

The United Kingdom Rocketry Association



UKRA

Members' Handbook

Version 1.2x
January 2008

Please Note: At the time of issuing this document the regulations governing explosives acquisition in the UK were in the process of being changed fundamentally; please refer to the UKRA website for the most current advice on this subject.

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<http://www.ukra.org.uk>



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UKRA Member's Notes.

1 Correspondence with the Association

1.1 General Guidance

- i) Please correspond with the correct official of the Association.
- ii) When you write, be brief and to the point and write to the relevant person. If you want a written reply always enclose a stamped self-addressed envelope; it is not only courteous, but reduces expenses.

1.2 Contact Address

105 Thomas Way, Lakesview International Business Park. Hersden. Canterbury. Kent.
CT3 4NH.

1.3 Who to Contact

- i) **Secretary** - All matters dealing with the general administration of the Association as provided for in our Constitution and Rules, and, all Safety and Technical enquiries.
- ii) **Treasurer** - All matters concerning payments to/from the Association.
- iii) **Membership Secretary** - All matters concerning membership.

2 Payments To The Association

- i) When you send moneys to the Association ensure that all cheques and postal orders are made payable to the United Kingdom Rocketry Association. **Do not send cash through the post.**

3 Glossary

Amateur Rocketry – Non-professional rocketry

SGM – Special General Meeting.

Centre.

CAA – Civil Aviation Authority.

AGM – Annual General Meeting.

BNSC – British National Space

HSE – Health and Safety Executive.

4 Documentation

- i) All documentation will not be published annually. Any alterations or amendments to documents will, however, be issued as necessary in loose page form, which should be inserted into the relevant document. The UKRA “Handbook” consists of a number of distinct and separate documents. The documents that make up this manual may be excerpts of the originals. The version numbers of these documents are detailed below -

UKRA Members Notes. v1.2

UKRA Constitution. v3.3

UKRA Council Standing Orders. v1.3

UKRA Safety Code. v4.21

UKRA Rules And Regulations. v1.6

UKRA Information Pack. v3.2

- ii) Copies of the individual documents can be obtained from the UKRA website, or via post by writing to the UKRA address.



UKRA Safety Code.

1 General Rules

1.1 Definitions

Rocket Motor

The motor which propels any rocket vehicle whether utilising solid propellant, liquid propellant or a combination of solid and liquid (hybrid) propellant. Rocket motors are classed according to the following table:

Motor Type	Propellant	
	Fuel	Oxidiser
Solid Motor	Solid	Solid
Hybrid Motor	Solid	Liquid
Hybrid Motor	Liquid	Solid
Liquid Motor	Liquid	Liquid

Propellant

The name given to the mixture of fuel and oxidiser which react in the rocket motor to produce exhaust gases. Some propellants may be classified as an explosive in the UK.

Model Rocket

Model Rocket relates to any rocket vehicle falling into all of the following categories:

- where the combined propellant mass of rocket motors used is less than 125 grams or the total impulse is less than 160 Newton seconds
- where all individual motors have a propellant mass of less than 62.5 grams
- where the maximum mass of the model at launch is less than 500 grams for a propellant mass of 62.5 grams or less, and less than 1500 grams for a combined propellant mass of 125 grams or less.
- uses only pre-manufactured, solid propellant motors,
- does not use metal body tubes, nose cones or fins.

High Power Rocket

High Power Rocket (HPR) relates to any rocket vehicle in any of the following categories:

- where the combined propellant mass of rocket motors used is over 125 grams
- where any single motor has a propellant mass over 62.5 grams
- where the rocket motor propellant is liquid, gas, or solid, or a hybrid of these

- where there is a single motor limit of O power (40,960NS maximum total impulse) and a total power limitation of 81,920NS total impulse.
- has metal airframe components, where metal is required to insure structural integrity of the rocket over all of its anticipated flight.

Rocket	This mean a device propelled by ejecting expanding gases, generated in its motor, from self contained propellant and not dependant on the intake of outside substances. It includes any part of the device that becomes separated during its operation.
Small Rocket	This means a rocket of which the total impulse of the motor or combination of motors, does not exceed 10,240 Newton-seconds. (ANO Definition)
Large Rocket	This means a rocket of which the total impulse of the motor or combination of motors is more than 10,240 Newton-seconds. (ANO Definition)
UKRA	United Kingdom Rocketry Association
Safety Officer	A member of the UKRA acting as Safety Officer (must be certified as a qualified Safety Officer by the UKRA Safety and Technical Committee if overseeing launches of above G class total impulse).
RSO	Range Safety Officer
Launch Site	This should be a suitable open area for launching and recovering rockets. It must conform to the minimum dimensions laid out in the UKRA Launch Site Dimensions Table.
CAA	Civil Aviation Authority
NOTAM	Notification To Air Men (issued by the CAA)
ANO	Air Navigation Order (contains rules specifically related to the flying of rockets)

1.2 Safety

Safety is the concern of all members. Members causing serious damage / injury to third parties, livestock, vehicles or property whilst involved in rocketry of any kind must report the incident in full to the Safety & Technical Committee, even if the UKRA codes of practice were not in force at the time of the incident.

The Safety & Technical Committee would appreciate reportage of minor mishaps, anonymously if preferred, to be included in any association magazine, for the education of other members.

1.3 Laws

All members of the UKRA must fly in compliance with the laws and regulations of the CAA, HSE, national and local laws, rules, regulations, statutes and ordinances.

Specifically, any member wishing to fly with motors or igniters requiring legal documentation shall ensure that they have such legal documentation, i.e. Explosive Licence, Registered Explosive Store and RCA.

Your documentation should be carried with you to all launches in the event of inspection by the authorities.

There is a set of legislation, created by the Directorate of Airspace Policy that specifically covers the area of rocketry and rocket flight. This is the Regulation of Rockets - Article 87A of the ANO. The other existing pieces of legislation concerning rocketry are Articles 63 and

64 of the ANO. All these articles have been included at the rear of this safety code, in Annex B, for your reference. Please study them carefully as they are law and breaking them will have serious implications, not only for yourself, but for the whole rocketry community. Please be aware that there are some exemptions to Article 87A when flying rockets whose total impulse does not exceed 160 Newton-seconds. (Specific article numbers may be subject to change throughout the life of the ANO)

1.4 Certification

Any UKRA member wishing to fly any rocket using greater than G class total impulse whilst still being covered by UKRA insurance will require HPR certification from UKRA.

Certification requires a successful test flight performed before a UKRA certified Safety Officer and may also require the passing of a written multiple choice exam

Full details of the certification process may be obtained from the UKRA Certification Guide.

UKRA members wishing to fly hybrid motors still need to be aware of the certification process and should again refer to the UKRA Certification Guide.

1.5 Insurance

UKRA cover / insurance is third party only. Members launch rockets entirely at their own risk, and are not covered for accidents to themselves.

All UKRA insured flights must follow this safety code and must not fall into the experimental flying rules of this code.

Any rocket classified as experimental may still be able to be flown under UKRA insurance. See Section 5 - experimental flying below.

1.6 Payloads

No UKRA member's rocket will ever carry live animals or any payload that is intended to be flammable, explosive, or harmful.

1.7 Disreputable Behaviour

If UKRA members are discovered by the Safety & Technical Committee to be employing particularly dangerous practices that could bring the British rocketry fraternity into disrepute, they will be subject to a disciplinary committee possibly leading to a ban from UKRA.

Any members found to be engaged in rocketry of a non-peaceful nature at any time, such as the fitting of explosives or incendiaries (except in very small quantities as part of a recovery / stage separation system, or as scientific payload with permission of the Safety & Technical Committee), aiming at targets, carriage of live animal payloads or members who have set out to harm others via rocketry, will face an immediate lifetime ban and may be reported to the authorities.

2 Equipment

2.1 The Rocket

2.1.1 Rocket Components / Materials

All rockets flown under this safety code shall be made of a minimum quantity of materials that possess suitable structural rigidity to withstand the flight stresses expected for a given rocket flight.

The Safety Officer has the right to decide, prior to a flight, that a given rocket vehicle is constructed in such a way that it is unlikely to withstand the stresses of flight and therefore prohibit the flight from taking place. In addition to the right to cancel any flight, the Safety Officer has the right to decide that a rocket is unflightworthy for the proposed power. This may be due to the rocket requiring additional structural reinforcement or the utilisation of a less powerful motor. It could also be due to the rocket being of too heavyweight a construction to be flown safely.

The Safety Officer also has the right to decide that the rocket is constructed in such a way that it must be classed as Experimental, see section 5 below.

2.1.2 Stability

Proper design procedures and tests must be undertaken to ensure the rocket's stability during flight until recovery devices are enabled. For passive aerodynamically stabilised rockets (fixed fins) the RSO must be satisfied as to the stability of the rocket.

The minimum static stability margin is between 1 calibre stable (the CP should be behind the CG by 1 body diameter). Flyers should be aware of overly stable rockets weather cocking and that the relationship between the CP and the CG changes during motor burn.

2.1.3 Structural Safety

The RSO must be satisfied that the rocket is flight worthy and sufficiently robust to survive launch, aerodynamic, and recovery system loads. Particular attention must be paid to recovery and fin attachment.

2.1.4 Recovery Devices

All rockets must use a recovery system that will return it safely to the ground so it may be flown again. Rockets will use "flame-resistant recovery wadding" if wadding is required by the design of the rocket.

2.1.5 Electronic Devices

Where a rocket uses any electronic equipment, the utmost care must be taken when assembling, installing and testing. You should read the manufacturers instructions carefully and completely, taking note of any specific points to be aware of and possess a good understanding of the device's limitations. The RSO is entitled to question you about the operation of your electronic devices.

