

***NATIONAL WEATHER SERVICE INSTRUCTION 10-1301  
APRIL 8, 2023***

***Operations and Services  
Surface Observing Program (Land), NDSPD 10-13  
AVIATION AND SYNOPTIC OBSERVATIONS***

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**NOTICE:** This publication is available at: <http://www.nws.noaa.gov/directives/>.

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**OPR:** W/OBS31 (K. Boutin)

**Certified by:** W/OBS3 (J. M. Crocker)

**Type of Issuance:** Routine

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***SUMMARY OF REVISIONS:*** This Directive supersedes NWSI 10-1301, “Aviation and Synoptic Observations,” dated March 30, 2018. The directive has been extensively revised to reflect that the NWS has transitioned oversight of the Surface Aviation Weather Observing Program to the Federal Aviation Administration (FAA). Additional updates:

- This update removes Certification Authority for most of the CONUS except locations in Eastern Region for climate purposes and locations in Alaska and Pacific Regions, where basic aviation observing duties and responsibilities remain due to extreme distances and terrain.
- The Upper Air Certification requirement was removed.

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Date

**Aviation and Synoptic Observations**

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**1. Introduction**

The National Oceanic and Atmospheric Administration’s (NOAA) National Weather Service (NWS) uses aviation and synoptic observations to support aviation forecasting duties both domestically and internationally in support of national requirements and international commitments.

NWS Aviation and synoptic observations include:

1. Contractors at NWS Pacific Region Weather Forecast Offices (WSOs) in Micronesia
2. Paid, Part-Time Basic Stations (A-Paid), in Alaska
3. Synoptic-Paid Stations in Eastern Region

FAA staff or contractors are responsible for aviation weather observations as described in FAA Order 7900.5, "Surface Weather Observing," which can be found at: [JO 7900.5](#)

### **1.1. Aviation Observing Program**

The FAA is the U.S. meteorological authority as defined by the International Civil Aviation Organization (ICAO) and has designated the NWS as the U.S. meteorological provider. The FAA therefore works closely with the NWS on aviation observation requirements. The FAA oversees and manages the surface aviation weather observation program nationally. The Automated Surface Observing Systems (ASOS) program is a joint effort between the NWS, the Federal Aviation Administration (FAA), and the Department of Defense (DOD).

In the past, the NWS had responsibility for the Surface Observing Program. That program transitioned to the FAA in a lengthy process. Starting with the Weather Observation Service Standards, outlined in the Federal Register [Federal Register / Vol. 61, No. 123 / Tuesday, June 25, 1996](#) / Notices 32887 - Column B excerpt Page 32887:

"In addition, in March 1995, and in accordance with the Office of Management and Budget (OMB) policy, the FAA began the process to assume responsibility for aviation surface weather observations beginning in Fiscal Year (FY) 1996. As the NWS automates field offices and reallocates their personnel under this plan, the FAA will undertake accountability for observations at all NWS Automated Surface Observing Systems (ASOS) sites. The NWS began transitioning these ASOS sites to the FAA as the ASOSs are commissioned and has solicited public comment (61FR 19595; May 2, 1996). The FAA also expanded by more than two hundred, the sites to receive ASOSs, thus enhancing safety at sites without weather observations. All of these activities prompted the FAA to take aggressive action in addressing surface aviation observation requirements and do it within modest resource gains."

NWS continued to support aviation with certification of backup observers and Supplementary Aviation Weather Reporting Stations (SAWRS) supporting ASOS and Automated Weather Observing System (AWOS) automated and manual sites through 2015. [FAA made several announcements in 2015 with the final announcement on February 1, 2016 confirming,](#)

"The FAA assumed oversight of the SAWRS program on October 1, 2015. Although the FAA does not have a long-term plan to continue the SAWRS Program, the FAA has agreed to assume oversight of the SAWRS Program under existing NWS operational policies and requirements."

These announcements confirm the entire surface observing program at airports is the responsibility of the FAA, from the observations to the backup of those observations and the oversight of both Certification Authority and all active certifications were handed over to the FAA in 2015. NWS staff certifications then lapsed in 2016 and NWS only has certified staff at Pago Pago, American Samoa.

ASOS serves as the Nation's primary surface weather observing network. ASOS is designed to support weather forecast activities, aviation operations, and support the needs of the

meteorological, hydrological, and climatological research communities.

## **2. Responsibilities**

### **2.1 National Weather Service Headquarters (NWSH)**

NWSH staff is responsible for the development, drafting, and issuance of policy and guidance for the provision of aviation and synoptic observations in Appendix A. Through the Office of Observations (OBS), AFS24 is the responsible party for any questions related to section 2.7.2 below.

#### **2.1.1 Office of Observations (OBS)**

OBS provides guidance and direction for the execution of the surface observation program to carry out this responsibility through the tri-agency program between the DOD, FAA, and the NWS. As the NWS program lead, OBS:

1. Helps establish requirements for instrumentation for ASOS.
2. Coordinates and negotiates with other government agencies on national matters pertaining to aviation observing policies, procedures, and requirements with respect to ASOS.
3. Assesses the performance of existing sensors to ensure they meet NWS requirements.
4. Determines the need for new sensors and the replacement of defective or obsolete sensors.

