

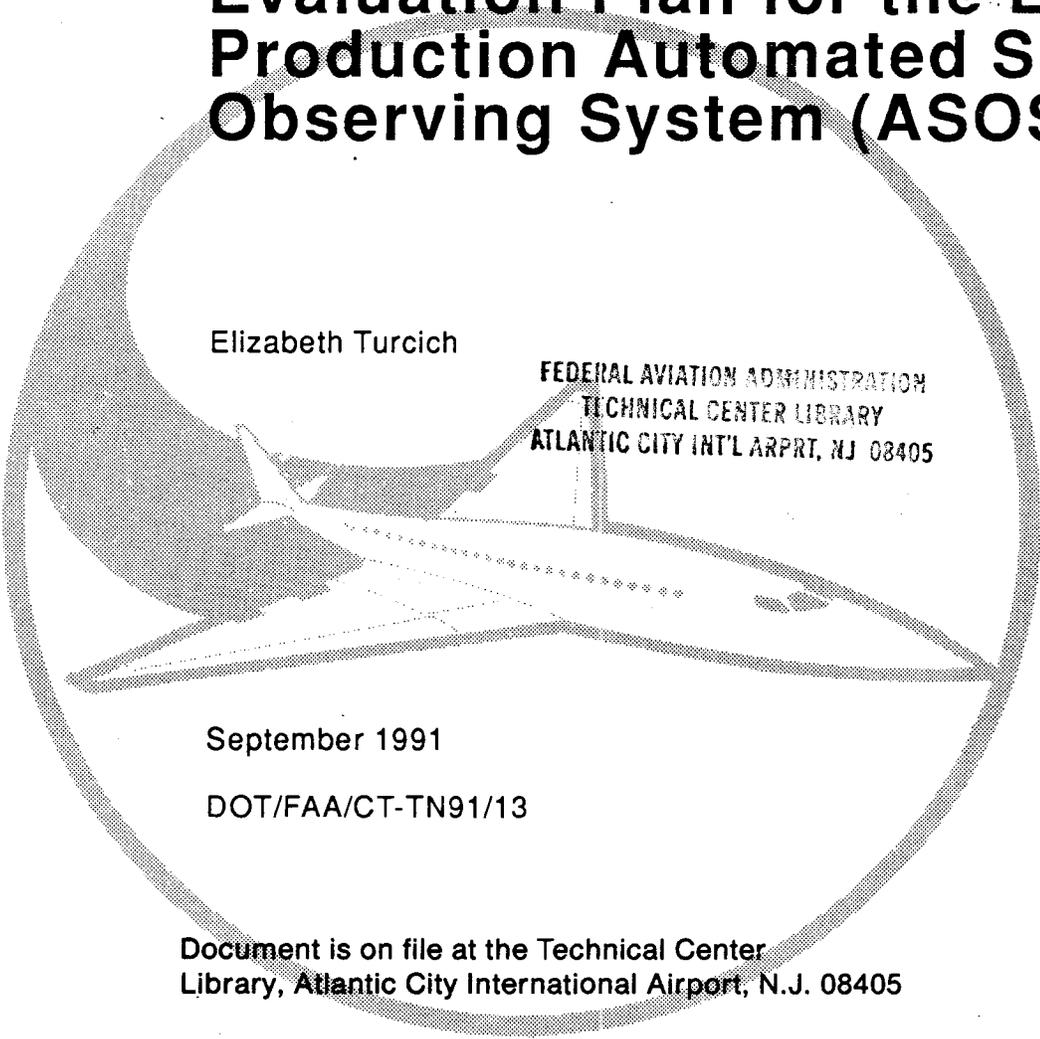
technical note

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Air Traffic Operational Evaluation Plan for the Limited Production Automated Surface Observing System (ASOS)

Elizabeth Turcich

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September 1991

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16. Abstract <p>The Automated Surface Observing System (ASOS) is a weather collection and display system that will be installed in air traffic control towers (ATCT). The system will be procured, installed, operated, and maintained by the National Weather Service (NWS) for the Federal Aviation Administration (FAA) under a Memorandum of Agreement (MOA). This plan outlines the FAA's operational evaluation of the limited production ASOS system, which is being produced by AAI Corporation. The FAA will conduct an operational evaluation on the limited production ASOS at Tulsa, OK; Grand Island, NE; and Colorado Springs, CO, ATCTs, which are located in the Southwest Region, Central Region, and Northwest Mountain Region, respectively. Additionally, an ASOS will be installed at the FAA Technical Center for evaluation purposes. Two controllers from each of the nine FAA regions will come to the FAA Technical Center to perform an evaluation on the system.</p> <p>Data will be collected via questionnaires completed by air traffic control specialists (ATCS) at the three operational sites and from those ATCSs reporting to the FAA Technical Center. The results of the evaluation will be used for consideration in making any necessary changes to the ASOS system prior to full production.</p>					
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PURPOSE

