

# **NEW SOUTH WALES ROCKETRY ASSOCIATION INC. (NSWRA)**



## **POLICIES AND PROCEDURES**

October 2013

# POLICIES AND PROCEDURES

## Table of Contents

1.0	New South Wales Rocketry Association By-laws .....	3
1.1	Name.....	3
1.2	Purpose.....	3
1.3	Office holders .....	3
1.4	Duties of the Officers.....	3
1.5	Scheduling of meetings .....	4
1.6	Elections.....	4
1.7	Amendments .....	4
1.8	Removal of Officers.....	4
1.9	Committees .....	4
1.10	Incidents.....	4
2.0	New South Wales Rocketry Association - Launch Operations Safety Policy .....	5
3.0	General Guidelines for Model Rockets.....	6
4.0	General Guidelines for Members.....	9
4.1	Registration and Membership .....	9
4.2	Mid Power Accreditation.....	9
4.3	High Power Certification.....	9
4.4	Launching of High Power Rockets .....	9
4.5	Extra Requirements for launching High Power Rockets at Doonside.....	10
4.6	Guidelines for the use of electronic ejection charges .....	10
4.7	Members' responsibilities .....	11
4.8	Launch day procedure for members.....	11
5.0	Duties of the Launch Control Officer .....	13
6.0	Duties of the Range Safety Officer .....	13
7.0	Range Preparation / Setup Procedures.....	15
8.0	Emergency Procedures and Contact Numbers .....	16
9.0	Abbreviations and Definitions .....	16

## 1.0 New South Wales Rocketry Association By-laws

### 1.1 Name

The name of this organization shall be the New South Wales Rocketry Association. This is commonly abbreviated to NSWRA.

### 1.2 Purpose

It shall be the purpose of the NSWRA:

- to operate and maintain a rocket range based on NAR and TRA Safe Practices, and in accordance with local laws and regulations
- to promote safe model rocketry in NSW
- to hold meetings for the purpose of aiding and encouraging those interested in rocketry

### 1.3 Office holders

The administrative offices shall include President, Vice-President, Secretary, Treasurer and Senior Advisor. An individual may not hold two administrative offices except as an interim measure. The operational offices shall include the Launch Control Officer(s) and the Range Safety Officer(s). An individual may hold up to two operational offices and one administrative office. All officers must be current full members of the NSWRA.

### 1.4 Duties of the Officers

The duties of the officers shall be as follows:

#### ***President:***

- To call and preside over meetings, organize events, and to see that activities proceed in an orderly and timely manner,
- To ensure that launch range equipment is appropriate and available,
- To assign duties to officers and members where necessary,
- To approve all launch days based on landowner's approval, CASA notification, fire brigade notification (if required), and insurance coverage.

#### ***Vice-President:***

- To assist the President in administrative duties,
- To act as President in the absence of the President.

#### ***Secretary:***

- To assist the President in administrative duties,
- To take the minutes of the meetings, and to preside at meetings in the absence of the President and Vice-President.
- To conduct internal and external correspondence.

#### ***Treasurer:***

- To maintain finances and registrations, and to control disbursements and receipts.

#### ***Senior Advisor:***

- To advise officers and members on technical and organisational matters.

**Launch Control Officer:**

- To control launch activities on launch day. *Refer to 6.0 Duties of the Launch Control Officer.*

**Range Safety Officer:**

- To enforce safety and assist in procedures and technical matters on launch day. *Refer to 7.0 Duties of the Range Safety Officer.*

**1.5 Scheduling of meetings**

An Annual General Meeting shall be held between the commencement of the financial year (one year being July to June) and the 6 months following. Other meetings may be held at the discretion of the President as needed. Notification is to be provided to members at least seven (7) days in advance.

**1.6 Elections**

General elections for every official role shall be held at the Annual General Meeting. A meeting will be held before or during the next launch day to elect officers to fill vacated positions.

**1.7 Amendments**

These policies and procedures may be amended by a majority vote of the committee members.