#### **2.1.2 OBS Surface and Upper Air Division (SUAD)**

The SUAD program management branch (OBS31) provides guidance and direction for the operation and maintenance of the systems that provide surface observations. To carry out this responsibility, OBS31:

1. Develops policy and procedures for the operation and maintenance of surface observing systems.
2. Manages national operational surface observing systems. This includes but is not limited to:
  - a. Developing implementation plans for surface observing systems and managing execution of the plans;
  - b. Conducting routine and ad hoc meetings;
  - c. Leading and coordinating interagency efforts to identify and resolve operational issues;
  - d. Managing the Operations and Maintenance (O&M) budget for surface observing systems. The OBS Sterling Field Support Center (OBS33), the Office of the Chief Operating Officer/Performance and Evaluation Branch (OCOO/PEB), and appropriate partner agencies perform testing and evaluation of surface observing systems;
  - e. Coordinating and facilitating the testing and evaluation of systems and integration of subsystems prior to implementation;

- f. Providing guidance for software development to support new systems; and
  - g. Testing new software prior to implementation.
3. Provides observing system logistics, reconditioning, and calibration support from the National Logistics and Reconditioning Center (NLRC) in Kansas City, Missouri.

### **2.1.3 ASOS Program Management Office (APMO)**

The APMO provides project management for developing, acquiring, and initially deploying new technology and systems. To carry out this responsibility, the APMO:

1. Manages execution of project management and development programs.
2. Assesses science and technology options, prepares solutions, and develops plans to meet service requirements.
3. Plans, coordinates, and manages technical infusion and evolution programs.
4. Leads and manages systems engineering, development, integration, and testing of and initial deployment of observing systems.
5. Approves all systems engineering changes, reviews system performance, and identifies needs for system changes.
6. Manages risk reduction activities.

### **2.1.4 ASOS Operations and Monitoring Center (AOMC)**

The AOMC provides a vital service for the ASOS program through its maintenance-monitoring support for all fielded ASOS sites and remote access to ASOS site-specific parameter and configuration files via a toll-free number. AOMC is also a precision time-source for the NWS. AOMC:

1. Provides maintenance support to ASOS by:
  - a. Remote monitoring of maintenance alerts reported by ASOS when a problem or issue is encountered.
  - b. Maintaining the master database of ASOS site configuration information.
  - c. Providing a precise time source linked to the National Institute of Standards and Technology (NIST) in Boulder, Colorado, keeping all ASOS system clocks synchronized.
2. Supports quality weather observations for NWS and NAS operations by opening ASOS trouble tickets based on:
  - a. Field calls of questionable data quality;
  - b. Missing observations;
  - c. Automated QC algorithm flags and alerts.
3. Supports the NWS Forensic Services Program by performing on-demand ASOS archives to support potential transportation investigations and/or litigation that may arise with aircraft mishaps.

## **2.2 NWS Regional Headquarters (NWSRH)**

The NWSRHs are responsible for field office compliance with this instruction. In addition,

NWSRHs may:

1. Establish and fund A-Paid and Synoptic-Paid Sites. This includes documenting agreements and fees for observing services between the NWS and the observer. Appropriate NWS staff will use [NOAA Form 36-14](#) for the A-Paid and Synoptic-Paid programs.
2. Similar to A-Paid and Synoptic-Paid, the Snow Paid Program is a version of these programs. Snow Paid sites may not be established at the discretion of the Regions or Field, sites are determined and funded by NWSHQ and managed by the Regional Headquarters to support snow climatology for past LCD sites. Snow Paid sites utilize the same documents and process as A-Paid and Synoptic-Paid sites, these detailed in Appendix A.

Snow Paid sites should be a compatible location to supplement the ASOS Observation. NWS Regions will provide snow measuring equipment and training for each station measuring snow, both Snow Paid sites and FAA Observers providing snow measurements.

Snow is augmented in the observation by FAA Contract Weather Observers at some sites at no cost, these sites are listed in the latest FAA Order [JO 7900.5](#) in Appendix F by agreement between FAA and NWS. Should the FAA Contract Weather Observer change such that snow observations are no longer taken, NWS would reclaim the snow board and other provided equipment and begin a Snow Paid site after consultation with NWSHQ.

Snow Paid sites are not listed in the ASOS SIS profile as a snow element. Instead they are documented in the Permanent Remarks section of SIS. For example “ Snow paid observer located 3.2 ESE of the airport provides snow/water equivalent information using an NWS SRG, snow board and snow stick. “ A comment in the permanent remarks section of the ASOS profile is all that is necessary.

3. As feasible, evaluate FAA requests to authorize use of remote observations for instrument flight rules (IFR) operations. [Policy OPR: AFS24]
  - a) Title 14 of the Code of Federal Regulations, Section 135.213(b) states, “weather observations made and furnished to pilots to conduct IFR operations at an airport must be taken at the airport where those IFR operations are conducted, unless the Administrator issues operations specifications allowing the use of weather observations taken at a location not at the airport where the IFR operations are conducted. The Administrator issues such operations specifications when, after investigation by the U.S. National Weather Service and the responsible Flight Standards office, it is found that the standards of safety for that operation would allow the deviation from this paragraph for a particular operation for which an air carrier operating certificate or operating certificate has been issued.”
  - b) Site Evaluations: The NWS recommendation concerning the representativeness of observations should be made by the appropriate Regional NWS Meteorologist (e.g., Regional Aviation Meteorologist (RAM)) at their discretion, based on

available resources and locations of the selected sites.