The purpose of this plan is to describe the air traffic (AT) operational evaluation to be performed on the limited production Automated Surface Observing System (ASOS). The ASOS is a weather collection and display system developed by AAI Corporation, Hunt Valley, Maryland, under contract to the National Weather Service (NWS). The AAI Corporation was awarded a limited production contract on February 15, 1991, to produce and install 54 ASOS units within 355 days from the date of contract effectiveness (February 19, 1991). The NWS, under terms of a reimbursable Memorandum of Agreement (MOA) with the Federal Aviation Administration (FAA), will procure, install, operate, and maintain 37 ASOS systems for the FAA.

The FAA conducted an operational evaluation of the preproduction ASOS system at the Tulsa International Airport, OK, in May 1990. That evaluation resulted in the identification of several operational issues, along with suggestions for their improvement (documented in FAA Technical Note DOT/FAA/CT-TN90/42). A second evaluation of ASOS will be conducted at three operational sites and the FAA Technical Center. The second evaluation of ASOS will (1) enable the AT personnel at the Tulsa, OK, Air Traffic Control Tower (ATCT) to evaluate the limited production ASOS as updated with some of their recommendations, (2) provide an opportunity for a broader range of AT personnel to evaluate the operational suitability of the system, and (3) provide the FAA with the opportunity to evaluate the feasibility of integrating the ASOS voice message with the existing Automated Terminal Information System (ATIS), and the ASOS alphanumeric information with existing data displays.

REFERENCE DOCUMENTS

This section lists the applicable documentation and reference materials which relate to the contents of this plan.

DTF01-88-Z-02004	Memorandum of Agreement Federal Aviation Administration/National Oceanic and Atmospheric Administration.
FAA-STD-024a	Preparation of Test and Evaluation Documentation.
FAA Order 1810.4a(b)	FAA NAS Test and Evaluation Program
DOT/FAA/CT-TN89/56	Plan for the FAA Air Traffic Operational Evaluation of the Automated Surface Observing System (ASOS).
DOT/FAA/CT-TN90/42	FAA Air Traffic Operational Evaluation of Automated Surface Observing System (ASOS).

EVALUATION PHILOSOPHY

The AT operational evaluation is designed to ensure that the limited production ASOS has incorporated the requested recommendations from the Tulsa evaluation, that the system is acceptable to a wide range of Air Traffic Control Specialists (ATCSs), and to allow for demonstrating the feasibility of integrating ASOS with both ATIS and existing data display systems. The evaluation will pay particular attention to the following areas which were identified as issues in the Tulsa evaluation: (1) man-machine interface on the Operator Interface Device (OID), (2) voice quality, (3) system response rate, (4) readability of the Controller Video Display (CVD) in both the tower and Terminal Radar Approach Control (TRACON), (5) weather format on the CVD, and (6) integration with existing systems to consolidate displays and labor intensive activities.

The original evaluation of the preproduction system was conducted using only personnel from the Tulsa ATCT. Now that the system is in a limited production mode, it is important to conduct an evaluation of the system that incorporates a wider range of AT personnel from varied FAA regions. The present evaluation will be conducted at two operational sites in addition to Tulsa, and will also include representative ATCSs from each region who will evaluate an ASOS at the FAA Technical Center.

In order to overcome negative user reaction to yet another display in crowded tower cabs and TRACONs, this evaluation will evaluate the feasibility of incorporating the ATIS information onto the ASOS voice broadcast, and integrating ASOS alphanumeric data onto Systems Atlanta Information Dissemination/Display System (SA-IDS). The SA-IDS network has been installed by many regions in their tower cabs and TRACONs.

All other testing required as part of the ASOS program (software development tests, content of weather data, integration tests, etc.) is under the direction of the NWS. The NWS Test and Evaluation Master Plan (TEMP) and Integrated Test Plan (ITP) provide the details of all testing to be performed on the ASOS.

