



# **OPERATIONAL TEST AND EVALUATION (OT&E) FINAL REPORT**

For  
**Automated Surface Observing System  
(ASOS) CL31 Ceilometer Replacement  
And  
ASOS Acquisition Control Unit Version (V)  
2.79X with Data Collection Platform V2.0  
Erasable Programmable Read Only Memory  
and IFW V4.54 Firmware  
October 2009**

U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Weather Service/Office of Operational Systems  
Field Systems Operations Center/Test and Evaluation Branch

## Executive Summary

This test report contains the test and evaluation results from the Operational Test & Evaluation (OT&E) for the Vaisala replacement ceilometer (CL31) on the Automated Surface Observing System (ASOS) using the Acquisition Control Unit (ACU) Version (V) 2.79X and Data Collection Platform (DCP) V2.0 Erasable Programmable Read Only Memory chips (EPROMs). The report includes the test objectives and criteria, Test Trouble Reports (TTRs), test results, and recommendations.

The OT&E started on March 9, 2009, and concluded on August 20, 2009. OT&E was performed at 21 ASOS sites representing a diverse set of ASOS hardware configurations, ASOS regions, FAA, U.S. Air Force, and U.S. Navy sites. Weekly Test Review Group (TRG) meetings were held via teleconference with the TRG members during the OT&E, and the detailed minutes from each TRG meeting (and other information from the OT&E) were recorded and are available on the OPS24 website:

[http://www.nws.noaa.gov/ops2/ops24/documents/asos\\_ceilometer.htm](http://www.nws.noaa.gov/ops2/ops24/documents/asos_ceilometer.htm)

The OT&E was conducted in three phases.

Phase 1 ran at 17 sites from March 12, 2009 to May 4, 2009. During Phase 1, the ceilometers were operated in a dual installation mode with the existing CT12K ceilometer configured as the operational sensor, and the new CL31 ceilometer configured as the test sensor. The OT&E sites were running ASOS ACU V2.79V with DCP EPROMS V2.0 during Phase 1.

Phase 2 ran at the same 17 sites from May 18, 2009 to June 5, 2009. During Phase 2, the new CL31 ceilometer was configured as the operational ceilometer, and the existing CT12K ceilometer was configured as the test sensor. Before Phase 2 began, a Technical Implementation Notice (TIN) and corresponding Public Notification Statement (PNS) were sent out by each WFO participating in the OT&E. The TIN was also sent out nationally by NWS Headquarters. The OT&E sites were running ASOS ACU V2.79V with DCP EPROMS V2.0 during Phase 2.

Phase 3 ran at all 21 sites from June 15, 2009 to August 20, 2009. During Phase 3, the new CL31 ceilometer was configured as the stand alone operational sensor, and the existing CT12K ceilometer was deconfigured. During Phase 3, the four remaining test sites ran with multiple CL31s installed. At these four sites, in addition to the primary operational CL31 ceilometer, three sites installed and configured a back up CL31, and one site installed and configured a meteorological discontinuity sensor. This helped test various operational ceilometer configurations. The OT&E sites were running ASOS ACU V2.79V with DCP EPROMS V2.0 during the first part of Phase 3.

During Phase 3a, in early July 2009, a recommendation from the TRG was to fix a critical Test Trouble Report (TTR #210: "V2.79V Did Not Generate "F" Flag when IFW Sensors Thermistor Failed") that was found during V2.79V OT&E involving the Ice Free Wind (IFW) Sensor and the ASOS V2.79V software. IFW sensor firmware version (V) 4.54 with ASOS software version V2.79X fixed the critical TTR. The TRG recommended verifying this fix during Phase 3a of the OT&E by upgrading the software to V2.79X and installing IFW sensor firmware V4.54.

From mid July 2009 through August 20, 2009, Phase 3b ran with ASOS V2.79X installed at all 21

OT&E sites, and IFW firmware installation at a subset of 11 OT&E sites. The other 10 sites ran with the previous version of IFW firmware to make sure that V2.79X would run with both versions of IFW firmware. Phase 3b was completed using ASOS ACU V2.79X with DCP EPROMS V2.0.

No critical TTR's were found during the OT&E. All TTR's found during OT&E were adjudicated and resolved.

OT&E successfully concluded on August 20, 2009 with 13 out of 14 TRG members voting yes on whether to move to recommend national deployment of the CL31 with V2.79X ASOS ACU firmware, V2.0 DCP EPROMS, and IFW sensor firmware version V4.54. The only TRG member that voted against national deployment was the Alaska region. The Alaska region voted yes to deploying ASOS ACU V2.79X firmware in conjunction with IFW sensor firmware V4.54 without the CL31 being deployed. The ASOS Test Review Board (ATRB) unanimously voted to recommend national deployment of the CL31 with V2.79X ASOS ACU firmware, V2.0 DCP EPROMS, and IFW sensor firmware V4.54. There were two recommendations from the TRG which were provided during the 'wrap up' OT&E meeting on August 20, 2009.

