**I. General information:**

1. Mission name: **SENEX 2013**

2. Instrument name: SO2, CO

3. What is measured: SO2, CO

4. Short description of measurement technique:

SO2: Pulsed UV Fluorescence

CO: Resonant VUV Fluorescence

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. John Holloway | [john.s.holloway@noaa.gov](mailto:john.s.holloway@noaa.gov) | (303) 497-3273 | (303) 990-0587 |
| 2. |  |  |  |
| 3. |  |  |  |
| 4. |  |  |  |
| 5. |  |  |  |
| 6. |  |  |  |

**II. Specific information:**

**1. Total installed weight: 0.0 lbs**

(rack, gas cylinders, hoses, cabling, pumps, inlets, permeation tubes, etc.)

|  |  |  |
| --- | --- | --- |
| **Rack weight and balance info** | **Allowed** | **Actual** |
| Weight, lbs.: | 263 lbs | 245 lbs |
| Overturning moment, in-lbs.: | 7875 in-lbs | 5489 in-lbs |

**Pod weight and CG:** CO: 350 lbs / within ±3.0 in of center of mounting lugs as per MIL-STD-8591, 5.7.1.2

**NOTE**: Please also provide weight-and-balance information for all installed equipment. Templates for standard electronics racks are available for download [here](http://esrl.noaa.gov/csd/groups/csd7/measurements/2013senex/P3/integration/). 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. gas bottle tray | Station 6/F.S 788 | 54 |
| 2. computer | Station 6/F.S 788 | 28 |
| 3. data system | Station 6/F.S 788 | 13 |
| 4. TECO 43C-TL, SO2 instr. | Station 6/F.S 788 | 55 |
| 5. kbd/monitor tray | Station 6/F.S 788 | 20 |
| 6. sample pump | Station 6/F.S 788 | 18 |
| 7. power distribution panel | Station 6/F.S 788 | 3 |
| 8. instrument rack w/ floor plates | Station 6/F.S 788 | 45 |
| 9. cabling and tubing | Station 6/F.S 788 | 7 |

**3. Component power consumption in Amps**

Please provide an electrical power diagram in Appendix A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Component name** | **Location name** | **400 Hz**  **3Ø** | **400 Hz**  **1Ø** | **60 Hz** | **28VDC** | **28VDC**  **WOW** |
| 1. SO2 instrumentation | Sta. 6 |  | 3(6) A |  |  | 0.1 A |
| 2. CO wing pod | Sta. 12/L.W.S. 83 |  | 6(10) A |  |  |  |
| 3. |  |  |  |  |  |  |
| 4. |  |  |  |  |  |  |
| 5. |  |  |  |  |  |  |
| 6. |  |  |  |  |  |  |
| 7. |  |  |  |  |  |  |
| 8. |  |  |  |  |  |  |
| 9. |  |  |  |  |  |  |
| 10. |  |  |  |  |  |  |
| 11. |  |  |  |  |  |  |
| 12. |  |  |  |  |  |  |
|  | **Totals:** |  | 9 |  |  | 0.1 |
|  |  | **400 Hz**  **3Ø** | **400 Hz**  **1Ø** | **60 Hz** | **28VDC** | **28VDC**  **WOW** |

**4. Inlet and exhaust information:**

Please provide an inlet/exhaust line diagram in Appendix B

|  |  |  |
| --- | --- | --- |
| **Inlet/exhaust name** | **Location name and flight station** | **Hole size through hull, inches** |
| 1. SO2 inlet | Sta. 5 window / F.S.764 | 3.7 in. (existing window plate) |
| 2. SO2 exhaust | LIPF venture plate, F.S. 780 | 3/8 tubing venting through rearward rakes on venturi plate |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. |  |  |

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

|  |  |
| --- | --- |
| **Pump name** | **Location name and flight station** |
| 1. SO2 diaphragm pump | Sta. 6 / F.S. 788 |
| 2. CO diaphragm pump | CO wing pod / Sta. 12, L.W.S. 83 |
| 3. |  |
| 4. |  |
| 5. |  |
| 6. |  |

**6. Installed hazardous materials or equipment:**

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

**A. Lasers n/a**

Type:

Class:

Wavelength:

Output power:

Eye-safe?

Beam fully contained within instrument during normal operation?

*For non-eye-safe lasers, please attach a description of safety measures taken (safety interlocks, beam fully enclosed within instrument, etc.) and a procedure for safe instrument operation during testing and laser alignment. Please contact the* [*AIC*](mailto:carsten.warneke@noaa.gov) *for an example of laser safety documentation from TexAQS 2006.*

**B. RF transmitters**: (note that mass spectrometer RF generators are not designed to transmit, and do not need to be included here) **n/a**

Description:

Transmitted RF power:

Frequency range:

**C. Radioactive materials: n/a**

Isotope:

Half-life:

Type of emitter:

Generally licensed?