EVALUATION APPROACH

The AT operational evaluation will be conducted at three operational ATC facilities and the FAA Technical Center. Tulsa International Airport, OK; Colorado Springs Peterson Field, CO; and Grand Island Central Nebraska Regional, NE, airports were selected based on their experience with the system, location, and installation dates. The FAA Technical Center will have an ASOS installed as a site for additional field personnel to evaluate the system.

Once an ASOS is installed at a designated operational field site, AAI Corporation will train six FAA personnel at that site on the use of the ASOS equipment. These six FAA personnel will train the remainder of the ATCT staff at that site. After training at the site is complete, an evaluation conductor from the FAA Technical Center will be sent to brief the controllers on the purpose, scope, and procedures of the evaluation and to conduct the evaluation. Each field site evaluation will be accomplished in approximately 2 weeks.

Two air traffic controllers from each of the nine FAA regions will be brought to the FAA Technical Center for 2 days to receive training on the ASOS and perform the evaluation. Scenarios will be generated for the OID to ensure that all functions are exercised.

During each of the field site and FAA Technical Center evaluations, controllers will be requested to complete a detailed questionnaire and a summary form. The questionnaire is organized to highlight various ASOS devices, system areas, and interfaces that the controller will utilize. The summary is designed to allow the controllers to respond in depth to questions, and provide opinions and recommendations on the system. Following each evaluation, the completed questionnaires will be analyzed by ACN-250 personnel at the FAA Technical Center. The data collected will form the basis for a quick look report which in turn will be forwarded to the principle organizations supporting the ASOS evaluation. The quick look reports will be the means for providing the FAA Weather Sensors Program, ANW-140, with interim data after each site evaluation. After the overall evaluation is completed, ACN-250 will hold a debriefing at the FAA Technical Center with a group of controller evaluators and the principle headquarters AT organizations, to produce a list of problems/issues and corresponding recommendations to be included in the final report.

EQUIPMENT

The components of the ASOS system that will be installed in the towers consists of three displays, plus associated equipment:

Operator Interface Device (OID). The OID consists of a color monitor which displays Surface Aviation Observations (SAOs), 1-minute observations, local observations, and archived data. A keyboard is associated with the monitor for entering remarks, tower visibility, and review and/or archiving ASOS weather data. The OID has a variable audible alarm for alerts, and the weather element is highlighted and/or blinking on the screen. A microphone for entering information into the ASOS for voice message output to pilots is included with the OID. The OID is intended to be located in the tower cab as close to the Flight Data Operator (FDO) position as space will allow. During the evaluations, locations with the ATIS will append the ATIS information onto the ASOS voice message output.

Video Display Unit (VDU). The VDU is a monochrome monitor which displays the latest hourly, special, or local 1-minute observations intended for use by the supervisor. Its location is dependent upon that of the supervisor (tower cab or radar room).

Controller Video Display (CVD). The CVD is an electroluminescent flat panel display that will be placed at selected controller positions in the tower cab and in the radar room. Up to nine CVDs will be provided per location. It will display SAOs, winds, altimeter, and a limited set of remarks. The CVDs may be either mounted on, or cut into, the consoles. At evaluation locations that have data display units from Systems Atlanta, Inc., an attempt will be made to interface the two systems in order to display ASOS data on the SA-IDS. A successful display of ASOS data on the existing SA-IDS may alleviate the need for some additional ASOS displays in already crowded air traffic control (ATC) facilities.

ORGANIZATION ROLES AND RESPONSIBILITIES

The principal organizations which will be participating in the evaluation of ASOS include the following: the FAA Weather Sensors Program Office, ANW-140; Weather and Remote Maintenance Monitoring Systems Branch, ACN-250; Hardware Engineering Branch, ACN-320; FAA Air Traffic Plans and Requirements Service, ATR-130; Air Traffic Rules and Procedures, ATP-124; Office of Air Traffic System Management, ATM-120; the nine FAA Regional Air Traffic Divisions; NWS ASOS Program Office (NWS W/OSD3); ATCT personnel at Tulsa, OK; Grand Island, NE; and Colorado Springs, CO; and selected towers within the nine FAA Regions; FAA Technical Center support contractors, and the prime contractor, AAI Corporation.

RESPONSIBILITIES.

ANW-140. ANW-140 is the FAA ASOS program office and has the overall authority for the evaluation. This office will coordinate activities with the NWS, and review and approve documentation.