The first recommendation was to form a team to resolve Serial Input Output (SIO) card error issues found at some of the OT&E sites. A team of NWS subject matter experts from the Office of Science and Technology (OST31), the National Reconditioning Center (NRC), the Office of Operational Systems Maintenance Branch (OPS12), and the OPS Software Branch (OPS23) will investigate the possibility of a standard ASOS port assignment or other solution to SIO card errors that have existed on ASOS for many operational software loads.

The second recommendation was to form a team to investigate a bird issue which induced occasional "false reporting" of low clouds at Oklahoma City (OKC). OST31 has a preliminary test plan to address the "false reporting" of low clouds at OKC with possible bird abatement recommendations. To help address the "false reporting" of low clouds at OKC, a wildlife camera with motion activation has been installed near the CL31 ceilometer at OKC, and a "whirly bird" bird abatement device has also been installed at OKC.

The TRG also recommended proceeding slowly with national deployment of the CL31 ceilometer, starting with Northern U.S. ASOS sites.

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## Acronyms

ACU	Acquisition Control Unit
ACCB	ASOS Configuration Control Board
AOMC	ASOS Operations and Monitoring Center
APMC	ASOS Program Management Council
ASOS	Automated Surface Observing System
ATRB	ASOS Test Review Board
CL31	Vaisala CL31 Replacement Ceilometer
CT12K	Current Vaisala 12K Ceilometer
DCP	Data Collection Platform
DoD	Department of Defense
EPROMs	Erasable Programmable Read Only Memory
FAA	Federal Aviation Administration
IFW	Ice Free Wind Sensor
MCE	Meteorological Comparison Evaluation
Mod Notes	NWS Engineering Modification Notes
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OT&E	Operational Test and Evaluation
OOS	Office of Operational Systems
OPS24	Office of Operational Systems, Test & Evaluation Branch
OST	Office of Science and Technology
PNS	Public Notification Statement
SFSC	Sterling Field Support Center
TIN	Technical Implementation Notice
TRG	Test Review Group
TRR	Test Readiness Review
TTR	Test Trouble Report
USAF	United States Air Force
WFO	Weather Forecast Office

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## **1.0 Introduction**

This test report contains the test and evaluation results from Operational Test & Evaluation (OT&E) for the Vaisala replacement ceilometer (CL31) on the Automated Surface Observing System (ASOS) using the Acquisition Control Unit (ACU) Version (V) 2.79X and Data Collection Platform (DCP) V2.0 Erasable Programmable Read Only Memory chips (EPROMs).

The OT&E started on March 9, 2009, and concluded on August 20, 2009. Weekly Test Review Group (TRG) meetings were held via teleconference with the TRG members during the OT&E, and the detailed minutes and other supporting documentation from each TRG meeting were recorded and are available on the OPS24 website:

[http://www.nws.noaa.gov/ops2/ops24/documents/asos\\_ceilometer.htm](http://www.nws.noaa.gov/ops2/ops24/documents/asos_ceilometer.htm)

The CL31 V2.79X and DCP V2.0 EPROM OT&E was conducted at the following 21 sites:

CMH Columbus, OH  
ROA Roanoke, VA  
CAR Caribou, ME  
BTV Burlington, VT  
GDP Guadalupe Pass, TX  
OKC Oklahoma City, OK  
GUY Guymon, OK  
JKL Jackson, KY  
ABR Aberdeen, SD  
ANJ Sault Ste. Marie, MI  
BIS Bismarck, ND  
CYS Cheyenne, WY  
DDC Dodge City, KS  
PHX Phoenix, AZ  
HIO Portland, OR  
CMA Camarillo, CA  
OXR Oxnard, CA  
GEG Spokane, WA  
FAI Fairbanks, AK  
ITO Hilo, HI  
KNBC Beaufort Marine Air Station, SC

Before the start of the OT&E, a Test Readiness Review meeting was conducted by OPS24 on March 9, 2009, and confirmed all prerequisites listed from the test strategy were met.

## **2.0 Purpose**

The purpose of the OT&E was to confirm the suitability of the replacement ceilometer and supporting ASOS software for operational use at ASOS locations under the auspices of the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS), the Federal Aviation Administration (FAA), Department of Defense (DoD) U.S. Air Force (USAF), and DoD U.S. Navy.

### **3.0 OT&E Summary**

The OT&E was performed at 21 specific ASOS sites listed in the introduction (see Appendix B for details) representing all six NWS regions. The sites included NWS ASOS sites, Federal Aviation Administration (FAA) ASOS sites, and a U.S. Navy ASOS site. The OT&E started in March 9, 2009 and officially ended on August 20, 2009. The OT&E was divided into three phases.

