**I. General information:**

1. Mission name: **SONGNEX 2015**

2. Instrument name: ACES (Airborne Cavity Enhanced Spectrometer)

3. What is measured: Glyoxal (CHOCHO), Nitrogen dioxide (NO2)

4. Short description of measurement technique:

Cavity enhanced spectroscopy using light emitting diodes, a grating spectrometer and a CCD for spectrally resolved measurements of optical extinction from 420- 470 nm with 0.5 nm resolution. Both NO2 and CHOCHO have structured electronic absorption bands in this region.

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. Kyle Zarzana | [kyle.zarzana@noaa.gov](mailto:kyle.zarzana@noaa.gov) |  |  |
| 2. Rebecca A. Washenfelder | [rebecca.washenfelder@noaa.gov](mailto:rebecca.washenfelder@noaa.gov) | 303 497 4810 | 619 507 2510 |
| 3. William P. Dubé | [william.p.dube@noaa.gov](mailto:william.p.dube@noaa.gov) | 303 497 3933 | 303 859 1592 |
| 4. Steven S. Brown | [steven.s.brown@noaa.gov](mailto:steven.s.brown@noaa.gov) | 303 497 6306 | 303 261 2265 |
|  |  |  |  |

**II. Specific information:**

**1. Total installed weight: 334.0 lbs**

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

|  |  |  |
| --- | --- | --- |
| **Rack weight and balance info** | **Allowed** | **Actual** |
| Weight, lbs.: | 262.5 | 250 |
| Overturning moment, in-lbs.: | 7875 | 4400 |

**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://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. ACES Rack | Floor mount, Sta 6b | 250 |
| 2. Zero Air Cylinder | Floor mount, Sta 6b | 35 |
| 3. He Cylinder | Floor mount, Sta 6b | 35 |
| 4. Inlet | Sta 6b Window | 6 |
| 5. Window Plate | Sta 6b Window | 8 |
| 6. |  |  |

**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. ACES Rack | Sta 6b |  | 10 |  |  |  |
| 2. |  |  | 15(start) |  |  |  |
| 3. |  |  |  |  |  |  |
| 4. |  |  |  |  |  |  |
| 5. |  |  |  |  |  |  |
| 6. |  |  |  |  |  |  |
| 7. |  |  |  |  |  |  |
| 8. |  |  |  |  |  |  |
| 9. |  |  |  |  |  |  |
| 10. |  |  |  |  |  |  |
| 11. |  |  |  |  |  |  |
| 12. |  |  |  |  |  |  |
|  | **Totals:** |  | 10 |  |  |  |
|  |  | **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. ACES Winglet | Sta 6b Window | 4” |
| 2. ACES Static port | Sta 6b Window | ¼” |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. |  |  |

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

|  |  |
| --- | --- |
| **Pump name** | **Location name and flight station** |
| 1. ACES Vacuum | Sta 6b |
| 2. |  |
| 3. |  |
| 4. |  |
| 5. |  |
| 6. |  |

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

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

**A. Lasers** None

**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** | **3** | **4** | **5** |
| Gas description | Zero Air | He |  |  |  |
| Mixing ratio | na | 100% |  |  |  |
| Cylinder size (ft3) | 67 | 67 |  |  |  |
| Max pressure (psig) | 2216 | 2216 |  |  |  |
| # installed on aircraft | 1 | 1 |  |  |  |
| Location on aircraft | Sta 6b | Sta 6b |  |  |  |
| Service frequency | 1 flt | 1 / 4 flt |  |  |  |
| *toxic/flammable gases:* |  |  |  |  |  |
| In containment vessel? | na | na |  |  |  |
| Gas alarm provided? |  |  |  |  |  |
| MR if vented to cabin, ppmv |  | 1.6% |  |  |  |
| OSHA 8-hr PEL, ppmv |  | na |  |  |  |
| 30-min IDLH, ppmv |  | na |  |  |  |

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Chemical number:** | **1** | **2** | **3** | **4** | **5** | **6** |
| Concentration | 40% Glyoxal Solution |  |  |  |  |  |
| Amount | 0.005 kg |  |  |  |  |  |
| Container description | 1=Glass 2=Metal |  |  |  |  |  |
| Purpose | Cal. |  |  |  |  |  |
| Solution pH | na |  |  |  |  |  |
| Spill kit provided? | na |  |  |  |  |  |

**F. Cryogens:** None

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

**H. Motors**

Description: Vacuum Pump

Motor current draw : 1 Ø, 400 Hz, 1.9 A startup, 1.5 A running

Thermal interlock enabled? Yes

**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:

A Cat 5 cable from Sta 6b to the Galley would be helpful

Serial drops requested: 1

IRIG-B drops (BNC coax connector) requested: 0

Vacuum/exhaust/ emergency dump lines:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Flow rate, slpm** | **Line pressure, Torr** | **Pump type** | **Trace gas concentration(s)** |
| 1. |  |  |  |  |
| 2. |  |  |  |  |
| 3. |  |  |  |  |
| 4. |  |  |  |  |

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

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:

|  |  |  |
| --- | --- | --- |
| **Parameter name** | **Voltage range** | **Unit conversion** |
| 1. Glyoxal | 0-5 V | 1 V / ppbv |
| 2. |  |  |
| 3. |  |  |

**8. Aircraft access**

**a. flight days:**

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

Routine pre-flight ground support required? Access to wing to trim inlet tip

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

Routine post-flight ground support required? None

**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.)

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:

Two times per flight

5 to 10 minutes each

Level flight desired, no specific altitude required

Briefly describe instrument sensitivity to flight conditions:

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

None that we are aware of at this time

**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.)

Same as in-flight cal source

*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.

None anticipated at this time.

*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.

No start-up or shut-down required

**III. Ground laboratory space**

**1. Tampa space requests**:

Power requirements: Single phase, 120 VAC, 60 or 400 Hz

Special requests:

**2. Field space requests**:

Workspace, ft2: 50 ft2

Number of tables/chairs: 1 table, 3 chairs

Power requirements: Single phase, 120 VAC, 1 kW

Storage space, ft2: 50 ft2

Other requests: Vent line (1/4”) to outside

Support / rack / clamp adjacent to work space for cylinders