ACN-250. The FAA Technical Center (ACN-250) has been designated by the program office to manage, coordinate, and conduct the ASOS operational evaluation. ACN-250 personnel will develop the operational evaluation plan and associated questionnaires. ACN-250 will provide the evaluation director and evaluation conductors who will participate in initial site visits to coordinate the evaluation, and will brief AT personnel at the designated sites on the questionnaires and logistics of the evaluation. ACN-250 personnel will train AT personnel who come to the FAA Technical Center to take part in the evaluation, and brief them on the evaluation and completion of the questionnaires. ACN-250 will provide interim quick look reports to the program office following each evaluation. A data analysis will be performed on all questionnaire data collected. At the conclusion of the overall evaluation, ACN-250 will bring in a group of controller evaluators, one from each region, for a debriefing in order to refine the data that was collected from the questionnaires. These data will be included in preparing a final report to the program office and principle AT organizations, on the status of the system.

ACN-320. The Hardware Engineering Branch, ACN-320, will support the installation of ASOS in the FAA Technical Center tower cab mockup.

ATR-130. ATR-130 will review the operational evaluation plan and questionnaires to verify conformity with AT ASOS requirements, participate in monitoring the evaluation, and the debriefing. ATR-130 personnel will coordinate with regional AT division offices concerning the support from the three evaluation sites and coordination of air traffic controllers from each region to participate in the Interregional Controller Evaluation Team.

ATP-124. ATP-124 will review the operational evaluation plan and questionnaires to verify conformity with AT ASOS requirements, participate in monitoring the evaluation, and the debriefing.

ATM-120. ATM-120 will review the operational evaluation plan and questionnaire to verify conformity with AT ASOS requirements, participate in monitoring the evaluation, and the debriefing.

REGIONAL AIR TRAFFIC DIVISION OFFICES. The Central, Southwest, and Northwest Regional Offices will serve as the liaison for the operational evaluation sites within their regions. All FAA regions will support the evaluation by providing ATCSs as members of the Interregional Controller Evaluation Team.

TULSA, OK; GRAND ISLAND, NE; AND COLORADO SPRINGS, CO, ATCTs. Each facility will be responsible for training operational personnel that are not trained by AAI Corporation. Facility managers will provide the necessary meeting/briefing facilities and space to accommodate the evaluation conductor(s). The ATCSs at these facilities will perform the ASOS evaluations and complete the questionnaires. Each facility will provide one cognizant representative for the post-evaluation debriefing.

NATIONAL WEATHER SERVICE. The NWS will review the AT operational evaluation plan, questionnaires, and draft final report. NWS will serve as the interface with AAI Corporation.

FAA TECHNICAL CENTER SUPPORT CONTRACTORS. FAA Technical Center support contractors will provide personnel to support the development of the operational evaluation plan and questionnaires, and participate in site visits, reviews, and briefings. They will serve as evaluation conductors and train ATC personnel on the use of ASOS installed at the FAA Technical Center. They will assist in the data analysis and in the preparation of the quick look and final reports.

PRIME CONTRACTOR. The AAI Corporation will install limited production ASOS units at the designated sites. They will certify to the NWS that the system is ready for operational evaluation. The AAI Corporation personnel will provide the training, as detailed in their statement of work, to operational ATC personnel at the evaluation sites and to ACN-250 personnel.

ROLES.

EVALUATION DIRECTOR. The evaluation director is a member of the FAA Technical Center and will oversee all aspects of the operational evaluation including preparation of the quick look reports and final report.

EVALUATION CONDUCTORS. The evaluation conductor(s) will be the on-site evaluation coordinators. They will participate in all site visits, reviews, and briefings. The conductors will brief the ATCSs on the purpose of the evaluation and the questionnaires, and be present to conduct the evaluation. The conductors will train the controllers who are detailed to the FAA Technical Center in the use of the ASOS, and will brief them on the evaluation and completion of the questionnaires. The evaluation conductors will support data analysis, the post-evaluation debriefing, and the preparation of quick look and final reports.

INTERREGIONAL CONTROLLER EVALUATION TEAM. This team consists of two operational ATCSs from each region. The team will evaluate the ASOS system at the FAA Technical Center. One team member from each region will participate in the post-evaluation debriefing.

EVALUATION PARTICIPANTS. The ATCSs at Tulsa, Grand Island and Colorado Springs will evaluate the ASOS that is installed at their respective facility. The ATCSs selected from other regions, who come to the FAA Technical Center, will evaluate the ASOS that is installed in the mock-up tower cab. When the evaluations have been completed, a group of controller evaluators (one from each region) will be requested to come to the FAA Technical Center to take part in a debriefing.