#### **3.1 Phase 1: CT12K Operational Ceilometer CL31 Test Ceilometer**

Phase 1 began on March 9th, 2009 and ran until May 4, 2009. During Phase 1, the ceilometers ran in a dual configuration mode. In this dual configuration mode, the CT12K ceilometer was configured as the operational ceilometer, and the CL31 ceilometer was configured the test ceilometer. Phase 1 ran at 17 of the 21 OT&E sites during this period. The other 4 OT&E sites had multiple ceilometers (either a back up or a meteorological discontinuity sensor), and could not be configured in a dual configuration mode due to band width limitations on ASOS that would not allow a mix of CT12K and CL31 ceilometers at sites with multiple ceilometers. These 4 sites were tested during Phase 3 of the OT&E. The OT&E sites were running ASOS ACU V2.79V with DCP EPROMS V2.0 during Phase 1.

Before Phase 1 began, and during the early part of Phase 1 a parallel Meteorological Comparison Evaluation (MCE) was performed at 7 OT&E sites and the Sterling Field Support Center (SFSC). During the MCE ceilometer cloud amount and cloud height data from the CT12K and CL31 sensors were compared. The purpose of the CL31 and CT12K Ceilometers Meteorological Comparison Evaluation was to assess the functional comparability of the ASOS algorithm output from the CL31 and CT12K ceilometers in weather conditions critical for aviation and weather forecasting. The NWS wanted to ensure the replacement CL31 produces similar ASOS algorithm-generated cloud reports to those generated with the existing CT12K ceilometer. The MCE was conduct for meteorological comparison purposes and was not a specification compliance test. Results indicated that the CL31 and the CT12K cloud amounts and cloud heights were comparable in most conditions. Differences in cloud heights and amounts seen in precipitation and fog were documented and put in the Technical Implementation Notice (TIN) and corresponding Public Notification Statement (PNS) that was send out by each WFO participating in the OT&E before Phase 2. Details on the MCE study, contained in the MCE final report can be found on the OPS23 website:

[http://www.nws.noaa.gov/ops2/ops24/documents/asos\\_ceilometer.htm](http://www.nws.noaa.gov/ops2/ops24/documents/asos_ceilometer.htm)

#### **3.2 Phase 2: CL31 Operational Ceilometer CT12K Test Ceilometer**

Phase 2 began on May 18, 2009 and ran until June 5, 2009. During Phase 2, the CL31 ceilometer was configured as the operational ceilometer, and the CT12K ceilometer was configured as the test sensor. Before Phase 2 began, a TIN and corresponding PNS was sent out by each WFO participating in the OT&E. The TIN was also sent out nationally by NWS Headquarters. The OT&E sites were running ASOS ACU V2.79V with DCP EPROMS V2.0 during Phase 2.

### 3.3 Phase 3a: CL31 as Stand Alone Operational Ceilometer

Phase 3 ran at all 21 sites from June 15, 2009 – August 20, 2009. During Phase 3 the CL31 ceilometer was configured as the stand alone operational sensor, and the existing CT12K ceilometer was deconfigured. During Phase 3, four test sites ran with multiple CL31's installed. At these four sites, in addition to the primary operational CL31 ceilometer, three sites installed and configured a back up CL31, and one site installed and configured a meteorological discontinuity sensor. This helped test various operational ceilometer configurations. Please see Appendix A for details on site configurations. The OT&E sites were running ASOS ACU V2.79V with DCP EPROMS V2.0 during Phase 3a. In early July 2009, the TRG recommended fixing a critical Test Trouble Report (TTR) that was found during V2.79V OT&E involving the Ice Free Wind (IFW) Sensor and the ASOS V2.79V software. IFW sensor firmware version V4.54 in combination with ASOS software version V2.79X fixed that critical TTR. This initiated Phase 3b of the OT&E.

### 3.4 Phase 3b: V2.79X ACU Firmware with IFW Sensor Firmware V4.54

Phase 3b ran at all 21 OT&E sites from mid-July 2009 until August 20, 2009. During Phase 3, the CL31 sensor was configured as the stand alone operational ceilometer. ACU firmware V2.79X in conjunction with IFW sensor firmware V4.54 fixed critical TTR 210: "V2.79V Did Not Generate "F" Flag when IFW Sensors Thermistor Failed". V2.79X corrected TTR 210, and V2.79X correctly generates an "F" flag and \$ for failed IFW Thermistor on the ASOS maintenance page. In addition to the ACU V2.79X, the IFW firmware V4.54 corrected a latent defect with IFW heater problems where the sensor doesn't send a "Failed" flag or System Log error message to ASOS. The OT&E sites were running ASOS ACU V2.79X with DCP EPROMS V2.0 during Phase 3b. IFW firmware V4.54 was installed at a subset of 11 OT&E sites during this period. The other 10 OT&E sites ran with the previous version of IFW sensor firmware. Please see Table 1 in section 5.2 for a list of the ten OT&E sites that installed IFW firmware V4.54. There were issues and no TTR's generated at the OT&E sites during phase 3b.