# installed and location:

# of spares and location:

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cylinder number:** | **1** | **2** | **3** | **4** | **5** |
| Gas description | SO2/N2 | pure air | CO2/Ar | CO/air | pure air |
| Mixing ratio | 10 ppmv |  | 0.25% | 10 ppmv |  |
| Cylinder size (ft3) | 30 | 30 | 10 | 10 | 10 |
| Max pressure (psig) | 1800 | 2000 | 1500 | 1500 | 1500 |
| # installed on aircraft | 1 | 1 | 1 | 1 | 1 |
| Location on aircraft | Sta. 6 | Sta. 6 | Sta. 12 | Sta. 12 | Sta.12 |
| Service frequency | none | ~5 flts | ~6 flts | none | ~8 flts |
| *toxic/flammable gases:* |  |  |  |  |  |
| In containment vessel? |  |  |  |  |  |
| Gas alarm provided? |  |  |  |  |  |
| MR if vented to cabin, ppmv |  |  |  |  |  |
| OSHA 8-hr PEL, ppmv |  |  |  |  |  |
| 30-min IDLH, ppmv |  |  |  |  |  |

**E. Chemicals (solids and liquids):**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Chemical number:** | **1** | **2** | **3** | **4** | **5** | **6** |
| Concentration |  |  |  |  |  |  |
| Amount |  |  |  |  |  |  |
| Container description |  |  |  |  |  |  |
| Purpose |  |  |  |  |  |  |
| Solution pH |  |  |  |  |  |  |
| Spill kit provided? |  |  |  |  |  |  |

**F. Cryogens:**

Location:

Description:

Container description:

Quantity on board per flight:

Serviced on the aircraft?

**G. UPS and battery installation:**

Location:

Description: (Manufacturer, model no., power)

Battery type:

Has an adjustable input voltage tolerance? (highly recommended)!

**H. Motors**

Description: SO2 diaphragm pump

Motor current draw 1Ø, 400Hz, 1.5 A/ 0.6 A

(e.g., 3Ø, 400Hz, 8A startup, 4A running)

Thermal interlock enabled? Yes

Description: CO diaphragm pump

Motor current draw 1Ø, 400Hz, 2.4 A/ 1.0 A

(e.g., 3Ø, 400Hz, 8A startup, 4A running)

Thermal interlock enabled?

**I. Operator seat requests -**

Test flights: 1 seat for 1 flight

Transit flights: 1 seat

Science flights: 1 seat one time

**7. Data and plumbing drops**

Network (Cat. 5/6 ethernet) drops requested: F.S 788 and L.W.S 83

Serial drops requested: F.S. 788

IRIG-B drops (BNC coax connector) requested: F.S. 788 (in absence of network time server)

Vacuum/exhaust/ emergency dump lines:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Flow rate, slpm** | **Line pressure, Torr** | **Pump type** | **Trace gas concentration(s)** |
| 1. SO2 diaphragm pump | 5 std-l/min | atmospheric | diaphragm | 20 ppbv SO2 |
| 2. |  |  |  |  |
| 3. |  |  |  |  |
| 4. |  |  |  |  |

Ground gas service lines (number, location, type of service):

One ¼” line from Sta.6 to freefall chute for pure air (run in pre-flight)

Other gas lines (number, location, type of service):

Will you be sending data to the AOC data station? If so, please provide the following information: **No**

|  |  |  |
| --- | --- | --- |
| **Parameter name** | **Voltage range** | **Unit conversion** |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |

**8. Aircraft access**

**a. flight days:**

Pre-flight time requested at aircraft (hours): 2 hrs

Routine pre-flight ground support required?

(stands, ladders, forklifts, covers, external equipment, etc.)

inlet cover removal; ladder Sta. 5 window

Routine post-flight time requested at aircraft (hours): 1.0 hr

inlet cover replacement; ladder Sta. 5 window

Routine post-flight ground support required?

(stands, ladders, forklifts, covers, external equipment, etc.)

**b. non-flight days:**

Routine external access to inlets or zenith mounts required?

(please describe location, how often, for how long, type of ground support equipment needed, weather constraints, etc.)

refill compressed gas bottles in pod at Sta.12, ~50 flight hours

*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:

SO2: periodic in-situ calibration consisting of 60 s instrument zero on 20 min period; 60 s sensitivity by std. addition on 40 min period. All altitudes necessary to determine pressure dependence.

CO: periodic in-flight calibration consisting of 40 second instrument zero on 15 minute period; 40 second sensitivity by std. addition on 30 minute period.

Briefly describe instrument sensitivity to flight conditions:

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

SO2: potential of aspirating liquid water in clouds

**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.)

Compressed N2 gas to Sta. 12 / L.W.S. 83 pod postflight.

*2. Fabrication and sheet metal support:* Please describe fully any anticipated requests for fabrication or sheet-metal support during installation in Tampa. This list should be kept to an absolute minimum; please recognize that this superb AOC resource is quite limited. To ease the strain on the AOC shop, we will work with each PI to ensure they arrive in Tampa with as much in hand as possible.

*3. Ferry flight/check flight procedures.* On occasion, AOC will perform an aircraft check flight, during which the instruments may be flown without power. Aircraft maintenance needs may also dictate a ferry flight without science crew or SED techs on board. Instruments should be designed with these eventualities in mind. However, if your instrument requires standby power during this kind of flight, this may be provided at the discretion of AOC personnel.

If so, the flight crew will need to be briefed well ahead of time to ensure proper instrument operation. Please provide with this document a bare-minimum checklist of instrument startup and shutdown procedures requested for these flights.

**III. Ground laboratory space**

**1. Tampa space requests**:

Power requirements: 60 Hz / 1A

Special requests:

**2. Field space requests**:

Workspace, ft2: 12 sq. ft.

Number of tables/chairs: 1 chair, access to table space

Power requirements: 60 Hz / 1A

Storage space, ft2: 12 sq. ft

Other requests: soft music / mood lighting