DOCUMENT REQUIREMENTS AND CONTROL

The documents listed below are required to plan, describe, conduct, and report results of the operational evaluation of the ASOS.

AIR TRAFFIC OPERATIONAL EVALUATION PLAN.

This plan describes the requirements, methods, and responsibilities for conducting the operational evaluation of ASOS. It will provide a method for the FAA to obtain ATCS reaction to the usefulness and effectiveness of the ASOS in a live operational environment and in a test evaluation environment at the FAA Technical Center.

EVALUATION QUESTIONNAIRE.

In order to obtain the user evaluations of ASOS, a questionnaire and summary form have been developed with input from Headquarters AT personnel. The questionnaire is divided into areas by display device, and then into subareas such as readability. The questionnaire is structured to obtain the evaluation of ASOS by rating a statement about each feature/function on a five-point scale ranging from very good to very poor, plus a "not applicable" category. The participants will be asked to complete those items that are relevant to their work environment.

The summary form consists of questions asking for written responses concerning problems, issues, and recommendations on ASOS.

QUICK LOOK REPORTS.

A quick look report, providing a brief synopsis of the evaluation results, will be prepared and forwarded to ANW-140 within 15 days following the completion of each site evaluation.

DRAFT FINAL REPORT.

Within 60 days following the end of the operational site and FAA Technical Center evaluations, a draft final report will be submitted to ANW-140 for review.

FINAL REPORT.

After review and editing of the draft final report, the final report will be prepared and will include the conclusions, problems/issues, and recommendations resulting from the post-evaluation debriefing. This report will be sent to ANW-140 and the participants within 45 days after receiving comments on the draft final report.

TRAINING

The AAI Corporation will provide training at the three operational field sites. Four weeks prior to system installation, AAI Corporation will provide a videotape overview of the ASOS system and six workbooks to each of the three ASOS sites. The workbooks will give the trainees exercises to prepare for contractor provided hands-on training. After ASOS system acceptance, AAI Corporation will conduct on-site hands-on training in the use of the OID. Up to six personnel at each location will be given one-on-one training that will last approximately 2 hours. The videotape will be retained at each facility to provide refresher training and for training newly hired employees.

The FAA Technical Center personnel will receive AAI Corporation training in preparation for training the 18 air traffic controllers reporting to the FAA Technical Center for the ASOS evaluation.

EVALUATION SUPPORT REQUIREMENTS

This section describes the instrumentation required for the evaluation, the types of data analysis to be performed, and the evaluation article configurations.

INSTRUMENTATION.

No special instrumentation is required for the evaluation. The AAI Corporation will install the ASOS equipment at the three operational sites and at the FAA Technical Center. The systems will undergo acceptance procedures and be certified operational at the three operational sites prior to commencing the evaluation. The system located at the FAA Technical Center will undergo acceptance procedures.

DATA ANALYSIS.

Numerical values will be assigned to the questionnaire responses, and then analyzed using robust statistics. The intent of the analysis is to find the degree of agreement among controllers from the four sites and any significant differences in the ratings between the evaluation sites. The suggestions and freeform comments will be analyzed using content analysis. These responses will be categorized and quantified to provide additional controller feedback. Those areas showing low ratings will be discussed during the debriefing in order to provide recommendations for improvement, while those areas with a high deviation in ratings will be discussed to clarify any issues.

The evaluation of the following items is intended to answer questions regarding AT operational usage including:

1. Readability of the OID, VDU, CVD (and SA-IDS if applicable) in normal tower and radar room lighting conditions,
2. Presentation of weather data,
3. Ease of entering data on the OID,

4. Location of displays,
5. Interaction with other ATC tasks,
6. Voice quality,
7. Visibility of highlighted text,
8. Viability of ASOS/ATIS and ASOS/SA-IDS interfaces,
9. Completeness of training on the OID.

EVALUATION CONFIGURATION.

The evaluation will take place at three operational facilities and the FAA Technical Center. The configuration at each location is as follows:

Tulsa International Airport, OK ATCT. The ASOS installation at Tulsa will include two CVDs in the tower cab, and five CVDs in the TRACON. The VDU will be located in the TRACON at the supervisors position. The OID will be in the tower cab at the Flight Data Operator (FDO) position. Tulsa has both ATIS and SA-IDS. The tower is a Level III and is located in the Southwest Region.

