



SA Amateur Space Administration

HPR Safety Code

Version 1.1

Revised: 2012/02/04

Definitions

Commercial Manufacturer.

Any individual, firm, partnership, joint venture, corporation, or other business entity engaged as a licensed business in research, development, production, preparation, testing, maintenance, or supply of rockets, rocket motors, rocket propellant chemicals, rocket propellant, delay or ejection, or rocket components or parts.

Complex High Power Rocket.

A high power rocket that is multistaged or propelled by a cluster of rocket motors intended for simultaneous ignition at launch or in the air.

High Power Rocket.

A rocket vehicle:

- (a) That is propelled by a single rocket motor having a total impulse of more than 160 newton-seconds
- (b) That weighs more than 1500 g (53 oz), or
- (c) That contains a recovery device for returning it safely to the ground so it can be flown again.

(d) That is made of paper, wood, fibreglass, or plastic with the minimum amount of metallic parts necessary for airframe integrity dependent upon the installed total impulse, and whose primary use is for purposes of education, recreation, and sporting activities.

High Power Rocket Motor.

A rocket motor that has more than 160 newton-seconds of total impulse and that otherwise meets the other requirements set forth in this code.

Hybrid Rocket Motor.

A rocket motor in which the fuel is in a different physical state (solid, liquid, or gaseous) than the oxidizer and that derives its force or thrust from the combination thereof.

Liquid Propellant Rocket Motor.

A rocket motor that contains a fuel and an oxidizer in liquid form or in a combined monopropellant liquid form as a single chemical and that derives its force or thrust from the combustion thereof.

Installed Total Impulse.

The sum of the total impulses of all rocket motors installed in a rocket and intended to be ignited during the launching and flight of that rocket.

Labelled.

Equipment or materials to which has been attached a label, symbols, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labelled equipment or materials and by whose

labelling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Launching Area.

An area designated by the Range Safety Officer in which high power rockets are placed on a launching device and ignited.

Launch Site.

An area used for high power rocket activities that includes: prepping area(s), launching area(s), recovery area(s), spectator area(s), and parking area(s).

1. Scope

1-1.1 This code shall apply to the design, construction, limitation of propellant mass and power, and reliability of all high power rocket motors and motor components produced commercially for sale to or use by the certified user for education, recreation and sporting competition.

1-1.2 This code also shall apply to the design and construction of high power rocket vehicles propelled by the high power rocket motors specified in 1-1.1.

1-1.3 This code also shall apply to the conduct of launch operations of high power rocket vehicles specified in 1-1.2.

1-1.4 This code shall not apply to the design, construction, production, manufacture, fabrication, maintenance, launching, flight, test, operation, use, or activity in connection with a high power rocket motor when carried out or engaged in by

- (a) The government of South Africa;
- (b) Any local government authority;
- (c) Any college or university; or

(d) Any individual, firm, partnership, joint venture, corporation, or other business entity engaged, as a licensed for profit business, in research, development, production, testing, maintenance, or supply of high power rockets, high power rocket motors, high power rocket propellant chemicals, or high power rocket components or parts for ultimate sale to qualified users in conformance with this code, or in connection with contracts with local and federal governments or with commercial space transportation vehicle contractors or operating firms.

1-1.5 This code shall not apply to the design, construction, fabrication, production, manufacture, maintenance, launching, flight, test, operation, or use of rocket-propelled model aircraft that sustain their mass against the force of gravity by aerodynamic lifting surfaces during the entire duration of their flight in the air. However, this code shall apply to rocket motors and motor reload components used in such devices.

1-1.6 This code shall not apply to model or toy rockets propelled by pressurized liquid rocket motors less than 250 ml (8.45 fl. oz.) of water.

1-1.7 This code shall not apply to model rockets whose power and weight do not exceed the limits established in the Model Rocketry Safety Code; fireworks rockets, skyrockets, and rockets with sticks Outdoor Display Fireworks or other types of rockets not covered by this code.

2. Requirements for High Power Rocket Construction and Operation

2-1 User Qualifications. A person shall operate or fly a high power rocket only if that person is a member of SAASA.

