**I. General information:**

1. Mission name: **SENEX 2013**

2. Instrument name: **CRD + PAS + CLAP + UHSAS (Sta 2 rack)**

3. What is measured: **Aerosol extinction, aerosol absorption, aerosol size resolved number concentrations**

4. Short description of measurement technique:

**CRD: Laser-based measurement of light extinction of aerosols**

**PAS: Laser-based measurement of light absorption of aerosols**

**CLAP: Filter-based measurement of light absorption of aerosols**

**UHSAS: Fine particle size distribution by laser light scattering.**

5. Contact information for all personnel going to the field with this instrument:

 (*for multiple investigators,* *please list the PI or primary contact person first*)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Email** | **Office phone**  | **Cell phone** |
| 1. Dan Lack, PI  | daniel.lack@noaa.gov | 303-497-5824 | 720-635-2039 |
| 2. Charles Brock | charles.a.brock@noaa.gov | 303-497-3795 | 303-887-2523 |
| 3. Justin Langridge | justin.langridge@noaa.gov | 303-497-3470 | 720-242-7555 |
| 4. Nick Wagner | Nick.wagner@noaa.gov | 303-497-3924 | 303-544-0893 |

**II. Specific information:**

1. Total installed weight: **650.4 lb**

|  |  |  |
| --- | --- | --- |
| **Rack weight and balance info** | **Allowed** | **Actual** |
| Weight, lbs.: | 500 | 480.4 |
| Overturning moment, in-lbs.: | 13400 | 12380 |

**Pod weight and CG:**

**NOTE**: Please also provide weight-and-balance information for all installed equipment. Templates for standard electronics racks are available for download [here](http://www.esrl.noaa.gov/csd/tropchem/2008ARCPAC/P3/index.html). PIs with non-standard installations will need to provide relevant information in a similar format.

2. Individual subassembly info(weights should sum to total listed above)

|  |  |  |
| --- | --- | --- |
| **Component name** | **Location name and flight station** | **Weight, lbs** |
| 1. Sta. 2 rack + instruments | Station 2  | 480.4 |
| 2. Wall unit 1: flow controllers |  Sidewall, FS 495-505 | 20 |
| 3. Wall unit 2: Inlet conditioning |  Sidewall, FS 445-458 | 30  |
| 4. Wall unit 3:gas cylinders |  Sidewall, FS 430-444 | 70 |
| 5. Vacuum Pumps | Floor, Outboard, FS 444-458 | 50 |
| 6. |  |  |
| 7.  |  |  |

1. Component power consumption in Amps

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Component name** | **Location name** | **400 Hz****3Ø** | **400 Hz****1Ø** | **60 Hz** | **28VDC** | **28VDC****WOW** |
| 1. CRD-PAS | Station 2  |  |  | 10A |  |  |
| 2. CRD-PAS | Station 2 |  | 10A |  |  |  |
| 3.  |  |  |  |  |  |  |
| 4.  |  |  |  |  |  |  |
| 5. |  |  |  |  |  |  |
|  | **Totals:** |  |  8A | 9A |  |  |
|  |  | **400 Hz****3Ø** | **400 Hz****1Ø** | **60 Hz** | **28VDC** | **28VDC****WOW** |

4. Inlet and exhaust information

|  |  |  |
| --- | --- | --- |
| **Inlet/exhaust name** | **Location name and flight station** | **Hole size through hull, inches** |
| 1. Low Turbulence Inlet | FD window, FS 320 | 2.5 inches |
| 2. Sta 2 exhaust | Port side, FS 451, top port | 1/2”, BF Venturi plate dump |
| 3. |  |  |

5. Source of flow(name and location of pump or venturi)

|  |  |
| --- | --- |
| **Pump name** | **Location name and flight station** |
| 1. CRD-PAS scroll pump  | Station 2, FS 455 |
| 2. UHSAS brushless DC diaphragm pump | Internal to UHSAS, Station 2 |
| 3. Inlet scroll pump | Station 2, FS 447 |
| 4. |  |
| 5. |  |