Grand Island Central Nebraska Regional Airport, NE ATCT. The ASOS installation at Grand Island will include two CVDs in the tower cab. There is no TRACON at this facility. The VDU will be in the Air Traffic Managers office and the OID will be in the tower cab. Grand Island has an ATIS but does not have SA-IDS. The tower is a Level I in the Central Region.

Colorado Springs Peterson Field Airport, CO ATCT. The ASOS installation at Colorado Springs will have two CVDs in the tower cab, and two CVDs in the TRACON. The OID will be in the tower cab at the FDO position. There will not be a VDU. Colorado Springs has both ATIS and SA-IDS. The tower is a Level III in the Northwest Mountain Region.

FAA Technical Center. The ASOS installation at the FAA Technical Center will be in the tower cab mock-up located above the laboratory area. This installation will have one OID, one VDU, and three CVDs. A SA-IDS will be installed for the evaluation.

REVIEWS AND MEETINGS

The visits, briefings, and reviews described below are necessary to successfully conduct the operational evaluation of ASOS.

INITIAL SITE VISIT.

An initial visit to each field site ATCT is needed to obtain site specific information necessary to conduct the evaluation. Information to be gathered includes the number of controllers, the number of supervisors, layout of tower cab, weather observing equipment presently utilized, duty schedules, etc. These visits will be coordinated by the regional representative for each field site and will include ANW-140, ATR-130, ATP-124, ATM-120, and ACN-250.

EVALUATION BRIEFING.

Once the ASOS training has been completed, a briefing will be held at each of the three operational sites selected for the ASOS evaluation to insure that the intent of the evaluation is conveyed, the logistics are understood, and the questionnaires are thoroughly explained. Each ATCS evaluating the ASOS will receive the briefing. The evaluation conductors, who will be holding the briefings, will insure that every participant has been briefed and that all questions/concerns are addressed. The briefings will be held on an as needed basis so that all duty shifts are covered.

Personnel coming to the FAA Technical Center to participate in the evaluation will receive a similar briefing.

POST-EVALUATION DEBRIEFING.

In order to obtain more direct feedback from the controller participants, a post-evaluation debriefing will be conducted by ACN-250 at the FAA Technical Center. One Interregional Controller Evaluation Team member from each region, representatives from the three field facilities that participated in the evaluation, along with ANW-140 and Headquarters AT representatives, will be requested to participate in the debriefing. The intent of the debriefing is to better understand the reasons for specific poor ratings of features, clarify any discrepancies in ratings, obtain feedback that may not have been expressed on the questionnaires, and coordinate any necessary recommendations for system improvements.

SCHEDULE

Develop Evaluation Plan	1/90 through 6/91
Prepare Evaluation Questionnaires	2/91 through 7/91
Installation of ASOS Complete	
Tulsa	2/20/92
Grand Island	9/29/91
Colorado Springs	11/05/91
FAA Technical Center	9/05/91
Operational Evaluation Complete	
Tulsa	4/15/92
Grand Island	12/06/91
Colorado Springs	12/31/91
FAA Technical Center	10/31/91
Quick Look Reports	15 days following each evaluation
Post-Evaluation Debriefing	3-4 weeks after last evaluation
Draft Final Report	60 days after last evaluation
Final Report	45 days following return of comments on draft final report.