- c) Recommendations: Each request should be coordinated among the appropriate NWS regional staff and the WFO. Recommendations should be made to the requesting FAA Flight Standards District Office, for action, not to the operator involved, and should be confined to stating if the weather observations from one location can be expected to be generally representative of the weather occurring at the other location.
- d) Recommending any other particular course of action to the FAA should be avoided.

### 2.3 NWS Weather Forecast Offices (WFO)

The data the aviation and synoptic observing programs provide are vital to the completion of the NWS mission. The MIC/Official-in-Charge (OIC) directs WFO personnel and resources to:

1. Monitor aviation and synoptic observations in the respective area of responsibility. NWS WFO staff are users of the surface aviation weather observations to fulfill NWS Terminal Aviation Forecast (TAF) duties. In this capacity, time permitting, WFO staff perform perfunctory review of the surface aviation weather observations at specific airports. For more information on TAFs, see [NWSI 10-813](#). This review includes but is not limited to:
  - a. Reporting equipment-driven data quality issues and outages for ASOS sites to the local Electronics Technician (ET) staff. If the office ET is not available, WFO staff will report these issues and outages to AOMC. An Engineering Management Reporting System (EMRS) ticket will be opened in accordance with [NWSI 30-2111](#).
  - b. Contact the local airport Air Traffic Control Tower (ATCT) or Contract Weather Observer (CWO) if missing or incorrect data are observed at ASOS sites that are designated to be backed up and augmented. Each WFO should have a listing of these phone numbers in the Station Duty Manual. If the problem persists, WFO staff are encouraged to document this in the station log and contact the ROC, SDM, AMOC/NEMC.
  - c. Reporting data quality issues and outages for FAA AWOS sites to the FAA Network Enterprise Management Centers at (855) FAA-NEMC/(855) 322-6362.
  - d. Reporting issues or outages of all other aviation and synoptic observations to the appropriate entity per [JO 7900.5](#).
2. Report the relocation or extended outage of ASOS sites in accordance with [NWSI 30-2104](#) Section 3.3.1. In addition, the WFO will notify the appropriate NWSRH of any such instances.
3. Maintain up-to-date access to a technical library (electronic is sufficient) to aid in the monitoring of aviation and synoptic observations. This includes but is not limited to the following:
  - a. FMH -1 “Surface Weather Observations and Reports” [FMH-1](#)

b. FHM-2, “Surface Synoptic Codes” [FMH-2](#)

While not required, the WFO should consider having easy access to the current FAA Order 7900.5, “Surface Weather Observing” for reference. [FAA JO 7900.5](#)

### **3. Procedure for Changing or Discontinuing Observation Programs Due to Station Closures**

As a general rule, the NWS should not establish new sites for supporting aviation operations with the exceptions of locations needed in Alaska and Pacific Regions. See [Appendix A](#) for requirements related to establishing new sites in Alaska or Pacific Regions.

Existing NWS ASOS sites requiring a move should be made in coordination with OBS31 and the FAA. Responsibility for managing and funding the relocation of observing systems or sensors rests with the agency requiring the move. The ASOS Configuration Control Board will approve relocation of an ASOS before any move in accordance with [NWSI 30-1203](#), “Configuration Management for Operational Systems.”

NOTE: For outside partner questions regarding AWOS at airports, see: [“Frequently Asked Questions \(FAQs\) about the Non-Federal Program \(NFP\) — Airports.”](#)

NWSRHs may create other data sites and platforms to meet Regional non-aviation requirements. New platforms and networks should be added in consultation with OBS31 to ensure support and best use of NWS resources.

NWS staff should adhere to the following procedures when deciding to close an observing site:

1. The NWS will not maintain observations once a site is closed.
2. The NWS may grant requests by others wishing to continue observations at a site chosen for closure. In such a case, the requesting party is required to agree to assume responsibility for funding all costs of the program above and beyond costs the NWS incurs to provide normal support functions.
3. If a non-Federal Government party assumes observational responsibility, all NWS-owned aviation and synoptic observation equipment will be removed and retained by the NWS WFO for future use or returned to the National Logistics Support Center (NLSC), Kansas City, Missouri.

### **4. Historical File of Aviation and Synoptic Observation Forms/Data**

NWS Aviation and Synoptic program observations are archived at the National Centers for Environmental Information (NCEI) per written agreements between the two agencies following all applicable federal regulations and agency policies. Any observational records that need additional records retention should be coordinated through the [NWS Records Management Office](#).



## **Appendix A. Policy for the Aviation and Synoptic Observing Programs in Eastern, Alaska and Pacific Regions**

Due to the unique needs in NWS Eastern, Alaska and Pacific Regions, NWSH may fund and establish new observing sites in support of national and international requirements and commitments, and to the service of the NWS mission. These stations and their equipment are sited and configured in accordance with [Appendix C](#), Instrument Requirements and Standards for the NWS Aviation and Synoptic Observing Programs (Land).

