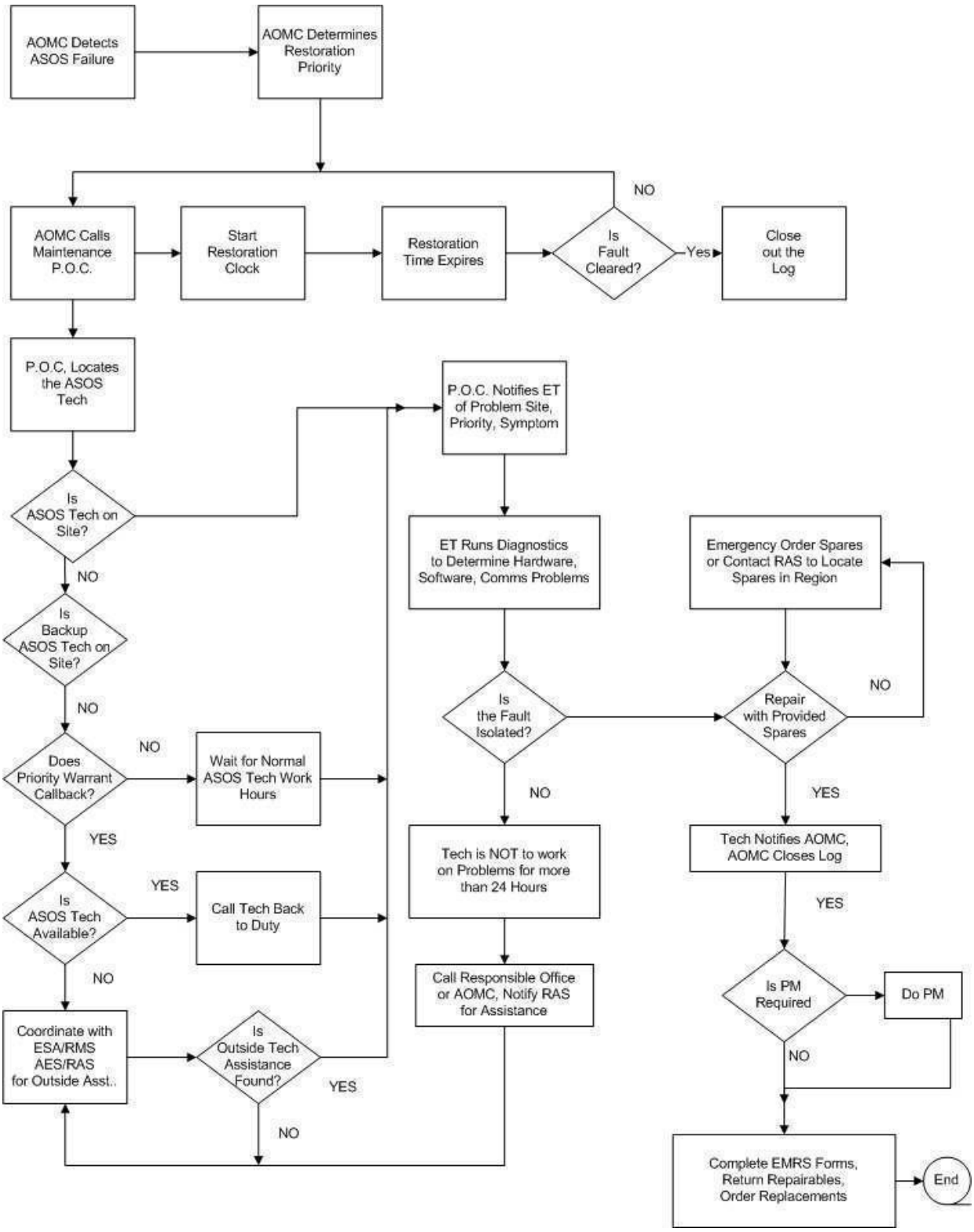
Service Level D Airport Class II	1-Safety-Related	36 hours
	2-Flight Operation/Forecasting	48 hours
	3- Low	120 hours

B-1

Special Considerations.

If a delay is encountered due to the effects of weather, flight schedules (commercial or chartered), or space availability, and the delay could result in an equipment outage time exceeding that specified in the Maximum Outage Times table, the AOMC will be immediately notified. The maintenance activity report (e.g., EMRS) includes the time that the equipment exceeded the maximum outage time, and the actions taken to minimize the delay.

APPENDIX C - ASOS Corrective Maintenance Flowchart



C-1

APPENDIX D: Terms of Reference

Failure: When one or more components of an ASOS unit becomes unavailable. There are three (3) classifications of Failure as noted in Appendix B of NWSI 30-2111, Appendix B. These failures are

1. Priority 1 failures: Safety related measurement devices;
2. Priority 2 failures: Loss of a sensor that affects flight operations and forecasting;
3. Priority 3 failures: Where a maintenance flag is appended to an ASOS product, but all sensors appear to be operating normally, or a sensor appears to be reporting erroneous data without an error code.

Outage: When there is a total loss of an ASOS unit as a result of maintenance activities, power failure, or other conditions causing the entire unit to not produce or a loss of all primary products.

Malfunction: A general term used to describe any issue or concern when a site, or any part of a site, is or appears to be operating improperly. Malfunctions are diagnosed to determine if they constitute a Failure, Outage, or neither.