2.1.6 Multi-Stage Rockets

For multiple stage rockets, each phase of the flight must be stable (e.g. for a 2 stage rocket, the 2 stages together must be stable as must the final stage on its own). All sections of the rocket must employ suitable recovery methods to return them safely to the ground. The RSO must be satisfied as to the stability of all phases of the rocket and the suitability of each stages recovery device.

2.1.7 Lift Generating Rockets / Boost Gliders

Winged rockets, boost gliders and rockets generating net lift are known to have especially unpredictable trajectories and extra care must be taken when flying such devices. It is recommended that when calculating the launch site dimensions for such a flight, the flyer use the next larger motor on the launch site calculation table for the determination of the required launch site dimensions.

2.1.8 Active Stabilisation

Any rocket employing active stabilisation will be treated as experimental and will operate under the rules for Experimental Flights (Section 5) detailed below.

2.1.9 Water Recovery Devices

Any floatation devices used on the Rocket must be jettisoned / rendered inactive so that the rocket sinks four hours after splash down if not successfully recovered (or within one hour if the rocket is in danger of drifting into major shipping lanes).

2.2 Motors

2.2.1 Solid Motors

Only the use of commercially available, HSE approved solid rocket motors is permitted. The motor must only be used in the manner recommended by the manufacturer. It is not

permissible to alter the rocket motor, its parts or its ingredients in any way, unless following the manufacturers written instructions.

Any flight that utilises a non-approved or modified motor will be treated as an Experimental Flight and will operate under the rules for experimental flights detailed below.

Approved solid motors may be used according to the certification levels listed below:

- All Motors up to G class Total Impulse - No certification required
- From H through to I Total Impulse - Level 1 certificate required
- From J through to L Total Impulse - Level 2 certificate required
- From M through to O Total Impulse - Level 3 certificate required

The exception to this rule is during certification test flights when the person flying the rocket must be closely supervised by a UKRA member certified to at least the same level, to the full satisfaction of the Safety Officer.

Full details of the certification process may be obtained from the UKRA Certification Guide.

2.2.2 Hybrid Motors

Only the use of commercially available hybrid motors is permitted, **if the flight is not to be classed as an experimental flight**. The motor must only be used in the manner recommended by the manufacturer. It is not permissible to alter the rocket motor, its parts or its ingredients in any way unless following the manufacturers written instructions.

Any flight that utilizes a non-commercially available or modified motor will be treated as an experimental flight and will operate under the rules for experimental flights detailed below.

To fly hybrids, the following criteria must be met :-

- (1) The flyer must have passed the examination part of the standard level 2 certification process.
- (2) The flyer may only fly hybrids of the equivalent power to his current certification level. (For example - To fly an "H" powered hybrid, the flyer must be UKRA level I certified and have passed the written part of the level II certification. If the flyer then wanted to fly a "J" powered hybrid, they would have to have passed both the written part and flight test of the level II certification.)
- (3) The flyer, may, at the discretion of the RSO / Certifying Officer, use a hybrid to complete certification flight tests.

Full details of the certification process may be obtained through the UKRA Information Pack under Section 1 - Certification .

The hybrid must also conform to the following specifications :-

- (1) All hybrid rocket motors must have a safe method of handling the pressurised systems associated with the hybrid rocket motor (for example; a certified pressure vessels for pre-loaded oxidiser tanks such as those used in Aerotech and Microhybrid hybrid rocket motors, remote loading and operations of pressure systems for hybrid rocket motors such as Hypertek, RATTWorks, Propulsion Polymers, West Coast Hybrids, and amateur hybrid rocket motors), **and the ability for the motor to be safely returned to its state prior to insertion into the rocket**. The remote distance shall not, under any circumstances, be less than 100ft or 33m for both the operator, RSO and spectators. For hybrid motors of "I" and greater power, the established UKRA safe distances chart should be used in respect of anyone other than the operator and RSO.
- (2) All hybrid motors used at UKRA events must be commercially available units and should only be assembled and flown in accordance with the manufacturers instructions. It is not permissible to alter the rocket motor, its parts or its constituents in any way.

- (3) All hybrid motors constructed by UKRA members, or to the design or instruction of UKRA members, will be classified as experimental and will be subject to the experimental flying rules in Section 5.

2.2.3 Liquid Motors

All Liquid propellant flights will be treated as experimental flights and will operate under the rules for experimental flights detailed below.

2.3 Igniters

The Safety Officer must be satisfied with the igniter system that is connected to the rocket motor. Any igniter should ignite the rocket within three seconds of the power being applied to the igniter.

Continuity tests on any ignition system should not be carried out whilst the igniter is fitted in the motor, unless the continuity test is an integral part of a count down sequence.

Rockets should not be left for long periods with the igniter in place.

Igniter leads should be connected / twisted together until the igniter is ready to be connected to the launch control system to prevent the risk of premature ignition from stray RF.

Igniters should be installed in the motor, when the rocket is on the launch pad, unless the rockets design does not permit this.

2.3.1 Hybrid ignition systems

Hybrid starting systems may not have igniters in the conventional sense. In these circumstances the Safety Officers must be satisfied that both they and the operator understand the ignition system and that it operates safely.

2.4 Weight & Power

Any rocket must not have a mass greater than the manufacturer's recommended maximum lift-off mass for the motors used if a single motor is used. An alternative way of ensuring this for commercial kit rocket kits is to only use motors recommended by the manufacturer of the rocket kit.

For all rocket flights, the average thrust of the motor(s) being used should be at least three times the weight of the vehicle at lift off. Lower thrust/weight ratios will be classed as experimental, see the experimental flight section below.

2.5 Launch Controllers

An electrical ignition system must be used which allows for remote operation of the igniter firing. The device should be operated from at least the minimum Safe Distance as determined by the total impulse of the rocket motor(s) according to the Safe Distance Table given below. At the RSO's discretion, this distance can be reduced to 100ft (33m)

The launch controller must include a safety key to immobilise the system when removed. This key should only be in place at the time of the launch and is to be removed immediately after an ignition attempt, especially in the event of a misfire. The safety key must not be capable of being removed leaving the controller in a live firing mode.

The firing circuit must only be live for a brief period sufficient to fire the igniter and must then return to an open circuit. Where a firing button is used, it must return to the off position when released.

2.6 Launch Pad

All rocket launches will take place from a rigid launcher / launch tower / launch pad that provides rigid guidance until the rocket has reached a speed adequate to ensure a safe flight. This launch pad must be sufficiently rigid such that the top of the launch pad will not sway / deflect noticeably in the strongest launchable winds. The launcher must incorporate a blast-deflector to prevent damage to the ground.

To prevent accidental eye injury, the launch pad should be placed so the end of the rod is above eye level or the end of the rod should be capped when approaching it. Always cap or

disassemble the launch rod when not in use and never store the launch rod in an upright position

3 The Launch Site

3.1 Launch Sites

Launch sites should be a suitable open area for launching and recovering rockets. It must conform to the minimum dimensions laid out in the Launch Site Dimensions table.

Clubs and individuals are strongly recommended to register their launch sites with UKRA, who can provide advice regarding the suitability of the site and maximum size motors which can be safely flown.

Any UKRA member wishing to fly from a UKRA registered site should first liaise with the club / individual responsible for the site and should also insure that they have the land owners permission.

UKRA Registered Launch Sites must be on open, private ground and permission from the owner of the land must be obtained for access and for every launch. The site must be at least 5km from any active commercial airport.

No launch site may be used in an area where distress flares may be used by the public, such as near large lakes or mountains. Although such sites may be used if the local rescue groups / authorities, such as mountain-rescue, are given notice of the pending launch(es) and have acknowledged such notification.

The area around the location of any launch pad(s) at the site must be cleared of brown grass, dry weeds or other easy-to-burn materials to a radius of ten feet.

3.2 Safety Officer

A Range Safety Officer must be appointed for each launch session. This person must be a UKRA certified RSO if acting as Safety Officer during any launch of above G class Total Impulse. The Safety Officer is not permitted to fly (or have a rocket belonging to them flown) during a period of duty

The Safety Officer should remember that he / she is in overall charge and is accountable for ensuring the safety of every launch. The Safety Officer has authority over and above all other persons present at the launch site and has the power to delay or cancel any launch until satisfied that it can proceed safely. Should other UKRA members feel that the launch would be hazardous, they should voice their concerns to the Safety Officer at the earliest point or persuade the owners of the rocket to cancel the launch.

3.3 Personnel

Only UKRA members may approach the rocket closer than the minimum safe distance during or after an igniter is being / has been installed into the rocket motor(s). Members may only approach nearer than the safe distance with the approval of the Safety Officer. Only the minimum number of members necessary to complete the required task should approach.

The minimum safe distance is determined by the total impulse of the rocket motor(s) according to the Safe Distance Table given below.

3.3.1 Spectators

All spectators / onlookers / press at a UKRA launch must be kept at least the minimum safe distance away from the launch area as determined by the total impulse of the rocket motor(s) according to the Safe Distance Table given below.

All spectators / onlookers / press at the launch site must be warned not to recover any stage of the rocket as there may be live rocket motors and /or recovery devices onboard due to misfiring or other electronic systems failures.

3.3.2 Minders

Any persons at the launch site who cannot watch the rocket, e.g. due to their monitoring of equipment must be protected either by a physical safety barrier or by persons beside them who can watch the rocket and issue a warning or take protective action.

3.3.3 Visual Rule

All persons at the launch site are to be made aware that for their own safety they must keep their eyes on the rocket from at least two seconds before launch until either the rocket lands or until visual contact is lost.

When visual contact is lost observations must be carried out until such a point as the rocket is deemed lost or until the rocket is sighted again.