### **1. Aviation Paid (A-Paid) Observations**

The A-Paid program is only in Alaska and provides aviation weather observations to support the NWSH forecasting process. A-Paid weather observers are private citizens who are recruited in areas where observation data is sparse. A-Paid observers are trained and certified by the NWS using FAA procedures and instructions. The observations taken by A-Paid observers include all of the basic elements of a METAR observation, and are taken at an arranged frequency which is outlined in the contract with the observer. As the name suggests, these observers are compensated for their work by the NWS. A-Paid sites are only located in Alaska. These sites and associated equipment will be sited and configured in accordance with Appendix C, Instrument Requirements and Standards for the NWS Aviation and Synoptic Observing Programs (Land).

### **2. Synoptic-Paid Observing Program**

Similar to A-Paid, Synoptic-Paid are manual observations taken by paid observers. In 2015, the NWSH decided to discontinue Synoptic-Paid sites across most of the CONUS. At this time, Synoptic-Paid sites are only located in Eastern Region. Due to historical significance, there are two sites in the NWS Eastern Region that have contracts in place for surface observations - Blue Hill, MA and Mt. Washington, NH. Because their contracts involve other duties, those locations are managed outside of the Synoptic-Paid program. However, since they are required to take synoptic observations, those sites follow the same practices as outlined in this Instruction as those sites that are Synoptic-Paid.

### **3. NWS Contract Meteorological Offices (NWSCMOs), Micronesia.**

NWSH pays private contractors to take surface observations throughout Micronesia. NWS provides weather services and related programs pursuant to Article VII from the Compact of Free Association, in part, through the Weather Service Office (WSO) established across Micronesia (Republic of Palau, Federated States of Micronesia and the Republic of the Marshall Islands.) Through the provision of the Compact, contract staff at each WSO provide observational data for the national/international forecast/warning mission and the historical climate record.

### **4. New NWS-Sponsored Sites in NWS Alaska and Pacific Regions**

The NWS Alaska and Pacific Regions may designate new locations where aviation observations are provided manually. These locations are usually off-airport, thus, FAA involvement is not required. Manual observations will follow instructions described in the latest version of [FAA Order 7900.5, Surface Weather Observing](#).

New sites can be established at locations for which meteorological data are required if:

1. Funding, both one-time and recurring, are available.
2. The MIC or designee has determined the location satisfies all applicable siting criteria defined in [Federal Meteorological Handbook \(FMH\)-1 Surface Weather Observations and Report \(2019\)](#) and [Appendix C](#) of this NWSI.
3. The requesting NWS official or staff member should provide the Contract Officer's Representative (COR) for contract-observing sites.
4. The requesting NWS official or staff member should notify NWS OBS of any addition for review and approval.

#### **5. Compensation at A-Paid and Synoptic Paid Stations**

Upon the establishment of A-Paid and/or Synoptic Paid Sites, the appropriate NWSRH will document the agreements and any fees for observing services between the NWS and the observer. Paid observers are usually paid per observation. Use [NOAA Form 36-14](#) for the A-Paid and Synoptic Paid programs. The Form may be adapted for regional use.

## Appendix B. Inspection Procedures for NWS-Sponsored Aviation and Synoptic Observation Sites in Alaska and Pacific Regions

Based on FAA [JO 7900.5](#)

### 1. Pre-Inspection Activities and Guidelines

#### 1.1 Advanced Notification of Inspections

The Observing Program Leader (OPL) or other responsible official should notify the supervisor at the NWS-sponsored or affiliated aviation and synoptic observing programs of each planned site visit as far in advance as possible, particularly when there's an inspection at a field site in their County Warning Area (CWA).

Prior to making an inspection, the person designated as the inspector should review all pertinent information regarding the station. Such advance preparation will permit the inspector to concentrate efforts on the particular station's known problem areas, making better use of time. Officials preparing the inspection should consider the following activities:

1. Consider the type of observing program to be inspected and forms and checklists required (e.g., [Weather Service \(WS\) form](#) "Aviation and Synoptic Observation Station Inspection Checklist").
2. Ensure all manuals and forms to be used are correct and up to date (e.g., FMH-1, FMH-2, and FAA Order 7900.5).
3. Review the previous aviation and synoptic program inspection report.
4. Review reports from other regional and local forecast office personnel who recently visited the station.
5. Review the station personnel roster, making note of recent personnel changes. (Note: It is desirable for the inspector to recognize the names of all the observing and supervisory personnel at the station to be visited.) Prepare a list of certified observers from the regional listing (name, certificate number, and programs certified) for each station to be visited on [WSF 10-13-10](#), Aviation and Synoptic Observations Station Inspection Report. Review and update each list when checking the observer certificates at the station being visited.
6. Review observing errors detected at the supervising office by use of computer-based "check surface observation" programs or quality control reports from local, regional, and/or national resources.
7. Review appropriate station description, instrumentation, and information forms (locally and regionally produced forms are also acceptable).
8. Spot check recently transmitted observations and compare them with recorded observations if applicable.

### 2. The Observation Site Inspection

The following guidelines are intended to assist inspectors from NWSRHs and supervising field offices in maximizing the effectiveness of observation site inspections.