**1.8 Removal of Officers**

Any officer may be removed by the President for incompetence, negligence, or unlawful acts. There are three steps to this disciplinary process that the President must follow. First, a verbal warning is given. In the event that this warning fails to correct the problem, a written notice shall be delivered in person. As a last resort, an impeachment vote may be taken at a meeting of the members; a vote of two-thirds majority is required to remove the officer. If the President is the officer to be disciplined, then any other officer may initiate the actions.

**1.9 Committees**

A two-thirds majority of the membership at any official meeting may appoint or disband a committee. Regular reports from each committee shall be presented at meetings. The President shall be a member of all committees.

**1.10 Incidents**

All incidents shall be recorded and investigated. If the potential remains for a similar incident to occur in the future, actions to correct the issue shall be completed in a timely manner.

End of By-Laws

## 2.0 New South Wales Rocketry Association - Launch Operations Safety Policy

The NSWRA values the safety of its members and visitors. To minimise any potential risks involved in NSWRA launch operations, the following processes are in place:-

- Portable fire fighting equipment is to be available.
- Portable first aid equipment is to be available.
- Safety barriers or tape to keep spectators behind a control line.
- No launch shall be conducted without a Launch Control Officer (LCO) and Range Safety Officer (RSO) taking charge of proceedings. These two roles may be performed by the same person depending on attendance numbers. These officers have certain responsibilities for ensuring that the range is safe. Members and visitors are required to follow their instructions.
- The LCO shall not launch a rocket without a logbook entry.
- All rockets are to be scrutinised by the RSO before their first flight of the day. The RSO, at their discretion, may re-scrutinise any rocket that is deemed to be potentially unsafe. Failed flights must be re-scrutinised before their next flight.
- People in the launch area shall be made aware of an impending launch with an audible countdown.
- Range launch equipment must be electrically isolated prior to any person approaching a rocket on a launcher.
- Any misfire will result in a minimum one-minute wait before any person can approach the launcher.
- Launches will take place from a cleared area, free of any combustible materials.
- Launches will be cancelled if high wind or weather prevents observation of the full duration of the flight.
- Rockets will not be launched during a fire ban. Compressed-air, water, and mechanical propulsion systems are excepted.
- Appropriate stability & pre-flight checks shall be performed before the first flight of all modified and scratch-built rockets.
- Parents are responsible for the actions of their children. Children must also adhere to all safety guidelines as stipulated in the policies and procedures and the range rules.
- No pets or animals are allowed in the launch area.
- During NSWRA launch events the decisions of the RSO on matters of safety are final. If a member or visitor refuses to abide by the applicable safety codes, the RSO has the authority to bar that person from further participation at that event.
- At the end of the event, the field must be returned to its original condition (or better). This includes the removal of all empty engine casings, igniters, plugs, rocket parts, litter and other debris.

**Safety, it's everyone's responsibility.**

### 3.0 General Guidelines for Model Rockets

Model rocketry has an excellent safety record and everyone would like to see it stay that way. If you have trouble with your model rocket, read the instructions supplied with the model or get assistance from an experienced flier. Please follow the Safety Rules and you will find model rocketry to be an enjoyable and safe hobby/sport for everyone.

#### **Construction:**

The nose, body, and fins of model rockets shall use lightweight, non-metal parts.

#### **Launch System:**

The system to launch the model rocket must be remotely controlled and electrically operated, and will contain a switch that will turn off when released.