3.3.4 Disabled Spectators

Special care must be taken to ensure that any disabled spectators are catered for. Particularly, minders must be provided for disabled persons to ensure that they are aware of pending rocket launches and have the best chance to avoid any incoming rockets or debris.

3.4 Documentation

If any flights are taking place that use greater than 160 NS total impulse rocket motors, copies of the following documents should be available at the site, preferably together in a folder, for inspection by the Police and other authorities that may arrive at the site unexpectedly. Some of this documentation will be personal and some will be site specific.

- Ordnance survey maps of the launch site and downrange area
- Aviation charts of the area
- Insurance documentation
- The Safety Officer's UKRA Safety Officer Identity Card
- This UKRA Safety Code
- Documentation for motor class, i.e. Explosives Cert, RCA and Registered Store Cert.

3.5 First Aid / Fire Prevention

A First Aid kit must be made available during every launch for minor injuries and burns, preferably with a qualified first-aid person on hand to assist.

For fire prevention, buckets of water, or preferably fire extinguishers must be available in case the ground or any other material catches fire. Pre-soaking the ground around the launcher may prevent this.

3.6 The Down Range Area

The RSO must be supplied with Ordnance Survey and aviation charts of the downrange area including the expected recovery area if these fall outside the official launch site area and he / she must be satisfied that these areas are safe.

Consideration must be given to where all stages of a multistage rocket may land. The worst case scenarios of a stage misfire or recovery device failure must be considered.

Written permission should be obtained from the owners of the land on this downrange area for access and flying of any rockets.

3.7 Dimension Tables

3.7.1 Safe Distance Table

All persons, except those required for the launch of a rocket must be kept at least the given minimum distance from the rocket motor during / after igniter installation. The launch controller should also be operated from at least this minimum distance unless express permission is obtained from the RSO. (See section 2.5 - Launch Controllers).

The RSO has the power to allow a flight of greater power than that which would be allowed by the minimum site dimensions table if he / she is happy that the proposed flight will reach

an altitude equal to or less than the actual minimum site dimension of the site from which the flight is to be made. Any RSO in doubt of whether a flight can be safely made should refuse to allow the flight.

Total Impulse of all Motors (Newton-Seconds)	Equivalent Motor Type	Minimum Distance From Rocket in Meters (ft)	
		Single Motor	Multiple Motors
0.00 -- 1.25	¼A ½A	2 (7)	3 (10)
1.26 -- 2.50	A	2 (7)	3 (10)
2.51 -- 5.00	B	3 (10)	6 (20)
5.01 -- 10.00	C	3 (10)	6 (20)
10.01 -- 20.00	D	5 (16)	10 (33)
20.01 -- 40.00	E	7 (23)	15 (50)
40.01 -- 80.00	F	10 (33)	20 (66)
80.01 -- 160.00	G	10 (33)	20 (66)
160.01 -- 320.00	H	15 (49)	30 (98)
320.01 -- 640.00	I	45 (148)	60 (197)
640.01 -- 1,280.00	J	45 (148)	60 (197)
1,280.01 -- 2,560.00	K	60 (197)	90 (295)
2,560.01 -- 5,120.00	L	90 (295)	150 (492)
5,120.01 -- 10,240.00	M	90 (295)	150 (492)
10,240.01 -- 20,480.00	N	150 (492)	300 (984)
20,480.01 -- 40,960.00	O	150 (492)	300 (984)

3.7.2 Launch Site Dimension Table

The Launch site should have the following minimum dimension (i.e. The launch position must be at least half the given distance from the edge of the launch site). Additionally the minimum site dimension should be equal to or greater than the predicted maximum altitude of the highest flight being made.

The largest of these two dimensions should be used.

Total Impulse of all Motors (Newton-seconds)	Equivalent Motor Type	Minimum Site Dimensions in	
		Meters (ft)	km (miles/yards)
0.00 -- 1.25	¼A ½A	15 (49)	0.015 km (16 yards)
1.26 -- 2.50	A	30 (98)	0.03 km (33 yards)
2.51 -- 5.00	B	60 (197)	0.06 km (66 yards)
5.01 -- 10.00	C	120 (394)	0.15 km (130 yards)
10.01 -- 20.00	D	150 (492)	0.15 km (164 yards)
20.01 -- 40.00	E	300 (984)	0.3 km (328 yards)
40.01 -- 80.00	F	300 (984)	0.3 km (328 yards)
80.01 -- 160.00	G	300 (984)	0.3 km (328 yards)
160.01 -- 320.00	H	450 (1476)	0.5 km (492 yards)
320.01 -- 640.00	I	760 (2493)	0.8 km (½ Mile)
640.01 -- 1,280.00	J	1600 (5,249)	1.6 km (1 Mile)
1,280.01 -- 2,560.00	K	1600 (5,249)	1.6 km (1 Miles)
2,560.01 -- 5,120.00	L	3200 (10,498)	3.2 km (2 Miles)
5,120.01 -- 10,240.00	M	4700 (15,420)	4.7 km (3 Miles)
10,240.01 -- 20,480.00	N	6445 (21,145)	6.5 km (4 Miles)
20,480.01 -- 40,960.00	O	8045 (26,394)	8.0 km (5 Miles)

3.8 Coastal Launch Sites

For launching out to sea, care must be taken to protect any shipping in the area and for any launchings near coast, the coast guard must be warned prior to launch in case the rocket vehicle is mistaken for a maritime distress flare. For this reason, night-time coastal launches have to be banned unless it is November the fifth.

When launching and recovering rockets from coastal areas, please ensure you are familiar with local weather conditions and tidal patterns.

4 Flying

4.1 Launch Permission

Before launching, a UKRA member must obtain the permission to launch from the RSO.

The Safety Officer must check the rocket until he / she is satisfied that the rocket is safe and flightworthy before giving permission to launch. The Safety Officer also has the power to prohibit the use of launch equipment if he/she reasonably believes it to be unsafe.

The Safety Officer must also satisfy themselves that the person in control of the rocket is competent to do so, e.g. not under the influence of any intoxicating substance or acting in an irresponsible manner.

If any UKRA members deliberately launch a rocket, without the Safety Officer's permission, the members in question will face a disciplinary hearing and probable ban from membership of UKRA.

4.2 Launching

Before flying a rocket or commencing a launch countdown, all people in the launch area must be made aware of the impending rocket launch and must be able to see the rocket on its launch pad.

All spectators should be at least the minimum safe distance from the rocket launch.

An electrical ignition system must be used which allows for remote operation of the igniter firing. The device should be operated from at least the minimum safe distance as determined by the total impulse of the rocket motor(s) according to the Safe Distance Table given above. This distance can be shortened with the express permission of the RSO as per section 2.5. Any igniter should ignite the rocket within three seconds of the power being applied to the igniter.

Only one person must initiate the actual launch.

The launch person must give the Safety Officer a clearly audible countdown of at least five seconds, alternatively the Safety Officer or any person recognised by all present as responsible for the countdown and authorised by the Safety Officer may announce the countdown.

4.3 Misfires

If a rocket suffers a misfire, no-one must be allowed to approach it or the launch pad until it is certain that the safety key has been removed and / or that the battery has been disconnected from the ignition system.

No one may approach the launch pad until a fixed time has elapsed. This time being, one minute for motors of G or less, or five minutes for motors above G, after the misfire. If the rocket is a hybrid **with a tank with venting capability**, the RSO must ensure that the oxidiser tank has been emptied. After this time the Safety Officer should give permission for one person to approach the rocket.

Special care must be taken if the rocket employs any active electronics devices such as timers, altimeters, etc. In such cases only someone with detailed knowledge of the rockets design may approach the rocket.

4.4 Launch Angle

A rocket must never be launched so that its flight path will carry it against a target. Any launch pad must be pointed within 20 degrees of vertical, unless the rocket is a boost glider design. In this event the downrange area must be carefully considered.

4.5 NOTAM's

Where a launch may utilise airspace frequented by other air users, a NOTAM should be issued for the day and times of the rocket launch.

The CAA request that flyers inform them, ideally, four weeks in advance of the intended launch. It should be noted that for periods shorter than this, the NOTAM may not be properly distributed to all air users.

4.6 Controlled Airspace

For details of the regulations concerning launching within controlled airspace, please see Annex B, Regulation of Rockets - Article 87A of the ANO, located at the rear of this safety code.

4.7 Air Traffic

All launchings must be carried out in conditions of good visibility and clear airspace unless suitable radar equipment is available. A visual scan of the sky must be made continuously, preferable by several persons, for at least one minute before launch. The countdown should be aborted if air traffic is spotted or heard.

It is the member's responsibility to obtain aviation charts of the airspace above any proposed launch site. For more information, please see Annex B, Regulation of Rockets - Article 87A of the ANO, located at the rear of this safety code.

4.8 Flying Conditions

Rockets may be launched only in light winds of less than 20mph. Also a rocket may not be launched under conditions where the rocket will fly into clouds, unless it can be safely determined that the flight will not pose any hazard to any aircraft that may be above the cloud layer.

Rockets may not be flown when the flight might be hazardous to people, property or flying aircraft.

4.9 Recovery

If a rocket becomes entangled in a power line or any other dangerous place, no attempt should be made to retrieve it. The appropriate authority must then be informed, as soon as is reasonably practical, in order to effect a safe recovery. No attempt shall be made to catch any rocket as it approaches the ground.

Care should be taken to minimise crop damage, ground erosion and worrying livestock by members of the recovery team and their vehicles.

Only UKRA members familiar with the rocket's design should recover any stages of a rocket. You should be aware that unfamiliar rockets may contain live motors, igniters and ejection charges which may have unpredictable results if handled. If in doubt - leave it alone.