#### 2.1 Frequency and Duration of Inspections

Supervising field offices or NWSRH personnel should conduct inspection visits to NWS-

sponsored or affiliated aviation and synoptic observing sites at least annually. Additional visits may be required for sites having recent changes in equipment, programs, or personnel, or when records indicate a less than satisfactory observation program exists.

Allow sufficient time to completely review the observation program. Since these programs vary in complexity and/or content, the visitation time can range from a few hours to a full day. Depending on requirements and availability, additional time may be needed for technical assistance.

### **2.3 Assessment**

Upon completion of the site visit, the inspector should verbally discuss strengths and discrepancies of the program as noted on the completed [WSF 10-13-9](#) with the station manager and the supervising observer. A copy of the form should be left at the field station prior to departure or sent (via mail or email) as soon as possible thereafter if copying facilities are not available on station.

## **3. Post Inspection Activities**

### **3.1 Station Inspection Reports**

Upon completion of each site visit, the inspector prepares a clearly written narrative report using the format on the form [WSF 10-13-10](#). The report will include:

1. Information request in the heading:
  - a. Name of station visited.
  - a. Type of station inspected (NWSCMO, A-Paid).
  - b. Person preparing the report and title; this should be the inspector.
  - c. The supervising station and the dates of the visit.
  - d. Station rating.
  - e. Type of visit (e.g., routine, follow-up, or unannounced inspection).
2. Persons contacted and position.
3. Justification for rating.
  - a. Any aspects of the station's program that are unusually favorable. In this category, include items that might be adopted at other stations.
  - b. An objective appraisal of the effectiveness of the observing program as conducted at the station. If the rating is Unsatisfactory or Conditionally Unsatisfactory, identify the items (minuses) that contribute to that rating.
4. Specific actions that should be taken to improve the program or to correct the deficiencies. These may include instructional changes, facilities improvements, improvements in the program, or personnel skills. Establish a target date for the completion of each action and determine the responsible party.

Contract sites are bound to the requirements of their contracts, so appropriate language should be used. The following terms should be used as guidelines:

- a. “Required” is used to describe an action that needs to be taken to achieve a satisfactory rating.
- b. “Recommend” is used to describe an action that should be taken to ensure a continued satisfactory rating.
- c. “Consider” is used to describe an action that is seen as a best practice, but does not affect the rating.

Whenever feasible, include photographs of documented deficiencies, e.g., exposure of sensors and safety hazards. These are especially useful for discussion purposes at the NWSRH.

5. Concise assessment of each of the areas inspected.
6. Other information considered pertinent to the program.
7. A list of all observers and their certificate numbers.
8. Pressure comparison results, if applicable.

### **3.2 Action Items**

Action items identified in the WSF 10-13-9 and WSF 10-13-10 will be followed up on to ensure corrections to deficiencies have been made.

#### **3.2.1 NWS-Sponsored or –Affiliated Offices**

All follow-up action items should be accomplished as promptly as possible. Report the office’s follow-up actions in a memorandum to the appropriate NWSRH as the actions are completed. If the action is not completed within 30 days after the visit, the station should submit a progress report.

#### **3.2.2 Required for Contract NWS Offices and A-Paid Observers**

A copy of the WSF 10-13-10 should be provided to the contractor or paid observer within one week upon return to the home office. A response should be required by a specified date to close out any action items. A follow-up visit or phone call should be conducted to ensure deficiencies are corrected.

#### **3.2.3 Unsatisfactory or Conditionally Unsatisfactory Ratings**

If a station is rated unsatisfactory or conditionally unsatisfactory, the appropriate Regional Observing Program Manager or designee should be notified. If the station is an NWS contract location, notify the NWS Regional COR as soon as possible. After each unsatisfactory or conditionally unsatisfactory rating, a follow-up report should be made to address all items rated as unsatisfactory during the first inspection.

If an NWS station is again rated unsatisfactory during the follow-up inspection, the following actions should be considered:

1. Contact the Regional Observing Program Manager or designee.

2. If the location is a NWS contract location, notify the NWS Regional COR immediately.
3. If, after two follow-up visits, the program is still unsatisfactory, the observing program should be suspended for that location.

### **3.3 Disposition of Weather Service Forms (WSF) 10-13-9 and 10-13-10**

Provide a copy of the WSF 10-13-10 to the station manager of the observing program that was inspected. Make available and distribute additional copies of the completed WSF 10-13-10 to other appropriate supervising offices (see [Pacific Region supplement 10-1301](#) for additional distribution responsibilities).

1. Retain completed WSFs 10-13-9 and WSF 10-13-10 the inspecting field offices for at least 3 years and the WSF 10-13-10 at the NWSRH for at least 2 years.
2. The latest Station Inspection Report, regardless of age, should be retained at the inspecting field offices for information and continuity until superseded.

## **4. Station Ratings**

The overall rating of an aviation and synoptic observation station should be carefully considered. The following are guidelines for the station evaluation:

1. “Excellent” should be considered if all ratings on the WSF 10-13-9 are pluses (“+”) and in the opinion of the inspector, the station exceeds expected standards.
2. “Satisfactory” should be considered if the minuses (“-“) on WSF 10-13-9 can be fixed quickly, and in the opinion of the inspector, the station meets or exceeds expected standards.
3. “Conditionally Unsatisfactory” should be considered if the program has a significant number of minuses (“-“) on WSF 10-13-9, but not enough to warrant a rating of Unsatisfactory. If the program fails to improve to satisfactory within 30 days, an “Unsatisfactory” rating should be given.
4. “Unsatisfactory” should be considered if there are numerous minuses (“-“) on WSF 10-13-9 and in the opinion of the inspector, the station overall program does not meet or is below expected standards.

