Integration of Aviation Automated Weather Observation Systems (AWOS) with Roadside Weather Information Systems (RWIS)

Phase 2: Final Report Presentation

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Disclaimer

The opinions, findings and conclusions expressed in this presentation are those of the authors and not necessarily those of the California Department of Transportation, or Montana State University.
Acknowledgments

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Abstract

Weather significantly affects safety as related to transportation, which includes regional surface transportation (highways and local streets) and aviation (airports, hospital heliports and flight paths). Starting in 2008, the Western Transportation Institute (WTI) at Montana State University (MSU), in partnership with the Mineta Transportation Institute (MTI) at San Jose State University, conducted a research and development study of the proof-of-concept system for integrating Automated Weather Observing System (AWOS) with Roadside Weather Information System (RWIS).

The goal of this multi-phase project is to provide airport managers, air traffic controllers, pilots, and related operators of air ambulance services with more comprehensive and accurate meteorological data by integrating currently used weather systems with systems used by related agencies. Implementing such an integrated system is expected to improve safety and increase efficiency.

The project is targeted at small, underserved rural airfields and hospital heliports.

This document summarizes work conducted in Phase II of the research project, which ends December 31st, 2015.
Project Tasks
Task: Project Management

Deliverables:

• Kickoff Meeting: Thursday, February 28th, 2013 in Sacramento.
• Quarterly Reports
• Other meetings via teleconference and web conference.
• Project web presence for background and updates: [http://www.westernstates.org/Projects/Aviation/Default.html](http://www.westernstates.org/Projects/Aviation/Default.html)
Task: Business Case Analysis

Deliverable:
• Benefit Analysis of the Aviation WeatherShare System by Wenbin Wei, San Jose State University. Finalized February 2, 2014.

Task: Research Additional Sources

Deliverable:
• Integration of Aviation Automated Weather Observation Systems (AWOS) with Roadside Weather Information Systems (RWIS) Phase II Data Sources Summary, by Daniell Richter and Douglas Galarus, Western Transportation Institute, Montana State University. Finalized April 27, 2015.
Task: Detailed System Requirements

Deliverable:

Task: Develop System
Deliverable:
• Phase II System in Development and Testing Environment

Task: Implementation
Deliverable:
• Phase II System in Production Hosting Environment: http://aviation.weathershare.org/.
Task: Evaluation

Deliverable:
• Evaluation Summary (Included in the Project Final Report)
  – SJSU Survey Results
  – Online Survey Results
  – Google Analytics Results

Task: AWOS/ASOS Gap Analysis

Deliverable:
Task: Determine Usage Status and Recommendations

Deliverable:
• Disclaimer on the splash screen, shown upon entry to http://aviation.weathershare.org/.

Task: Final Project Report and Presentation

Deliverable:
• Final Project Report will be finalized prior to the conclusion of the project: December 31st, 2015.
• The Final Project Presentation (this presentation)
The Prototype System

Data Retrieval and Processing…
Airport, Heliport and Military Aviation Facilities are presented as a static layer using data provided by Caltrans.
Aviation Layers
Surface, Surface Forecast and Surface Conditions Layers

- Surface Layers
  - JSON and KML Files

- Surface Forecast
  - JSON and Image Files

- Surface Conditions
  - JSON Files

- CCTV Retrieval and Processing
- NWS Alert Retrieval and Processing
- Surface Forecast Retrieval and Processing
- RWIS Retrieval and Processing
- MADIS Retrieval and Processing
- Mesowest Retrieval and Processing

- Caltrans CWWP2
- National Oceanic and Atmospheric Administration (NOAA)’s National Weather Service Public Alerts
- National Weather Service National Digital Forecast Database
- Caltrans Scanweb
- Meteorological Assimilation and Data Ingest System (MADIS)
- Mesowest
The Prototype System

A Pictorial Overview …
Aviation Layers

- AWOS/ASOS
- Pilot Reports
- Terminal Aerodrome Forecasts
- Airports
- SIGMETs/AIRMETs
- NWS Composite Reflectivity
- NWS 1-Hour Precipitation
- Satellite
- Wind Aloft
- Temperature Aloft
http://aviation.weathershare.org/
KBLU - BLUE CANYON - NYACK EMIGRANT GAP, CALIFORNIA

