What we offer ...

End-to-End Solutions for Aviation Weather

- Aviation grade meteorological sensors and data acquisition systems.
- Turnkey automated weather observing systems (AWOS) for airports and aerodromes of all sizes, including Runway Visual Range (RVR) and ATIS.
- Data management solutions for forecasters, pilots, airport managers, and met agencies.
- Program and project management services for aviation clients around the globe.

Proven Experience

Over several decades, Campbell Scientific has built a reputation for high quality, reliable measurement instrumentation, field proven in many different applications in every corner of the world.

Coastal has installed over 1200 aviation weather stations around the world. Clients include the US Air Force, NAV Canada, BMKG (Indonesia), NIMET (Nigeria), and civil and military aviation authorities worldwide.

Additionl Services:
- System Design & Consultation
- AWOS Refurbishment & Upgrades
- Site Surveys
- Training
- Program Management
- Software Development and Integration

Reliability in the Harshest Environments

Globally, Coastal AWOS have near 100% operability, even 10-15 years after installation.

A Truly Global Partner

Campbell Scientific’s network of companies have direct offices and service centers on six continents. Technical and logistical support can be provided to clients anywhere in the world, often in their own country and language.

Quality and Value

Aviation solutions from Campbell Scientific are supplied according to the client’s specifications and budget. These long-life sensors and systems can be maintained, upgraded, and replaced over time.

COROBOR has a worldwide presence with more than 1400 MESSIR Systems installed in more than 135 countries.
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Coastal has successfully installed over 1200 aviation weather station worldwide at commercial and private airports, military air bases, and heliports. Systems are modular in design and range in size and complexity, from a single weather station to a network of sensor groups on multiple runways.

Coastal’s AWOS solutions are rugged and built to meet our customers’ specifications. All of our systems are compliant with ICAO / WMO / FMH-1 reporting standards.

Key components of the AWOS include meteorological sensors, a field data collection unit (FDCU), AC or solar power systems, telecommunications, Coastal’s web-based Aviation INTERCEPT® display software, and user workstations.
Visualization software that displays your airport’s runway weather data.

Aviation INTERCEPT presents all weather and Runway Visual Range (RVR) data from the sensors at an airport in an easy to read, simple to navigate format. It fulfills all acquisition, processing, data display, reporting, archiving, system maintenance, and external data distribution requirements.

- Web-based viewing platform, accessible to authorized users through a web browser on any computer connected to the local network.
- No user licenses are required!
- Automatic METAR/SPECI reports (other report formats available: SYNOP, CLIMAT, TAF, etc.)
- ICAO/FAA/WMO/FMH-1 approved algorithms
- Remote maintenance monitoring
- Automatic Terminal Information Service (ATIS) broadcasts aviation weather reports generated by a Coastal AWOS
- Display screens are currently available in English, Spanish, Chinese, and Russian

A Runway Visual Range (RVR) Data Display in Aviation INTERCEPT® for a complex airport with 3 runways, and with instrumentation at 3 places along each runway.
Coastal’s portable/tactical weather stations are designed specifically to meet the demands of tactical or rapid deployment use, and are particularly suited for remote locations with harsh environmental conditions. Solar-powered systems are the solution for airfields with limited infrastructure.

**Features:**
- A complete AWOS solution that is ICAO/FMH-1/WMO compliant
- Rugged, weatherproof construction (passed MIL-STD-461E for EMI and MIL-STD-810F for severe environmental conditions)
- Professional grade meteorological sensors
- Very low power consumption
- Aviation INTERCEPT® installed on a rugged laptop computer
- Easy to pack, carry, and ship
- Survives rough handling while providing accurate aviation readings

Portable/tactical systems include professional grade meteorological sensors to measure wind speed and direction, dew point, pressure, temperature, visibility, cloud height, freezing rain, precipitation identification, precipitation amounts, and lightning detection.

Coastal's web-based Aviation INTERCEPT® software is simple and easy to use on a laptop. Data can also be sent remotely by cable (RS232/RS485), spread spectrum radio, GSM/GPRS modem, or satellite radio.

Systems are packed in durable, waterproof cases and can be assembled in minutes—no tools are required.

**Customers Include:**
Coastal’s AWOS for offshore installations are built to meet the unique challenges of providing site-specific aviation weather reporting at locations that are often remote, unmanned and face harsh conditions.