## 4.0 OT&E Activities Phase 1, Phase 2, and Phase 3a: CL31 with V2.79V and DCP EPROMS V2.0

### 4.1 Test Objectives

The following test objectives were validated during the OT&E:

- Installation Instructions CL31 (Mod Note 92) and ACU/DCP firmware (Mod Note 80) - PASS
  - **Successfully completed**
  - **Questionnaire: 8 sites overall good to excellent rating**
  - **7 sites provided detailed comments on Mod Notes**
- Draft Vaisala user's manual - PASS
  - **No comments received**
  - **Questionnaire: 8 sites overall rating good to excellent**
- Deliver CL31's from Vaisala to NLSC - PASS
  - **Successfully completed**
  - **Questionnaire: 8 sites overall rating good to excellent**

- Process for repair of field units if needed - PASS
  - **ABR (Aberdeen, SD) successfully replaced the CL31 engine board**
- CL31 Interfaces properly with ASOS configuration types - PASS
  - **Successfully demonstrated**
- ASOS V2.79V/X firmware and DCP EPROMS V2.0 must communicate with systems interfaced to ASOS - PASS
  - **Successfully demonstrated**
- ASOS V2.79V/X firmware and DCP EPROMS V2.0 capable of supporting CT-12K or CL31 - PASS
  - **Successfully demonstrated**
- CL31 and ACU firmware V2.79X does not negatively effect ASOS operations - PASS
  - **Successfully demonstrated**
- Process for Switching CL31 to operational ceilometer - PASS
  - **Successfully demonstrated**
- ASOS Operational Monitoring Center (AOMC) site support - PASS
  - **Successfully demonstrated**
  - **Questionnaire: 3 sites overall good rating**
- Maintenance process including preventative maintenance and corrective maintenance (if needed) - PASS
  - **Successfully completed at all sites (window cleaning)**
  - **ABR successfully replaced CL31 engine board**
  - **OST11 and OPS12 successfully provided support to sites**

## 4.2 Test Trouble Reports

The following Test Trouble Report (TTR's) were generated during OT&E and adjudicated in the following way before the end of the OT&E:

- **TTR 210: V2.79V Did Not Generate “F” Flag when IFW Sensors Thermistor Failed” – CLOSED.**
  - This TTR was fixed in V2.79X ACU firmware
- **TTR 211: Blank Field [ ] Instead of [CLR] in TEST CL31 12 hour Archive Page - CLOSED**
  - This TTR was closed because it will only occur when the CL31 is used as a TEST sensor. The blank field is the expected ASOS Sky Condition Algorithm output, which was only used for the Meteorological Comparison Evaluation (MCE). In either case the data would not be used on an operational ASOS site.
- **TTR 212: Dew Point Sensor Report Processing Automatically Turned Off – CLOSED**
  - This TTR will be tracked as a “watch Item TTR” and was not deemed critical for OT&E.
- **TTR 213: \$ Caused by a Hidden “N” Within the MAINT Page - CLOSED**
  - This TTR was determined to be a software bug, but it was closed because it is part of OTR 1090. A note was added to the TTR referencing OTR 1090.
- **TTR 214: Clock Time Drift Problem Synchronization with the AOMC – CLOSED**
  - This TTR was not associated with CL31 OT&E
- **TTR 215: A Random “warm start” problem noted at PHX – CLOSED**
  - This TTR was closed because the ET at PHX performed maintenance action that fixed the problem.

