

ARM Aerial Facility Baseline Measurements and Instrumentation for the Manned Aircraft

Atmospheric State and Aircraft State

Instrument	Description	Source/Supplier
BX-992 (GPS/INS System)	Inertial navigation system/global positioning system: position, velocity, attitude	Trimble
VN-200 (GPS/INS System)	Inertial navigation system/global positioning system: position, velocity, attitude	VectorNav
Aircraft Integrated Meteorological Measurement System – 20 (AIMMS-20)	5-port air motion sensing: true airspeed, angle-of-attack, side-slip Meteorology: temperature, relative humidity Inertial navigation system/global positioning system: position, velocity, attitude	Aventech
Chilled Mirror Hygrometer – General Eastern 1011C	Dewpoint temperature	General Eastern
Rosemount 1201F1	Pressure	Goodrich Corporation
Rosemount E102AL/510BF	Temperature	Goodrich Corporation
Nose Video Camera	Forward video images behind cockpit window	Axis
Tunable Diode Laser Hygrometer (open path)	Absolute humidity	Port City Instruments
CO ₂ /H ₂ O Gas Analyzer (LI-7000)	Absolute humidity	LI-COR

Cloud Properties

Instrument	Description	Source/Supplier
Multi-Element Water Content System (WCM-2000)	Cloud liquid water content, total water content, and ice water content derived	Science Engineering Associates, Inc.
Particle Volume Monitor-100A (PVM-100A)	Cloud liquid water content	Gerber Scientific, Inc.

Hotwire on Cloud Aerosol and Precipitation Spectrometer (CAPS)	Cloud liquid water content	Droplet Measurement Technologies
Cloud Spectrometer and Impactor (CSI)	Total condensed cloud water content	Droplet Measurement Technologies
Fast-Cloud Droplet Probe (F-CDP)	Cloud particle size distribution 2 to 50 μm	Stratton Park Engineering Company
CAPS, Cloud Imaging Probe (CIP)	Cloud particle size distribution 25 to 1,550 μm	Droplet Measurement Technologies
2-Dimensional Stereo Probe (2D-S)	Cloud particle size distribution 10 to 3,000 μm	Stratton Park Engineering Company
High-Volume Precipitation Spectrometer Version 3 (HVPS-3)	Cloud particle size distribution 150 to 19,600 μm	Stratton Park Engineering Company
Three-View Cloud Particle Imager (3V-CPI)	High-resolution images of ice crystals and cloud droplets	Stratton Park Engineering Company

Aerosol Properties

Instrument	Description	Source/Supplier
Aerosol Isokinetic Inlet	Sample stream of dry aerosol, sizes < 5 microns	Brechtel Manufacturing Inc.
Counterflow Virtual Impactor (CVI) Inlet	Sampling of cloud droplet residuals	Brechtel/PNNL build
3-Wavelength Integrating Nephelometer, Model 3563	Aerosol scattering coefficient 450, 550, 700 nm	Trust Science Innovation (TSI) Inc.
3-Wavelength Particle Soot/Absorption Photometer (PSAP)	Aerosol absorption coefficient 462, 523, 648 nm	Radiance Research
Ultrafine Condensation Particle Counter (UCPC), Model 3025A	Total aerosol concentration > 0.003 μm	Trust Science Innovation (TSI) Inc.
Condensation Particle Counter (CPC), Model 3772	Total aerosol concentration > 0.010 μm	Trust Science Innovation (TSI) Inc.
CAPS, Cloud Aerosol Spectrometer (CAS)	Aerosol size distributions 0.5 to 50 μm	Droplet Measurement Technologies
Dual-Column Cloud Condensation Nuclei Counter (CCN)	Concentration of cloud condensation nuclei at two specified supersaturations	Droplet Measurement Technologies
Humidigraph f(RH)	Aerosol scattering coefficient as a function of relative humidity	PNNL build
Laser Aerosol Spectrometer (LAS) – Model 3340	Aerosol size distribution 0.09 to 7.5 μm	Trust Science Innovation (TSI) Inc.

Passive Cavity Aerosol Spectrometer – 100X (PCASP)	Size distribution 0.10 to 3 μm	Particle Measuring Systems Inc. (PMS)
Ultra-High-Sensitivity Aerosol Spectrometer (UHSAS)	Aerosol size distribution 0.060 to 1 μm	Droplet Measurement Technologies
Scanning Mobility Particle Sizer	Aerosol size distribution 0.015 to 0.450 μm	BNL build
Single-Particle Soot Photometer (SP2)	Soot spectrometry	Droplet Measurement Technologies
Particle-in-Liquid System (PILS)	Particle ionic composition	BNL build

Gas-Phase Measurements

Instrument	Description	Source/Supplier
Cavity Ring Down (CRD) System – Model G2301-m	Concentration of CO ₂ , CH ₄ , and H ₂ O	Picarro
N ₂ O/CO – 23r	Concentration of CO, N ₂ O, and H ₂ O	Los Gatos
SO ₂ – Model 43i	Concentration of SO ₂	Thermo Scientific/BNL
O ₃ – Model 49i	Concentration of O ₃	Thermo Scientific
Oxides of nitrogen	Concentration of NO, NO ₂ , and NO _y	Air Quality Devices/BNL

Remote Sensing and Solar Radiation

Instrument	Description	Source/Supplier
Infrared Thermometer – Model KT1985	Infrared temperature	Heitronics
Infrared Thermometer – Model KT1981	Infrared temperature	Heitronics
Multifilter Radiometer (MFR) with a 1.6 μm channel	Shortwave spectral irradiance	Yankee/PNNL modified
Pyranometer, shaded, Zenith (SPN-1)	Total and diffuse irradiance	Delta-T Devices
Pyranometer, unshaded, Zenith (SPN-1)	Total irradiance	Delta-T Devices
Pyranometer, unshaded, Nadir (SPN-1)	Total irradiance	Delta-T Devices
Pyrgeometer, Zenith (CGR-4)	Far infrared radiation	Kipp & Zonen
Pyrgeometer, Nadir (CGR-4)	Far infrared radiation	Kipp & Zonen