Our modular approach to building aviation weather stations allows for flexibility in sensor selection, power, telecommunications, and installation and mounting of the AWOS.

Offshore AWOS, based on Coastal’s rugged WEATHERPAK technology, includes the following features:

- Power over Ethernet (PoE) — data and power over a single cable
- Rugged, weatherproof construction (passed MIL-STD-461E and MIL-STD-810F)
- Ability to add additional external sensors
- ICAO / FMH-1 / WMO compliant
- Automatically generated weather reports
- Optional voice broadcast directly to pilots

Offshore Aviation Systems for Platforms, Heliports, Buoys

Solar-powered WEATHERPAK® on offshore buoy in Colombia

Single point WEATHERPAK® system on a research vessel

AWOS for General Aviation

Coastal Environmental Systems’ Automated Weather Observing System (AWOS) for General Aviation measures and reports weather conditions at general aviation airports. The complete system includes aviation grade meteorological sensors, data transmission, and INTERCEPT® Lite display software. The system reports weather data in compliance with ICAO/WMO standards and is available in multiple configurations:

- Simplified, single screen display of aviation weather data
- Web-based platform, accessible to authorized users via web browser
- ICAO/WMO/FMH-1 approved algorithms
- Automatic METAR/SPECI reports
- Built-in tests and data quality checks
- ATIS output capability
- Data logs available for download or export
- Display screens are currently available in English and Chinese

Users may select screens optimized for day or night viewing
MESSIR-COMM:

- Collect Data from all over your country (ex: observations).
- Ingest Data from various sources (remote sensing, legacy systems).
- Collect Data from web sites.
- Distribute data and products to internal and external users in your country (Aviation, Army, Regional Centres, Professionals)
- Perform GTS Meteorological Message Switching in coordination with other countries.
- Migrate to the new WIS environment specified by WMO

What is MESSIR-COMM?

MESSIR-COMM is a system (hardware + software) initially developed as a GTS Meteorological Message Switching System. MESSIR-COMM can also fulfill the specific requirements of your Meteorological Centre in regard of Data collection, ingestion, and distribution. MESSIR-COMM can interface to legacy meteorological systems, provided that such systems conform to WMO standards and can export in well-documented formats.

MESSIR-COMM can also be used as a “brick” of the complete MESSIR-WIS solution allowing your Meteorological Centre to migrate to WIS in full compliance with WMO specifications.

MESSIR-COMM can be coupled/combined with the MESSIR-XBASE Real-Time Central Database.

Switch all Types of Data to the Right End User

- Traditional alphanumeric codes (TAC) including SYNOP, TEMP, METAR, TAF…
- Table-driven code forms (TDCF)
- Files in WMO format - Satellite and radar images
- Binary products such as GRIB, BUFR, PNG, T4-DFAX
- Export data into various formats: text, image, XML…
- WMO monitoring

Compliance with WMO/ICAO Standards, WIS, TDCF – BUFR and AvXML


AvXML Compliant

MESSIR-COMM can handle OPMET data as XML according to ICAO and WMO regulations

- METAR/TAF/SPECI and SIGMET conversion to AvXML
- Compatibility with AHLs (Abbreviated Heading Line) used for exchanging XML OPMET messages

Other Related Products from COROBOR Systems include:

- MESSIR-VISION – a forecaster workstation
- MESSIR-CLIM – an airport climate database
- MESSIR-SAT – reception and processing of satellite imagery
- MESSIR-NET – meteorological web portal for remote access of pilot briefing

All of these Solutions can be Connected with:

- National Meteorological Center
- AFTN (Aeronautical Fixed Telecommunication Network) or AMHS (Air Traffic Message Handling System)
- WAFC (World Area Forecast Centers) of London and/or Washington through FTP server
- Local AWOS (Automated Weather Observing System).
- GTS (Global Telecommunication System of the WMO).
MESSIR-NEO: Manage your Met, Hydro, Agro and Aviation Data within the same App. Access all your data anywhere, anytime, from your PC, smartphone or tablet with an online Web Application. Build your own dashboard where you can define your views, products and animations.

