Risk Assessment
Safety Plan

I. Project information:

Design of a Compact Pressure Sensor for use in Multi-Layer Insulation	1/20/2017
Name of Project	Date of submission

Team Member	Phone Number	e-mail
Sebastian Bellini	786-838-9106	sab13j@my.fsu.edu
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Faculty mentor	Phone Number	e-mail
Dr. Wei Guo	850-644-3980	wguo@magnet.fsu.edu

II. Project description:

Design a minimally invasive pressure sensor to determine the interstitial pressure between layers of MLI. The sensor must take one sample per second and have a reading range from 10^{-2} Pa to 101 kPa. Due to space being a vacuum, heat cannot dissipate similar to earth therefore the sensor must produce minimal heat. The additional requirements are that the sensor has minimal wiring and minimizes power consumption.

II. Describe steps from project initiation to completion:

The first steps were research into different nano-pressure sensors followed by generating design concepts. Once, three designs were produced, a decision matrix was used to determine the best two sensors. A large scale prototype of the designs will be created and tested in a vacuum chamber in order to simulate the environment the sensor will be working in. It is expected that there will be some degree of cryogenic testing involved to mimic the low temperatures in space.

III. Given that many accidents result from an unexpected reaction or event, go back through the steps of the project and imagine what could go wrong to make what seems to be a safe and well-regulated process turn into one that could result in an accident. (See examples)

Creating of Design: Cutting machinery, unsafe temperatures, electricity, chemicals, low pressures, electrical fire

Testing of Designs: Fluctuating pressure, electricity, electrical fire

IV. Perform online research to identify any accidents that have occurred using your materials, equipment or process. State how you could avoid having this hazardous situation arise in your project.

An injury that occurred while using a pressure chamber was that an employee did not allow for the pressure to be released before attempting to unscrew a nut. Thus the container exploded open injuring the employee. This could be avoided by properly allowing for the pressurized chamber to depressurize before opening and can be verified by checking the associated pressure sensors.

Link for incident: (https://www.osha.gov/pls/imis/accidentsearch.accident_detail?id=200651024)

V. For each identified hazard or "what if" situation noted above, describe one or more measures that will be taken to mitigate the hazard. (See examples of engineering controls, administrative controls, special work practices and PPE).

We are unsure if the creation of the design will be outsourced. If so, we as a group won't be at any risk. If the design is created by us then the following precautions will be used:

Cutting machinery: Gloves and goggles will be used as all times. Someone will supervise during use of the tool while someone with experience uses the tool. A blood circle will be made around the user to prevent the harm of 3rd party members.

Unsafe Temperatures: Heat resistant gloves, long sleeve shirt and pants will be used will handling the material. Also anyone not Wearing PPE (Personal Protective Equipment) will not be allowed in the vicinity. Supervision will be used at all times.

Electricity: Insulated gloves will be used while the user is grounded. Supervision will be used as well (also wearing PPE).Goggles will be used as well. The electricity used should not be more than household outlet, thus PPE will be sufficient equipment.

Electrical fire: a class C fire extinguisher will be used using the following method. Pointing at the base of the fire, squeeze the trigger, and sweep the base of the fire.

Low Pressures: A minimum of 10 feet will be kept from the sensor during the low pressure stages. A blast shield can also be used in order to prevent damage for if the sensor ruptures.

During testing of the design the following steps will be taken place:

Fluctuating Pressures: The pressure sensor will be placed 10 feet away from the experimenters during the test, as well as a blast shield like material can be placed around sensor.

Electricity: similar measures will be used as when dealing with electricity during the construction phase.

Electrical Fire: similar measures will be used as when dealing with electrical fire during the construction phase.

If, at any moment, an incident were to occur, 911 will be contacted immediately while the injured team member's injuries are tended to.

VI. Rewrite the project steps to include all safety measures taken for each step or combination of steps. Be specific (don't just state "be careful").

During the construction phase, proper equipment (thermos-insulated gloves, electrically insulated gloves, goggles, long sleeve shirt and pants) will be used when building the sensor. During the test run to see if sensor can withstand the pressure changes, a blast shield will be set up and tested more than 10 feet away from the experimenters. Following the construction phase, the testing phase will continue and possesses just as much risk as the construction phase. In order to prevent any injuries, proper PPE will be used, a blast shield will be set up and a Class C fire extinguisher will be handy in case of any unforeseen incident. Before moving the sensor, the pressure will be carefully released using a remote switch.

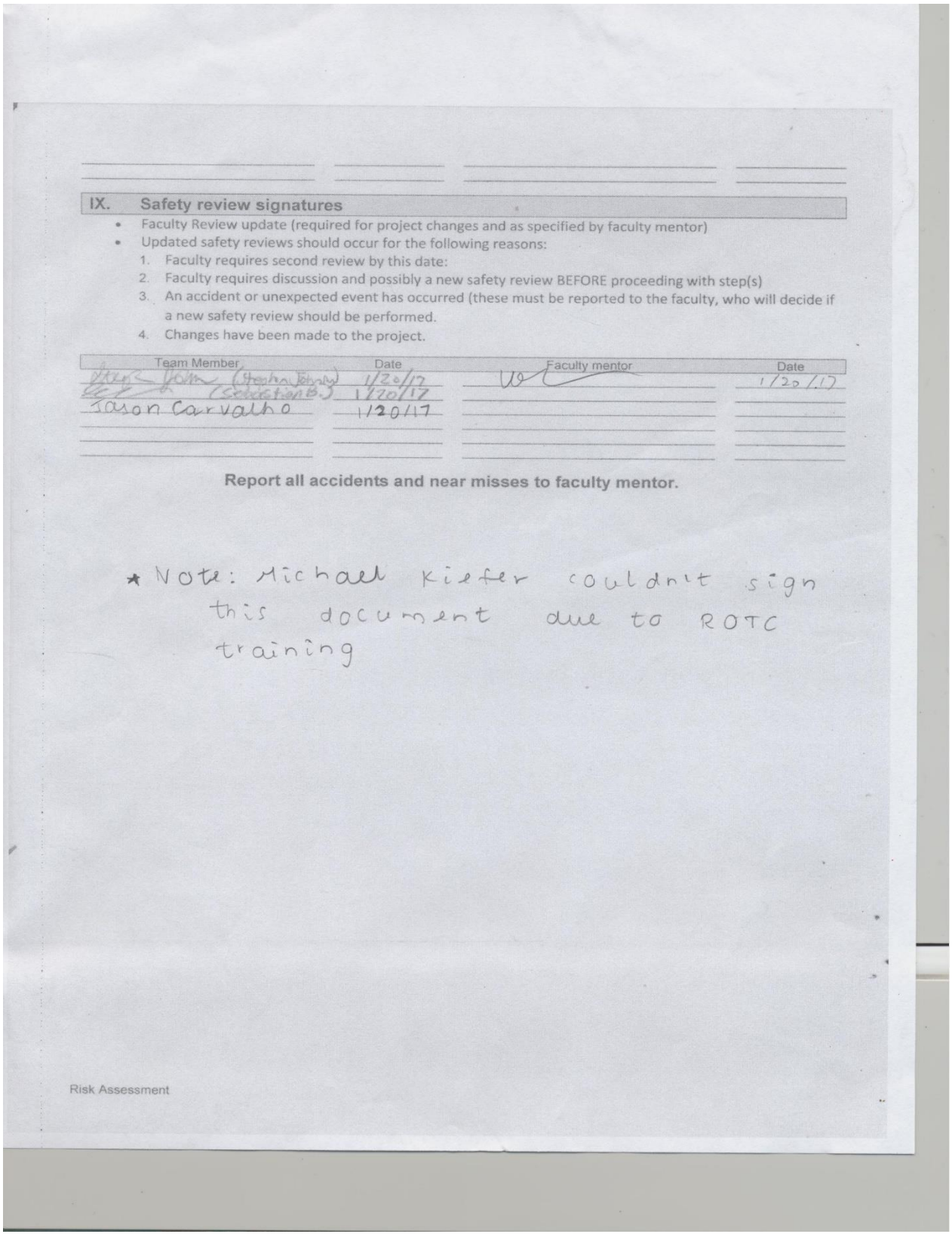
VII. Thinking about the accidents that have occurred or that you have identified as a risk, describe emergency response procedures to use.

If anything where to happen, members will divide into different tasks. One member will call 911 if situation is critical while the other members tend to the injured member. After the injury, that member will be looked at by one of the parents, who is a nurse. Dr. Guo will always be contacted following any injury that may occur. As a group, we will then assess how the incident occurred and develop future measures or actions that can be taken to prevent further accidents.

VIII. List emergency response contact information:

- Call 911 for injuries, fires or other emergency situations
- Call your department representative to report a facility concern

Name	Phone Number	Faculty or other COE emergency contact	Phone Number



IX. Safety review signatures

- Faculty Review update (required for project changes and as specified by faculty mentor)
- Updated safety reviews should occur for the following reasons:
  1. Faculty requires second review by this date:
  2. Faculty requires discussion and possibly a new safety review BEFORE proceeding with step(s)
  3. An accident or unexpected event has occurred (these must be reported to the faculty, who will decide if a new safety review should be performed.
  4. Changes have been made to the project.

Team Member	Date	Faculty mentor	Date
[illegible]	1/20/17	[signature]	1/20/17
[illegible]	1/20/17		
Jason Carvalho	1/20/17		

Report all accidents and near misses to faculty mentor.

★ Note: Michael Kiefer couldn't sign this document due to ROTC training

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