4.10 Night Time Flying

Launching after dark is more hazardous than launching in daylight for obvious reasons. Therefore, all night-launched vehicles must be illuminated. Where lights / flares would interfere with a scientific payload, for example on an astronomical mission, prior permission must be obtained from the Safety & Technical Committee for launching without lights.

The above night time rules can be waived on November the Fifth but it is still advisable to inform the Safety and Technical Committee.

5 Experimental Flying

5.1 Conditions

Any rocket that has been classed as Experimental (by a Safety Officer, the Safety & Technical Committee or it falls into a class listed below) may be allowed to fly under UKRA insurance. To qualify for such insurance this Safety Code (apart from rocket design parameters) has to be adhered to in full. The flight has also to be fully documented to the Safety & Technical Committee for their review at least thirty days before the flight and approval granted.

Any flight involving any of the following will automatically be classified as experimental:

- Powered by a Liquid propellant engine
- Powered by any motor(s) above O Class Total Impulse
- Employing active stabilisation techniques
- Any home designed / built rocket of non-proven design specified as experimental by the Safety & Technical Committee or the RSO.

The UKRA Safety & Technical Committee / RSOs have no obligation to give a member prior notice that a flight being undertaken by a member may be classified as an experimental flight. It is the obligation of a member to check their proposed flight with the Safety & Technical Committee (giving at least thirty days notice). The decision of the Safety & Technical Committee must be considered as final in this matter.

As the guidelines above cover such diverse and potentially complex vehicles and techniques no specific safety or technical rules can be made. It is the responsibility of the member to provide the Safety & Technical Committee with sufficient documentation and relevant research material to enable the committee to decide on the safety of the proposed flight. The Safety & Technical Committee may allow the flight to go ahead, may insist on changes before allowing the flight or may prevent the flight from taking place. The decision of the Safety & Technical Committee must be considered as final in this matter.

Upon a satisfactory review of the vehicle having taken place the Safety & Technical Committee will issue a printed and signed form, granting permission for the flight to take place. This form should be handed to the RSO on the day of the flight.

Any member found trying to circumvent this procedure or use a fraudulent form, will face a disciplinary committee and probable lifetime ban from UKRA.

5.2 Experimental Hybrids

The hybrid arena has in recent times become an increasingly popular area for rocketeers. The scope for designing and building your own motor is quite large with many people coming up with ever more inventive ideas and designs.

For the purpose of this document Nitrous Oxide (N_2O) based hybrids will be discussed as these comprise the bulk of the systems in use currently. The rules within this document however are to be applied to any hybrid system.

5.2.1 Pressure

One of the most important considerations is the ability of the rocket to revert to a safe and depressurised state in the event of any sort of failure.

This can be ideally be achieved, either by having a electro-mechanical device to release the nitrous oxide or by having a permanently vented system in which the pressure in the onboard tank subsides after a fixed period. Any other method of reverting to a safe state, must be satisfactorily demonstrated to the Safety & Technical Committee.

As it has been demonstrated both on paper and via live misfires that a hybrid rocket is usually of light enough construction to be propelled by escaping nitrous oxide should the worst happen and a burst disk fails or a fill stem dislodges from its seal. Due to the low thrust generated by escaping nitrous oxide, the rocket will usually be travelling at a very low speed and may have a dangerous and unpredictable trajectory.

It is therefore very important to ensure that a hybrid can be vented down to allow the safe approach of the launch crew in the event of any failure mode taking place. E.g. igniter or electronics failure.

The safest and most reliable method that the Safety and Technical Committee has seen is the permanent vented onboard tank option.

5.2.2 Pressurised Gas Safety

It is very important to understand the qualities of pressurised gases such as nitrous oxide. If any part of the system leaks, the highly pressurised nitrous oxide liquid will immediately boil off to a gas. However, any exposed skin could be subject to cold burns (frostbite), if the appropriate precautions are not taken.

As with all pressure vessels, tanks should not be dropped or roughly handled and should be pressure checked and certified at fixed periods to ensure tank integrity and their continued safety in accordance with HSE legislation.

5.2.3 Manufacturing

When manufacturing your own components it is very important to recognise the conditions that you will be asking the material in question to withstand.

The Safety and Technical Committee will look closely at the nature of materials being used, not only in and around the combustion chamber (excessive heat and pressure variations), but also all parts of the nitrous oxide feed systems (excessive cold and pressure variations).

5.2.4 Ignition

There are a number of ways that hybrids can be ignited but the main two are pyrotechnically and electrically.

The pyrotechnic method being the much more common option, in experimental hybrids, than the electrical method.

The Safety & Technical Committee will look carefully at the ignition method to ensure that it is the safest and most relevant method for the vehicle submitted for review.

5.2.5 Hybrid Assembly

It is important to ensure that the correct fitments are used for all fill lines, connectors and vents. The type of grease used is also very important. Vaseline should not, under any circumstances, be used. Only the correct cryolube should be used to grease joints and fitments.

5.2.6 Specific Systems

Micro Hybrids

One of the only exceptions to the experimental hybrid rules and considerations is the micro hybrid. UKRA has to look at many systems on a case by case basis and in this case it was decided that these small hybrids have an inherent safety by the virtue of their low power. The modes of failure for a correctly constructed unit are no greater than the equivalently sized black powder motor. (D class)

When using the micro hybrid system, care should be taken to ensure that the manufacturers / designers instructions are followed exactly.

Any member purchasing a unit and not building it, should ensure that the unit has been correctly manufactured and if the vendor is acting as a commercial venture, any appropriate legislation has been correctly followed:

Sale of Goods Act 1979 (as amended 1994/5)

The Supply of Goods and Services Act 1982

Consumer Protection Act 1987 (Part One - Product Liability)

General Product Safety Regulations 1994

The Safety and Technical Committee would like to stress that UKRA is not endorsing this product but merely commenting on issues regarding its safety and supply.

6 Flying Without a Safety Officer

6.1 Introduction

This set of instructions should be viewed as **recommendations only** and every attempt should be made to adhere to the UKRA Safety Code in full.

Where this is not possible, the member should be thoroughly familiar with the duties and responsibilities of a Safety Officer and should seek, as far as is reasonably practicable, to integrate the roles of flyer and Safety Officer.

This does not make the Flyer a UKRA certified Safety Officer, but merely makes them aware of their duties and responsibilities. It will be deemed that the flyer utilising the following recommendations, is solely responsible for all activities concerning their launch.

It is recommended that no -one should launch a High Power Rocket whilst unaccompanied.

In practice this means the following :

6.2 In Advance of the Flight

- (1) The flyer must have passed the UKRA Certification Examination.
- (2) The flyer may only fly hybrids of the equivalent power to his current certification level. (For example - To fly an "H" powered hybrid, the flyer must be UKRA level I certified and have passed the written part of the level II certification. If the flyer then wanted to fly a "J" powered hybrid, they would have to have passed both the written part and flight test of the level II certification.)
- (3) Ensure correct launch site dimensions. (See UKRA Safety Code)
- (4) Ensure the launch site is preferably not in controlled air space and where it is, the predicted height will not impinge upon the air traffic routes. If you think it will, then permission must be gained from the appropriate ATC.
- (5) UKRA can help members with assessing the suitability of flying sites.
- (6) Inspect the rocket, taking into consideration motor power, weight, stability and structural integrity. If at all possible show the rocket to another rocketeer, prior to the launch date, with a view to receiving suggestions and comments on features of the rocket you may have overlooked.
- (7) Ensure the correct functioning of all equipment especially the launch controller.
- (8) Ensure you have the permission of the landowner for launching and recovery.
- (9) Ensure the rockets total impulse is within the parameters of your current certification level.
- (10) Appropriate fire fighting equipment and first aid, should be on hand in the case of an emergency.
- (11) Ensure that there are sufficient numbers of people to keep track of all the stages of a complex vehicle. In the interests of safety, it is highly recommended that complex vehicles be launched at a UKRA event with a Safety Officer.
- (12) Ensure that your location and estimated timeframe are known to others.
- (13) Wherever possible take some form of mobile communication with you. (i.e. a mobile phone)

6.3 Immediately Prior to, and During the Flight.

- (1) Make a visual check of the skies, for any aircraft.
- (2) Ensure that the area directly around the launch site is clear of people or animals to the UKRA Safety Distance. (see UKRA Safety Code)
- (3) Always give a clear audible ten second countdown prior to launching you rocket.

6.4 After the Flight.

- (1) When retrieving your rocket please take into account your own personal safety when traversing difficult terrain or climbing trees.
- (2) Always leave the site free of litter and as you found it.(especially igniter leads !)

Annex A Launch Site Guidelines

UKRA Recommended Site Guidelines

The information required for assessing a site is:

- Full Affiliated Club Name or Host.
- Full contact details for club including Secretary, postal address, telephone number etc.
- Photos of the relevant flying site showing panoramic views from the launch point.
- Location. e.g. Cranwell, 9nm NE of Grantham, OS Grid Ref. N5301.80 W00028.90
- State if site is in Controlled/Uncontrolled Airspace. If proposed site is in controlled airspace please state what height restrictions apply. *
- State if there are any hazardous areas. e.g. Areas of special interest including intense gliding activity, parachuting and typical distance. *
- State maximum requested class of motor for site certification.
- State the times of year that the site may be used. e.g. All Year round, Spring etc.
- List any facilities on or near the site for members use. e.g. Toilets, telephone, car parking, pubs, shops etc.
- Full contact details for Landowners and/or Tenants if applicable.
- Permission from Landowners and/or Tenants to launch/recover rockets from the proposed site including confirmation that the proposed acts will not break local Bye Laws.
- List of local emergency services. e.g. Phone Nos. and addresses of Doctors, Police, Fire Brigade, Local Airports, Electricity, Gas, Water etc.
- Copy of up to date OS Pathfinder (4cm – 1km) maps for proposed site and immediate area highlighting/indicating the following information:
 - All roads and public Rights of Way.
 - Proposed launch sites and access points.
 - Any Site Constraints. e.g. Flat, open, wooded, undulating, hedges, clear ground, arable, grass, shrub etc.
 - Any Natural Hazards. e.g. Ponds, lakes, rivers, marsh or wet ground, trees and hedges.
 - Any Man made Hazards. e.g. Overhead lines-size 240V, 33000V, telephone radio masts, towers etc.