Meet Your Technological Needs

- A modern and user-friendly interface where you can enjoy your daily work
- Access to a wide range of Meteorological Data and Services
- Connection to a secure, reliable and highly available Platform
- Access to your dashboard anywhere and at any time
- Personalized trigger Alerts and Warnings to protect your operations

Modular and Adaptable Platform

- NEO was built with a modular architecture that adapts to your needs and infrastructure
- You have the option to subscribe to our MaaS solution and get access to all NEO features
- You can also choose to deploy NEO on your own infrastructure and access it from your network
- NEO is adaptable to your infrastructure and is fully compatible with the latest hardware technologies (SAN, Fiber Channels, Open Stack, Virtualization...)
- Define your own, customized NEO platform with the modules that you choose

Download Your Flight Folder in Only 3 Mouse Clicks

- Set up your routine flights only once;
- Automatic generation of charts focusing on your flight route: - Wind-Temperature charts (from GRIBs) - SIGWX charts (from BUFRS);
- Automatic retrieval of OPMET text data related to airports and FIRs along the flight route.

New Innovative Technologies for the Best User Experience

- NEO is built with the latest Web technologies: HTML 5, JavaScript, Web Caching, NoSQL, Bootstrap, RESTful API...
- Our technical architecture is using Clustering, Load balancing, High Availability and Health Check technologies.
- The MaaS version is deployed on multiple data centers to ensure Redundancy and the highest possible Service Uptime.
- Access your data really fast thanks to Caching mechanisms and NoSQL Cluster.
MESSIR-AERO: Meteorology Briefing for Pilots

COROBOR's pilot meteorological briefing solution, MESSIR-AERO, provides a complete set of meteorological information for airport operations and en-route flight planning. This includes airport forecasts for take-off and landing, forecasts of weather conditions at higher altitudes, and special and significant weather reports throughout the entire flight route.

MESSIR-AERO receives data from a variety of sources:

- METAR, SPECI, and TAF from AWOS at the departure, en-route, and destination airports
- Satellite and radar imagery
- Wind shear alerts
- Global data services such as SADIS and WIFS

This data is delivered to clients as meteorological flight folders in full compliance with ICAO Annex 3. MESSIR-AERO can send data to other applications and systems as requested by the client.

Main Features

- Automatic generation of standard charts from GRIBs and BUFRs on ICAO standard chart formats on projections and on user-defined specific geographical areas.
- Vertical/temporal cross section.
- Create charts automatically using our Image Maker module.
- Feed your AIS Flight Planning System with GRIB data.
- Data ingestion from WAFS, SADIS, WIFS, GTS, SFTP, HTTPS, FTP, EUMETCast, GEONETCast, Himawari.
- Rework directly on screen SIGWX charts prepared from BUFR.
- Visual/sound alerts upon reception of advisories: Volcanic Ash, Cyclone Advisories...
- Easy set-up only with user-friendly menus.

Display and Print Aeronautical Data and Products

- OPMET text data: METAR, TAF, SPECI, SIGMET, AIRMET...
- Wind, temperature, humidity, pressure, tropopause height charts prepared from GRIBs.
- GRIB2 thinned products including icing, turbulence, CAT and CB forecasts.
- High level SIGWX significant weather charts (SWH) from BUFRs.
- Medium level SIGWX significant weather charts (SWM) from BUFRs.
- PNG-coded SIGWX charts.

Create your Flight Folder in 3 Mouse Clicks
- Set up your routine flights only once.
- Automatic generation of charts focusing on your flight route:
  - Wind-Temperature charts (from GRIBs)
  - SIGWX charts (from BUFRs).
- Automatic retrieval of OPMET text data related to airports and FIRs along the flight route.
- Automatic preparation of flight folders using FPL messages received via AFTN or AMHS.
- The flight folder can be accessed on mobile devices (IOS/Android/Windows phone/Blackberry).

AVXML Compliant
MESSIR-COMM can handle OPMET data as XML according to ICAO and WMO regulations
- METAR/TAF/SPECI and SIGMET conversion to AvXML
- Compatibility with AHLs (Abbreviated Heading Line) used for exchanging XML OPMET messages

Graphical SIGMET, the Easiest Access to SIGMET Data
SIGMET reports to users the meteorological phenomena observed and/or planned which are dangerous for aircrafts. With GRAPHICAL SIGMET users will have a compiling of all valid data SIGMET on the zone of interest at a glance. This is an intuitive and easy-to-use feature and will help operators save time.