All persons shall remain at a safe distance from the rocket that is being launched. This distance will depend on the rocket being launched (refer to the following table, as per TRA Safe Launch Practices)

Installed Total Impulse (Ns)	Motor Type	Minimum Diameter of cleared area (m)		Minimum Safe Distance from rocket (m)	
		Regular	Sparky <sup>2</sup>	Non-complex	Complex <sup>3</sup>
0.01 – 20.00	Up to D	As required	-	5	10
20.01 – 160.00	E – G <sup>1</sup>	As required	23	10	20
160.01 – 1,280.00	H, I, J	15	23	30	60
1,280.01 – 2,560.00	K	23	36	60	90
2,560.01 – 5,120.00	L	30	45	90	150
5,120.01 – 10,240.00	M	38	60	150	300
10,240.01 – 20,480.00	N	38	60	300	450
20,480.01 – 40,960.00	O	38	60	450	600

<sup>1</sup> High Power “F” and “G” Motors (exceeding the limits in the definition of Model Rocket Motor) shall use the distances for “H” motors

<sup>2</sup> Due to the enhanced fire risk associated with sparky motors, an assessment regarding their use will be made on the launch day. Members intending to use these motors must advise the RSO and LCO beforehand

<sup>3</sup> A complex rocket is one that uses more than a single motor ie a cluster or more than 1 stage

Model rockets will be launched from a stable device that provides rigid guidance until the rocket has reached a speed adequate to ensure a safe flight path.

To prevent accidental eye injury, the launcher tip should be above eye level, or the tip should be capped with a hand when approached. A person should never place their head or body over the launch rod.

#### **Stability:**

The stability of a model rocket must be checked before its first flight, except when launching proven commercial models.

#### **Launch Safety:**

People in the launch area must be made aware of an impending launch with an audible countdown.

No person shall approach a model rocket on a launcher until either the safety interlock key has been removed or the battery has been disconnected.

No person shall approach a model rocket on a launcher within one minute after a misfire.

**Launch Area:**

Model rockets must be launched from a cleared area, free of any readily combustible materials

**LAUNCH SITE DIMENSIONS**

<b>Model Rockets</b>		
<b>Total Impulse (Ns)</b>	<b>Motor Type</b>	<b>Minimum Site Dimensions, m</b>
0-1.25	¼A & ½A	15
1.26-2.50	A	30
2.51-5.00	B	60
5.01-10.00	C	120
10.01-20.00	D	150
20.01-40.00	E	300
40.01-80.00	F	300
80.01-160.00	G	300

<b>High Power Rockets</b>		
<b>Total Impulse (Ns)</b>	<b>Motor Type</b>	<b>Minimum Site Dimensions, m</b>
160.01-320.00	H	460
320.01-640.00	I	460
640.01-1,280.00	J	460
1,280.01-2,560.00	K	460
2,560.01-5,120.00	L	460
5,120.01-10,240.00	M	460
10,240.01-20,480.00	N	610
20,480.01-40,960.00	O	920

**Jet Deflector:**

The launcher shall have a jet deflector device to prevent the exhaust directly hitting the ground.

**Launch, Targets and Angle:**

A rocket must never be launched on a flight path that would impact on a target on the ground. Explosive or combustible payloads must never be used.

Live vertebrate animals must never be carried as payloads.

The launcher must be pointed to within 30° of vertical.

**Prelaunch Test:**

When conducting research activities with unproven designs or methods, isolated pre-launch tests must be undertaken to determine the reliability and safety of the rocket.

**Recovery:**

A recovery system shall be used to return the rocket to the ground safely and in a reusable state.

A pre-flight test should be undertaken to ensure the recovery system functions properly. Only flame resistant wadding should be used.

***Flying Conditions:***

A model rocket should not be launched in high winds (over 30 kph), near buildings, power lines, tall trees, low flying aircraft or under any conditions that may be hazardous to people or property.

A person should not attempt to recover a rocket from a power line or other dangerous location.

The launcher should not be closer than one half of the Minimum Site Radius, to the periphery of the site.

Rockets must not be flown into clouds or in any other low visibility conditions unless otherwise authorised by CASA.

***Loaded Rockets:***

A loaded rocket must never be stored or left unattended.

A loaded rocket should be in a launcher or firmly restrained.

A loaded rocket or its exhaust nozzle should never be pointed towards a person. During flight preparations, there should be no persons in the flight path of the loaded rocket.

