

THE **Burns** GROUP ENGINEERING AND CONSTRUCTION



INNOVATIONS IN WEATHER INSTRUMENTATION (BECAUSE THE WEATHERMAN IS NEVER RIGHT)

Tuesday, March 3rd, 2015

PRESENTATION AGENDA

- History of weather instrumentation on airfields
- Description of systems and their functions
- FAA Involvement
- Advances in weather systems
- Takeaways

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HISTORY OF WEATHER INSTRUMENTATION SYSTEMS



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HISTORY OF WEATHER INSTRUMENTATION SYSTEMS

The Early Days - Why Airports?

- Early adopters due to relationship of weather conditions to flight safety
- To ensure operation thresholds are met, FAA-employed human observers to monitor weather conditions on airfield



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HISTORY OF WEATHER INSTRUMENTATION SYSTEMS

The late 1960s introduced automated systems

- AMOS - Automated Meteorological Observing System
- RAMOS - Remote Automated Meteorological Observation system

Weather parameters

- Ambient dew point temperature
- Wind speed and direction
- Air pressure



HISTORY OF WEATHER INSTRUMENTATION SYSTEMS

- AUTOB – Automated Observation
- Developed in early 1970s to measure 2 new parameters:
 - Sky condition
 - Visibility
- AUTOB was developed when technology and processing outpaced AMOS and RAMOS

HISTORY OF WEATHER INSTRUMENT SYSTEMS

AWOS – Automated Weather Observation System

- Developed in 1980s to increase:
 - Weather parameters
 - Frequency of weather status updates
- AWOS systems operate autonomously 24 hours a day
- Each sensor on an AWOS system updates continuously



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HISTORY OF WEATHER INSTRUMENT SYSTEMS

AWOS A

Weather parameter:

- Barometric pressure used for altimeter settings



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HISTORY OF WEATHER INSTRUMENT SYSTEMS

AWOS I

Weather parameters:

AWOS A parameter plus

- Wind speed and wind gusts
- Wind direction
- Variable Wind Direction
- Temperature and Dew Point
- Air Density



Temperature, Dew point, & Density



Wind speed, direction, & variable direction

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HISTORY OF WEATHER INSTRUMENT SYSTEMS

AWOS II

Weather parameters:

All AWOS I parameters plus

- Visibility
- Variable visibility



Combined visibility & present weather detector

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HISTORY OF WEATHER INSTRUMENT SYSTEMS

AWOS III – P, T, P/T

Weather parameters:

All AWOS II parameters plus

- Sky condition
- Cloud Ceiling height
- Liquid precipitation accumulation
- Precipitation type identification **[P]**
- Thunderstorm Detection **[T]**



Liquid Precipitation Accumulation



Precipitation Type Identification



Cloud Ceiling height & Sky Condition Sensor



Thunderstorm Detection

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HISTORY OF WEATHER INSTRUMENT SYSTEMS

AWOS IV – Z, R, Z/R

Weather parameters:

All AWOS III P/T parameters plus

- Freezing rain detection **[Z]**
- Runway surface condition **[R]**



Freezing Rain Sensor

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AUTOMATED SURFACE OBSERVATION SYSTEM

ASOS – operated, controlled and developed by the NWS with FAA and DoD

- Comprehensive system utilizes recent technology
- Deployment began in 1991, completed in 2004
- ASOS systems serve as a primary climatological observing network



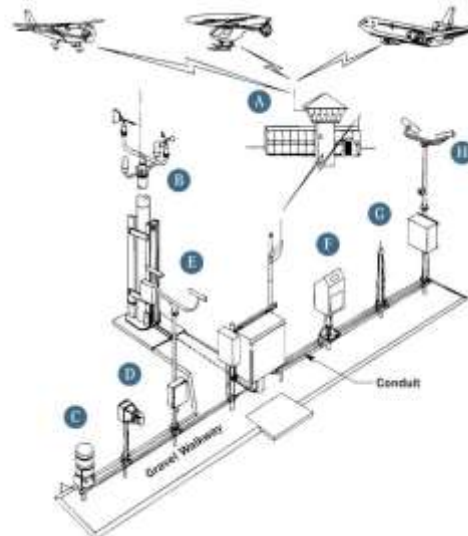
Over 900 in US

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ASOS DIAGRAM

ASOS Features

- A. FAA Ground-to-Air Radio
- B. Wind Tower (Tilting)
- C. Rain Sensor
- D. Temp./Dewpoint Sensor
- E. Precipitation Identification Sensor
- F. Ceilometer
- G. Freezing Rain Sensor
- H. Visibility Sensor



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RUNWAY VISUAL RANGE SYSTEMS

- Stand alone systems
- Required equipment for ILS approaches
- Located at runway TDZ areas



Transmissometer RVR
40 remaining in US



Forward Scatter RVR
Over 250 in US

FAA INVOLVEMENT

- AWOS – AIP grant eligible
- FAA AC 150/5220-16D AWOS for Non-Fed Applications
- ASOS – FAA F&E program



- AWOS A:
- AWOS AV:
- AWOS I:
- AWOS II:
- AWOS III:
- AWOS III P:
- AWOS III T:
- AWOS III P/T:
- ASOS:
- AWSS:
- AWOS IV:
- Misc.:

ADVANCES IN WEATHER SYSTEMS

Lightning detection

- Antenna detects magnetic signatures of lightning strikes
- Range of 200 miles



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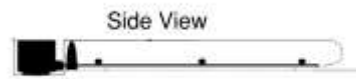
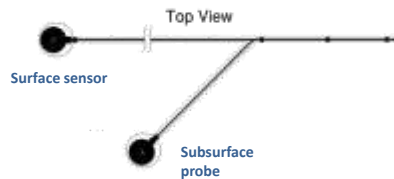
ADVANCES IN WEATHER SYSTEMS