Report Time: 9:52 AM MDT - Tue, Apr 7 2015
Location: 39.2749, -120.709379167
Flight Category: LIFR
Wind: 10 MPH (9 knots) from the South (180°)
Visibility: 0.25 miles
Dew Point: 28 °F
Pressure (altimeter): 29.769686 in. Hg
Elevation: 5278 ft.
Frequency: 120.075 (ASOS)
Phone: 530-389-2091 (ASOS)
Raw Data: KBLU 071552Z AUTO 180009KT 1/4SM +SN FZFG VV002 M01/M02 A2977 RMK AO2
PK WND 17026/1500 SLP093 P0008 T10111022
Airports

SIGMETs/AIRMETs
NWS Composite Reflectivity

NWS 1-Hour Precipitation
Satellite
Wind Aloft

From 3000 ft. AMSL To 15000 ft. AMSL
Temperature Aloft
Surface Layers

Surface Layers
NWS Alert
Caltrans CCTV
NWS Alerts

CAZ013 Active Alerts:

- Winter Storm Warning

Winter Storm Warning:
Sent: 03:30 Apr 07, 2015 PDT
Expires: 18:00 Apr 07, 2015 PDT
Effective: 03:30 Apr 07, 2015 PDT

Severity: Moderate
Urgency: Expected
Certainty: Likely

Type: Alert
Category: Met
Status: Actual
Scope: Public
Sender: NWS Sacramento (North Central California)
Source: w-nws.webmaster@noaa.gov

Note: Alert for Mountains Southwestern Shasta County to Northern Lake County; Shasta Lake Area; Northern Shasta County (California) issued by the National Weather Service

Area Description: Mountains Southwestern Shasta County to Northern Lake County; Shasta Lake Area, Northern Shasta County

Headline: Winter Storm Warning issued April 07 at 3:30AM PDT until April 07 at 6:00PM PDT by NWS Sacramento

Description: ...SPRING SNOW OVER THE MOUNTAINS TODAY... AN UNUSUALLY COLD SPRING STORM WILL BRING SIGNIFICANT SNOW TO THE MOUNTAINS OF NORTHERN CALIFORNIA TODAY. THE HEAVIEST SNOW EXPECTED THIS MORNING INTO THE EARLY AFTERNOON. DECREASING SNOWSHOES EXPECTED TONIGHT INTO WEDNESDAY. SNOW LEVELS EXPECTED TO BE 3500 FEET OR LOWER TODAY, RISING TO OVER 6000 FEET...
Caltrans CCTV
Surface Forecast Layers

- Air Temperature
- Wind Speed
- Wind Gust Speed
- Humidity
- Sky Cover
- 12-Hour Chance of Precipitation
- 6-Hour Precipitation
- Snow
- Weather
Humidity

Sky Cover
12-Hour Chance of Precipitation

6-Hour Precipitation
Snow

Weather

Legend: Weather
- Fog
- Rain
- Snow
- Sleet
- Hail
- Blowing
- Ice
- None

Legend: Snow
- 0.0
- 0.5
- 1.0
- 2.0
- 3.0
- 4.0
- 5.0
- 5.5
- 6.0
- 6.5
- 7.0

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Last Updated: 4/7/2015 11:11:44 AM MDT
Surface Conditions Layers

- Air Temperature
- Wind Speed
- Hourly Precipitation
- 24-Hour Precipitation
- Humidity
- RWIS Stations
Air Temperature

Station ID: PIEC1
Updated: 11:15 AM MDT - Tue, Sep 29 2015
Location: 40.24611, -120.6422
Elevation: 5809.54 ft.
Provider: MADIS
Source: RAWS

- **Sensor** | **Value** | **Updated**
- Temperature: 66° F | 11:15 AM MDT - Tue, Sep 29 2015
- Wind Speed: 8mph | 11:15 AM MDT - Tue, Sep 29 2015
- Wind Direction: 153° | 11:15 AM MDT - Tue, Sep 29 2015
- 1 Hour Precipitation: 0.0in | 11:15 AM MDT - Tue, Sep 29 2015
- 24 Hour Precipitation: 0.0in | 11:15 AM MDT - Tue, Sep 29 2015
- Humidity: 37% | 11:15 AM MDT - Tue, Sep 29 2015
Wind Speed

Humidity
Evaluation

Focus Group Survey (SJSU)
Online Survey
Google Analytics System Usage Statistics
(Gap Analysis)
Focus Group Survey

- San Jose State University conducted an open-ended survey of a focus group of prospective users once the Phase II prototype was available for use.
- Caltrans provided San Jose State University with a list of nine participants for this survey.
- Some of these participants forwarded the survey to others, resulting in sixteen total participants.
- Eleven of the participants were pilots, four were airport managers or government officials, and one was not specified.
- SJSU sent the survey to the focus group on October 22, 2013
Question #1. What are the strengths of the prototype integrated weather system? For example, do you find necessary weather information in the system or not?