***Operations:***

Rockets must not be launched near any active airport or aerodrome zones or in a manner that could create a hazard to low flying aircraft.

Persons should observe and listen for any aircraft prior to any launch.

The Civil Aviation Safety Regulation (*CASR Part 101 Unmanned Aircraft and Rockets*) must be followed. Large penalties apply for non-compliance.

***Age:***

Persons under the age of 18 years shall be supervised by a responsible adult who is competent in the preparation and launching of model rockets and can follow the necessary safety requirements and regulations.

***Solid Propellant Motors:***

Only factory-made, pre-loaded model rocket motors or reload kits may be used and only in the manner recommended by the manufacturer and certified by a recognised body (NAR, TRA).

Motors must not be modified in any way.  
Single use motors must not be reloaded.

## 4.0 General Guidelines for Members

### 4.1 Registration and Membership

Only current members and registered participating visitors will be allowed to fly rockets on launch days - no exceptions.

For the current fee structure, please refer to the NSWRA website.

Dues are payable in advance. All membership applicants and participating visitors will need to provide identification and contact details. A membership card will be issued once the application has been processed.

#### Regional Membership

This is for persons who do not fly at Doonside. This requires access to an NSWRA designated site. In order to obtain this, the NSWRA is required to obtain necessary approvals from CASA, the landowners, local council, WorkCover, insurance company, etc. The NSWRA will provide guidance and procedures for launch activities and once all approvals are obtained the NSWRA will approve the site as a designated NSWRA site. The regional membership fee is based on the fact that no other specific costs are incurred for using the site and is subject to change as a consequence.

HPR certifications must be arranged in conjunction with TRA. As per NSW legislation, HPR motors cannot be purchased unless the individual has obtained a Pyrotechnician's License through WorkCover. WorkCover and CASA regulations must be adhered to and can override any approvals given by the NSWRA. In addition, the NSWRA insurance policy will not cover unregistered sites.

### 4.2 Mid Power Accreditation

All NSWRA members are entitled to fly rockets with motors up to a total impulse of 20Ns (equivalent to black powder "D" motors), and black powder "E" motors. (Low Power Rocketry)

Members need to have MPR Accreditation to fly rockets using composite motors in the range "E" to "G" (impulse greater than 20Ns, up to 160Ns)

Refer to 'MPR Accreditation Procedure' for further details

### 4.3 High Power Certification

To use motors "H" and above (ie High Power Rocketry), individuals need to be certified by the Tripoli Rocketry Association (separate to NSWRA)

Certification	Motors	Motor Impulse range (Ns)
Level 1	H, I	160.01 - 640.00
Level 2	J,K,L	640.01 - 5,120.00
Level 3	M,N,O	5,120.01 - 40,960.00

### 4.4 Launching of High Power Rockets

High Power Rocket launches using solid propellant motors shall only take place in the presence of a person with a Pyrotechnics License issued by WorkCover NSW.

#### Setting up on the launch pad

The rocket must be placed on a suitably rigid rod or rail. The rod or rail must be sufficiently long so that the rocket is travelling fast enough to be stable when it clears the rod or rail. Launch angles must comply with the relevant safety code.

#### Conditions for launching HPR

Under no circumstances can a high power rocket be launched in high-wind conditions. Maximum wind speed is 30kph. It is recommended that HPR launches take place when conditions are calm.

#### Range Safety Officer

It is at the discretion of the RSO whether or not a HPR launch takes place. The RSO must consider the safety of the public (not associated with the launch activities) above all else.

### **4.5 Extra Requirements for launching High Power Rockets at Doonside**

The primary requirement is that rockets land within the allocated area. In addition, the rocket must fall under CASA's description of a model rocket. These requirements are:

Maximum launch weight of 1,500g

Maximum total impulse of 320Ns (ie "H" maximum)

Maximum propellant weight of 125g

(Note: Some "H" motors contain more than 125g of propellant. The flier and RSO must confirm compliance before use)

The nose, body, and fins shall use lightweight, non-metal parts

In addition, the maximum altitude permitted is 2000 feet

### **4.6 Guidelines for the use of electronic ejection charges**

Electronics can be affected by radio signals, vibration, movement, air pressure, etc. Without appropriate safeguards from radio signals (like CB radios), an electronic device may be inadvertently triggered at an inappropriate time.