If a text SIGMET cannot be rendered graphically, it will be displayed in text format on the graphic.

GRAPHICAL SIGMET makes editing SIGMET messages easier.
For a defined FIR the forecaster can draw the hazard zone himself directly on the interface, for example, after receiving a warning message from a pilot during flight. This will automatically create a SIGMET message with the coordinates.
Everything is done from a user-friendly and simple interface.

MESSIR-AERO at a Glance
- MESSIR-AERO is 100% compliant with:
  - SADISOPSG evaluation criteria.
- Provide the necessary meteorological information worldwide to ensure Aeronotical Security and Warning.
- Process data from various sources: SADIS, WIFS, AFTN/AMHS, OPMET...
- Only 3 mouse clicks are required on MESSIR-AERO to display or print a complete flight folder.
- Field experience of more than 20 years in more than 100 countries.
The safety and efficiency of your flight operations are the most important aspects to manage, regardless of the size of your airport. Weather phenomena can have a significant impact on your ability to safely and efficiently maintain flight operations. Campbell Scientific’s range of highly reliable and accurate optical sensors will help you to ensure that you meet the most stringent requirements and cope with these weather related challenges.

Some of the most important aspects to be monitored are Visibility, Background Luminance, Present Weather and Cloud Height.

Campbell Scientific's CS120A and CS125 sensors provide accurate visibility measurements. The CS125 will additionally provide present weather as METAR or NWS codes. The CS140 provides background luminance; crucial for RVR calculations. The CS135 gives cloud information such as cloud base (cloud height) and sky condition (cloud coverage). We also offer the AVM200 which combines RVR, visibility and present weather detection in a single system. All comply with CAA and ICAO guidance and meet or exceed all recommendations and specifications (this includes CAP437, CAP670 and CAP746).

**Optical Range Overview**

**Visibility and Present Weather – CS120A and CS125**

The CS120A and CS125 both measure visibility up to 75 km with the CS125 additionally reporting present weather. Both sensors use the proven forward scatter system for visibility measurement, utilising downward facing hoods to protect against contamination of the lenses as recommended by ICAO. The CS125 provides unprecedented functionality, reporting extensive METAR, SYNOP and NWS present weather codes.

**Ceilometer – CS135**

Our CS135 ceilometer provides reporting of up to 5 layers of cloud cover tracking according to ICAO and WMO rules. For the instances when detailed data is shared with Environmental agencies, there are options for providing Boundary layer data. The CS135 is designed around a novel single biaxial lens system. This optical design gives superior performance compared to traditional dual lens designs especially over the lower altitudes relevant to aviation. Sophisticated data processing is combined with its tilt feature to avoid direct reflections from precipitation overhead.

**Background Luminance – CS140**

Combining the visibility output of either the CS120A or the CS125 with background luminance from a CS140 background luminance sensor providing all the sensor data needed for an IRVR system.

**IRVR – the Campbell Scientific IRVR controller**

The IRVR controller unit brings together the Campbell Visibility and Luminance sensors to create an Integrated Runway Visual Range system of unequalled simplicity and performance. This can be used stand-alone for airports looking to move from human to instrument RVR in the most efficient manner or to upgrade their level of operations.
The CS120A and CS125 are forward scatter visibility and present weather sensors for stand-alone use or with automatic weather stations. They use the well established forward scatter system for visibility measurement, utilising a 42° scatter angle which gives accurate estimates of Meteorological Observable Range (MOR) for fog and snow. The CS125 identifies precipitation particles from their scattering properties and fall speeds, and combines this with a temperature measurement to identify the weather type.

Both devices follow ICAO guidance in having downward pointing optics that reduce the risk of contamination of the optics and blockage with snow. This also means that direct sunlight will never shine directly into the optics. Interference to the sample volume from the sensor by flow distortion or heat is minimised by keeping it clear of the hood and electronics box.

The sensors incorporate low-power dew-prevention heaters and higher power anti-icing heaters for the hoods as standard. These are automatically controlled to ensure operation in all weathers or can be disabled to save power.

A CS215 temperature and relative humidity sensor can be fitted to the CS125. This gives better performance in differentiating between liquid and solid precipitation and also allows relative humidity information to be transmitted.

The CS120A and CS125 comply with ICAO, UK, FAA and CAA guidance and meets or exceeds all recommendations and specifications (this includes ICAO 9837, ICAO Annex 3, CAP437, CAP670 and CAP746).