The inspector’s experience and knowledge of the observing program should allow the inspector to detect the strengths and weaknesses of the station and should give the inspector the ability to recognize aspects of the observing program that would be unusually favorable. The rating of a station should not be determined solely by the number of pluses and minuses recorded on WSF 10-13-9.

The “grace periods” listed on the WSF 10-13-9 for certain elements are the time limits for correcting unacceptable conditions. The WSF 10-13-9 remarks section or the WSF 10-13-10 explaining an unsatisfactory rating will include the grace periods. This instruction is not intended to include every foreseeable situation; a station could be given a particular rating for any reason that is well documented.

## Appendix C. Instrument Requirements and Standards for the NWS Aviation and Synoptic Observing Programs (Land)

This appendix describes the methods and procedures for NWS oversight of aviation and synoptic observing programs at land stations.

### 1. Standards for Sensors Used in the Observing Programs

The standards in this appendix pertain to individual instruments or meteorological sensors. For some automated systems, data collection platforms (DCPs) integrate and disseminate sensor data. Any data provided by DCPs will meet standards set by the observing program the system supports. [FMH-1](#) establishes the minimum standards for accuracy and resolution of sensors for aviation and synoptic programs. All sensors used in the NWS aviation program or that NWS staff oversee will adhere to these standards. [Section 5](#) below contains a listing of the aviation observing program instrument requirements and standards. [Section 6](#) below contains a listing of the synoptic observing program instrument requirements.

### 2. Siting and Exposure of Meteorological Sensors

Siting and exposure standards will be followed as closely as possible to ensure uniformity of observations. Implementing these standards should be flexible enough to achieve a balance between meteorological representation, space availability, and cost-effectiveness. The NWS will follow the guidelines documented in the [Federal Standard for Siting Meteorological Sensors at Airports \(2019\)](#).

### 3. Commissioning Systems and Sensors

The commissioning of major systems (e.g., ASOS being relocated) will be in accordance with [NWSPD 80-2, System Commissioning and Decommissioning](#). Individual sensors in automated systems will not be commissioned prior to the commissioning of the entire system. The commissioning of standalone individual sensors will be accomplished in accordance with NWS Policies and Instructions. Always activate and commission sensors of automated systems that the NWS procures and maintains prior to operational use. Commissioning or certification of Federal and non-Federal AWOS are the responsibility of the FAA. NOTE: Per [Section 1](#) above, new observing locations will be installed only in Alaska and Pacific Regions unless otherwise noted and approved.

### 4. Relocating of Systems or Sensors

Responsibility for managing and funding the relocation of observing systems or sensors rests with the agency requiring the move. Relocation of an ASOS will be approved by the ASOS Configuration Control Board (ACCB) before any move, in accordance with [NWSI 30-1203 Configuration Management for Operational Systems](#).

### 5. ASOS Sensors

Details on sensors used at ASOS stations are given in the [ASOS User's Guide](#).

**5.1 Visibility Charts**

All NWS sponsored aviation observing stations reporting visibility will have a visibility chart on site. If more than one location is used for visibility observations, a separate chart will be prepared for each location. The phrase “visibility chart” includes any documentation providing a graphical display identifying location and distance to day and nighttime visibility markers. The supervising official at a NWS-funded observing station is responsible for preparing and keeping the visibility charts current. The supervising WFO or RH will check visibility charts at the observing site for proper format and reasonableness during inspection visits. Visibility chart(s) depicting day and night visibility reference points will follow [JO 7210.3](#)

**5.1.1 Visual Elements**

Visual elements are those items that can be seen from a defined reference point at a given observation site. These elements can be used to assist in reporting meteorological conditions such as visibility. In order for visual elements to be used properly for observations, an observer should have an unobstructed view of:

1. At least half of each quadrant of the natural horizon with no more than 45 degrees continuous obstruction.
2. At least 80 percent of the celestial dome (that portion of the sky that would be visible provided, due to absence of human-made structures, there was an unobstructed view of the horizon in all directions from the observation site) and the ambient night lighting will not present a sky evaluation problem at the location.
3. The direction from which weather most often approaches the station.

**5.2 Sensors for Determining Cloud Heights**

All stations staffed or overseen by the NWS and taking observations at airports with at least one precision approach runway will be equipped with a cloud-height indicator. See Table C-1 for Cloud-Height Sensor Performance Standards. NOTE: No backup equipment is required for reporting cloud heights. However, if backup sensors are used, they will meet the cloud-height indicator performance standards in Table C-1.

Cloud-Height Sensor Performance Standard		
Parameter	Accuracy	Range
Height of cloud base in feet	±3 Reportable Values	0 – 12,000 feet (minimum)
The resolution for sensors used as cloud-height indicators is the reportable values for cloud heights as defined in the Federal Meteorological Handbook No. 1, “Surface Weather Observations and Reports.”		