Before a rocket is prepared for launch, the individual must notify the RSO that an electronic charge is to be used in a rocket. The individual must take all precautions when other people are in the vicinity of the rocket being prepared and must inform them of the activity taking place. All persons not associated with the preparation of the rocket must keep away. The use of a black powder charge greater than 1g must be questioned. Once prepared, the individual must inform the RSO that the rocket is to be placed on the launch pad.

The RSO must decide the most appropriate time for the rocket to be placed on the pad in order to minimise exposure to other individuals. Ideally, it should be the last rocket to be set up. It is the RSO's responsibility to notify all individuals that a rocket with an electronic charge is being armed on the pad.

The LCO must notify the spectators and members that no one other than the owner is to approach the rocket after it has landed.

In the case that the ejection charge was not triggered, the owner of the rocket must wear appropriate personal protective equipment before approaching the rocket. At a minimum, this will be safety glasses. In addition to this, gloves, face shield and a long-sleeve cotton shirt should be worn. No one else is to be in the vicinity of the rocket until it has been disarmed.

#### **4.7 Members' responsibilities**

It is the responsibility of all members and participating visitors to:

- abide by all requirements of the NSWRA policies and procedures and the instructions of the NSWRA officers on launch days
- have a valid membership or visitor registration to launch rockets
- ensure that a log book entry is made for every launch
- ensure that rockets are built to a high safety standard according to manufacturers' instructions and NSWRA procedures
- ensure that all rockets, components, debris, litter, tools, etc. are collected before leaving the site
- ensure that the property is left in the same or better condition

In addition,

- Parents are responsible for the behaviour of their children.
- Junior members must be supervised by the nominated parent/guardian who is familiar with NSWRA policies and procedures.
- No animals or pets are allowed.
- If in doubt, ask the LCO or RSO for assistance.

#### **4.8 Launch day procedure for members**

This is the typical procedure to be followed for launching a rocket:

- Get your rocket ready to fly. Make sure that you are using a properly certified engine, safe recovery system, and fire-retardant wadding (if the design requires it)
- All new and/or unproven designs must be inspected by the RSO before launching. The RSO has the final decision on whether or not a rocket will be allowed to fly.
- Choose an available pad that is suitable for your rocket. If you are unsure which one would be appropriate, ask the RSO for assistance. Each person is allowed a maximum of one pad per session unless authorised by the LCO.
- Enter all details accurately and legibly in the launch day logbook at the signup table.
- When all the rockets are ready for the launch session, the LCO will ask everyone to clear the launch area and stay behind the safety line. The RSO will conduct a final inspection of the launch pad area and give their approval to the LCO. Any issues need to be raised with the LCO who will determine whether to postpone the launch session or pass on individual rockets.

- It is **everyone's** responsibility to ensure all the launches occur safely. If there is any hazard, eg. overhead aircraft, people in harm's way, yell out 'HALT', 'STOP', etc.
- The LCO will go through the log book and launch the rockets. If you want to push the button to launch your rocket, you need to notify the LCO and be at the launch control table when the LCO gets to your rocket.
- Do not retrieve your rocket until the LCO gives the OK. Once all the rockets are launched in that session, the LCO will isolate the controller and state 'the range is safe' or similar. Do not retrieve other people's rockets without their authority. Some rockets may have charges that may not have triggered. Only the owner will know how to safely disarm the rocket.
- If your rocket fails to launch, wait until the LCO gives the OK. Then, you will need to remove your rocket from the launch pad, rectify the problem and sign up again for a new pad in a later session.

If you ever have any questions about proper launch procedures, ask the range officers on duty.