* Information on which can be found on Air Navigation Maps.

A form that outlines all the relevant information can be obtained from the UKRA website or by post by writing to the UKRA address.

Annex B Air Navigation Order

63 Endangering safety of an aircraft

A person shall not recklessly or negligently act in a manner likely to endanger an aircraft, or any person therein.

64 Endangering safety of any person or property

A person shall not recklessly or negligently cause or permit an aircraft to endanger any person or property.

87A Regulation of rockets

(1) (a) Subject to sub-paragraph (b), this article shall apply to:

- (i) small rockets of which the total impulse of the motor or combination of motors exceeds 160 Newton-seconds; and
- (ii) large rockets.

- (b) This article shall not apply to
 - (i) an activity to which the Outer Space Act 1986 applies; or
 - (ii) a military rocket.
- (2) No person shall launch a small rocket to which this article applies unless the condition in paragraph (3), and any of the conditions in paragraph (4) which are applicable, are satisfied.
- (3) The condition first mentioned in paragraph (2) is that he has reasonably satisfied himself that:
 - (a) the flight can be safely made; and
 - (b) the airspace within which the flight will take place is, and will throughout the flight, remain clear of any obstructions including any aircraft in flight.
- (4) The conditions mentioned secondly in paragraph (2) are that:
 - (a) for a flight within controlled airspace, he has obtained the permission of the appropriate air traffic control unit for aircraft flying in that airspace;
 - (b) for a flight within an aerodrome traffic zone at any of the times specified in Column 2 of the Table in rule 39(1) of the Rules of the Air Regulations 1996, he has obtained the permission of the air traffic control unit at the aerodrome or, where there is no air traffic control unit, he has obtained from the aerodrome flight information service unit at that aerodrome information to enable the flight within the zone to be conducted safely or, where there is no air traffic control unit nor aerodrome flight information service unit, he has obtained information from the air/ground radio station at that aerodrome to enable the flight to be conducted safely;
 - (c) a flight for aerial work purposes is carried out under and in accordance with a permission granted by the CAA .
- (5) No person shall launch a large rocket unless he does so under and in accordance with a permission granted by the CAA.
- (6) For the purposes of this article a permission granted by the CAA shall be in writing and may be granted subject to such conditions as the CAA thinks fit



UKRA Constitution.

1 Title

- i) The Association shall be called the “United Kingdom Rocketry Association” or UKRA.

2 Mission Statement And Aims Of The Association

2.1 Mission Statement

- i) “To act as an enabling, advisory and standards forum for all parties interested in Rockets and Amateur Rocketry in the United Kingdom.”

2.2 Aims Of The Association

- i) To establish the UKRA Safety Code as a common standard.
- ii) To provide third party flight insurance for all “Full” members.
- iii) To encourage affiliation of all interested clubs.
- iv) To establish UKRA as “the primary liaison” with HSE, CAA, Police, BNSC and other interested parties.
- v) To operate a flight certification scheme.
- vi) To promote rocketry through education.
- vii) To issue a publication promoting amateur rocketry and the aims of the association.
- viii) To promote amateur rocketry in the United Kingdom

3 Membership

3.1 UKRA Membership Types

- i) **Full Senior Member:** This grants full access to the facilities offered by UKRA including flight insurance, access to UKRA publications, full voting rights, and the right to stand for election to any office within the Association. The minimum age for Full Senior Membership is 18 years of age.
- ii) **Full Junior Member:** This is available to anyone under 18 years of age. All membership rights of a Full Senior Member are available, excluding the right to stand for election.
- iii) **Associate Member:** This type of membership is aimed at non-flyers. All membership rights of a Full Senior Member are available, excluding flight insurance and the right to stand for election.

3.2 BMFA Membership

- i) Where applicable, BMFA membership at the appropriate level, is included in UKRA membership

3.3 Club Affiliation

- i) Other clubs and organisations may affiliate to the Association at the discretion of the council. Rules for granting Affiliate Status are given in the UKRA Rules And Regulations.

4 Subscriptions

- i) All membership subscription rates shall be as determined by the Council from time to time.
- ii) The Council may at its discretion introduce and withdraw discount membership types or schemes, and / or alter their conditions. Any schemes are described in the UKRA Rules And Regulations.
- iii) The membership year runs from 1st January to 31st December inclusive

5 Annual General Meeting

5.1 Date, Place and Time.

- i) The council shall determine the date, place and time of the meeting.
- ii) There will be one Annual General meeting per calendar year.

5.2 Representation.

The following shall be entitled to be present:

- i) Council Members including Elected Officers
- ii) All Members who have fully paid their membership subscriptions at least one month before the meeting.
- iii) Invited guests.

5.3 Notice of AGM and Business to be transacted.

- i) The Secretary shall give six (6) weeks minimum notice of the date of the AGM.
- ii) The Secretary shall issue the Annual General Meeting Agenda and Election nominations prior to the date of the AGM.
- iii) The Agenda for the AGM shall provide for:
 - (1) Chairman's Remarks.
 - (2) Receive the Minutes of the previous AGM.
 - (3) Receive the Annual Report of the Council.
 - (4) To consider the Audited Financial Statements, Balance Sheet, and the Report of the Auditors.
 - (5) To receive the Result of Elections to Council
 - (6) To appoint Auditors.
 - (7) To appoint a Solicitor.
 - (8) To consider alterations to the Constitution of the Association.
 - (9) To consider any General Business
 - (10) To consider any other business not specifically provided for in the Agenda.

5.4 Alteration to Constitution.

- i) Notice of any proposed alteration to the Constitution of the Association must be submitted in writing by the proposer to the Secretary three (3) weeks before the AGM and shall be included on the Agenda.
- ii) Any alterations to the constitution will come into effect immediately following a successful vote.

5.5 General Business.

- i) Providing that due notice in writing has been given to the Secretary three (3) weeks before the AGM, of any matters of "General Business" these will be included on the Agenda.

5.6 Voting

- i) **General Voting.** Each person qualified to attend the Annual General Meeting shall have one vote. All voting shall be by show of hands, and a majority of votes cast shall decide all matters before the meeting, except any proposed alteration to the

Constitution of the Association which must be supported by at least two-thirds of the vote.

- ii) **Election to Council.** All Full and Associate members are entitled to vote and will be able to cast Five (5) votes for separate individuals standing for Election to Council. Vote will be taken by ballot, before commencement of the AGM. The Eight (8) candidates receiving the highest number of votes will form the Council. In the event of the same number of votes being cast for the final positions on the council lots will be drawn to assign places.
- iii) **Postal Votes.** Qualified persons unable to attend the AGM may submit a postal vote to the Secretary of the Association. Postal votes must be received by the Secretary addressed to the UKRA PO Box one week before the date of the AGM.

6 Special General Meeting

6.1 Convening the meeting

- i) The Secretary shall convene a Special General Meeting by order of the Council or upon receiving a request to do so signed by not less than ten percent (10%), or at least twenty (20) Members of the Association, whichever is the greater.

6.2 Notice.

- i) The Secretary shall give one calendar month notice of all Special General Meetings.

6.3 Date, Place and Time.

- i) The Council shall determine the date, place and time of such meetings.

6.4 Agenda.

- i) An agenda of the meeting shall accompany the Notice, and shall take the nature of the business for which the Meeting is being summoned.

6.5 Other Business.

- i) No other business shall be discussed at the Special General Meeting.

6.6 Representation.

- i) The requirements of item 5.2 will apply

6.7 Alteration to Constitution.

- i) Where a request under item 6.1 calls for an alteration to the Constitution, the Council, after due consideration, may if they so decide, instruct the Secretary to include on the Agenda their views on the matter.

6.8 Voting.

- i) The conditions of items 5.6 i) and 5.6 iii) will apply.

7 Discontinuance Of The Association

7.1 Discontinuation.

- i) Should an alteration of the Constitution which would involve the discontinuation of the Association, as at present constituted, be carried at an Annual General Meeting or a Special General Meeting, by the appropriate majority aforesaid, the Executive Officers shall then refer this resolution to a postal ballot. All members who have representation rights under 5.2 ii) at the date of the meeting shall be included in the postal ballot. The postal ballot shall be held within one calendar month of the aforementioned meeting.

7.2 Validity of resolution.

- i) The resolution shall only become valid if it is supported by at least 65% of the total votes recorded in such a postal ballot.

7.3 Confirmation of discontinuation.

- i) Should the result of the ballot confirm that the discontinuance of the Association, as at present constituted, the Council will take the necessary steps to wind up the Association at the earliest possible opportunity.

8 Executive Officers Of The Association

8.1 Executive Officers.

- i) The Executive Officers of the Association shall consist of a Chairman, Deputy Chairman, Treasurer and Secretary.

8.2 Election of Executive Officers.

- i) The Executive Officers of the Association are to be elected by ballot from the Council, by the Council, immediately following the Annual General Meeting.

8.3 Rotation of Executive Officers.

- i) The period of elected service is to be from one Annual General Meeting to the next.

8.4 Removal of Executive Officers.

- i) Chairman, Deputy Chairman Treasurer and Secretary may be removed from office upon a motion to that effect being passed by Council with a 75% majority of all Council members. The removal motion must be ratified by an Annual General Meeting, or a Special General Meeting called for the purpose.