*Table C-1: Cloud-Height Sensor Performance Standards*

**5.3 Sensors for Determining Pressure**

All stations staffed or overseen by the NWS will be equipped with an approved pressure sensor. Pressure sensors will be compared routinely following applicable procedures. Refer to [Section 5.3.1](#) for procedures on comparisons. The following pressure sensors are approved for use at locations staffed or overseen by the NWS.

1. Precision Digital Barometer (PDB-1). At manual-observing stations with an upper-air program and a PDB, the station pressure of the PDB may be used as the barometric



home station standard (HSS) for the aviation program. The PDB readings for altimeter and sea-level pressure will not be used.

2. Paroscientific Digiquartz model 760-16B. The Paroscientific model 760-16B is the traveling standard barometer directly traceable to the PDB at the NWS National Pressure Standards Laboratory. The traveling standard will be:
  - a. Used in both the aviation and synoptic observing programs.
  - b. Used for comparing the ASOS pressure sensors by NWS electronics technicians.
  - c. Used for comparisons with the PDB pressure sensors by NWS field operations staff.
  - d. Returned to the NWS National Pressure Standards Laboratory annually for calibration
  
3. Precision Aneroid Barometers and Digital Altimeter Setting Indicators. These sensors may be used in manual-observing programs such as A-Paid and at locations designated by the RH, provided certification and calibration is traceable to the National Institute of Standards and Technology (NIST).

Pressure Sensor Performance standards can be seen in Table C-2.

Pressure Sensor Performance Standard				
Parameter	Units	Accuracy	Range	Resolution
Station Pressure	Inches of Mercury	± 0.02 inches of Hg	22 – 35 inches of Hg	0.005 inches of Hg
Altimeter Setting	Inches of Mercury	± 0.02 inches of Hg	22 – 35 inches of Hg	0.01 inches of Hg
Sea-Level Pressure	Hectopascals	± 0.68 hPa	800 – 1100 hPa	0.1 Hectopascals

Table C-2: Pressure Sensor Performance Standard

### 5.3.1 PDB Comparison Procedures

[Procedures and form](#)

Precision Digital Barometer Comparison Policy		
Function	Calibration	Comparison Requirement
Home Station Standard/Operational Barometer	<ol style="list-style-type: none"> <li>1. Initial calibration before deployment.</li> <li>2. Annually after initial deployment.</li> </ol>	<ol style="list-style-type: none"> <li>1. A verification of the PDB readings will be conducted at least once every 6 months with the Traveling Standard.</li> <li>2. Consultation with RHQ and the Pressure Standards Lab if more than 0.007 inch from the Traveling Standard.</li> <li>3. <a href="#">Form and procedures</a></li> </ol>

Table C-3 Precision Digital Barometer Comparison Policy

**5.3.2 Surface Observation Backup**

No correction will be applied to the PDB when used as the operational backup to surface observations. Due to the potential for inaccurate data, the PDB readings for altimeter setting and sea-level pressure will not be used to backup those elements in the surface observation.

**5.4 Temperature Sensors**

All stations staffed or overseen by the NWS will have a temperature and dew point sensor meeting the performance standards indicated in Table C-3, unless otherwise stated. The following temperature and dew point sensors may be used in the aviation program:

1. Hygro-Thermometer.
2. Thermometers. Liquid-in-glass or approved electronics.
3. Psychrometer. Liquid-in-glass or approved electronics.

Temperature/Dew Point Sensor Performance Standards				
Parameter	Units	Accuracy	Range	Resolution
Temperature	Degrees Celsius	± 1.1	- 57 to - 50	0.1
		± 0.6	- 50 to + 50	0.1
		± 1.1	+ 50 to + 54	0.1
Dew Point	Degrees Celsius	± 2.2	- 34 to - 24	0.1
		± 1.7	- 24 to - 01	0.1
		± 1.1	- 01 to + 30	0.1

Table C-4. Temperature/Dew Point Sensor Performance Standards.

**5.4.1 Requirement for Backup Temperature Sensors**

All stations staffed or overseen by the NWS will have backup temperature and dew point sensors unless otherwise noted. Where the hygro-thermometer or similar system is the station standard, it should be backed up with approved FAA items. A liquid-in-glass (LIG) thermometer system will include spare thermometers.

**5.5 Wind-Measuring Sensors**

All stations staffed or overseen by the NWS will have a wind sensor meeting the performance standards indicated in Table C-4. Backup wind direction and speed can be estimated. NOTE: Backup sensors are not required for reporting winds. However if they are used, they will meet the wind sensor performance standards in Table C-4.

Wind Sensor Performance Standard				
Parameter	Units	Accuracy	Range	Resolution
Direction	degrees	± 5 degrees when speed is 5 knots	1 - 360 degrees	10 degrees
Speed and Character	knots	± 1 knot up to 10 knots ± 10% above 10 knots	2 - 90 knots	1 knot

Wind Sensors used to support the aviation program will have the capability to generate a derivable 2-minute average wind speed and direction.

Table C-5 Wind Sensor Performance Standards

**5.6 Visibility Sensors**

All stations staffed or overseen by the NWS will have a visibility sensor meeting the performance standards indicated in Table C-6.