**Have fun and be safe!**

## 5.0 Duties of the Launch Control Officer

The LCO has the following responsibilities:

- Verify that the launch site and facilities conform to the applicable safety codes.
- Ensure that the ignition system is set up correctly.
- Ensure that an area has been set up for recording launch information.
- Ensure that all rocket launches are logged in the launch day logbook. It is the responsibility of the rocket owner to enter all details accurately and legibly.

*Example of log book column titles*

Membership number	Name of member	Name of rocket	Motor(s) used	Kit Y/N	Launch Pad No.	Comments on flight
-------------------	----------------	----------------	---------------	---------	----------------	--------------------

- Ensure all owners of rockets launched on the day are registered - no exceptions. Expired memberships are not valid and must be renewed before any participation in rocket launches.
- Together with the RSO, ensure the range is safe for launches before any launches take place.
- Announce all flights. An audible countdown must be given for each flight (refer Section 2.0 and 3.0). After every flight a comment about the flight and recovery should be recorded. The LCO will call 'heads up' and warn spectators in the case of any flight failure. A 'heads up' shall be called on all first flight rockets, modified rockets, rockets with engine clusters, staged rockets, or on any rocket that the RSO deems necessary.
- On completion of a launch session, the LCO will isolate the ignition system electrically and will call 'range is safe' or similar to allow members to collect their rockets from the range. A misfire will require a minimum one-minute wait after the last ignition attempt before any person is allowed to approach the rocket.

## 6.0 Duties of the Range Safety Officer

The Range Safety Officer has the following responsibilities:

- Ensure the environmental conditions are safe for launching. Things to consider are wind speed, wind direction, rain, light, ground conditions, fire hazards, etc.
- Ensure that the launch rods and thrust deflectors are set up correctly and away from any fire hazards.
- Ensure that fire safety equipment is accessible.
- Ensure that first aid equipment is accessible.
- Scrutinise all modified and scratch-built rockets before their first flight ensuring flight stability and correct trajectory. Any issues are to be communicated between the owner and the LCO.
- Ensure that the CASA approved ceiling of the flying area will not be compromised.
- Provide constructive feedback to owners of rockets, which were deemed unsatisfactory for launch.
- Abort any launch if deemed to be unsafe.

### RSO Pre-launch checks

The RSO must scrutinise all rockets before their first launch of the day and scrutinise all modified and scratch-built rockets before their first flight ensuring flight stability, correct trajectory, and structural integrity.

Rocket construction elements to be considered by a model inspector or RSO before allowing a launch are:

1. Airframe – structurally intact, sturdy, and undamaged.
2. Launch Lug/s – securely affixed & clear of obstructions. They need to be of an appropriate size for the weight and thrust of the rocket. When the rocket is mounted on the launch rod/rail, it must be able to move freely. Any rod bind may cause the rocket to either stick to the launcher or cause the rocket to become airborne at an unsafe velocity.
3. Nose – tight enough to not fall loose during the end of the thrust phase, or during inversion, but still loose enough to come loose under ejection.
4. Motor mount – sufficient to firmly secure the motor in the airframe under thrust and ejection forces without coming loose (unless part of the recovery design).
5. Fins/Aerodynamic control surfaces – must be securely mounted to the airframe. Fins must be parallel to the intended direction of flight. Poorly aligned fins will cause an unintended trajectory or a spinning flight (unless part of the design).
6. Recovery System – Shock cords, attachment points, and materials are in good order, packed appropriately, and protected from ejection gases and particles. The shock cord must be strong enough to handle the ejection charge as well as a high-speed parachute deployment. The size of the parachute must be appropriate for the rocket.
7. Motor – No chipped or cracked nozzles, damaged ejection caps, structural distortions in the case, and general condition. The motor must be certified and comply with site restrictions. The motor to be of adequate impulse to safely propel the rocket. Rule of thumb is that the thrust:weight ratio must be at least 5:1
8. Stability – Scratch-built rockets and any modified rockets need to be checked for stability. The CG of the loaded rocket must be at least one calibre forward of the rocket's CP. The CG of the rocket can be measured simply by finding the balance point of the loaded rocket. The CP can be calculated through various software programs. A swing test can also be used.  
High power rockets must have the position of the CP marked on the rocket
9. Altitude prediction – Altitude attained by the rocket must not exceed that allowed by CASA
10. Delay charge calculation – Ejection should occur as close as possible to apogee. Too early or too late can result in structural damage to the rocket or recovery device, or the rocket may hit the ground before deployment of the recovery device.