2-2 Operating Clearances. A person shall fly a high power rocket only in compliance with:

(a) This code;

(b) CAA Rules and regulations;

2-3 Pre-flight Inspection. A person shall fly a high power rocket only if it has been inspected and approved for operation immediately prior to flight by the Range Safety Officer (RSO). The Range Safety Officer shall confirm the rocket's compliance with the applicable provisions of this code and be confident that the rocket will fly in a safe manner.

2-4 High Power Rocket Motors and Components.

2-4.1 A person shall use only certified high power rocket motors or motor reloading kits or components.

2-4.2 No person shall dismantle, reload, or alter a single use high power rocket motor. No person shall alter the components of a reloadable high power rocket motor or use the contents of a reloadable rocket motor reloading kit for a purpose other than those specified by the manufacturer in the rocket motor or reloading kit instructions.

2-5 Rocket Construction. A high power rocket shall be constructed in such a manner and with suitable materials to withstand the operating stresses and retain structural integrity under conditions expected or known to be encountered in flight.

2-6 Rocket Airframe Materials. A high power rocket vehicle intended to be propelled by one or more high power rocket motors shall be constructed using lightweight materials such as paper, wood, rubber, plastic, fibreglass, or, when necessary ductile metal so that the rocket conforms to the other requirements of this code.

2-7 Stability. A person intending to operate a high power rocket shall determine its stability before flight. This person shall provide documentation of the location of the centre of pressure and the centre of gravity of the high power rocket to the Range Safety Officer if the Range Safety Officer requests it.

2-8 Weight and Power Limits.

2-8.1 A person intending to operate at high power rocket will ensure that it weighs less than the rocket motor manufacturer's recommended maximum lift-off weight for the rocket motor(s) used for the flight. This person shall present documented proof of compliance with this requirement if the Range Safety Officer during pre-flight inspection requests it.

2-8.2 A person shall not install in a high power rocket a rocket motor or combination of rocket motors that will produce more than 40,960 newton-seconds of total impulse (4.45 newtons equals 1.0 lb.).

2-9 Recovery.

2-9.1 A person shall fly a high power rocket only if it contains a recovery system that will return all parts of it safely to the ground so it can be flown again.

2-9.2 A person preparing the high power rocket for flight shall install only flame-resistant recovery wadding if wadding is necessary by the design of the rocket.

2-9.3 A person shall not attempt to catch a high power rocket as it approaches the ground.

2-9.4 A person shall not attempt to retrieve a high power rocket from a place that is hazardous to people. The person flying the rocket shall attempt as

soon as practicable to notify the utility company or other appropriate authority if the high power rocket becomes entangled in a power line when descending.

2-10 Payloads.

2-10.1 A person shall not install or incorporate in a high power rocket a payload that is intended to be flammable or explosive or to cause harm.

2-10.2 A person shall not fly a vertebrate animal in a high power rocket.

2-11 Launching Devices.

2-11.1 A person operating a high power rocket shall launch it from a stable device that provides rigid guidance until the rocket has reached a speed adequate to ensure a safe flight path.

2-11.2 The person launching the high power rocket shall ensure that the launcher incorporates a blast deflector device if necessary to prevent the rocket motor exhaust from impinging directly on flammable materials.

2-11.3 A launching device shall not be used to launch a high power rocket at an angle more than twenty degrees (20") from vertical.

2-11.4 A person operating a high power rocket shall place the end of the launch rod or rail above eye level or cap it to prevent accidental eye injury. A person shall store a launch rod or rail so it is capped, cased, or left in a condition where it cannot cause injury.

2-12 Ignition Systems.

2-12.1 A person launching a high power rocket shall use an ignition system that is remotely controlled, is electrically operated, and contains a launching switch that will return to "off" when released.

2-12.2 The ignition system shall contain a removable safety interlock device in series with the launch switch.

2-12.3 The launch system and igniter combination shall be designed, installed, and operated so the lift-off of the rocket shall occur within three seconds of actuation of the launch system. If the rocket is propelled by a cluster of rocket motors designed to be ignited simultaneously, the person operating the rocket shall install an ignition scheme that has either been previously tested or has a demonstrated capability of igniting all rocket motors intended for launch ignition within one second following ignition system activation.

2-12.4 A person shall install an ignition device in a high power rocket motor at the launcher or within the area designated by the Range Safety Officer. The rocket shall be pointed in a safe direction during and after installation of the ignition device.