Visibility Sensor Performance Standard			
Visibility - Standard Visibility Sensor	Percentage of Data Within or Exceeding a Given Range		
	At least 80% Within	No more than 18% Exceed	No more than 2% Exceed
0 through 1 ¼	± ¼	± ½	± 1
1 ½ through 1 ¾	+ ¼ , - ½	+ ½ , - ¾	± 1
2 through 2 ½	± ½	± 1	± 1
3	+ ½, - 1	± 1	± 1
4 through 10	± 1 RV *	± 2 RV*	± 2 RV*
*RV = Reportable value, all other values in miles.			

Table C-6. Visibility Sensor Performance Standard

**5.7 Precipitation Gauges**

All stations staffed or overseen by the NWS will have a precipitation gauge. The NWS standard for measuring precipitation is the 8-inch non-recording precipitation gauge. Additional performance standards are indicated in Table C-7.

Precipitation Gauge Performance Standard			
Parameter	Accuracy	Range	Resolution
Liquid Precipitation Accumulation Amount	± 0.02 inches or 4 % of hourly amount (whichever is greater)	0 – 10 inches/hour	0.01 inch
Snow Depth	0 – 5 inches ± 0.5 inches 5 – 99 inches ± 1.0 inch	0 – 99 inches (auto)	1 inch
Freezing Precipitation	Detection occurs whenever 0.01 accumulates	0 – 40 inches	0.01 inches

Frozen Precipitation (water equivalent)	± 0.04 inches or 1 percent of total accumulation	0 – 40 inches	0.01 inches
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Table C-7. Precipitation Gauge Performance Standard

**5.8 Snow Shields**

All stations staffed or overseen by the NWS will use wind shields on any operational or backup precipitation gauge at stations reporting data for climatology where the average annual snowfall is 10 inches or more.

**6. Instrument Requirements for the NWS Synoptic Observing Program**

Stations staffed or overseen by the NWS that provide synoptic observations will have, as a minimum, the following instruments adhering to the performance standards of the aviation weather program:

1. Temperature sensors capable of providing ambient air temperature, dew point, and daily maximum and minimum temperatures.
2. An approved NWS pressure sensor.
3. A wind direction and speed system. (Note: At remote locations with limited infrastructure, hand-held wind instruments or wind estimations are allowed.)
4. A standard 8-inch precipitation gauge.

Other equipment can be added to the station as necessary to satisfy additional requirements.

**7. Instrument Deficiency Notification Procedure**

For any deficient instrument, notify the appropriate NWSRH Program Manager and the Pressure Standards Lab. If necessary, a replacement PDB will be shipped via overnight delivery. NWS field staff should verify station-dependent data within the PDB’s memory upon receipt of the PDB.

## Appendix D. Certification of NWS managed Observers

### 1. Applicability

This information will be applicable only to NWS observers in Alaska and Pacific Regions along with the two historical observation sites located in Eastern Region (Mount Washington, NH and Blue Hill, MA). All contract individuals who take or validate officially sanctioned NWS observations will possess a valid Certificate of Authority. See [JO 7900,5](#) under Appendix J for all questions about testing, observing requirements and responsibilities.

NWS Certificates of Authority are not required for the following classes of weather observations although the NWS also considers the observations official.

- a. Cooperative program observations, including supplementary data, river, rainfall, snowfall, snow depth, climatological observations, and severe storm reporting networks.
- b. Coastal marine and cooperative merchant ships.
- c. Upper Air Balloon flights by NWS staff or agents.
- d. Synoptic Observations. Certification testing is not required for taking, encoding, or disseminating synoptic observations. Observers designated to generate manual synoptic observations should have an assessment and demonstrate their practical ability to take synoptic observations.

**Appendix E. Acronym List**

ACCB	ASOS Configuration Control Board
AOMC	ASOS Operations and Monitoring Center
A-Paid	Aviation-Paid
APMO	ASOS Program Management Office
ATCT	Airport Traffic Control Tower
AWOS	Automated Weather Observing Systems
CWA	County Warning Area
CO	Central Operations
COR	Contracting Officer’s Representative
CWO	Contract Weather Observer
DAPM	Data Acquisition Program Manager
DCO	Data Collection Office
DCP	Data Collection Platform
DOD	Department of Defense
ET	Electronic Technician
FAA	Federal Aviation Administration
FAQ	Frequently Asked Question
HMT	Hydrometeorological Technician
HSS	Home Station Standard
Hg	Mercury
HQ	Headquarters
ICAMS	Interagency Council for Advancing Meteorological Services
IFR	Instrument Flight Rule
MIC	Meteorologist-in-Charge
NAS	National Airspace System

NCEI	National Centers for Environmental Information
NCEP	National Centers for Environmental Prediction
NIST	National Institute of Standards and Technology
NLSC	National Logistics Support Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
NWSCMO	National Weather Service Contract Meteorological Office
NWSH	National Weather Service Headquarters
NWSRH	National Weather Service Regional Headquarters
O&M	Operations and Maintenance
OBS	Office of Observations
OIC	Official-in-Charge
OPL	Observing Program Leader
PDB	Precision Digital Barometers
SID	Site Identifier
SUAD	Surface and Upper Air Division
TAF	Terminal Aviation Forecast
WFO	Weather Forecast Office
WS	Weather Service
WSF	Weather Service Form
WSO	Weather Service Office