Integrated low power heaters prevent the build-up of dew and higher powered anti-icing heater are also included. All heaters are automatically controlled for simple operation in all weather.

**Benefits & Features**

- High performance visibility and present weather sensors at an economical price
- Uses established 42° scatter angle for good MOR readings in all precipitation types
- Incorporates both dew and hood heaters for all-weather operation
- The CS125 gives present weather and precipitation accumulation
- RS232/RS485 and logic level alarm outputs
- Simple field calibration with optional calibration disk including dirty window zero offset correction
- Low power – suitable for remote applications
- Automatic fault/contamination detection
- Sample volume clear of disturbance from the mounting and the electronics enclosure
- The CS125 gives present weather to ICAO standards

**Applications**

- Road weather
- Airport visibility and Runway Visual Range
- Marine weather stations
- Automatic weather stations
- Wind farms

**Specifications at a Glance**

**CS120A and CS125**

- Maximum reported visibility: 75 km (approx. 47 miles)
- Accuracy: <600 m ±8%
  - 600-10,000 m ±10%
  - 10,000-15,000 m ±15%
  - 15,000-75,000 m ±20%
- Resolution: 1 metre
- Alarm outputs: 2 x 0-5V outputs, 32 mA (max)
- Serial interface: RS-232 or RS-485
- Operating temperature: -25 to +60 °C
- Extended operating temperature: -40 to +70°C option
- Operating humidity: 0 . . . 100%
- Wind speed: up to 60 m/s
- Sensor sealing: rated to IP66
- Power: (7-28V DC)
- Hood heater supply: 24V DC or AC
- Hood heater power: 2 x 30W
- Total unit power: <3W while sampling continuously (including dew heaters)

**CS125 only**

- Present and past weather: identifies as standard mist, fog, drizzle, freezing drizzle, drizzle and snow, rain, freezing rain, rain and drizzle, rain and snow and snow
- Outputs 56 SYNOP present weather codes according to WMO code table 4680, associated METAR codes at WMO code table 4678 and NWS codes
- Accumulation reported range: 0-999.9 mm
- Accumulation resolution: 0.1 mm

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**Campbell Scientific**

**Aviation Sensors**

CS120A/CS125 Visibility and Present Weather Sensors

CS120A and CS125

• Maximum reported visibility: 75 km (approx. 47 miles)
• Accuracy: <600 m ±8%
  - 600-10,000 m ±10%
  - 10,000-15,000 m ±15%
  - 15,000-75,000 m ±20%
• Resolution: 1 metre
• Alarm outputs: 2 x 0-5V outputs, 32 mA (max)
• Serial interface: RS-232 or RS-485
• Operating temperature: -25 to +60 °C
• Extended operating temperature: -40 to +70°C option
• Operating humidity: 0 . . . 100%
• Wind speed: up to 60 m/s
• Sensor sealing: rated to IP66
• Power: (7-28V DC)
• Hood heater supply: 24V DC or AC
• Hood heater power: 2 x 30W
• Total unit power: <3W while sampling continuously (including dew heaters)
The Campbell Scientific CS135 LIDAR Ceilometer measures cloud height and vertical visibility for meteorological and aviation applications. Utilizing LIDAR (Light Detection And Ranging) technology, the instrument transmits fast, low-power laser pulses into the atmosphere and detects back-scattered returns from clouds and aerosols above the instrument.

The CS135 employs a single lens design to increase optical signal-to-noise ratio over other instruments. The Transmit and Receive sections are optically isolated. This allows the device to have exceptional performance with low altitude overlap between the transmitter and receiver whilst integrating larger optics into a compact package. The optics are also immune to damage from direct sunlight.

The CS135 provides information on cloud height, sky condition (up to five layers) and raw backscatter profiles.

As an option, Mixing Layer Height can be calculated within the CS135 and inserted in data messages.

The CS135 can be tilted up to 24°. Cloud heights are automatically corrected. A small tilt is an important feature as it allows the CS135 to resist high levels of reflection from large raindrops and frozen particles that can impair a vertical sensor.

The CS135 complies with ICAO and CAA guidance and meets or exceeds all recommendations and specifications (this includes ICAO 9837, ICAO Annex 3, CAP437 and CAP746).