2-12.5 No firing circuits shall be armed with the rocket in other than a launching position.

2-13 Launch Site.

2-13.1 A person shall launch a high power rocket only in an outdoor area where tall trees, power lines, and buildings will not present a hazard, in the opinion of the safety monitor, to the safe flight operation of a high power rocket.

2-13.2 A person shall not locate a launcher closer to the edge of the launch site than one-half the minimum launch site dimension stated in table 2-13.

Table 2-13 Launch Site Dimensions

INSTALLED TOTAL IMPULSE(N-SEC)	EQUIVALENT MOTOR TYPE	MINIMUM SITE DIMENSIONS (M)	EQUIV, KMS
160.01 - 320.00	H	457	0.5
320.01 - 640.00	I	914	0.9
640.01 - 1280.00	J	1609	1.6
1280.01 -2560.00	K	1609	1.6
2560.01 - 5120.00	L	3219	3.2
5120.01 -10240.00	M	4828	4.8
10,240.01 - 20480.00	N	6437	6.4
20,480.01 -40960.00	O	8047	8.0

Note 1: For a circular area, the minimum launch site dimension is the diameter in metres; for a rectangular area, it is the shortest side in metres.

2-13.3 The flying field (launch site) shall be at least as large as that stated in Table 2-13.

2-13.4 As an alternative to the launch site dimensions, the size of the launch site shall be established as no less than one-half the maximum altitude expected, calculated, simulated, or granted (by the authority having jurisdiction) for the particular flight in question. In no case shall the minimum launch site dimension be less than 450 m.

2-13.5 In no case shall the minimum site dimension be less than one-half the estimated maximum altitude of the high power rocket.

2-14 Launcher Location.

2-14.1 The launch site shall contain no occupied buildings or public highways on which traffic flow exceeds ten (10) vehicles per hour.

2-14.2 The person launching a high power rocket shall ensure that the ground for a radius of 3 m around the launcher is clear of brown grass, dry weeds, or other easy-to-burn materials that could be ignited during launch by the exhaust of the rocket motor.

2-14.3 The person intending to launch a high power rocket shall locate the launcher more than 457 m from any occupied building or public highway on which traffic flow exceeds ten (10) vehicles per hour.

2-15 Safe Distances.

2-15.1 No person shall be closer to the launch of a high power rocket than the person actually launching the rocket and those authorized by the safety monitor.

2-15.2 All spectators shall remain within an area determined by the Range Safety Officer and shall remain behind the Range Safety Officer and the person launching the rocket.

2-15.3 A person shall not be closer to the launch of a high power rocket than the applicable minimum safe distance set forth in Table 2-15.

Table 2-15 Safe Distances

INSTALLED TOTAL IMPULSE(N-SEC)	EQUIVALENT MOTOR TYPE	MINIMUM SAFE DISTANCES (METRES)	MINIMUM SAFE DISTANCES (COMPLEX ROCKET) (METRES)
160.01 - 320.00	H	50	60
320.01 - 640.00	I	50	60
640.01 - 1280.00	J	100	100
1280.01 -2560.00	K	100	150
2560.01 - 5120.00	L	100	150
5120.01 -10240.00	M	150	350
10,240.01 - 20480.00	N	350	500
20,480.01 - 40960.00	O	500	750

A "complex" high power rocket is one that is multistaged or propelled by a cluster of motors.

2-15.4 No one will be permitted in the launch area between the LCO table and the launch pads except vehicle crew (members) for prepping purposes. Crew photographers, or event photographers, permitted in the launch area will maintain a distance of 50m from the launch pad.

2-16 Launch Operations.

2-16.1 A person shall not ignite and launch a high power rocket horizontally, at a target, or so the rocket's flight path goes into clouds or beyond the boundaries of the flying field (launch site).

2-16.2 A person shall not launch a high power rocket if the surface wind at the launcher is more than 32km/hr.

2-16-3 A person shall not operate a high power rocket in a manner that is hazardous to aircraft.

2-17 Launch Control.

2-17.1 A person shall launch a high power rocket only with the immediate knowledge, permission, and attention of the Range Safety Officer.

