#### National Space Centre - Risk Assessment Form

#### General Risk Assessment Reference – G399

| **Location** | National Space Centre |
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| **Equipment or Activity to be assessed** | Whoosh Bottles |
| **Description of Activity** | The combustion of various alcohols is investigated using a large (around 18 litre), narrow-necked, polycarbonate container (as used in water coolers). The alcohol / air mixture in the bottle is ignited, resulting in a rapid combustion reaction, often accompanied by a ‘whoosh’ sound. |
| **Date of assessment** | 02/10/2024 |
| **Last review date (if applicable)** | 22/04/2024 |
| **Next review date** | October 2025 but earlier review date required following outcomes of accidents, absences and near misses, or changes to processes, work methods, materials, technology, equipment or legislation. |
| **Risk Assessment created by [name / date]** | Sophie Allan [02/10/2024] |
| **Authorised by Line Manager [name / date]** | Sophie Allan [02/10/2024] |
| **Authorised by Health and Safety Manager [name/ date]** | Katrina May Neve [02/10/2024] |

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| **What are the hazards?**  *Something with the potential to cause harm* | **Who might be harmed and how?** | **Control Measures**  *What is already in place to reduce the risk?* | **Additional Control Measures**  *What needs to be put in place to further reduce the risk?* | **Risk Rating**  *Refer to risk matrix below* | **Authorised by Health and Safety Manager** |
| Flammability of IMS | **Who**  Staff and students  **How**  Exposure to fire, exposure to smoke, unconsciousness, fatalities | Do not use near naked flames and ensure there is a suitable extinguisher. (*Extinguishers suitable for Class C Fires – Flammable Gases: Dry Powder / Class B Fires – Flammable Solids – CO2, Foam, Dry Powder)*  Please refer to SRA006 – The Whoosh Bottle Demonstration from CLEAPSS for further instruction. |  | Likelihood: 1  Severity: 5  Risk Rating: 5  [Low] | Katrina May Neve  Health and Safety Officer  [02/10/2024] |
| Injury due to shattering of the bottle | **Who**  Staff and students  **How**  Burns, scolds, cuts, bruises | The bottle to be used must be made out of polycarbonate and should state PC on the base on the bottle.  Students should be at least 2m away and behind a screen where possible.  Glass bottles or polycarbonate bottles that have signs of frosting, damage or cracking should not be used. |  | Likelihood: 1  Severity: 4  Risk Rating: 4  [Low] | Katrina May Neve  Health and Safety Officer  [02/10/2024] |
| Demonstration of the large whoosh bottle | **Who**  Demonstrator  **How**  Cuts, bruises, burns, scolds | Excess alcohol must be removed from the bottle before the mixture is ignited. If left in the bottle, the burning liquid could melt the plastic. Do not delay the ignition process.  Ignite splint that is attached to the end of a metre rule – keep at least 1m between demonstrator and bottle.  Any alcohol or methylated spirits must be wiped off the outside of the bottle.  The bottle must be placed on a stable base. Only use a laboratory base if the distance between the top of the bottle and the ceiling is greater than 2.5m  Check that there is nothing on the ceiling over the demonstration area that could be set alight.  Never add pure oxygen to the bottle, use alcohol / air mixtures only.  Wear eye protection to standard EN 166. It is recommended that students or those watching the demonstration also wear eye protection.  After rolling the bottle, the vapour pressure inside may cause alcohol to spray out when the stopper is removed. Take care to avoid spraying yourself or the audience. |  | Likelihood: 1  Severity: 4  Risk Rating: 4  [Low] | Katrina May Neve  Health and Safety Officer  [02/10/2024] |
| Small horizontal whoosh bottle along drainpipe | **Who**  **How** | Ignite using lit splint and ensure students are stood away from the bottle flight path and fire.  Check bottle flight path before setting up demonstration to ensure nothing will be damaged. Do not fire in the direction of a door in case someone walks in.  Demonstrator to distribute IMS to bottles putting lid on between bottles to prevent vapour trail.  Small amounts of IMS used so that if bottle falls it will burn out before it reaches the floor. |  | Likelihood: 1  Severity: 4  Risk Rating: 4  [Low] | Katrina May Neve  Health and Safety Officer  [02/10/2024] |

**Risk Rating Matrix**

**Risk = Likelihood of injury x Severity of injury**

**R = L x S**

**Low risk = 1 – 6, Medium risk = 8 - 12, High risk = 15 - 25**

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|  | | **S = Severity of injury** | | | | |
| **Minor injury or illness (1)** | **First aid injury or illness (2)** | **3-day injury or illness (3)** | **Major injury or illness (4)** | **Fatality, disabling injury, etc (5)** |
| **L = Likelihood of injury** | Very unlikely (1) | 1 = Low | 2 = Low | 3 – Low | 4 = Low | 5 = Low |
| Unlikely (2) | 2 = Low | 4 = Low | 6 = Low | 8 = Medium | 10 = Medium |
| Likely (3) | 3 = Low | 6 = Low | 9 = Medium | 12 = Medium | 15 = High |
| **Very likely (4)** | 4 = Low | 8 = Medium | 12 = Medium | 16 = High | 20 = High |
| **Almost certain (5)** | 5 = Low | 10 = Medium | 15 = High | 20 = High | 25 = High |

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|  | **Risk Rating Definitions and Guidelines** |
| **Low** | **Minor to no injury.**  This is an acceptable level of risk. No further controls are required as the risk rating cannot be reduced any further. However, it is advised continual monitoring occurs to ensure that no changes/deviation of control measures occur. |
| **Medium** | **An injury requiring further medical assistance or is a RIDDOR related incident.**  It is advised that further control measures are implemented to reduce the risk rating to a low a level as possible. If the risk cannot be reduced to lower than a medium, then on-site monitoring should occur to ensure that all stipulated controls are bring adhered to. |
| **High** | **Death, paralysis, long term serious ill health.**  This is an unacceptable risk rating. Urgent interim controls should be implemented to reduce the risk so far as is reasonably practicable. If the risk rating cannot be reduced to lower than high, then a documented safe system of work should be implemented to control the activity. It may be necessary to seek further professional advice. Serious consideration should be given to the validity of carrying out the activity at all. Regular Monitoring of the activity should occur. |