8.5 Replacement of Executive Officers.

- i) If an Executive position is vacated for any reason during a term of office, then the Council must hold a ballot to elect a replacement from the Council at the first possible opportunity.

9 Solicitor

- i) The Association may appoint a Solicitor who shall be nominated and elected at each Annual General Meeting. The Solicitor may only attend meetings of the Association when specially invited by the Council.

10 Auditors

- i) The Association shall appoint Auditors. Such Auditors shall be nominated and appointed at each Annual General Meeting. No Officer of the Association or member of the Council shall serve as Auditor.

11 Council Of The Association

11.1 The Council

- i) The Association shall be governed by a Council
- ii) The Council shall manage, through it's Committees, the affairs of the Association in accordance with the Constitution and Rules And Regulations of the Association and shall have all such administrative powers as may be necessary to properly carry out the objectives of the Association.

11.2 Council Members

- i) The Council shall consist of a maximum of Eight (8) members, as follows:
 - (1) Elected Executive Officers of the Association
 - (2) Elected Council Members
 - (3) Co-opted Council Members. These are Full members recruited to Council by elected Council members for specialist knowledge or to fill Council vacancies.

11.3 Election to Council

- i) The Council shall be elected yearly at the Annual General Meeting, by the procedure under item 5.6 ii)

11.4 Financial Matters

Without prejudice to the generality of the foregoing the Council shall have power:

- i) To purchase or otherwise acquire any real or personal property of any interest in the same respectively on behalf of the Association and out of funds of the Association which shall be considered for the benefit of the Association at large whether directly or indirectly connected with the aims of the Association.
- ii) To give direction to improve, develop, manage, mortgage, let or sell any real or personal property of the Association and to turn the same to profit and advantage, in any way that the Council may deem desirable.
- iii) To borrow money either at one time or from time to time and at such rate of interest and in such form and manner upon any such security as the Council shall determine. The Council shall make all such dispositions of the property of the Association or any part thereof and enter into such agreements in relation thereto, as it may deem proper for giving security of such loans and interest.
- iv) To lend or invest such funds or surplus moneys accrued in trust for the Association as a whole in such manner and upon such terms, as the Council shall deem fit.
- v) To subscribe or make grants from the funds of the Association to any other Association, Profession, Journal, Institution, Charity or other body having similar interests in the Association.

11.5 Attendance At Council Meetings

- i) Should any member of the Council be absent from five (5) consecutive meetings of the Council without reasonable excuse the council shall have power to declare the seat vacant.
- ii) Should any member of Council be unable to attend a Council meeting, the member should inform the secretary of such in advance of the meeting.

11.6 Council Standing Orders

- i) The Council shall have authority to make Standing Orders to regulate and control the business of the Council and the conduct of its members. Any member of the Council may propose amendments, alterations or additions to the Council Standing Orders by giving in writing to the Secretary a Notice of Motion, which shall then appear, on the Agenda for the next ensuing Meeting of the Council.
- ii) Any accepted amendments, alterations or additions to the Council Standing Orders will be communicated to the membership at the first possible opportunity.

11.7 Council Quorum

- i) Each meeting of the Council must have a quorum of three (3) members including at least one (1) executive officer in attendance before the business of the Council can be proceeded with.

11.8 Delegation Of Powers

- i) The Council shall have power to appoint such Committees or Commissions as may be considered necessary, and delegate all or any of its powers to such Committees or Commissions.

11.9 Emergency Committee

- i) The Executive Officers of the Association shall have full delegated powers to act for and on behalf of the Council in matters of an urgent nature arising between meetings of the Council, and where they have so acted they shall report the circumstances to the next meeting of the Council.

12 Rules And Regulations Of The Association

12.1 Councils Powers.

- i) The Council of this Association shall have power to make rules and regulations from time to time as they deem necessary, which shall become effective upon publication.

12.2 Amendments

- i) Any member may propose amendments, alterations or additions to the Rules And Regulations by giving in writing to the Secretary a Notice of Motion, which shall then appear, on the Agenda for the next ensuing Meeting of the Council.
- ii) Any accepted amendments, alterations or additions to the Rules And Regulations will be communicated to the membership at the first possible opportunity.

12.3 Enforcement.

- i) The Council of this Association shall enforce the Rules and Regulations of the Association as promulgated.

13 Disciplinary Procedure

13.1 Disciplinary Committees

- i) Disciplinary Committees may be appointed to will deal with:
 - (1) Serious breaches of any UKRA Rule or Regulation.
 - (2) Any member bringing the Association into disrepute.
 - (3) Any matter defined as gross misconduct in Item 13.4
 - (4) Any other matter where deemed necessary, and agreed upon by a 75% vote of the full Council.
- ii) Committees will consist of three (3) elected Members of Council. The Associations Chairman shall appoint the Committee and nominate a Chairman.

13.2 Disciplinary Procedure

- i) The Disciplinary Committee shall deal with all reports or complaints, coming within their jurisdiction, by correspondence between the Members of the Committee.
- ii) Where, however, a written application is received asking for a report or complaint to be heard, the Disciplinary Committee shall determine the date, time and venue for the hearing.
- iii) Member(s) failing to reply to correspondence will after a suitable reminder letter be deemed to be in receipt of said correspondence and to be in agreement with it.
- iv) The decision of a Disciplinary Committee shall be final and not subject to appeal, except within the provisions of the Association.
- v) Disciplinary Committees will notify all persons concerned of their decisions, in writing within one (1) month of said decision.

13.3 Sanctions Available to Disciplinary Committees.

- i) The severity of the sanction applied will depend on the Disciplinary Committees judgement as to the seriousness of the infringement. Repeat offences will result in increasing levels of sanctions being applied. The following sanctions may be applied
 - (1) Disciplinary Committee letter of Admonishment.
 - (2) Recommendation for Suspension of Insurance for one (1) month in addition to Item 13.3 i)1
 - (3) Recommendation for Suspension of Insurance for two (2) months in addition to Item 13.3 i)1
 - (4) Recommendation for Suspension of Insurance for four (4) months in addition to Item 13.3 i)1
 - (5) Recommendation for Suspension of Insurance for eight (8) months in addition to Item 13.3 i)1

- (6) Recommendation for Suspension of Insurance for three (3) years in addition to Item 13.3 i)1
- (7) Lifetime ban from UKRA membership.

13.4 Gross Misconduct

- i) The following are defined as acts of gross misconduct:
 - (1) Serious infringement of the UKRA Safety Code.
 - (2) Victimisation or harassment of UKRA Members.
 - (3) Violent behaviour towards other UKRA Members.
 - (4) Attempt to defraud or mislead the Association.
 - (5) Embezzlement of UKRA funds.
 - (6) Unauthorised use of UKRA assets.
 - (7) False representation of UKRA officials.

13.5 Recommendation of Suspension of Insurance

- i) While UKRA Flight Insurance is provided by a third party, the Council does not have the power to suspend insurance as a disciplinary sanction. However, upon such a sanction being passed in a Disciplinary Committee, the Safety and Technical Committee will make a recommendation to the insurers that Flight Insurance is suspended for the allotted time period.

14 Complaints By Members Or Affiliated Clubs

14.1 Complaints Procedure

- i) Any complaint made by an individual or affiliated club shall be in writing to the Chairman with a duplicate copy sent to the Secretary.

14.2 Expenses

- i) Before hearing any complaint, the Council shall have the power to request payment of any foreseeable expenses with respect to the hearing of the complaint. If the complaint is found to be answerable (neither frivolous nor vexatious), then all monies paid will be returned.
- ii) For a complaint to be found frivolous or vexatious at least 75% of the Council must be in agreement.

14.3 Representation

- i) No barrister or solicitor shall represent an individual or affiliated club at the hearing of a complaint unless he is the individual concerned or the Chairman or Secretary of the club concerned.

15 Accounts Of The Association

15.1 Accounts

- i) The Council shall keep a Profit and Loss Account of the Association which shall contain all Income and Expenditure.

15.2 Surplus or Deficit

- i) Any Surplus or Deficit arising in the Accounts mentioned above shall be transferred to or from a high interest savings account.
- ii) The Association being a non-profit making body established for promoting Amateur Rocketry in the United Kingdom shall not distribute to its members any Surplus Income over Expenditure.

15.3 Signatories

- i) Authorised Signatories for cheques drawn on the associations accounts shall be Chairman or Deputy Chairman and any other Executive Officers as required by the banking authorities.

16 Appointment Of Association Staff

- i) The Council shall appoint and fix the terms and conditions of employment of such whole-time or part-time staff as may be required.



UKRA Rules and Regulations.

1 Safety Code

- i) The UKRA Safety Code is published as a separate document.
- ii) Any revisions to the Safety Code become current as soon as they are published.
- iii) All members flying activities **MUST** adhere to the Safety Code

2 Insurance

2.1 General.

- i) UKRA cover / insurance is third party only. Members launch rockets entirely at their own risk, and are not covered for accidents to themselves.

2.2 Provision of Cover.

- i) UKRA insurance only provides cover for Rocket Flying activities, when:
 - (1) The UKRA Safety Code is followed.
 - (2) For flights up to and including G-class (160 NS) combined impulse:
 - (a) The flyer is one of the following:
 - (i) A Full or Temporary Member of UKRA.
 - (ii) A School / Youth Group Member of UKRA flying under the supervision of their Group Leader
 - (iii) Covered by one of the Insurance Extensions listed in item 2.3.
 - (3) For flights greater than G-class (160 NS) combined impulse:
 - (a) A UKRA certified Range Safety Officer (who is certified at a level to oversee the flight) supervises the launch.
 - (b) The flyer is one of the following:
 - (i) A Full Member of UKRA and certified for the level of the motor which they intend to use.
 - (ii) A Temporary Member of UKRA and holds valid high power certification from a UKRA recognised rocketry organisation for the level of the motor which they intend to use.
 - (iii) A School / Youth Group Member of UKRA whose supervising Group Leader is certified for the level of the motor which they intend to use.
 - (iv) Covered by one of the Insurance Extensions listed in item 2.3, and holds valid high power certification from a UKRA recognised rocketry organisation for the level of the motor which they intend to use.
 - (4) The launch site meets the UKRA recommended guidelines for the flight.

