**MAIR-E PROJECT SAFETY ASSESSMENT**

**Participating instrument hazards, procedures, safety and training questionnaire**

**Instrument name:** \_\_methaneAIR\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Function (brief): \_\_**Measures methane and oxygen surface fluxes**\_\_**

**Principal Investigator: \_\_**Steven C. Wofsy**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Address, phone #: \_\_**24 Oxford St. Cambridge, MA 02138**\_\_\_\_\_\_\_**

**E-mail: \_\_**swofsy@g.harvard.edu**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instrument Operator(s): \_\_**Jonathan Franklin, Jacob Hawthorne, Julian Kostinek, Bruce Daube\_\_

**If COTS\*, list the manufacturer: \_\_**Headwall Photonics**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***\*COTS = Commercial Off The Shelf***

**List serial numbers of the instruments if applicable: \_\_\_\_**N/A**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**If the instrument is not COTS, please provide information requested below:**

**Designed by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Organization: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Contact: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Telephone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Built by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Organization: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Contact: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Describe general hazards, hazard warnings and safety features.** If COTS, please provide a copy of pages of the instruction manual that describe hazard warnings, safety features, and safety rules for the operation of the instrument. If not COTS or modified from COTS, provide the same materials produced by the instrument developer / modifier.

The instrument is passive, except for the cameras. The cameras were manufactured by Princeton Infrared Technologies, with part number 1280SCICAM. No hazards or warnings were identified. The power consumption is low, less than 30W, at 24VDC, and no batteries or other hazardous materials are present.

**Has the instrument wiring documentation been submitted to and approved** by the RAF Electrical Engineer / Electrical DER (Kurt Zrubek)? Yes

**Does the instrument contain, use, or produce:**

**Hazardous Chemicals: Flammable liquids and gases, Toxic materials and gases, Compressed gases:**

* 1. Have you had HazCom & GHS training? Yes
	2. Provide chemical inventory list and SDS for each chemical. Indicate chemicals used on the ground and onboard the aircraft. Add rows as necessary:

| **Chemical or compressed gas name** | **Quantity (or cylinder count)** | **Used on ground** | **Installed on aircraft** |
| --- | --- | --- | --- |
| Air, compressed | 1 80A |  | 1 |
|  |  |  |  |

* 1. You agree to bring, and will use proper PPE for hazards associated with your work. Yes
	2. All containers have complete, legible and compliant labels. Yes
	3. Is special storage or use needed – i.e. flammable cabinets, hoods, wet chemical facilities? No
	4. ***You must take all your chemicals back to your home institution after the project.***

**Radioactive materials: If you do not have Radioactive Materials skip this question. Otherwise list the following:** None

* 1. Isotope:
	2. Activity in Curies:
	3. How many devices:
	4. Fixed or sealed sources:
	5. Are the sources arriving separately or installed within equipment?
	6. Are your sources used on the aircraft or only for calibration in the lab?
	7. Has source transfer / transport been approved by your Radiation Safety Officer (RSO)?
	8. Has your RSO communicated with UCAR’s RSO? If not, initiate this communication.

**Other ionizing radiation:** None

 Only certain fixed/sealed sources are allowed on the UCAR license. Contact RAF Project Manager or UCAR RSO for more info.

**Radar: None**

Describe safety measures and procedures to control personnel exposure.

**Explosive materials:** None

Requires special consideration and process. Contact RAF project manager to discuss.

**Non-ionizing radiation:** None

Identify any sources, specify training you and your personnel have, and describe safety procedures required for other project participants when working near your instrument.

**Lasers: provide the following information for each of your lasers, unless they are fully enclosed inside the instrument and will never be exposed during the project:** None

* 1. Type:
	2. Class:
	3. Wavelength:
	4. Power:
	5. Manufacturer and model:
	6. Pulsed:
	7. Electrical hazards such as High Voltage / Current:
	8. Laser Generated Air Contaminates:
	9. Compressed Gases or Cryogenic Liquids:
	10. Fire Ignition Sources:
	11. Other hazardous associated such as chemicals, dyes or solvents:
	12. Please provide a description of the control measure for any of the listed hazards:
		1. Any required laser eyeware needed:
		2. A Temporary Laser Control Area needed for maintenance or alignment:
		3. If your laser will be operating at a wavelength that is not eye safe, what procedures must be established to minimize the danger to yourself and other project participants?

**Compressed Gases:**

* 1. All gas cylinders, including rack-mounted small bottles, must have current DOT certification. Noted
	2. Do you have flammable gases? No Specify quantity you intend to bring. None
	3. Do you have toxic gases? No
	4. Is a containment vessel required? Does it meet design specifications and criteria for aircraft use? Not required
	5. How many gas cylinders will you be bringing? 1
	6. Will you be transporting these or will a vendor be delivering? We will bring it.
	7. Be prepared to separate the gases per hazard classification upon arrival.
	8. Will you be re-filling any compressed gas cylinders, either at RMMA or during the field deployment? No
	9. If you are using compressed gas cylinders, what is the maximum pressure expected for each cylinder type? 2000 psig

**If your experiment consumes or discharges materials, will you need to carry additional materials on board? If No, skip to next question. No**

* 1. What and how much extra materials will you need to carry? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. What kind of container will you need to carry these materials? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Are there any other hazards associated with the instrument itself, the required ground support equipment or any other device or procedure not addressed above?** No

**Do you and your personnel have the required safety training addressing your instrument’s specific hazards?** Yes

**Do your instrument’s hazards require other project personnel to be specifically trained to safely work in the vicinity of your instrument?** No

**How would you describe the probability of an accident resulting from the presence and use of your instrument on board the NCAR aircraft?** Very low probability.

**How would you describe the possible severity of such an accident?** Not severe.

**What precautions will you take to decrease the probability and the severity of an accident? If any documented safety procedures from your home facility or university are available, please attach a copy of these materials to this form.** The most hazardous component is the compressed gas cylinder. It will be transported carefully with the cap installed, and will be securely mounted in the aircraft before removing the cap. The regulator and plumbing will be oriented to avoid any sort of obstruction.

This page will need to be signed once the responsible persons arrive at RAF.

This document can be submitted electronically without signatures in advance of the project.

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Signature of principal investigator or operator Date

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Printed name of principal investigator or operator

Reviewed by

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature of RAF project manager Date

☐ Check this box if further review of these instrument hazards by a NCAR safety expert is requested.

Please describe the reason for further review. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Signature of reviewer Date