



Risk Assessment [Ref Number: 6502] - Live

Date Printed: Friday, 22 December 2023

Name	Building and Launching Model Rockets	Current Rating	Residual Rating
Location	Bentley Campus	Medium	Medium
Business Unit		Last Review Date	Risk Owner
School of Earth and Planetary Sciences (EPS)		4/12/2023	Meg Berry
Risk Assessment Team		Risk Approver	
Robert Howie (238682D@curtin.edu.au, 08 9266 3018) Meg Berry (295154G@curtin.edu.au)		Renae Sayers	
Additional Notes			
Describe task / use			
Adults and children will decorate and launch model rockets < 500g using solid rocket motors < 25g of propellant per motors.			



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Risk Factors

Risk Factor	Description
Environment / Hazardous area	<p>When retrieving a rocket, a person gets hit by an ascending or descending rocket</p> <ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- Yes• Fire/explosion -- No• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- No• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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Low	Low
Existing Controls	Proposed Controls
<ul style="list-style-type: none">• 3 - Isolation: Launching the rockets at an angle which launches them away from people standing behind the launchers (no more than 30 degrees from the vertical as per NAR guidelines)• 3 - Isolation: Mark area with min 3 warning signs• 5 - Administration: Launch controller shall not authorise a launch while anyone is in the launch area• 5 - Administration: Operate launch procedures as per the attached NAR Model Rocketry Code• 4 - Engineering: Rockets are equipped with parachute to control speed of descent.• 4 - Engineering: Employ a launch rod to guide rocket on takeoff to constrain flight trajectory to a predictable direction	



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Risk Factor	Environment / Hazardous area	Description
Fire or projectile hazard from storage of solid rocket motors		<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- Yes• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- No• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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<ul style="list-style-type: none">● 3 - Isolation: Avoid storage near extreme heat, ignition sources or open flame.● 4 - Engineering: Storage area should be secure, dry and well-ventilated.● 4 - Engineering: Protect from humidity and water.● 4 - Engineering: Store at 32-140 °F / 0-60 °C.● 4 - Engineering: Store rocket motors before use in a non metallic box or wood lined metallic box marked with the word "Explosives", in the back of a room, with a fire extinguisher immediately next to the door on entry into. Door to storage room to be marked with a DG diamond to denote flammable/explosives● 5 - Administration: In case of total fire ban, launch will be rescheduled	



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Risk Factor	Environment / Hazardous area	Description
Participant trips risk over wire between launch pad and launch control box.		<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- No• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- Yes• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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<ul style="list-style-type: none">• 5 - Administration: Participants will be warned to take care when placing their rocket on the launch pad and collecting their rocket after flight.• 4 - Engineering: Place cable cover/carpet over wire to lessen trip hazard	



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Risk Factor	Environment / Hazardous area	Description
Eye injury risk from impalement upon launch rod		<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- No• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- No• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- Yes



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<ul style="list-style-type: none">• 4 - Engineering: Install highly visible protective cap on top of launch rail until time of launch.• 5 - Administration: Caution participants of eye injury risks and instruct participants to take care when loading their rocket and installing the igniter.• 6 - Personal Protective Equipment (PPE): Participants to wear safety glasses when placing their rocket on launch rod	



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Risk Factor	Environment / Hazardous area	Description
	While designing + building a rocket, gets a cut from hobby knives or paper	<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- No• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- Yes• Slip trips falls -- No• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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<ul style="list-style-type: none">• 5 - Administration: If a student is found misbehaving they will be warned and excluded from the activity• 5 - Administration: Staff supervision• 5 - Administration: Staff supervising participants to have mobile phones. For life threatening emergencies Dial 000 from a mobile and contact Safer Community Team on 9266 4444.• 5 - Administration: At least one staff supervising participants to have current First Aid Training.	