• It is nice to have the AWOS and Cal-Trans info in a single location.

• Flying: Found the information I need for local flying. No information for trips leaving or entering California beyond the border. Even for local flying, I would like to see large scale systems such as weather extend far beyond the state’s boundaries.

• Intuitive operations (don’t really need instructions).

• after several times on the site I found that each time was better and that I can get real time information from anywhere.

• Good job it is a keeper.

• like the proposed site...great utility...easy to manipulate...cannot think of any thing lacking....when finished it will become my # 1 WX site for both aviation and surface operations...thanks for the opportunity to "take an early look" .
Question #1. What are the strengths of the prototype integrated weather system? For example, do you find necessary weather information in the system or not?

(Continued …)

• There’s a wealth of information available, which may be an obstacle for some people. It might seem overwhelming.

• The Caltrans roadcam layer is a good idea, many pilots might not think to check this resource if it hadn’t been integrated.

• Being able to see all the surface wind vectors on the map could be infinitely useful for low level planning as well as educational to see how the terrain effects wind locally in different weather systems.

• As a pilot, I use ADDS because it consolidates so many items. Your graphical navigation of many of those items is very useful for California trips. However, since I live in far northwest California, I would find it useful to see Oregon data as well. Any plans to expand this to the full set of Pacific NW states as well as California?
Question #2. In what specific areas do you think that the system should be improved? For example, what additional weather information or features should the system have?

- It would be nice if the airport icon colors indicated the current conditions at the field i.e: VFR, MVFR, IFR, LIFR.

- Having density altitude reporting at airports is important in our area of mountains and short runways. Cloud ceilings I noticed are not reported which is important.

- I noticed that the weather for awos and forecast aviation weather is not fully decoded.

- Plain English instead of raw data would be helpful.

- Cloud ceilings and tops are common needs for pilots

- I like the “Flight Path Tool” on the ADDS website

- Any way to integrate icing?

- It would really be something if this were expanded to other states.
Question #3. What other suggestions do you have for the developers of this integrated weather system?

• Hopefully have it available as an iPhone app.

• In proposing an integrated weather system, make sure you can sustain it over the long haul. If pilots begin to depend on it and then it’s not there............

• Add coverage to other states like Oregon, Washington, Nevada and Idaho.

• It would be good if you could somehow note the differences between this info and other sources. I think you are using RAW, RWIS etc that most of the other sources do not use. Also having the CT Web cams is great – not available on any other weather info site.

• If there are a "Quick Start Guide" or a "Basic Usage Video", they should be findable. Do NOT use a "video"; they use "Flash Player"!! ..see next...

• Your site needs a name. “Integrated Weather System” doesn’t cut it from a marketing standpoint. Am I going to ask my friends if they use Integrated Weather System or IWS? We don’t need another TLA (three-letter acronym). How about if we just call it “WeatherShare”?\
Question #4. Any other comments?

• Hopefully this can catch on in more than California, I’d be a little afraid of getting too dependant on this system and then forget how to read hieroglyphics in DUATS/Aviationweather.gov when flying out of State.

• I think that you are on the right track. From both a pilots and aviation safety officer aspect I feel that it is critical to have a centralized and easily manipulated source of weather information to make informed Go / No-Go decision making. The good geographical layout along with cameras to reinforce conditions at particularly remote locations will serve users well in better planning their activities.

• The interface has been very well thought out.