- **TTR 225:** 1513 Suspect Module Error on ABR CL31- **CLOSED**
  - This TTR was closed because ABR (Aberdeen, SD) successfully replaced the CL31 engine board.
- **TTR 216:** 1st part: SIO Card Lock Up does not allow CL31 to be configured as the Operational Ceilometer – **CLOSED**
  - This TTR was closed because W/OPS12 (Greg Dalyai) and W/OST11(John Monte) helped ITO and FAI to correctly configure their CL31's
- **TTR 216:** 2nd part (CRITICAL): SIO Card transmission error – two sites: GDP (Guadalupe Pass, TX) and GEG (Spokane, WA)) experienced chronic errors of this type - **CLOSED**
  - This TTR was closed, but a recommendation by the TRG was to have OPS12, OST11, and NRC conduct a follow on action plan to investigate the possibility of developing a standard ASOS sensor configuration on the SIO cards. GDP fixed their problem by replacing their DTS-1 sensor and moving the DTS-1 sensor to a new SIO card. A statistical analysis of pre-OT&E versus OT&E SYSLOG showed that, overall, there was no increase in the number of SIO transmission errors recorded in the SYSLOG before OT&E versus those recorded during OT&E. The AOMC performed an independent trouble ticket analysis during the pre-OT&E versus OT&E period, and confirmed that there was no increase in the number of AOMC trouble tickets generated before OT&E versus those generated during OT&E.
- **TTR 223:** CL31 Warning Message Incorrect – **OPEN (not critical)**
  - SYSLOG message says “window conditioner” needs to be changed to “window condition”.
- **TTR 224:** False low cloud ceiling at OKC – **OPEN (not critical)**
  - The TRG determined that this TTR will not stop the deployment of the CL31.
  - birds were roosting on or near the CL31 and jumping back and forth over the CL31 window/laser.
  - OKC cut the grass and removed the horizontal bird abatement rods from the back up CL31- false cloud reports have been minimized
  - A motion camera and a “whirly-bird” bird deterrent will be placed near OKC CL31's to gather evidence of birds
  - OST has developed an action plan to address this problem.
- **OTR 1090** – Software Handling of Maintenance Page Component Level “Degraded” Status Flag – **OPEN (not critical)**
  - The group decided that this OTR should be fixed. W/OPS12 recommended fixing it in V3.01, AOMC said that they could wait until V3.05. W/OPS23 will meet with Prism to price out the cost and time needed to fix this problem, and in which software version the fix will be implemented.

There were two "software patches" that were implemented and approved by the TRG.

#### **Software Patches:**

- **TTR 194:** 1015 (CT-12K) Ceilometer #1 Response Timeout Error at 00:01 LST Everyday Causes “\$”. **CLOSED**
  - The ASOS software has been modified to use ceilometer data received just before midnight, if there is no response from ceilometer sensor at midnight.
- **TTR 198:** CL31 Error at Start of New Month- **CLOSED**
  - The “Software Patch” has the same solution as TTR 194

### 4.3 Lessons Learned

During the OT&E there were several "lessons learned" that are summarized here:

- Follow Mod Notes closely. Make sure ET's know that Mod Notes are written for deployment, and that some modifications or exceptions may exist for the Mod Notes during OT&E
- Dual Installation instructions (CT-12K and CL31) should be sent out earlier in the OT&E process with details about how they are different than the Mod Notes for deployment.
- Most problems occurred with dual installation (CT-12K and CL31)
- ET's or ESA's should remember to jumper power to right side of card UART
- Force Cold Boot (download) to DCP PULL JUMPER at DCP to assure clean start and clean memory from DCP when installing any new firmware version.
- Send out Mod Note comments to OT&E sites as received instead of waiting until after OT&E is complete
- SIO card errors (GEG, GDP) – look at all possible causes for problems including other ASOS sensors
  - OPS12, NRC, and OST have follow up Action Plan to look at possible solutions
- Bird issue "false clouds" OKC
  - A follow up Action Plan has been written by OST.
- Fiber Optic Modems seemed to be an issue at some OT&E sites. ET' should check FO modems if they have problems installing the CL31.
- The bolts to mount CL31 need to be longer when shimming the sensor for tilting. A new Field Modification Kit (FMK) with long bolts has been developed by OST.

### 4.4 Conclusions and Recommendations

The TRG had the following recommendations at the end of the OT&E:

- Deploy slowly starting in Northern US. The deployment schedule is dependent upon the time of year (thus the climate) that the CL31 ceilometers are deployed.
- SIO card error issues
  - The NWS (NRC, OST31, OPS12, and OPS23) will investigate possibility of a standard ASOS port assignment or other solution to SIO card errors that have existed on ASOS for many operational software loads.
- Bird Abatement Action Plan for "False Cloud" reports at OKC (OST, OPS22, NWS Southern Region, OKC)
  - OST has developed a draft action plan for this activity
  - A wildlife camera has been installed at OKC for WFO Norman staff to document bird activity on or around the CL31
  - WFO Norman installed the "whirly bird" abatement supplied by the Navy to see if it helps deter birds from the CL31.

On August 20, the thirteen of fourteen TRG members voted "yes" to recommend national deployment of the CL31 ceilometer with V2.79X ASOS ACU firmware, V2.0 DCP EPROMS, and IFW sensor firmware version V4.54. The only TRG member that voted against national deployment of the CL31 with V2.79X ASOS ACU firmware, V2.0 DCP EPROMS was the Alaska region. The Alaska region had concerns about the SIO card error issues experienced during OT&E. Also on August 20, the ASOS Test Review Board (ATRB) unanimously voted "yes" to recommend national

deployment of the CL31 ceilometer with V2.79X ASOS ACU firmware, V2.0 DCP EPROMS. A list of the TRG members, the ATRB members and their votes can be found in Appendix A.