## **7.0 Range Preparation / Setup Procedures**

### **7.1 Launch pads / level surfaces**

A launching device or mechanism must be used that shall provide rigid guidance until the rocket has reached a speed adequate for the aerodynamic controls to ensure a safe flight path. Launching devices may comprise:

- A steel rod of 3mm diameter, approximately 800mm to 1 metre in length - for light models and models using less than 20 Newton-seconds of impulse.
- A steel rod of 5 or 6mm diameter, approximately 1 metre in length - for heavier or higher powered rockets. Longer rockets may require the use of longer rods
- A supported rail that provides superior rigidity for heavier and higher power rockets.

A launching angle of less than thirty degrees from the vertical must be used.

The launcher shall be set up on reasonably level ground, be stable, and must allow the rocket to travel smoothly along the full length of the launcher. The launcher will have a jet deflector device to prevent the motor exhaust from hitting the ground directly. A clear area (clear of dry grass & weeds, or other combustible materials) around the launch device shall be maintained at all times during launching activities.

The top of the launch rods should be 1.8m above the ground in order to avoid eye injuries. Shorter launch rods shall have a cap or ball placed on them when not in use.

### **7.2 Launch Ignition System**

Launching or ignition of a model rocket must be conducted by remote electrical means from a distance as required by the safety code, and must be under the control of the person launching the model (ultimately under the control of the LCO). All persons in the vicinity of any launching must be advised when a launching is imminent. All persons need to check for any aircraft in the vicinity. An audible countdown must be given before ignition or launching of a model rocket. Members may be allowed to use their own launchers if approved by the RSO and LCO.

### **7.3 Spectator barriers / separation from launch area**

Spectator barriers shall be in place to separate people from the launch area. Refer to the "Minimum personnel distance" in Section 3.0

The spectator and parking area should not be located upwind of the launch pad. Rockets fly into the wind and people and property should not be in this area.

### **7.4 Safety considerations when running cables to launch pads**

All cables shall be completely unwound and laid flat on the ground in such a way as to avoid any trip hazards. Cables shall be placed at the launch rods in the corresponding number to that they are attached to the launch controller.

### **7.5 Logbook entry / Inspection point**

The LCO shall set up a table for logbook entries. This will typically be the location from where the LCO will co-ordinate proceedings. The RSO shall operate from this area for the purpose of scrutinising.

## 8.0 Emergency Procedures and Contact Numbers

In case of personal injury the first aider is the first point of call. If further assistance is required the emergency services should be called on '000' or '112' from mobile phones.

In case of fire, extinguishers shall be used. If the fire grows out of control the fire brigade must be called on '000' or '112' from mobile phones.