**Benefits & Features**

- Single lens design for high signal-to-noise ratio, maximized detector sensitivity and extended range
- State-of-the-art signal processing
- Integrated heater, blower and radiation shield as standard
- In-built calibration capability
- Tilt angles to 24°
- Two axis inclinometer for automatic correction of cloud height
- Continuous comparison between two internal clocks for confidence in reliable operation

**Specifications at a Glance**

- **Range:** 0-10 km / 32,800 ft
- **Minimum reporting resolution:** 5 m / 15 ft
- **Accuracy:** +/- 0.05% +/- 4.6 m
- **Cloud layers reported:** Up to five layers with cover in oktas
- **Data output:** RS-232/RS-422/RS-485/Ethernet
- **Power:** 110/115V230 VAC ±10%, 50-60 Hz, 15W to 470W when operating full heaters
- **Battery:** Internal 12V 2Ah battery
- **Maintenance port:** USB 2.0 (USB 1.1 compatible)
- **Temperature range excluding battery:** -40°C to 60°C, -40°F to 140°F
- **Humidity:** 0-100% RH
- **Wind speed:** 55 m/s (wind tunnel tested)
- **IP rating:** IP55 (NEMA 4X)
- **Vertical:** 6°, 12°, 18° and 24° tilt positions (for improved performance in rainfall)
- **Integrated heater, blower and radiation shield as standard**
- **Sky condition calculation as standard**
- **Exceptional laser life in excess of 10 years**
- **Eye safety:** Class 1 M
- **Laser safety compliance:** EN60825-1:2001
- **Electrical safety compliance:** EN61010-1
- **EMC compliance:** BS EN 61326:2006
The CS140 is a high quality background luminance sensor. It provides the luminance data required to assess the visibility range for lights such as runway lights or warning lights.

The field of view and elevation angle follows aviation practice and the spectral response follows the CIE curve that matches the typical response of the human eye. The optics are designed so that with the sensor horizontal the field of view is elevated by 6°. This allows maximum protection from precipitation for the window.

The CS140 meets the standards of ICAO, the UK CAA and the FAA. It is a robust instrument and is immune to damage from sunlight shining directly into the window.

Benefits & Features
- High performance sensor at an economical price
- Elevated field of view with hood horizontal to give high resistance to contamination on the window
- Incorporates both dew and hood heaters for all-weather operation
- RS232/RS485 outputs so can operate independently of a host visibility sensor for flexible, reliable operation
- Low power - suitable for remote applications
- Automatic window contamination detection
- Configurable window contamination correction
- Monitoring of internal supply voltages and temperatures

Specifications at a Glance

**CS140**
- Measuring range: 0-45,000 cd/m²
- Accuracy: ±0.2 cd/m² <2 cd/m² ±10%
- >5 cd/m²
- Resolution: 0.1 cd/m²
- Field of view 6° wide with sharp cut-off
- Elevation angle 6° with hood horizontal
- Spectral response closely follows CIE curve matching the response of the human eye
- Operating temperature: -25 to +60 °C
- Extended operating temperature: -40 to +70 °C option
- Operating humidity: 0 . . . 100%
- Wind speed: up to 60 m/s
- Sensor sealing: rated to IP66

**IRVR**
- Calculates IRVR to ICAO requirements for up to 3 sites (up to 6 sensors)
- Three RS-485 inputs for sensor data
- Ethernet connection for displays and data messages
- RS-485 serial output for data messages
- USB service port
- RS-232 input for Wharton or other external clock
- Power requirements: 100-240V AC, 15W 50-60 Hz
- Sensor sealing: rated to IP66

The Campbell Scientific IRVR controller provides the core of a system for automated assessment of Instrument Runway Visual Range (IRVR). The IRVR controller can poll sensors at between one and three sensor locations to cover operations from CATI to CATIII in accordance with ICAO standards.

Campbell Scientific can provide IRVR systems to meet all needs from simple self-contained systems to interfacing with a larger AWOS system.

Benefits & Features
- It can operate as a stand-alone IRVR system utilising the internal web pages or provide IRVR data to a larger AWOS system
- Datalogger based unit for high MTBF
- 2U 19” rack mountable for flexible installation
- Ethernet connection for displays and data messages
- USB service port for easy maintenance
- Data is recorded for traceability and incident recording and can be downloaded for external review