The chairman of the ATRB sent an official letter to the chairman of the ASOS Configuration Control Board (ACCB) recommending national deployment of the CL31 ceilometer with V2.79X ASOS ACU firmware, V2.0 DCP EPROMS. Due to the large cost associated with deploying the CL31 ceilometer, the chair of the ACCB forwarded this request to the ASOS Program Management Council (APMC) for their approval. Once APMC approval is obtained, deployment of the CL31 ceilometers will begin. Details of the testing of V2.79X ACU firmware and IFW sensor firmware V4.54 are provided in section 5.

## 5.0 OT&E Activities Phase 3b: V2.79X with IFW Sensor Firmware V4.54

### 5.1 Test Objectives

Part II of the OT&E activities was initiated as a result of a recommendation by the TRG that critical TTR 210: "V2.79V Did Not Generate "F" Flag when IFW Sensors Thermistor Failed" had to be fixed before ACU V2.79V could be fielded. V2.79X corrects TTR 210, and V2.79X correctly generates an "F" flag and \$ for failed IFW Thermistor on maintenance page. In addition to the ACU V2.79X, the IFW firmware V4.54 corrects latent defect with IFW heater problems where sensor doesn't send "Failed" flag or System Log error message to ASOS.

### 5.2 V2.79X with IFW Firmware V4.54 Test Summary

ASOS V2.79X was installed at all 21 OT&E sites, and IFW firmware V4.54 was installed at a subset of 10 OT&E sites in mid July 2009, and ran through August 20, 2009. No critical TTR's were found during this time period. TABLE 1 lists the 21 OT&E sites that received V2.79X ACU firmware, and the subset of OT&E sites that received IFW firmware V4.54.

**Table 1: OT&E Sites with V2.79X and selected OT&E sites with IFW sensor V4.54 firmware**

SITE	ACU Firmware version	IFW V4.54 sensor firmware?
CMH Columbus, OH	V2.79X	Yes
ROA Roanoke, VA	V2.79X	Yes
BTV Burlington, VT	V2.79X	No
OKC Oklahoma City, OK	V2.79X	No
GUY Guymon, OK	V2.79X	Yes
PHX Phoenix, AZ	V2.79X	Yes
ITO Hilo, HI	V2.79X	Yes
JKL Jackson, KY	V2.79X	Yes
ANJ Sault Ste. Marie, MI	V2.79X	Yes
ABR Aberdeen, SD	V2.79X	No

CAR Caribou, ME	V2.79X	Yes
GDP Guadalupe Pass, TX	V2.79X	No
BIS Bismarck, ND	V2.79X	No
CYS Cheyenne, WY	V2.79X	No
DDC Dodge City, KS	V2.79X	No
HIO Portland, OR	V2.79X	No
GEG Spokane, WA	V2.79X	No
FAI Fairbanks, AK	V2.79X	Yes
KNBC Beaufort, SC	V2.79X	Yes
CMA Camarillo, CA	V2.79X	No
OXR Oxnard, CA	V2.79X	Yes

### 5.3 Conclusions and Recommendations

- There were no TTR's written and no issues reported for V2.79X software or IFW V4.54 firmware.
- On August 20, the TRG and the ATRB unanimously recommend fielding V2.79X software and IFW V4.54
- The chairman of the ATRB forwarded the recommendation from the ATRB to the chairman of the ACCB for final approval.
- Once final approval is obtained from the ACCB, IFW V4.54 firmware will be available from OPS12 for all ASOS sites to download.

## Appendix A – Test Review Group Members - ASOS Test Review Board Members

Results (in Table form) of the TRG members vote on the question: “Should the CL31 sensor proceed to national deployment” in conjunction with ASOS ACU V2.79X and DCP V2.0 EPROMS?” as follow:

### TRG Members

Name/Organization	Function	National Deployment of CL31? (Vote)
Jerald Dinges (W/OPS24)	Test Review Group Chair	-
Joseph Fiore (W/OPS24)	Test Director	Y
Greg Dalyai (W/OPS12)	Maintenance Branch	Y
Bing Huang (ATO-T)	FAA Focal Point	Y
Tim Rutkoski (W/ER41) Matt Ferrell (ER RMS) (filling in)	Eastern Region ASOS Focal Point	Y
Lewis Harrington (W/SR41)	Southern Region ASOS Focal Point	Y
Bob Brashears (W/CR43) (Dan Lester (CRH) (filling in)	Central Region ASOS Focal Point	Y
Son Nguyen (W/WR4) Joe Lachaez (WRH) (filling in)	Western Region ASOS Focal Point	Y
Jim Jones (W/AR42) Don Bolton (WRH) (filling in)	Alaska Region ASOS Focal Point	N
John Bush (W/PR1)	Pacific Region ASOS Focal Point	Y
Christopher Kornkven (WFO MKE)	NWS Employee Organization Focal Point	Y
Kevin Conaty (W/CIO12)	AOMC	Y
Richard Parry (W/OPS22)	NWS HQ (ASOS)	Y
Ron Heatherdale (U.S. Navy)	SPAWARSYSCEN	Y
William “Mac” Lawrence (U.S. Air Force)	USAF	Y