ACRONYMS AND ABBREVIATIONS

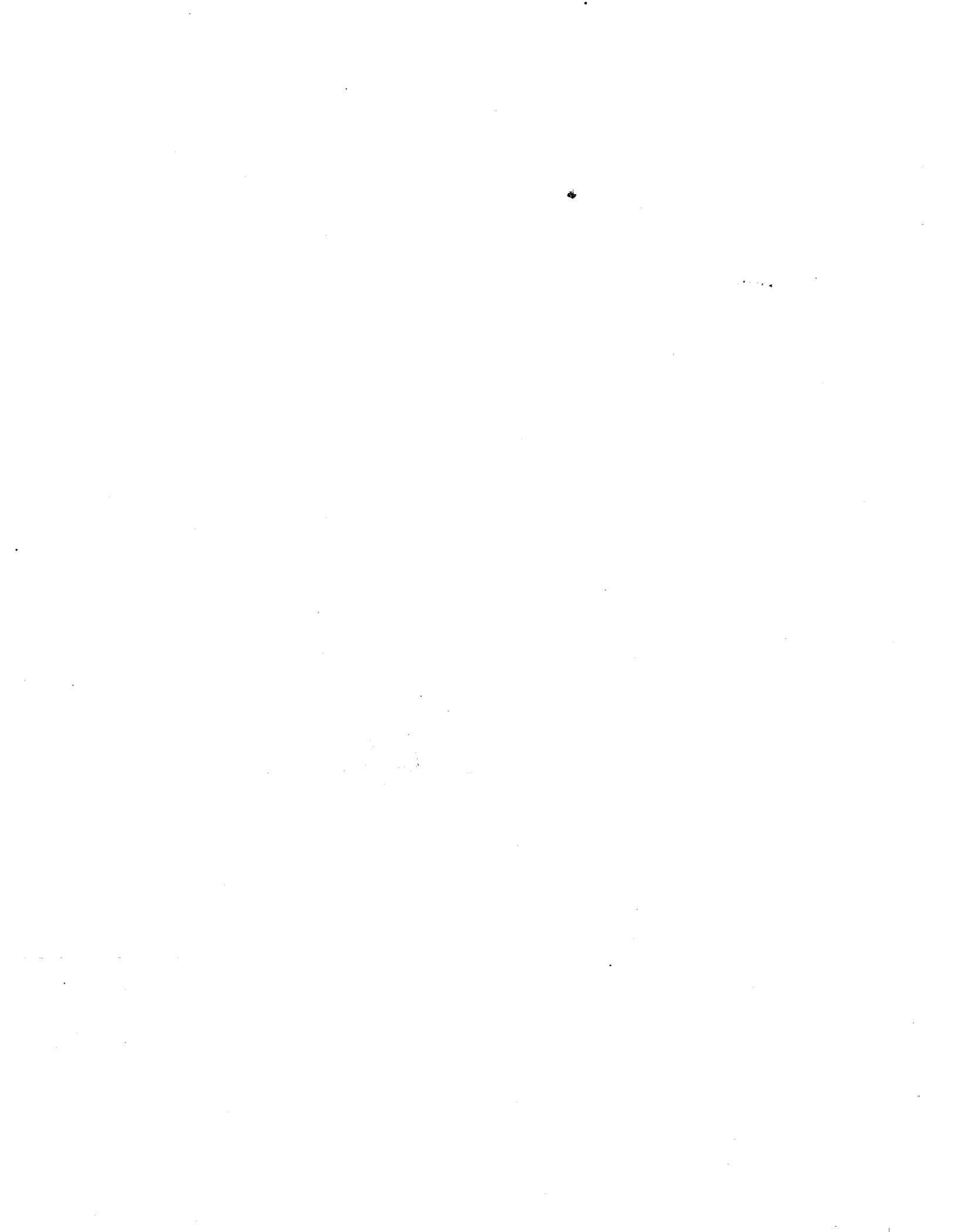
ASOS	Automated Surface Observing System
AT	Air Traffic
ATC	Air Traffic Control
ATCS	Air Traffic Control Specialist
ATCT	Air Traffic Control Tower
ATIS	Automated Terminal Information System
CVD	Controller Video Display
FAA	Federal Aviation Administration
FDO	Flight Data Operator
ITP	Integration Test Plan
MOA	Memorandum of Agreement
NWS	National Weather Service
OID	Operator Interface Device
RMMS	Remote Maintenance Monitoring System
SA-IDS	Systems Atlanta Information Dissemination/Display System
SAO	Surface Aviation Observation
TEMP	Test and Evaluation Master Plan
VDU	Video Display Unit

ASOS EVALUATION REQUIREMENTS MATRIX.

The ASOS evaluation requirements matrix contains the AT operational requirements from the ASOS specification that pertain to the displays that will be located at FAA-towered locations (see appendix A). This matrix will be utilized to ensure traceability from the ASOS evaluation questionnaires to the ASOS specification. The matrix contains the specification reference, requirement, and the evaluation questionnaire category under which it will be evaluated.