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Risk Factor	Environment / Hazardous area	Description
Slipping on a wet surface due to paint spillage		<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- No• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- Yes• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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Low	Low
Existing Controls	Proposed Controls
<ul style="list-style-type: none">5 - Administration: Warning signs about slippery surface	



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Risk Factor	Description
Muscle injury while moving water bottles and tables/materials for rocket building	<ul style="list-style-type: none">• Moving heavy objects -- Yes• Ergonomic design -- No• Repetitive or sustained application of force -- No• Repetitive or sustained awkward posture -- No• Repetitive or sustained movement -- No• Application of high / sudden force -- No• Exposure to sustained vibration -- No• Handling of a person or an animal -- No• Handling of unstable or unbalanced loads -- No



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<ul style="list-style-type: none">● 5 - Administration: Using trolleys● 5 - Administration: Having two people move heavy items● 4 - Engineering: Instruct personnel on correct manual handling techniques	



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Entering controlled airspace		<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- No• Confined space -- No• Unauthorised access / activity -- Yes• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- No• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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Existing Controls	Proposed Controls
<ul style="list-style-type: none">4 - Engineering: Model rocket trajectory and conduct test flight ahead of on-campus rocket launches in an area with controlled airspace at a much higher altitude than the modelling predicts (Refer attached Perth VTC map).	



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Risk Factor	Vehicles / transport	Description
Rocket hits plane		<ul style="list-style-type: none">• Interaction of vehicles, cyclists, pedestrians -- Yes• Property damage -- No• Adverse Environmental impact -- No• Uncontrolled vehicle -- No• Unauthorised use -- No• Non-adherence to traffic laws -- No



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Medium	Medium																		
Existing Controls	Proposed Controls																		
<ul style="list-style-type: none">• 1 - Elimination: Do not launch rockets if plane flying overhead• 1 - Elimination: Do not launch rockets into clouds• 4 - Engineering: Model the trajectory (OpenRocket) and a check of the rocket weight before launch (to compare against a conservative simulation conducted by a staff member in OpenRocket). <p>Conduct test flight ahead of on-campus rocket launches in an area with controlled airspace at a much higher altitude than the modelling predicts (Refer attached Perth VTC map).</p> <ul style="list-style-type: none">• 4 - Engineering: Check flight radar prior to launch <p>https://ok2fly.com.au/?lat=-32.004454132167595&lon=115.88960004147253&map=street&zoom=14.34339938691478</p>	<table border="1"><thead><tr><th>Description</th><th>Responsibility</th><th>Target Date</th></tr></thead><tbody><tr><td>Do not launch rockets if plane flying overhead</td><td>Robert Howie</td><td>29/01/2024</td></tr><tr><td>Do not launch rockets into clouds</td><td>Robert Howie</td><td>29/01/2024</td></tr><tr><td>Model the trajectory (OpenRocket) and a check of the rocket weight before launch (to compare against a conservative simulation conducted by a staff member in OpenRocket).</td><td>Robert Howie</td><td>29/01/2024</td></tr><tr><td>Conduct test flight ahead of on-campus rocket launches in an area with controlled airspace at a much higher altitude than the modelling predicts (Refer attached Perth VTC map).</td><td></td><td></td></tr><tr><td>Check flight radar prior to launch</td><td>Robert Howie</td><td>29/01/2024</td></tr></tbody></table>	Description	Responsibility	Target Date	Do not launch rockets if plane flying overhead	Robert Howie	29/01/2024	Do not launch rockets into clouds	Robert Howie	29/01/2024	Model the trajectory (OpenRocket) and a check of the rocket weight before launch (to compare against a conservative simulation conducted by a staff member in OpenRocket).	Robert Howie	29/01/2024	Conduct test flight ahead of on-campus rocket launches in an area with controlled airspace at a much higher altitude than the modelling predicts (Refer attached Perth VTC map).			Check flight radar prior to launch	Robert Howie	29/01/2024
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Rocket motor or LiOn battery fire		<ul style="list-style-type: none">• Adverse environmental impact -- No• Diving -- No• Exposure to extreme cold, heat, temperatures -- No• Natural disaster – flood, storm, bush fire, earthquake -- No• Hit by falling object -- No• Fire/explosion -- Yes• Confined space -- No• Unauthorised access / activity -- No• Low oxygen / atmosphere/ asphyxiant / suffocation -- No• Adverse impact of noise / vibration -- No• Exposure to hazardous substance / materials -- No• Working/falling from heights -- No• Exposure to sharps -- No• Slip trips falls -- No• Digging -- No• Hot work -- No• Other high risk work -- No• Poor environmental characteristics / housekeeping -- No• Poor ergonomic design/ layout -- No• Medical incident / emergency -- No