Next, the ATRB (NCAR was the only ATRB member that was not present at the meeting) voted. The results of the vote by the ATRB members follow in table format:

### ATR B Members

Name/Organization	Function	National Deployment of the CL31? (Vote)
Jerald Dinges (W/OPS24)	ATR B Chair/Primary	--
Joseph Fiore (W/OPS24)	DOC/NWS Secretariat/Alternate Chair/Primary	-
Khien Nguyen (W/OPS24)	DOC/NWS Secretariat Alternate	-
Dave Mannarano (W/OPS22)	DOC Primary	-
Tom Townsend (W/CR1)	DOC Alternate	Y
Bing Huang (FAA- ATO-T)	FAA Primary	Y
Tugen Kieu (FAA-ATO-W)	FAA Alternate	-
William Lawrence (USAF contractor HQ AFWA/A8PA)	USAF Primary	Y
Todd Allen (USAF YE-3)	USAF Alternate	-
Gerald "Wayne" Knight (SPAWARSYSCEN)	US Navy Primary	-
Ronald Heatherdale (SPAWARSYSCEN)	US Navy Alternate	Y
Roy Rasmussen (NCAR)	NCAR Primary	not present
Scott Landolt (NCAR)	NCAR Alternate	-

The TRG and ATRB voted on whether to field the V2.79X software in conjunction with IFW V4.54 firmware. The results of the vote by the TRG and ATRB in table format follow:

### TRG Members

Name/Organization	Function	Field V2.79X software with IFW 4.54 firmware (Vote)
Jerald Dinges (W/OPS24)	Test Review Group Chair	-
Joseph Fiore (W/OPS24)	Test Director	Y
Greg Dalyai (W/OPS12)	Maintenance Branch	Y
Bing Huang (ATO-T)	FAA Focal Point	Y
Tim Rutkoswki (W/ER41) Matt Ferrell (ER RMS) (filling in)	Eastern Region ASOS Focal Point	Y
Lewis Harrington (W/SR41)	Southern Region ASOS Focal Point	Y
Bob Brashears (W/CR43) (Dan Lester (CRH) (filling in)	Central Region ASOS Focal Point	Y
Son Nguyen (W/WR4) Joe Lachaez (WRH) (filling in)	Western Region ASOS Focal Point	Y
Jim Jones (W/AR42) Don Bolton (WRH) (filling in)	Alaska Region ASOS Focal Point	Y
John Bush (W/PR1)	Pacific Region ASOS Focal Point	Y
Christopher Kornkven (WFO MKE)	NWS Employee Organization Focal Point	Y
Kevin Conaty (W/CIO12)	AOMC	Y
Richard Parry (W/OPS22)	NWS HQ (ASOS)	Y
Ron Heatherdale (U.S. Navy)	SPAWARSYSCEN	Y
William "Mac" Lawrence (U.S. Air Force)	USAF	Y
Name/Organization	ATRB Function	National Deployment of the CL31? (Vote)
Jerald Dinges (W/OPS24)	ATRB Chair/Primary	--
Joseph Fiore (W/OPS24)	DOC/NWS Secretariat/Alternate Chair/Primary	-
Khien Nguyen (W/OPS24)	DOC/NWS Secretariat Alternate	-
Dave Mannarano (W/OPS22)	DOC Primary	-
Tom Townsend (W/CR1)	DOC Alternate	Y
Bing Huang (FAA- ATO-T)	FAA Primary	Y
Tugen Kieu (FAA-ATO-W)	FAA Alternate	-
William Lawrence (USAF contractor HQ AFWA/A8PA)	USAF Primary	Y

Todd Allen (USAF YE-3)	USAF Alternate	-
Gerald "Wayne" Knight (SPAWARSYSCEN)	US Navy Primary	-
Ronald Heatherdale (SPAWARSYSCEN)	US Navy Alternate	Y
Roy Rasmussen (NCAR)	NCAR Primary	not present
Scott Landolt (NCAR)	NCAR Alternate	-