2-17.2 All persons in the launching, prepping, spectator, and parking areas during a countdown and launch shall be standing and facing the launcher if requested to do so by the Range Safety Officer.

Exception: Those individuals that have mobility restrictions.

2-17.3 The person launching a high power rocket shall precede the launch with a five-second countdown audible throughout the launching, spectator, and parking areas. The person launching the rocket, the Range Safety Officer, or other flying site operating personnel shall give this countdown.

2-17.4 No person shall approach a high power rocket that has misfired until the safety interlock has been removed or the battery has been disconnected from the ignition system, one minute has passed, and the Range Safety Officer has given permission for only a single person to approach the misfired rocket to inspect it.

3. Prohibited Activities.

3-1 The following activities shall be prohibited by this code:

(a) The use of a high power rocket motor for the primary purpose of producing a spectacular display of colour, light, sound, or any combination thereof.

Exception No. 1: This prohibition shall not be construed as prohibiting the public demonstration of high power rockets as defined herein and as authorised according to regulations.

Exception No. 2: This prohibition shall not be construed as prohibiting the use of chemical additives to the propellant to produce a brightly coloured exhaust flare or dense collared smoke to aid in following or tracking the rocket in flight.

(b) The use of a high power rocket or high power rocket motor as a weapon against a target.

(c) Tampering with a high power rocket motor, motor reloading kit, or module in any manner or degree that is contrary to the purpose for which said high power rocket motor or motor reloading kit is designed and intended to be used.

(d) The sale, offering for sale, exposing for sale, or otherwise making available a rocket motor or motor reloading kit that does not comply with the requirements herein and has not been authorised according to regulations.

Exception No. 1: This prohibition shall not be construed as prohibiting the transfer of rocket motors or motor reloading kits to a certifying authority for the purpose of authorisation.

Exception No. 2: This prohibition shall not be construed as prohibiting the transfer, sale, offering for sale, exposing for sale, or otherwise making available authorised model rocket motors, or motor reloading modules.

(e) The operation, discharge, or activation of a high power rocket contrary to the provisions of Civil Aviation regulations.

(f) The manufacture, production, fabrication, operation, maintenance, launch, flight, test, discharge, or other experimentation with high power rockets, high power rocket motors, or motor reloading kits, or pyrotechnic modules that have not been authorised including, but not limited to old propellant rocket motors, hybrid rocket motors, liquid propellant rocket motors, steam rocket motors, and rocket propellant chemicals for solid, liquid, and hybrid rocket Motors including monopropellants.

Exception: This prohibition shall not be construed as prohibiting the evaluation and authorisation of new, high power rocket motor technology for a recognized national user organization or an authority having jurisdiction provided that all other requirements of this code are complied with and all activities are in accordance with applicable national and local laws, regulations, and ordinances.

(g) The sale, offering for sale, exposing for sale, making, or using of fuse, wick, or other ignition devices intended to be activated by a hand-held flame for the purpose of starting or igniting a high power rocket motor.

(h) Affixing to a high power rocket motor or motor reloading kit a statement of compliance with the regulations or statement of authorisation, or statements in writing in advertising or on the package that authorisation according to Chapter 4 has been obtained when such authorisation has not been obtained, has been withdrawn, or has been denied.

(i) Reloading any expendable, disposable solid propellant high power rocket motor with any material once said motor has been operated; or reloading any

reloadable, non expendable solid propellant high power rocket motor with any material or by any means not specifically provided or recommended by the manufacturer.

(j) Selling or conveying a high power rocket motor or motor reloading kit to any person contrary to any national and local laws, regulations, and ordinances.

(k) Possession, storage, or use of a high power rocket motor or motor reloading kit by any person contrary to any national and local laws, regulations, and ordinances.

(l) The storage of high power rocket motors, motor reloading kits, or modules contrary to the provisions of the Explosives Unit of the SAPS regulations.

(m) Persons participating in the prepping or launching of high power rockets, including spectators in the prepping areas, that have consumed alcohol, narcotics, medication, or drugs that could affect judgment, movement, or stability.

(j) The transporting of high power rocket motors, motor reloading kits, or modules contrary to the provisions of the Explosives Unit of the SAPS regulations.

Based on the NZRA Safety Code, with kind permission.