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<ul style="list-style-type: none">4 - Engineering: Mitigate with either one type A fire extinguisher or a bucket of water and a bucket half full of sand	



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Risk Factor	Events	Description
Participant or staff exposure to extreme heat/UV		<ul style="list-style-type: none">• Alcohol and other drugs (e.g. service of alcohol, liquor license, intoxication, crowd control) -- No• Stall set up / performance (e.g. manual handling, slips/trips/ overcrowding, traffic flow) -- No• Food service (e.g. food poisoning, illness, allergies, local council permits and registrations) -- No• Medical incident / emergency -- No• Evacuations (e.g. unaware of procedures, access/egress, muster point procedures not in place) -- No• Fire safety (e.g. extinguishers, fire equipment, blanket) -- No• Lost children -- No• Security (e.g. personal theft, assault, money) -- No• Amenities (e.g. waste management, hygiene, toilets, washing facilities) -- No• Weather (e.g. poor weather, heat, cold, rain) -- Yes• Vehicle and pedestrian movements -- No• BBQs (e.g. Manual handling, gas leak, set up, burns) -- No• Activity specific (e.g. amusement rides, games, animals) -- No• Electrical (e.g. fire, trips, setup, testing/tagging, maintained equipment) -- No• Noise / vibration -- No• Contractors (e.g. Curtin approved contractor, risk assessment, licenses) -- No



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Medium	Medium									
Existing Controls	Proposed Controls									
<ul style="list-style-type: none">• 5 - Administration: Advise staff and participants to bring and fill their own water bottles and stay hydrated on launch day.• 6 - Personal Protective Equipment (PPE): Ensure staff and participants bring appropriate hat/clothing and wear sunscreen to protect from sunburn.	<table border="1"><thead><tr><th>Description</th><th>Responsibility</th><th>Target Date</th></tr></thead><tbody><tr><td>Advise staff and participants to bring and fill their own water bottles and stay hydrated on launch day.</td><td>Meg Berry</td><td>29/01/2024</td></tr><tr><td>Ensure staff and participants bring appropriate hat/clothing and wear sunscreen to protect from sunburn.</td><td>Meg Berry</td><td>29/01/2024</td></tr></tbody></table>	Description	Responsibility	Target Date	Advise staff and participants to bring and fill their own water bottles and stay hydrated on launch day.	Meg Berry	29/01/2024	Ensure staff and participants bring appropriate hat/clothing and wear sunscreen to protect from sunburn.	Meg Berry	29/01/2024
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Appendix

Documents Referenced

Estes Model Rocket Engines / Motors (\leq 30g propellant) Safety Data Sheet "Estes_Model_Rocket_Engines_Motors_Less_30.pdf"

Estes Green Eggs Model Rocket Instructions "007301.pdf"

<https://www.casa.gov.au/rules/regulatory-framework/casr/part-101-casr-unmanned-aircraft-and-rockets>

Civil Aviation Safety Regulations 1998

NAR Model Rocketry Safety Code

Perth Visual Terminal Chart (scanned low res - expires June 2024)

Perth Visual Terminal Chart Legend



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Risk Matrix Level

Low	Manage by documented routine processes and procedures, monitor periodically to determine situation changes which may affect the risk
Medium	A mitigation plan shall be developed. Control strategies are implemented and periodically monitored.
High	A mitigation plan shall be developed and authorised by area manager or supervisor to reduce the risk to as low as reasonably practicable.
Extreme	Immediate action required to reduce exposure. A detailed mitigation plan must be developed, implemented and monitored by senior management to reduce the risk to as low as reasonably practicable.

ATTACHMENTS