APPENDIX A

ASOS EVALUATION REQUIREMENTS MATRIX



SPECIFICATION S100 - SPO01 Feb 15, 1991 PARA NUMBER	SPECIFICATION REQUIREMENT	FAA AIR TRAFFIC OPERATIONAL EVALUATION OF ASOS QUESTIONNAIRE	REMARKS
3.3.15.1	The OID screen shall be rectangular and 12 to 13 inches diagonal	OID Display Characteristics	
3.3.15.1	The OID shall consist of a video display and a keyboard which may be an integrated desktop unit	OID Display Characteristics	
3.3.15.1	The OID shall be readable at angles up to 45 degrees to the plane of the display and at a distance of 6 feet	OID Display Characteristics	
3.3.15.1	The OID shall be readable by a person with normal vision in levels varying from normal lighting to near darkness	OID Display Characteristics	
3.3.15.1	The OID shall be capable of transmitting/receiving at a rate of 9600 BPS	OID Display Characteristics	
3.3.15.2	The response time between the depression of a key for selecting an item displayed on the OID and the display of a subsequent menu shall not exceed one second	OID Display Characteristics	
3.3.15.2	The operator must be able to interact with ASOS, performing various functions through the OID	OID Screen Layout	

SPECIFICATION S100-SPO01 Feb 15, 1991 PARA NUMBER	SPECIFICATION REQUIREMENT	FAA AIR TRAFFIC OPERATIONAL EVALUATION OF ASOS QUESTIONNAIRE	REMARKS
3.3.15.1	The OID shall accept data from the ACU and display that data in the OID format specified for operator interaction through the keyboard	OID Screen Layout	
3.3.15.1	The OID keyboard shall provide active function keys and separate active cursor keys for performing the OID functions as described	OID Screen Layout	
3.3.16.2	The layout of the elements shall conform to the order in which the weather elements appear in an SAO	OID Screen Layout	
3.3.15.2	Through the OID, air traffic controllers who are signed on shall be able to edit the weather	OID Functions	
3.3.15.2	Through the OID, air traffic controllers who are signed on shall be able to enter tower visibility	OID Functions	
3.3.15.2	Turn off report processing such that if left in automatic mode the output to the general display and observations shall be "M" for missing	OID Functions	

SPECIFICATION S100-SPO01 Feb 15, 1991 PARA NUMBER	SPECIFICATION REQUIREMENT	FAA AIR TRAFFIC OPERATIONAL EVALUATION OF ASOS QUESTIONNAIRE	REMARKS
3.3.15.2	All operator functions must be accessible through the OID	System Access	
3.3.15.2	The following function(s) shall be available to all signed on operators: Sign on/off ASOS	System Access	
3.3.15.2	Provide ATC access to tower visibility when the observer is signed on	System Access	
3.3.15.2	The OID shall notify operators by audible and visual alarm	Alarms	
3.3.15.2	A message shall be displayed on screen which indicates the status of the alarms	Alarms	
3.3.15.2	The CVD shall be readable in light levels from bright sunlight artificial light, to near darkness	CVD Display Characteristics	
3.3.16.2	In a free standing configuration the CVD shall swivel + or - 15 degrees in the horizontal and vertical directions	CVD Display Characteristics	
3.3.16.2	The CVD shall have an adjustable brightness or background luminance	CVD Display Characteristics	

SPECIFICATION S100-SP001 Feb 15, 1991 PARA NUMBER	SPECIFICATION REQUIREMENT	FAA AIR TRAFFIC OPERATIONAL EVALUATION OF ASOS QUESTIONNAIRE	REMARKS
3.3.16.2	The layout of the elements shall conform to the order in which the weather elements appear in an SAO	CVD Display Characteristics	
3.3.16.2	The display shall have high contrast characteristics, comparable to high quality LCD or plasma display. It shall have an adjustable brightness or background luminance capability, and an adjustment to vary the brightness	CVD Display Characteristics	
3.3.16.2	Winds and Altimeter shall be highlighted	CVD Display Characteristics	
3.3.18	The ASOS shall have the capability to interface with FAA link up for voice broadcast	Voice	
3.3.15.2	Through the OID, controllers shall be able to select message output	Voice	
3.3.15.2	Through the OID, controllers shall be able to control recording/erasing messages via the microphone	Voice	
3.3.18	The combination of automated voice with manual voice shall produce a balanced output such that the volume level is consistently even for the entire voice message	Voice	

SPECIFICATION S100-SPO01 Feb 15, 1991 PARA NUMBER	SPECIFICATION REQUIREMENT	FAA AIR TRAFFIC OPERATIONAL EVALUATION OF ASOS QUESTIONNAIRE	REMARKS
3.3.16.1	The VDU shall be readable in levels varying from normal room lighting to near darkness	VDU Display Characteristics	
3.3.16.2	The layout of the elements shall conform to the order in which the weather elements appear in an SAO	VDU Display Characteristics	
3.3.16.2	Winds and Altimeter are highlighted	VDU Display Characteristics	

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