Surface Sensor System

Weather parameters:

- Surface temperature
- Surface state

Typically installed in TDZ areas



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ADVANCES IN WEATHER SYSTEMS

Remote Processing Unit (RPU)

Weather parameters:

- Wind speed/direction
- Air temp and pressure

Installed outside RSA



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ADVANCES IN WEATHER SYSTEMS



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ADVANCES IN WEATHER SYSTEMS

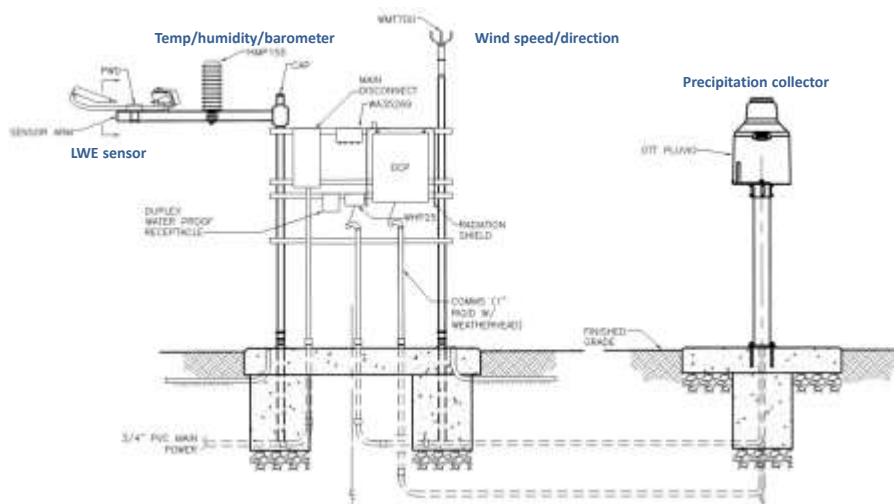
Avicast: Aviation Decision Support System

- Supplement an RWIS system
- Measures liquid water equivalent to enhance operations' winter plan
- Uses a combination of ground stations and NOAA port information



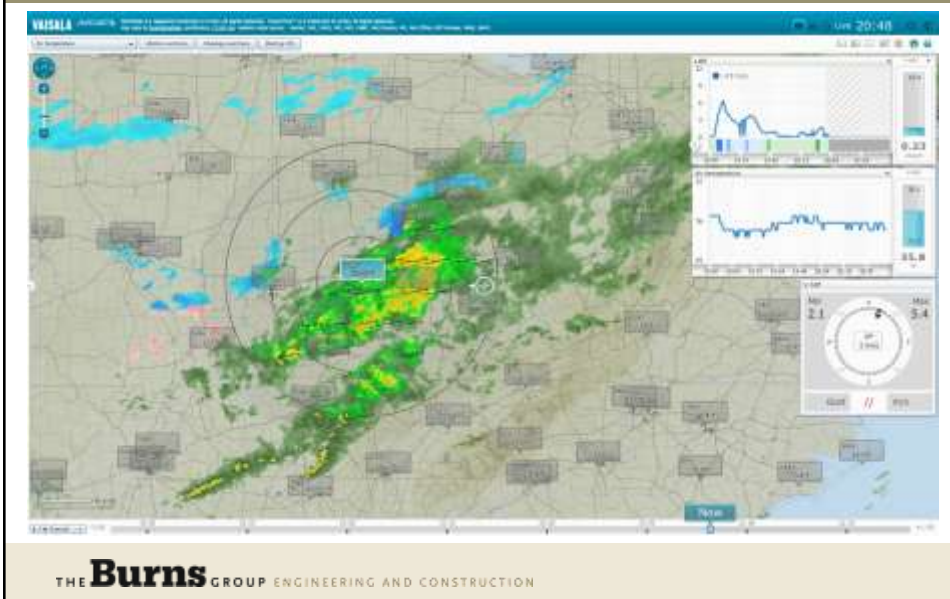
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ADVANCES IN WEATHER SYSTEMS



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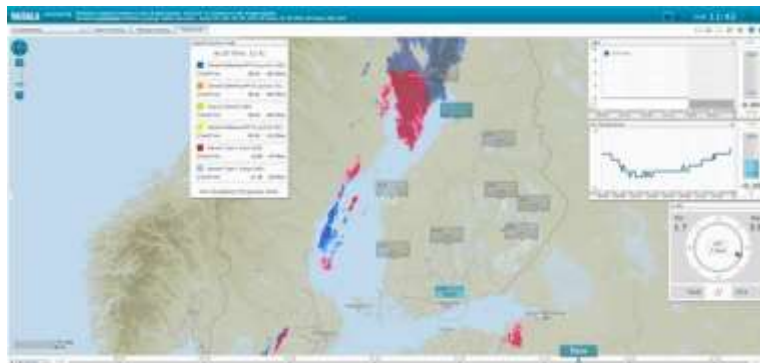
ADVANCES IN WEATHER SYSTEMS



ADVANCES IN WEATHER SYSTEMS

Check Time System

- Evaluates all parameters in the previous 2 hours to provide the last time an aircraft could have been de-iced



MOBILE SURFACE SENSORS

- Mobile sensors enable airport users to determine what contaminants are on the runway
- Reported surface conditions:
 - Snow
 - Ice
 - Water thickness



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TAKEAWAYS

- Instrumentation has evolved and advanced - are your airport's needs being met?
- Depending on your region, additional instrumentation can provide added information

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