2.3 Extensions.

- i) **First Time Inexperienced Flyers.** This extension allows cover for first time visitors to a UKRA or Affiliated Club's flying event who have no previous experience but are seeking to try out rocket flying prior to joining UKRA (and the Club). Insurance cover

will only be in place when flights are being totally organised and supervised by a UKRA Certified Range Safety Officer, and for flights up to and including G-class (160 NS) combined impulse. Cover is limited to 3 days for any single inexperienced flyer.

3 Certification

- i) Flight Certification is required to fly any rocket with a combined impulse of more than 160 Newton Seconds.
- ii) The rules and procedures for Flight Certification can be found in the Certification Guide, which published as part of the UKRA Information Pack.

4 Requirements for Safety Officers

- i) Only Full Senior Members can apply to become a safety officer.

5 Membership Packages

UKRA currently offers the following additional membership packages:

5.1 Family Membership

- i) This is a reduced membership package for families with at least one full adult member, and any number of junior members.
- ii) The lead family member must be a full UKRA member, partners and juniors may be full or associate members.

5.2 Temporary Membership

- i) This package is normally provided for non UKRA members who wish to fly at a UKRA or a UKRA affiliated club's flying event, and is valid for one month.
- ii) The member will be insured for all flights up to a combined impulse of G-class.
- iii) If the member holds valid high power certification from a UKRA recognised rocketry organisation, then they will also be insured for all flights within their certification level.
- iv) The cost of temporary membership may be subtracted from the cost of full UKRA membership provided the application to join is made within one month of the end of the flying event.
- v) The cost of temporary membership will be reduced if the flyer is an existing BMFA member

5.3 School and Youth Group Membership

- i) This is a discounted membership scheme to allow recognised Schools and Youth Groups to take part in flying activities.
- ii) Groups consist of a Group Leader, and a minimum of 4 (four) Junior Members. The junior members do not need to be named - the scheme allows for any number of individuals so long as the total number does not exceed that which the group has registered.
- iii) The Group Leader will have Full UKRA Membership and insurance for his/her flying pursuits both within the group and individually.
- iv) Junior Members are only insured whilst flying with the group, under the direct supervision of the Group Leader.
- v) The Group Leader may only supervise launches that fall within the combined impulse of their own personal certification. If they have no certification then only launches of up to 'G' class may be supervised.
- vi) It is recommended that the Group Leader applies for UKRA RSO Certification. This is a requirement if they are going to supervise any flights with greater than 160NS total impulse.
- vii) The Group Leader will be charged the current Full Senior UKRA fees at the time of joining. The junior members will be charged one third of the Junior Membership fee (rounded to the nearest whole £)

5.4 Early Members.

- i) Any prospective or lapsed member, who applies for membership for the following year in the period between renewal notices being issued and the end of December, will be granted UKRA membership for the remainder of the current year.

5.5 Overseas Members.

- i) Insurance cover cannot be extended to non UK residents, only Associate Membership is available to them.
- ii) To cover extra postage costs, these members will be charged a small premium based on their Postal Zone.

6 Club Affiliation

All Clubs flying Rockets in accordance with all UKRA rules, being based in the United Kingdom may be eligible for Affiliate status to the Association.

All applications for affiliation are subject to the approval of Council.

6.1 Requirements.

- i) The club must have at least two full UKRA members of which one member must be a UKRA Certified Safety Officer.
- ii) All flying activity at an affiliated club site must be third party insured, and operate in accordance with the UKRA Safety Code and Certification scheme.
- iii) All Clubs, before being admitted to Affiliate status and at any time thereafter when so required, shall satisfy the Council that they are properly constituted.
- iv) Affiliated UKRA clubs are encouraged to register their flying site(s).
- v) Affiliated Clubs may change their details, as and when they see fit, but should inform the Secretary within One month of any changes.

6.2 Benefits.

- i) The Secretary of a UKRA Affiliated Club can collect UKRA Membership Fees from their members. Any club member joining (or renewing) in this way will have insurance cover from the moment they pay their club and UKRA fees. The Club Secretary must forward any UKRA Membership Forms and fees to the UKRA Membership Secretary within fourteen days.
- ii) Affiliated clubs can offer insured flying sessions for First Time Inexperienced Flyers at their launch events.
- iii) When borrowing or renting (as appropriate) any UKRA owned equipment for use at their launch events, Affiliated clubs will have precedence over other members.
- iv) Space will be reserved in UKRA's publications for Affiliated clubs to inform the readership about their activities and recruit new members.

7 Announcement of AGM

In order to comply with Constitution items 5.3 i), 5.3 ii), 5.4, and 5.5 and still keep the membership fully informed, the following procedure will be used to announce the AGM:

- i) In the issue of the UKRA publication prior to the AGM, an announcement will be posted informing the membership of the AGM.
- ii) This announcement will contain the following items:
 - (1) The proposed date of the meeting.
 - (2) A request for Council Election nominations.
 - (3) A request for any Constitutional Changes.
 - (4) A request for any items of General Business.
 - (5) The 'cut-off' dates for items (2), (3), and (4).

- iii) One month prior to the AGM the secretary will issue the agenda as it stands at that point.
- iv) Two weeks prior to the AGM the secretary will issue any additions to the agenda arising from any received items for Constitutional Change or General Business.

8 Infringements Of The UKRA Safety Code

- i) **Minor Infringements of the UKRA Safety Code.** The Safety Officer on duty should deal with minor infringements of the UKRA Safety Code at the time of the alleged incident. The Safety Officer should inform the offender(s) as to the nature of the infringement and offer guidance on how not to repeat the offence.
- ii) **Serious Infringements of the UKRA Safety Code.** In the event of a serious breach of the Safety Code, initially, Item 8(i) will be followed. In addition the Safety Officer on duty at the time of the alleged incident should produce a written report on the incident. UKRA Document "Safety Officer Incident Report UKRA 0030" should be used as a template for this purpose. The report should then be sent to the Chairman of the UKRA Safety and Technical Commission who in conjunction with the rest of the Commission will then decide what action should be taken. A duplicate copy should also be sent to the offender(s)
- iii) **Actions to be Taken, Admonishment Letters.** In the event of an infringement of the UKRA Safety Code as reported in Item 8(ii) which is judged by the Safety and Technical Commission to be not serious enough for referral to a Disciplinary Committee a letter of admonishment should be sent to the offender(s).
- iv) **Actions to be Taken, Referral to a Disciplinary Committee.** In the event of an infringement of the UKRA Safety Code as reported at Item 8(ii) which is judged by the Safety and Technical Commission to be serious, the matter will be referred to a Disciplinary Committee (See Constitution Item 13)
- v) **Actions by Members on Receipt of Safety Officers Reports.** On receipt of the Safety Officers report the persons concerned, if in disagreement with said report, should reply, in writing within Fourteen days, stating either areas of disagreement or the full incident from their point of view. The subjects of the report may have their case heard before a commission

9 Complaints against Safety Officers.

- i) Complaints against Safety Officers should be made in writing to the Chairman of the Safety and Technical Commission. The written complaint should comprise the date time and full nature of the problem. Complaints will be dealt with in the same manner as Safety Officer Reports

10 Assaults Upon Safety Officers

- i) **Statement of Intent.** Assaults upon Safety Officers are a criminal act. This Association is determined not only to assist in the prosecution of offender(s) in Court, but also to take disciplinary action against the offender(s).
- ii) **Action to be Taken.** The actions outlined in the Constitution Item 13 shall be followed.



UKRA Council Standing Orders.

1 Proceedings

- i) Where not specifically specified, all proceedings shall take place according to 'Robert's Rules of Law'.

2. Council Meetings

- i) The Chairman shall determine the dates on which the Council shall meet, and he/she shall be empowered to vary such dates or to call additional Meetings, as he/she deems necessary.
- ii) A meeting of the Council shall be defined as;
 - 1) A prearranged assembly of Council members to conduct UKRA business.
 - 2) Council members conducting UKRA business via any common form of communication. Such communication may be initiated at any time by any Council member.
- iii) Council members must be allowed 1 week to respond to proposals arising from business conducted in accordance with 2.ii.2. If no response is received from a Council member within 1 week then that member will be taken to have abstained from voting on the proposal.

3 Representation

- i) The following shall be entitled to be present at Council Meetings:
 - (1) Council Members.
 - (2) Invited guests.
 - (3) UKRA Members who have requested to be present - at the discretion of the Chairman.

4 Record Of Attendance

- i) A record shall be kept of the attendance of Members at each Meeting.

5 Notice Of Meetings

- i) The Secretary shall give at least fourteen days clear notice to each member of every meeting of the Council together with an Agenda of the business to be transacted.

6 Notice Of Motion

- i) That notices of all intended motions shall be given in writing to the Secretary 21 clear days previous to the meeting, and such notices shall be placed on the agenda in the order received. In the absence of the member in whose name it stands, the motion shall

not be proceeded with unless he/she has given written authority to some other member to proceed with it.