• Your project is developing an excellent tool. Thank you for your efforts. Think about the marketing point. Many potential users are not necessarily all that tech-savy, and some of the ease-of-use features will need some work.
Online Survey

• The Phase II prototype includes a link to an online survey to solicit further input from prospective users.
• To date, seven people have responded to the online survey.
• No effort was made to advertise this survey beyond placement of a link in the application.
• An excerpt of survey responses through September 30th, 2015 are presented here.
Question: Please rate the usefulness of the following surface condition layers:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Very Useful</th>
<th>Somewhat Useful</th>
<th>Not Very Useful</th>
<th>Not Aware of it</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Temperature</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Wind Speed &amp; Direction</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Precipitation Last Hour</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Precipitation Last 24 Hours</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>RWIS Stations</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>
Question: Please rate the usefulness of the following surface forecast layers:

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Very Useful</th>
<th>Somewhat Useful</th>
<th>Not Very Useful</th>
<th>Not Aware of it</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Temperature</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Wind Speed &amp; Direction</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Wind Gust Speed &amp; Direction</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Sky Cover</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>12-hour Chance of Precipitation</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>6-hour Amount of Precipitation</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Snow</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Weather</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>
Question: Please rate the usefulness of the following surface layers:

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Very Useful</th>
<th>Somewhat Useful</th>
<th>Not Very Useful</th>
<th>Not Aware of it</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWS Alerts</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Caltrans CCTV Images</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
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</table>
Question: Please rate the usefulness of the following aviation layers:

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Very Useful</th>
<th>Somewhat Useful</th>
<th>Not Very Useful</th>
<th>Not Aware of it</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWOS/ASOS (METAR)</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Pilot Reports (PIREPS)</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Terminal Aerodrome Forecasts (TAF)</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Radar: NWS CONUS Merged Reflectivity Composite</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Radar: NWS 1-Hour Precipitation</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Satellite: Visible (vis)</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Satellite: Rainbow (rb)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Satellite: Visible (rgb)</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Satellite: Shortwave (ir2f)</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Satellite: JSL2 (jsl)</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Satellite: Aviation (avn)</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Wind Aloft</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Temperature Aloft</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>
Google Analytics System Usage Statistics

- System usage is tracked via Google Analytics.
- The project team has implement tracking mechanisms to record user selection of layers and markers.
- Additionally, Google Analytics provides information about users and user sessions including the locations of users.
- Tracking via Google Analytics started during Phase 1 on June 1st, 2010.
- The Phase 2 prototype system went live on August 13th, 2013, and additional tracking of layers and markers was implemented at that time.
- Google Analytics data from August 13th, 2013 through September 30th, 2015 is presented here.
- 2883 sessions
- 1261 users
- 1643 Sessions from 128 Communities in California

<table>
<thead>
<tr>
<th>Place</th>
<th>Total Sessions</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacramento</td>
<td>579</td>
<td>35.24%</td>
</tr>
<tr>
<td>Redding</td>
<td>153</td>
<td>9.31%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>74</td>
<td>4.50%</td>
</tr>
<tr>
<td>Rancho Cordova</td>
<td>65</td>
<td>3.96%</td>
</tr>
<tr>
<td>Corning</td>
<td>61</td>
<td>3.71%</td>
</tr>
<tr>
<td>Chico</td>
<td>49</td>
<td>2.98%</td>
</tr>
<tr>
<td>Monterey</td>
<td>44</td>
<td>2.68%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>40</td>
<td>2.43%</td>
</tr>
<tr>
<td>Hollister</td>
<td>37</td>
<td>2.25%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>32</td>
<td>1.95%</td>
</tr>
<tr>
<td>Riverside</td>
<td>27</td>
<td>1.64%</td>
</tr>
<tr>
<td>Oakland</td>
<td>23</td>
<td>1.40%</td>
</tr>
<tr>
<td>Weaverville</td>
<td>20</td>
<td>1.22%</td>
</tr>
<tr>
<td>Vacaville</td>
<td>19</td>
<td>1.16%</td>
</tr>
<tr>
<td>Dixon</td>
<td>18</td>
<td>1.10%</td>
</tr>
<tr>
<td>Yreka</td>
<td>18</td>
<td>1.10%</td>
</tr>
<tr>
<td>Patterson</td>
<td>16</td>
<td>0.97%</td>
</tr>
<tr>
<td>Folsom</td>
<td>15</td>
<td>0.91%</td>
</tr>
<tr>
<td>Rocklin</td>
<td>15</td>
<td>0.91%</td>
</tr>
<tr>
<td>Santa Rosa</td>
<td>15</td>
<td>0.91%</td>
</tr>
<tr>
<td>Yuba City</td>
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<td>0.91%</td>
</tr>
<tr>
<td>Napa</td>
<td>14</td>
<td>0.85%</td>
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</tbody>
</table>