6. Installed hazardous materials or equipment:

(only for items *installed* *in the aircraft for use during flight*)

A. Lasers

 **1) CRD**

 **a) Type: solid state Nd-YAG, open path**

 **Class: 4**

 **Wavelength: 532 nm**

 **Output power: 100 microJ/pulse, 1kHz repetition rate**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

 **b) Type: solid-state diode laser**

 **Class: 3B**

 **Wavelength: 660 nm**

 **Output power: 130 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

 **c) Type: solid-state diode laser**

 **Class: 3B**

 **Wavelength: 405 nm**

 **Output power: 120 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

**2) PAS**

 **a) Type: solid-state Nd-YAG, directly mounted, 2 each**

 **Class: 3B**

 **Wavelength: 532 nm**

 **Output power: 200 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

 **b) Type: solid-state diode laser**

 **Class: 3B**

 **Wavelength: 660 nm**

 **Output power: 70 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

 **c) Type: solid-state diode laser, 2 each**

 **Class: 3B**

 **Wavelength: 405 nm**

 **Output power: 60 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

**3) UHSAS**

 **a) Type: solid-state diode laser, directly mounted**

 **Class: I (in closed unit with safety switches)**

 **Wavelength: 800 nm**

 **Output power: 1000 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

 **b) Type: solid-state Nd3+:YLF**

 **Class: I (in closed unit with safety switches)**

 **Wavelength: 1054 nm**

 **Output power: 30 mW continuous**

 **Eye-safe? no**

 **Beam fully contained within instrument during normal operation? yes**

**NOTE - SEE BELOW for laser operational safety constraints**

B. RF transmitters: **NONE**

C. Radioactive materials: **NONE**

D. Compressed gases: (1 ft3 = 28.32 liters; cabin volume = 4260 ft3 = 1.21 x 105 liters)

|  |  |  |
| --- | --- | --- |
| **Cylinder number:** | **1** | **2** |
| Gas description | zero air | Oxygen |
| Mixing ratio | pure air | pure |
| Cylinder size (ft3) | 67 | 28 |
| Max pressure (psig) | 2216 | 2200 |
| # installed on aircraft | 1 | 1 |
| Location on aircraft | Wall unit, FS 435 | Wall unit, FS 440 |
| Service frequency | Every 3rd flight | Every 5th flight |
| *toxic/flammable gases:* | no | no |
| In containment vessel? | no | no |
| Gas alarm provided? | no | no |
| MR if vented to cabin, ppmv | NA | NA |
| OSHA 8-hr PEL, ppmv | NA | NA |
| 30-min IDLH, ppmv | NA | NA |