**Appendix B - OT&E Site Characteristics**

**TABLE 2 - OT&E Sites (NWS, FAA, NAVY, AIR FORCE)**

Number	ASOS SITE ID	ASOS SITE NAME	AGENCY	NWS Region	ASOS Type	Spare Pedestal/ Temporary Mount	Number of CL31 ceilometers
1	CMH	Columbus, OH	NWS	E	2 DCP	Not Required	1 primary 1 Met Disc
2	ROA	Roanoke, VA	NWS	E	2 DCP	Not Required	1 primary 1 back up
3	CAR	Caribou, ME	NWS	E	1 DCP	Temp	1 primary
4	BTV	Burlington, VT	NWS	E	1 DCP	Spare	1 primary
5	GDP	Guadalupe Pass, TX	NWS	S	1 DCP	Temp	1 primary
6	OKC	Oklahoma City, OK	NWS	S	1 DCP	Not Required	1 primary 1 back up
7	GUY	Guymon, OK	NWS	S	SCA	Spare	1 primary
8	JKL	Jackson, KY	NWS	C	1 DCP	Temp	1 primary
9	ABR	Aberdeen, SD	NWS	C	1 DCP	Spare	1 primary
10	ANJ	Sault Ste. Marie, MI	NWS	C	SCA	Temp	1 primary

11	BIS	Bismarck, ND	NWS	C	1 DCP	Temp	1 primary
12	CYS	Cheyenne, WY	NWS	C	1 DCP	Temp	1 primary
13	DDC	Dodge City, KS	NWS	C	1 DCP	Temp	1 primary
14	PHX	Phoenix, AZ	NWS	W	1 DCP	Not Required	1 primary 1 back up
15	HIO	Portland, OR	FAA	W	1 DCP	Temp	1 primary
16	CMA	Camarillo, CA	FAA	W	1 DCP	Spare	1 primary
17	OXR	Oxnard, CA	FAA	W	1 DCP	Spare	1 primary
18	GEG	Spokane, WA	FAA	W	1 DCP	Temp	1 primary
19	FAI	Fairbanks, AK	NWS	A	2 DCP	Temp	1 primary
20	ITO	Hilo, HI	NWS	P	1 DCP	Spare	1 primary
21	KNBC	Beaufort Marine Air Station, SC	NAVY	S	1 DCP	Temp	1 primary

**Table 3 - OT&E Site Operational Characteristics and Interfaces by NWS Region (21 Sites)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
GDP	Guadalupe Pass, TX	C	PT	S	1	---	-	Y	Y	DIAL	GTA	---	---	2.79E
OKC	Oklahoma City, OK	B	FT	S	1	B	Y			ADAS	ATIS	---	WSP	2.79D
GUY	Guymon, OK	D	---	S	SCA	---	Y			ADAS	GTA	---	---	2.79E

**Southern (3)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
CMH	Columbus, OH	A	FT	E	2	M				DIAL	ATIS	ACE	---	2.79D
ROA	Roanoke, VA	C	PT	E	2	B	Y			ADAS	ATIS	---	---	2.79D
CAR	Caribou, ME	D	---	E	1	---		Y	Y	DIAL	GTA			2.79E
BTV	Burlington, VT	B	FT	E	1	---	Y			AWIPS	ATIS	---	---	2.79E

**Eastern (4)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
ABR	Aberdeen, SD	C	FT	C	1	B	Y			ADAS	ATIS	---	---	2.79D
ANJ	Sault Ste. Marie, MI	D	---	C	SCA	---				DIAL	GTA	---	---	2.79D
BIS	Bismarck, ND	C	PT	C	1	---	-	Y	Y	ADAS	ATIS	ACE	---	2.79D
CYS	Cheyenne, WY	C	PT	C	1	---	-			ADAS	ATIS		---	2.79D
DDC	Dodge City, KS	D	---	C	1	---	-			ADAS	GTA	ACE	---	2.79E
JKL	Jackson, KY	D	---	C	1	---	-		Y	ADAS	GTA	---	---	2.79D

**Central (6)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
PHX	Phoenix, AZ	A	FT	W	1	B	-		Y	ADAS	ATIS	ACE	---	2.79D
HIO	Portland, OR (FAA)	C	PT	W	1	---			Y	ADAS	ATIS	---	---	2.79D
CMA	Camarillo, CA (FAA)	C	PT	W	1	--	Y			ADAS	GTA	---	---	2.79D
OXR	Oxnard, CA	C	PT	W	1	---	Y			ADAS	ATIS		---	2.79D
GEG	Spokane, WA (FAA)	A	FT	W	1	---				ADAS	ATIS	ACE	WSP	2.79E

**Western (5)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
FAI	Fairbanks, AK	A	FT	A	2	--	-	Y	Y	ADAS	ATIS	-	---	2.79B

**Alaska (1)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
ITO	Hilo, HI	C	PT	P	2	---	Y		Y	DIAL	ATIS	ACE	---	2.79E

**Pacific (1)**

SID	Name	FAA Service Level	Observing Staff	NWS Region	DCPs	Multiple Sensors	Spare pedestal	Ice crystal	Met Comp	Comms	GTA/ ATIS	ACE	WSP	Current S/W Version
KNBC	Beaufort, SC	---	FT?	S	1	---	---			DIAL	ATIS	---	---	2.79D

**DoD U.S. Navy (1)**