TOTAL 1643 100%
Surface Condition Events

Layer and Sublayer Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu Select</td>
<td>1377</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>346</td>
</tr>
<tr>
<td>Air Temperature</td>
<td>259</td>
</tr>
<tr>
<td>24-Hour Precipitation</td>
<td>160</td>
</tr>
<tr>
<td>RWIS Stations</td>
<td>148</td>
</tr>
<tr>
<td>Hourly Precipitation</td>
<td>137</td>
</tr>
<tr>
<td>Humidity</td>
<td>118</td>
</tr>
</tbody>
</table>

Marker Selection Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Temperature</td>
<td>925</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>714</td>
</tr>
<tr>
<td>RWIS Stations</td>
<td>551</td>
</tr>
<tr>
<td>Humidity</td>
<td>124</td>
</tr>
<tr>
<td>Hourly Precipitation</td>
<td>100</td>
</tr>
<tr>
<td>24-Hour Precipitation</td>
<td>88</td>
</tr>
</tbody>
</table>
# Surface Forecast Events

## Layer and Sublayer Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu Select</td>
<td>1221</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>207</td>
</tr>
<tr>
<td>Weather</td>
<td>155</td>
</tr>
<tr>
<td>Wind Gust Speed</td>
<td>142</td>
</tr>
<tr>
<td>12-Hour Chance of Precipitation</td>
<td>117</td>
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<td>SkyCover</td>
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<td>Air Temperature</td>
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<tr>
<td>Humidity</td>
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## Marker Selection Events

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<td>Wind Gust Speed</td>
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Surface Layer Events

### Layer and Sublayer Events

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### Marker Selection Events

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# Aviation Layer Events

## Layer and Sublayer Events

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<td>NWS Composite Reflectivity</td>
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## Marker Selection Events

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Gap Analysis

For further information see:

Heat Map Showing Distances (mi) to the Nearest Reporting AWOS / ASOS Site from All Locations in California and Extreme Points within Areas of Poor Coverage

(Blue = less than 25 miles from nearest site, White = 25 miles from nearest site, Red = more than 25 miles to nearest site)
Heat Map Showing Distances (mi) to the Nearest Reporting AWOS / ASOS / RWIS Site from All Locations in California and Extreme Points within Areas of Poor Coverage

(Blue = less than 25 miles from nearest site, White = 25 miles from nearest site, Red = more than 25 miles to nearest site)
Heat Map Showing Distances (mi) to the Nearest Reporting AWOS / ASOS / RWIS / MADIS / MesoWest Site with QC-Passed Observations and Reporting Frequency of 15 Minutes or Better from All Locations in California and Extreme Points within Areas of Poor Coverage

(Blue = less than 25 miles from nearest site, White = 25 miles from nearest site, Red = more than 25 miles to nearest site)
## 40 airports fall more than 25 Miles from the nearest reporting AWOS/ASOS site.

<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
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<th>Distance to AWOS/ASOS</th>
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<td>Lassen</td>
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<td>Merced</td>
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</table>
18 airports fall more than 25 Miles from the nearest reporting AWOS/ASOS, RWIS, MADIS or Mesowest site.

<table>
<thead>
<tr>
<th>Name</th>
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<th>Distance to Weather Station</th>
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<tr>
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</table>
Conclusions

- Feedback has been generally positive and both the focus group and participants in the online survey have provided useful suggestions.
- The system does appear to be on the right track.
- The Google Analytics data helps to augment the survey data in identifying the most used and useful data layers in the system.
- Not surprisingly, users seem most interested in wind speed data.
- One potential data set identified as missing and beneficial is cloud ceilings. Users also requested additional icing data.
Conclusions

• The gap analysis identified areas that are underserved by existing weather stations, relative to data that is accessible by the prototype system.

• Not surprisingly the underserved areas are extremely rural and located in the northeast, northwest, west-central, east-central and southeast portions of the state.

• While rural, there are a number of air fields in these areas that could benefit from having more local weather information. EMS flights certainly occur in these areas as well.

• Aside from identifying gaps, the gap analysis helped to demonstrate the utility of the prototype system over AWOS/ASOS alone.

• Otherwise, the gap analysis results may prove helpful in determining locations in which to deploy future AWOS/ASOS or RWIS.
Contact:

Doug Galarus
Western Transportation Institute
(406) 994-5268
dgalarus@coe.montana.edu

For Further Information see:

http://aviation.weathershare.org

http://www.westernstates.org/Projects/Aviation/