## 9.0 Abbreviations and Definitions

Apogee	The highest point of a rocket's trajectory ie maximum altitude attained
BP	Black Powder. A slow-burning form of gunpowder. Motors using this propellant generally have casings made of wound paper and range in impulse from 1/4A to E.
CASA	Civil Aviation Safety Authority.
CASR	Civil Aviation Safety Regulation.
CATO	Catastrophe At Take Off - An extremely rare occurrence where the manufactured motor will suffer a failure in operation or structure at the time of ignition, or immediately after. The cause may include a cracked or chipped nozzle, premature ejection, or incorrect assembly. The risks can be minimised by proper storage and installation.
Centre of Gravity	(Centre of Mass) The point in an object where its weight is balanced.
Centre of Pressure	The point along the axis of an object where the aerodynamic forces balance.
CG	Centre of Gravity (Centre of Mass)
Complex Rocket	A rocket using more than a single motor ie a cluster or more than 1 stage
Composite Motor	Motors that use a propellant mixed and cured to hardness based on ammonium perchlorate as the oxidiser. They generally have a phenolic, fibreglass, or metal casing (metal casings used in RMS motors).
CP	Centre of Pressure
HPR	High Power Rocket (High Power Rocketry)
High Power Rocket	A rocket whose construction technique is similar to a model rocket but exceeds the limits for a model rocket. A high power rocket can weigh more than 1500g and be propelled by one or more motors having a total impulse greater than 160Ns. The rockets are generally manufactured from higher strength materials including heavy gauge cardboard, phenolic, fibreglass, carbon fibre, plywood, and plastics.
Impulse	The total energy provided by a rocket motor (units: Newton-seconds). Rocket motors are classed by their impulse level, designated by a letter. Each letter has up to twice the power of the preceding letter. Eg a "C" motor is twice as powerful as a "B" motor, which is twice as powerful as an "A" motor.
Instrument (CASA)	A permit issued by CASA for the use of additional airspace. Commonly (incorrectly) referred to as a waiver in Australia.
Large Model Rocket	Any rocket using one or more motors with impulse more than 20Ns (E motor) and less than 160Ns (G motor), and weighing

	no more than 1,500grams at lift-off The nose, body, and fins of model rockets use lightweight, non-metal parts. Materials used are typically balsa, wood, plastic, and cardboard.
LCO	Launch Control Officer - controls launch activities on launch day
LMR	Large Model Rocket.
LPR	Low Power Rocketry. Small Model Rocket
MPR	Medium Power Rocketry. Large Model Rocket.
Model Rocket (CASR)	Any rocket weighing not more than 1500g which is propelled by one or more rocket motors producing not more than 320Ns total impulse, with no more than 125g of propellant. The nose, body, and fins of model rockets use lightweight, non-metal parts. Materials used are typically balsa, wood, plastic, and cardboard. A model rocket contains a device for returning it to the ground in a condition to fly again.
MR	Model Rocket
NAR	National Association of Rocketry (USA)
N	Newton, the SI unit of force. The force required to accelerate 1kg by 1metre/second/second. (Equivalent to 102 grams-force.)
NOTAM	NOtice To AirMen. A notification produced by CASA to alert aircraft pilots of any hazards at a specific location.
Ns	Newton Seconds, the impulse of a rocket motor.
Reloadable Motor System	A rocket motor consisting of a metal casing and a reload kit. This provides for users a more cost effective option in the longer term.
RMS	Reloadable Motor System.
Rocket Motor	The rocket motors referred to in this document are commercially available units which have been independently batch tested and verified for compliance with advertised parameters as marked on the rocket motor body.
Rod bind	Excessive friction between the lugs on the rocket and the launch rod/rail due to a complication or unusual interaction between the model and the launcher. In these instances, the motor will ignite, and propel the model up the rod a short distance, or at a very slow speed, and fail to become airborne at a safe velocity. This problem is typically caused by residue accumulating on the launch-rod, undersized launch lugs, inappropriately placed launch lugs, or strong cross winds.
RSO	Range Safety Officer - enforces safety and assists in procedures and technical matters on launch day
Propellant	The chemical component of a rocket motor which provides the thrust for the duration of the motor burn.
TRA	Tripoli Rocketry Association
Small Model Rocket	Any model rocket weighing less than 500g and having 20Ns or less total impulse at lift-off. The nose, body, and fins use lightweight, non-metal parts. Materials used are typically balsa, wood, plastic, and cardboard
Static Centre of Pressure	A crude method of determining the Centre of Pressure of an object. A two-dimensional model of the object is made and the balance point determined. Also called the "cardboard cut-out" method
Waiver	A term used in the USA for a permit for the use of additional airspace (see Instrument).