E. Chemicals (solids and liquids):

**1) <1 L of pure water for circulating coolant system.**

**2) <1 kg of Purafil CP 50 scrubber used to scrub NO2 and O3 from the instrument exhaust.**

F. Cryogens: **NONE**

G. UPS and battery installation: **NONE**

H. Motors

 **1) CRD**

 **a) Description: Scroll pump, Agilent IDP3**

**Motor information: AC, 120V, 1A**

 **Thermal interlock enabled? yes**

 **b) Description: Compressor, KNF Neuberger**

 **Motor information: Brushless DC, 24V, 3A, intermittent**

 **Thermal interlock enabled? no**

 **c) Description: Water circulating pump, Thermaltake**

 **Motor information: Brushless DC, 12V, 0.6A**

 **2) PAS**

 **a) Description: Scroll pump, Agilent IDP3**

**Motor information: AC, 120V, 1A**

 **Thermal interlock enabled? yes**

 **b) Description: Water circulating pump, Thermaltake**

 **Motor information: Brushless DC, 12 V, 0.6A**

 **Thermal interlock enabled? no**

 **3) UHSAS**

 **a) Description: sealed diaphragm air pump, KNF Neuberger**

 **Motor information: Brushless DC, 24 V, 0.4A**

 **Thermal interlock enabled? no**

 **4) Various small brushless DC fans, 12 V**

I. Operator seat requests

Test flights: **1**

Transit flights: **1**

Science flights: **1**

7. Data and plumbing drops

 Network (Cat. 5/6 ethernet) drops requested: **1**

 Serial drops requested: **NONE**

 IRIG-B drops (BNC coax connector) requested: **NONE**

 Vacuum/exhaust/ emergency dump lines: **1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Flow rate, slpm** | **Line pressure, Torr** | **Pump type** | **Trace gas concentration(s)** |
| 1. Sta 2. Exhaust | <20 | Atmospheric + 20 Torr | Scroll, diaphragm | water, noncondensing, RH<35% at 20 oC; O3<10 ppmv |
| 2.  |  |  |  |  |
| 3. |  |  |  |  |

 Ground gas service lines (number, location, type of service): **NONE**

 Other gas lines (number, location, type of service): **NONE**

Will you be sending data to the AOC data station? If so, please provide the following information:

|  |  |  |
| --- | --- | --- |
| **Parameter name** | **Voltage range** | **Unit conversion** |
| 1. DryExtinction532 | 0-5V | 1v = 50 Mm-1 |
| 2. Abs532 | 0-5V | 1v = 5 Mm-1 |
| 3. |  |  |

8. Aircraft access

 a. flight days:

 Pre-flight time requested at aircraft (hours): **3 Hours**

 Routine pre-flight ground support required? **None**

 Routine post-flight time requested at aircraft (hours): 1 **Hour**

Routine post-flight ground support required? **None**

b. non-flight days:

 Routine external access to inlets or zenith mounts required? **None**

*Please note there is zero access and zero power to the aircraft (including pods) on hard-down days. These occur at least once every seven calendar days while in the field.*

**9. Aircraft maneuvers**

 Briefly describe in-flight calibration frequency, duration, altitudes desired:

 **1 minute zero period approximately every 15 minutes.**

 Briefly describe instrument sensitivity to flight conditions:

(issues during roll/pitch, ascent/descent, sampling in cloud, icing etc.)

**Valid data may not be acquired during in-cloud sampling due to droplet or ice crystal shattering on LTI.**

10. Miscellaneous

 *1. Hazmat for preflight/postflight calibrations*: Please describe fully any additional hazardous materials - compressed gases, solvents, radioactive ion sources – that you anticipate *temporarily* bringing onto the aircraft for periodic instrument calibration purposes (e.g., *n*-butanol in a CN counter, 210Po in a DMA, a UPS for power, compressed gas cylinders for calibrations, etc.)

 **a) CRD and UHSAS**

 **1) Methanol for optics cleaning (<40 ml)**

 **2) Compressed zero air cylinder (<150 ft3) during cals**

 **3) n-butyl alcohol (<1 liter) for CN counter during cals**

 **4) <20 mCi 210Po in DMA during cals**

 **5) Dilute di (2-ethylhexyl) sebacate in isopropyl alcohol (<1 liter) during cals**

 **b) PAS**

 **1) Built-in O3 generator (<100 ppmv) will be enabled during ground cals, vented to BF venturi plate via Sta. 2 exhaust line**

 *2. Fabrication and sheet metal support:* **NONE**

1. *Ferry flight/check flight procedures.* **NONE**

**III. Ground laboratory space**

1. Tampa space requests:

 Power requirements: **115V 60Hz AC, 12A**

 Special requests: **100 ft2 for crate storage.**

2. Field space requests:

 Work space, ft2: **50**

 Number of tables/chairs: **4 tables, 5 chairs**

 Power requirements: **115V 60 Hz AC, 12A**

 Storage space, ft2: **150**

 Other requests: