**FAMU-FSU College of Engineering**

**Project Hazard Assessment Policy and Procedures**

**INTRODUCTION**

University laboratories are not without safety hazards. Those circumstances or conditions that might go wrong must be predicted and reasonable control methods must be determined to prevent incident and injury. The FAMU-FSU College of Engineering is committed to achieving and maintaining safety in all levels of work activities.

**PROJECT HAZARD ASSESSMENT POLICY**

Principal investigator (PI)/instructor are responsible and accountable for safety in the research and teaching laboratory. Prior to starting an experiment, laboratory workers must conduct a project hazard assessment (PHA) to identify health, environmental and property hazards and the proper control methods to eliminate, reduce or control those hazards. PI/instructor must review, approve, and sign the written PHA and provide the identified hazard control measures. PI/instructor continually monitor projects to ensure proper controls and safety measures are available, implemented, and followed. PI/instructor are required to reevaluate a project anytime there is a change in scope or scale of a project and at least annually after the initial review.

**PROJECT HAZARD ASSESSMENT PROCEDURES**

It is FAMU-FSU College of Engineering policy to implement followings:

1. Laboratory workers (i.e. graduate students, undergraduate students, postdoctoral, volunteers, etc.) performing a research in FAMU-FSU College of Engineering are required to conduct PHA prior to commencement of an experiment or any project change in order to identify existing or potential hazards and to determine proper measures to control those hazards.
2. PI/instructor must review, approve and sign the written PHA.
3. PI/instructor must ensure all the control methods identified in PHA are available and implemented in the laboratory.
4. In the event laboratory personnel are not following the safety precautions, PI/instructor must take firm actions (e.g. stop the work, set a meeting to discuss potential hazards and consequences, ask personnel to review the safety rules, etc.) to clarify the safety expectations.
5. PI/instructor must document all the incidents/accidents happened in the laboratory along with the PHA document to ensure that PHA is reviewed/modified to prevent reoccurrence. In the event of PHA modification a revision number should be given to the PHA, so project members know the latest PHA revision they should follow.
6. PI/instructor must ensure that those findings in PHA are communicated with other students working in the same laboratory (affected users).
7. PI/instructor must ensure that approved methods and precautions are being followed by :
	1. Performing periodic laboratory visits to prevent the development of unsafe practice.
	2. Quick reviewing of the safety rules and precautions in the laboratory members meetings.
	3. Assigning a safety representative to assist in implementing the expectations.
	4. Etc.
8. A copy of this PHA must be kept in a binder inside the laboratory or PI/instructor’s office (if experiment steps are confidential).

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| **Project Hazard Assessment Worksheet** |
| PI/instructor: Dr. Shayne McConomy | Phone #: 850-410-6624 | Dept.: Mechanical | Start Date: 11/30/2020 | Revision number: 1 |
| Project: Team 517: Lunar Landing Payload Crane | Location(s): FAMU FSU College of Engineering (COE), FSU Innovation Hub, NASA Marshal Center Marshall Space Flight Center, Martin Rd SW, Huntsville, AL 35808 |
| Team member(s): Jayson Dickinson, Alanna Black, Christina Morrow, Ryker Mullinix | Phone #: 980-229-8889 | Email: jpd15e@my.fsu.edu |

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| **Experiment Steps**  | **Location** | **Person assigned** | **Identify hazards or potential failure points** | **Control method**  | **PPE** | **List proper method of hazardous waste disposal, if any.** | **Residual Risk** | **Specific rules based on the residual risk** |
| Wiring/Soldering | COE Mechatronics Lab | Ryker Mullinix | Electrocution,Burns,Hazardous Fume Inhalation | Multimeter for current testing. Manufacturer Specifications will be noted and followed. Multisim or other program may  | SafetyGlasses, Fume Fan | Soldering waste will be properly disposed of in the mechatronics lab.  | HAZARD:3CONSEQ:Significant  | A written Project Hazard Control is required and must be approved by the PI before proceeding. A copy must be sent to the Safety Committee before proceeding. A second worker must be in place before work can proceed (buddy system). Limit the number of authorized workers in the hazard area. |
| Residual:Medium |
| Cutting/Drilling Plywood/Aluminum | COE Machine Shop | Ryker Mullinix  | Cuts, Splinters, Dust Inhalation | Most metalwork will be done by the machine shop. Minor metalwork will be done in the senior design lab. Power Tools used for plywood processing by team members will have blade guards if applicable. | Work Gloves,SafetyGlasses, Respirator, Ear Protection | N/A | HAZARD:3 CONSEQ:Significant  | After approval by the PI, a copy must be sent to the Safety Committee. A written Project Hazard Control is required and must be approved by the PI before proceeding. A copy must be sent to the Safety Committee before proceeding. A second worker must be in place before work can proceed (buddy system). Limit the number of authorized workers in the hazard area |
| Residual:Medium |
| Coding and CAD | Remote | Christina Morrow | Eye strain, Carpal Tunnel,  | After every 20 mins of screen time, look away from screen for 20 seconds to reduce eye strain. After every hour of repetitive computer mouse work gently stretch hands and wrists. | N/A | N/A | HAZARD:1 CONSEQ:Negligible | Safety controls are planned by both the worker and supervisor. Proceed with supervisor authorization. |
| Residual:Low |
| 3D Printing  | Innovation Hub | Jayson Dickinson | Hazardous Fume Inhalation, Burns | Innovation hub rules/policies will be followed. | N/A | N/A | HAZARD:1 CONSEQ:Negligible | Safety controls are planned by both the worker and supervisor. Proceed with supervisor authorization. |
| Residual:Low |
| Laser Cutting | Innovation Hub | Alanna Black | Immediate skin hazard and eye hazard from exposure to either the direct or reflected beam; may also present a fire hazard (OSHA). | Innovation hub rules/policies will be followed. | Eye Protection | N/A | HAZARD:3 CONSEQ:Significant | After approval by the PI, the Safety Committee and/or EHS must review and approve the completed PHA. A written Project Hazard Control is required and must be approved by the PI and the Safety Committee before proceeding. Two qualified workers must be in place before work can proceed. Limit the number of authorized workers in the hazard area. |
| Residual:Med High |

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| Lander/ARROW Demonstration Transportation | NASA Marshal Center | Christina Morrow | Lifting Heavy Objects, Crushed Appendages | Objects over 20 lbs. will be a two-person lift. | N/A | N/A | HAZARD:1 CONSEQ:Moderate | Safety controls are planned by both the worker and supervisor. A second worker must be in place before work can proceed (buddy system). Proceed with supervisor authorization. |
| Residual:Low Med |
| Lander/ARROW Demonstration Assembly | COE | Alanna Black | Lifting Heavy Objects, Crushed Appendages, Cuts | Objects over 20 lbs. will be a two-person lift. | N/A | N/A | HAZARD:1 CONSEQ:Moderate | Safety controls are planned by both the worker and supervisor. A second worker must be in place before work can proceed (buddy system). Proceed with supervisor authorization. |
| Residual:Low Med |

**Principal investigator(s)/ instructor PHA:** I have reviewed and approved the PHA worksheet.

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| **Name** | **Signature** | **Date** | **Name** | **Signature** | **Date** |
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**Team members:** I certify that I have reviewed the PHA worksheet, am aware of the hazards, and will ensure the control measures are followed.

**Name Signature Date**

Alanna Black:  12/3/20

Jayson Dickinson:  12/3/20

Christina Morrow:  12/3/20

Ryker Mullinix:  12/3/20

 **DEFINITIONS**:

**Hazard:** Any situation, object, or behavior that exists, or that can potentially cause ill health, injury, loss or property damage e.g. electricity, chemicals, biohazard materials, sharp objects, noise, wet floor, etc. OSHA defines hazards as “*any source of potential damage, harm or adverse health effects on something or someone".* A list of hazard types and examples are provided in appendix A.

**Hazard control:** Hazard control refers to workplace measures to eliminate/minimize adverse health effects, injury, loss, and property damage. Hazard control practices are often categorized into following three groups (priority as listed):

1. **Engineering control:** physical modifications to a process, equipment, or installation of a barrier into a system to minimize worker exposure to a hazard. Examples are ventilation (fume hood, biological safety cabinet), containment (glove box, sealed containers, barriers), substitution/elimination (consider less hazardous alternative materials), process controls (safety valves, gauges, temperature sensor, regulators, alarms, monitors, electrical grounding and bonding), etc.
2. **Administrative control:** changes in work procedures to reduce exposure and mitigate hazards. Examples are reducing scale of process (micro-scale experiments), reducing time of personal exposure to process, providing training on proper techniques, writing safety policies, supervision, requesting experts to perform the task, etc.
3. **Personal protective equipment (PPE):** equipment worn to minimize exposure to hazards. Examples are gloves, safety glasses, goggles, steel toe shoes, earplugs or muffs, hard hats, respirators, vests, full body suits, laboratory coats, etc.

**Team member(s):** Everyone who works on the project (i.e. grads, undergrads, postdocs, etc.). The primary contact must be listed first and provide phone number and email for contact.

**Safety representative:** Each laboratory is encouraged to have a safety representative, preferably a graduate student, in order to facilitate the implementation of the safety expectations in the laboratory. Duties include (but are not limited to):

* Act as a point of contact between the laboratory members and the college safety committee members.
* Ensure laboratory members are following the safety rules.
* Conduct periodic safety inspection of the laboratory.
* Schedule laboratory clean up dates with the laboratory members.
* Request for hazardous waste pick up.

**Residual risk:** Residual Risk Assessment Matrix are used to determine project’s risk level. The hazard assessment matrix (table 1) and the residual risk assessment matrix (table 2) are used to identify the residual risk category.

The instructions to use hazard assessment matrix (table 1) are listed below:

1. Define the workers familiarity level to perform the task and the complexity of the task.
2. Find the value associated with familiarity/complexity (1 – 5) and enter value next to: HAZARD on the PHA worksheet.

**Table 1. Hazard assessment matrix.**

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|  | **Complexity** |
| Simple | Moderate | Difficult |
| **Familiarity Level** | Very Familiar | 1 | 2 | 3 |
| Somewhat Familiar | 2 | 3 | 4 |
| Unfamiliar | 3 | 4 | 5 |

The instructions to use residual risk assessment matrix (table 2) are listed below:

1. Identify the row associated with the familiarity/complexity value (1 – 5).
2. Identify the consequences and enter value next to: CONSEQ on the PHA worksheet. Consequences are determined by defining what would happen in a worst case scenario if controls fail.
	1. Negligible: minor injury resulting in basic first aid treatment that can be provided on site.
	2. Minor: minor injury resulting in advanced first aid treatment administered by a physician.
	3. Moderate: injuries that require treatment above first aid but do not require hospitalization.
	4. Significant: severe injuries requiring hospitalization.
	5. Severe: death or permanent disability.
3. Find the residual risk value associated with assessed hazard/consequences: Low –Low Med – Med– Med High – High.
4. Enter value next to: RESIDUAL on the PHA worksheet.

**Table 2. Residual risk assessment matrix.**

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| **Assessed Hazard Level** | **Consequences** |
| Negligible | Minor | Moderate | Significant | Severe |
| 5 | Low Med | Medium | Med High | High | High |
| 4 | Low | Low Med | Medium | Med High | High |
| 3 | Low | Low Med | Medium | Med High | Med High |
| 2 | Low | Low Med | Low Med | Medium | Medium |
| 1 | Low | Low | Low Med | Low Med | Medium |

**Specific rules for each category of the residual risk:**

Low:

* Safety controls are planned by both the worker and supervisor.
* Proceed with supervisor authorization.

Low Med:

* Safety controls are planned by both the worker and supervisor.
* A second worker must be in place before work can proceed (buddy system).
* Proceed with supervisor authorization.

Med:

* After approval by the PI, a copy must be sent to the Safety Committee.
* A written Project Hazard Control is required and must be approved by the PI before proceeding. A copy must be sent to the Safety Committee.
* A second worker must be in place before work can proceed (buddy system).
* Limit the number of authorized workers in the hazard area.

Med High:

* After approval by the PI, the Safety Committee and/or EHS must review and approve the completed PHA.
* A written Project Hazard Control is required and must be approved by the PI and the Safety Committee before proceeding.
* Two qualified workers must be in place before work can proceed.
* Limit the number of authorized workers in the hazard area.

High:

* The activity will not be performed. The activity must be redesigned to fall in a lower hazard category.

**Appendix A: Hazard types and examples**

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| **Types of Hazard** | **Example** |
| Physical hazards  | Wet floors, loose electrical cables objects protruding in walkways or doorways |
| Ergonomic hazards  | Lifting heavy objects Stretching the bodyTwisting the bodyPoor desk seating |
| Psychological hazards  | Heights, loud sounds, tunnels, bright lights |
| Environmental hazards  | Room temperature, ventilation contaminated air, photocopiers, some office plants acids |
| Hazardous substances  | Alkalis solvents |
| Biological hazards  | Hepatitis B, new strain influenza |
| Radiation hazards | Electric welding flashes Sunburn |
| Chemical hazards  | Effects on central nervous system, lungs, digestive system, circulatory system, skin, reproductive system. Short term (acute) effects such as burns, rashes, irritation, feeling unwell, coma and death.Long term (chronic) effects such as mutagenic (affects cell structure), carcinogenic (cancer), teratogenic (reproductive effect), dermatitis of the skin, and occupational asthma and lung damage. |
| Noise  | High levels of industrial noise will cause irritation in the short term, and industrial deafness in the long term. |
| Temperature  | Personal comfort is best between temperatures of 16°C and 30°C, better between 21°C and 26°C.Working outside these temperature ranges: may lead to becoming chilled, even hypothermia (deep body cooling) in the colder temperatures, and may lead to dehydration, cramps, heat exhaustion, and hyperthermia (heat stroke) in the warmer temperatures. |
| Being struck by  | This hazard could be a projectile, moving object or material. The health effect could be lacerations, bruising, breaks, eye injuries, and possibly death. |
| Crushed by  | A typical example of this hazard is tractor rollover. Death is usually the result |
| Entangled by  | Becoming entangled in machinery. Effects could be crushing, lacerations, bruising, breaks amputation and death. |
| High energy sources  | Explosions, high pressure gases, liquids and dusts, fires, electricity and sources such as lasers can all have serious effects on the body, even death. |
| Vibration  | Vibration can affect the human body in the hand arm with `white-finger' or Raynaud's Syndrome, and the whole body with motion sickness, giddiness, damage to bones and audits, blood pressure and nervous system problems. |
| Slips, trips, and falls  | A very common workplace hazard from tripping on floors, falling off structures or down stairs, and slipping on spills. |
| Radiation | Radiation can have serious health effects. Skin cancer, other cancers, sterility, birth deformities, blood changes, skin burns and eye damage are examples. |
| Physical  | Excessive effort, poor posture and repetition can all lead to muscular pain, tendon damage and deterioration to bones and related structures |
| Psychological  | Stress, anxiety, tiredness, poor concentration, headaches, back pain and heart disease can be the health effects |
| Biological | More common in the health, food and agricultural industries. Effects such as infectious disease, rashes and allergic response. |

**Project Hazard Control- For Projects with Medium and Higher Risks**

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| **Name of Project:** Team 517: Lunar Landing Payload Crane | **Date of submission:** 12/04/2020 |
| **Team member** | **Phone number** | **e-mail** |
| Alanna Black | 904-627-6508 | anb16c@my.fsu.edu |
| Jayson Dickinson | 980-229-8889 | jpd15e@my.fsu.edu |
| Christina Morrow | 850-242-1603 | cjm18bn@my.fsu.edu |
| Ryker Mullinix | 850-797-8685 | rwm18c@my.fsu.edu |
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| **Faculty mentor** | **Phone number** | **e-mail** |
| Dr. Shayne McConomy | 850-410-6624 | smcconomy@eng.famu.fsu.edu |
| Dr. Eric Hellstrom | 850-645-7489 | hellstrom@asc.magnet.fsu.edu |
| **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”).** |
| The cutting and drilling of plywood as well as aluminum will be necessary in the creation of our ARROW and the Peregrine Lander model. This was decided to be a Medium risk and could result in dust inhalation, lacerations, contusions, splinters, and crushed appendages. The safety measures taken for this will involves proper training for different tools, PPE worn including gloves and goggles, and proper clothing will be worn. Cutting and drilling will take place outside of the FAMU-FSU College of Engineering, at one of the group member’s residence, and the area that will be worked in will be free of debris as well as have proper ventilation as well as have other members of the group present.Laser cutting of gears and other precise components will be performed by the Innovation Hub. This is another Medium High risk and has the potential for burns, lacerations, splinters, and damage to the user’s eyes. The Innovation Hub employees will monitor all laser cutting and will give any required training for use of the laser cutter. The team members will also follow other rules, including performing these tasks with a partner, wearing proper PPE regardless of the rules of the Innovation Hub, and will allow adequate time for parts to cool prior to removing them from the laser cutter.Wiring and soldering the electrical components of the ARROW has a Medium risk. The potential injuries include, but are not limited to electrocution, burns, and fume inhalation. To combat these risks, eyeglasses, masks, and non-loose clothing will be worn. A fan will be used to reduce the fumes, and all electrical equipment will be properly grounded prior to use. A partner will be present for all wiring/soldering, and no task will be done without getting approval from the Principal Investigator.The demonstration transportation and assembly are considered Low Medium risk. The safety measures involved in the transportation include obeying all traffic laws, wearing a seat belt, securely fastening the demonstration inside the vehicle so as to avoid shifting during relocation, and having a passenger in the car in the event of an emergency. The assembly of the demonstration can result in muscle strains, crushed appendages, lacerations, and contusions. As a result of this, gloves will be worn, and the demonstration will be carried by two team members to share the load. A supervisor will be called to authorize any relocations as well as oversee the assembly process to ensure that FAMU-FSU College of Engineering protocols are being followed. |
| **Thinking about the accidents that have occurred or that you have identified as a risk, describe emergency response procedures to use.** |
| * Remove the injured person from location of accident if safe to do so
* Call the appropriate authority (supervisor, FSUPD, 911, Poison Control dependent on severity and injury)
* Call emergency contact of injured person and inform them of incident
* Shut down/close off source of injury if possible, in a safe and controlled manner
* Isolate scene until the responding authority arrives
* Ensure responding authority has all necessary information on the situation and assist them however they may need
* Compose an accident report with all team members present following the conclusion of the incident
* Share accident report with Faculty supervisor or Principal Investigator
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| **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 | Member Name | Faculty or other COE emergency contacts | Phone number |
| **Kyle Prince** | **904-451-0795** | Alanna Black | Dr. Shayne McConomy | 850-410-6624 |
| **Hannah Patten** | **954-625-9837** | Jayson Dickinson | Donald Hollett | 850-410-6600 |
| **Michael Macedo** | **850-499-0052** | Ryker Mullinix | Sahar Mohammadi | 850-410-6623 |
| **Ernest Morrow** | **850-528-5914** | Christina Morrow | Jeremy Phillips | 850-410-6113 |
| **Safety review signatures**  |
| Team member  | Signature | Date | Faculty mentor |  | Date |
| Alanna Black |  | 12/3/20 |  |  |  |
| Jayson Dickinson | Inserting image... | 12/3/20 |  |  |  |
| Christina Morrow |  | 12/3/20 |  |  |  |
| Ryker Mullinix |  | 12/3/20 |  |  |  |
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| **Important Phone Numbers** |
| **FSUPD Non-Emergency Line** | **850-644-1234** |
| **Poison Control** | **800-222-1222** |
| **FSU Environmental Health and Safety** | **850-644-6895** |
| **Leon County First Responders Non-Emergency Line** | **850-606-5800** |

**Report all accidents and near misses to the faculty mentor.**