7 Order Of Proceedings

- i) The Agenda for Council Meetings shall provide for:
 - (1) Reading and approval of the minutes of the previous meeting.
 - (2) Matters arising from the previous minutes.
 - (3) Secretary's Report.
 - (4) Finance Report.
 - (5) Membership Report.
 - (6) Reports from Committees and Commissions.
 - (7) Items of General Business
 - (8) Any other business not specifically provided for in the Agenda.
- ii) The business before the meeting as stated on the Agenda shall be proceeded with in such order as the Chairman may decide.

8 Objectionable Business

- i) If the Chairman is of the opinion that any motion proposed to be made is of an objectionable character he may at once put it to the vote (on which there shall be no discussion) whether it shall be entertained or not. If two-thirds of the members present decide not to entertain such a motion the matter is disposed of for that meeting.

9 Mode Of Voting

- i) All questions shall be determined by a show of hands, unless the vote is to be recorded. Recorded voting shall be done at the request of any member provided that they are supported by no less than two others. In that case the names for and against shall be taken down by the Secretary and entered into the minutes. At any time during a discussion any member can propose and any other member second the following motion. i.e. "That the question be now put". This motion shall at once be put from the chair and voted upon without any further discussion. If carried the Chairman shall ask any member having a right to reply for their comments and after such comments the question shall be carried without any further discussion. If the vote is equally divided the Chairman is entitled to a casting vote.

10 Procedure Of Investigation

- i) During investigations of complaints, reports of Safety Officers, or other matters in which witnesses are admitted into the Council Room, every member who wishes to question the person under examination may only do so through the Chairman.

11 Retracted Resolutions

- i) A Resolution shall not be retracted at the meeting of the Council at which it has been passed unless the motion to retract is carried by 75% of the members present.

12 Ex-Officio Members

- i) The Executive Officers of the Association shall be ex-officio Members of all Committees of this Association.

13 Executive Committee Powers and Duties

- i) Take steps as necessary to give effect to the decisions of the Council or such policies or other acts as are authorised by the Council.
- ii) Action policy agreed by the Council, including such matters requiring urgent attention without prior reference to Council. Such decisions to be communicated to Council as soon as practical.

- iii) Call additional meetings of the Council where matters of policy to be followed by the Association need urgent discussion.
- iv) The Executive Committee shall consist of the Chairman, Deputy Chairman, Treasurer and Secretary.

14 Commissions Of The Association

- i) Where it is necessary for a commission to be appointed, either to act solely in matters affecting this Association or jointly with other organisations, the Secretary shall be empowered to appoint such Commissions, e.g. Project teams, from members of the Council. If for any reason he/she is unable to act, any one of the Executive Officers can deputise. Council shall determine terms of reference.

15 Delegation Of Powers

- i) The Committees and Commissions established under Items **Error! Reference source not found.** and **Error! Reference source not found.** shall have full delegated powers to act on behalf of the Council in all matters that of necessity must be decided or resolved before the next meeting of the Council. But shall in such cases report their decisions or resolutions to the next meeting of the Council for information.

16 Reports Of Committees Or Commissions

- i) Each Committee or Commission appointed under Items **Error! Reference source not found.** and **Error! Reference source not found.**, shall, through its Chairman or Secretary, report back to Council on current business.

17 Procedure For Election Of Officers

- i) **Where there are two (2) candidates.** Simple majority of votes cast shall elect the Officer. In the event of a tie, the Chairman shall declare a re-ballot. Should the result of the re-ballot be tied then lots shall be drawn to determine the successful candidate.
- ii) **Where there are more than two (2) Candidates.** If any one candidate receives 50% of the total votes cast plus ONE (1) vote, then the candidate shall be declared elected. If no Candidate receives 50% of the votes cast plus ONE (1) vote the Chairman shall declare a re-ballot. If in the event all candidates receive the same number of votes then the Chairman shall declare a re-ballot. Should all candidates receive the same number of votes in the re-ballot then lots will be drawn to decide which candidate(s) will retire from the ballot.
- iii) **Where a Re-ballot is declared.** This ballot shall be contested by the Two (2) candidates receiving the highest number of votes cast at the previous ballot or by the drawing of lots, as described above. All other candidates shall retire from the ballot. The election of the Officer shall be decided on a simple majority of the votes cast in the ballot. Should this ballot result in a tie then the Chairman shall declare a re-ballot. Should the result of the re-ballot be tied then lots shall be drawn to determine the successful candidate.



UKRA INFORMATION PACK

1 Certification Guide

1.1 Flight Certification

Flight Certification is required to fly any rocket with a combined impulse above 160Ns.

UKRA currently operates three levels of flight certification:

- Level I - 'H' to 'I' combined impulse motors.
- Level II - 'J' to 'L' combined impulse motors.
- Level III - 'M' and above combined impulse motors.

Certification is only available to Full Members of UKRA. Temporary or Associate members cannot apply for certification.

Full Junior Members can apply for certification, but the Certifying Officer should carefully assess the maturity of the candidate before allowing any certification attempt.

Note: The term 'combined impulse' refers to the total impulse of all motors fitted to a rocket. If a cluster of motors is used or the rocket has multiple stages, all the motors are included in the combined impulse.

1.2 Level I Certification

This level of certification is required to fly rockets with a combined impulse between 'H' and 'I' class (between 160Ns and 640Ns), regardless of whether the combined impulse is from a single motor, a cluster of smaller motors or multiple stages.

The member must perform a successful flight test that is signed off by a UKRA Certified Safety Officer (who is also at least Level I Certified). The guidelines for the flight test are detailed below in Section 1.6.

If the flight test is not successful, the member must wait one day before re-applying for Certification.

1.3 Level II Certification

This level of certification is required to fly rockets with a combined impulse between the 'J' and 'L' class (between 640Ns and 5120Ns), regardless of whether the combined impulse is from a single motor, a cluster of smaller motors or multiple stages.

In order to obtain Level II Certification, a member must have been Level I Certified for a least one-day.

The Level II Certification process has two stages; the UKRA Certification Exam, and the Level II Flight Test.

The member must pass the Certification Exam before attempting the Flight Test. Details of the exam can be found in Section 1.7 of this document.

After passing the exam, the member must then perform a successful flight test that is signed off by a UKRA Certified Safety Officer (who is also at least Level II Certified). The guidelines for the flight test are detailed below in Section 1.6.

If the flight test or the exam are not successful, the member must wait one day before re-applying for Certification.

1.4 Level III Certification

This level of certification is required to fly rockets with a combined impulse of 'M' or above (over 5120Ns), regardless of whether the combined impulse is from a single motor, a cluster of smaller motors or multiple stages.

The details of Level III Certification are more complex than the previous two certification levels.

The process will follow the basic structure given below. For a complete set of Level III procedures, please contact the UKRA Safety and Technical Committee.

In order to obtain Level III Certification a member must have been Level II Certified for a least one day.

A brief overview of the project should be sent to the UKRA Safety and Technical Committee. After initial consultation with the applicant, a member of Safety and Technical Committee will be assigned to oversee and help the applicant's project.

A full Project Report must then be submitted to the UKRA Safety and Technical Committee for approval. The report should include details such as stability calculations, structural calculations, drawings for rocket and recovery systems, details of flight electronics, etc.

After the UKRA Technical Committee formally accepts the Project Report, the member must perform a successful flight test that is signed off by two UKRA Certified Safety Officers (one of them must be Level III Certified). The guidelines for the flight test are detailed below in Section 1.6.

If the Project Report is not accepted, or the Flight Test is not successful, the member must wait one month before re-applying for Certification.

1.5 Hybrid Certification

There is no separate certification level for hybrid motors. This does not mean however, that there are no regulations to be followed.

To fly hybrids, the following criteria must be met :-

- (1) The flyer must have passed the UKRA Certification Exam.
- (2) The flyer may only fly hybrids of the equivalent power to their current certification level. (For example - To fly an "H" powered hybrid, the flyer must be UKRA Level I Certified and have passed the Certification Exam. If the flyer then wanted to fly a "J" powered hybrid, they would have to be fully Level II Certified.)
- (3) The flyer, may, at the discretion of the RSO / Certifying Officer, use a hybrid to complete certification flight tests.

1.6 The Flight Test

If the rocket uses a single motor, the motor must be within the combined impulse classes covered by the certification level (i.e. 'H' to 'I' if Level I - 'J' to 'L' if Level II - 'M' or above if Level III).

If the rocket uses a cluster of motors or has multiple stages, **at least one motor must be within the combined impulse classes covered by the certification level**, however the

combined impulse of all the motors in the cluster must not exceed the combined impulse covered by the certification level.

The Flight test starts with the preparation of the rocket, which must be observed by the Safety Officer.

The flight must then be performed, observed by the Safety Officer. The rocket must be owned and built by the person performing the flight test (the rocket may be scratch built or a kit).

For the flight to be deemed successful, the following must be observed:

- If a cluster, all motors must ignite as intended.
- If multiple stages, all stages must ignite and separate as intended.
- Stable flight (no veering off course, tumbling, etc - weather cocking is permissible).
- All recovery devices should be seen to deploy correctly, and in the manner declared before the flight (i.e. both drogue and main if fitted must deploy at the correct phase of the flight).
- No item of the rocket should return to the ground without a recovery device (no bits can fall off).
- The rocket must be retrieved undamaged or with only minor cosmetic damages (surface scratches, parachute charring, etc), however damage due to unforeseen landing on a hard surface is permissible.

Note: The intended method of any cluster ignition, stage ignition, airframe separation, and recovery device deployment must be declared before flight.

If the rocket is lost but the Safety Officer observed the recovery system deployment and believed that the flight would otherwise have been successful, the flight test will be deemed a success.

If a member has any disability that would stop them from carrying out any part of the flight test, then they may use a helper. The helper may carry out any task directly instructed by the member, but should not act on their own initiative. The helper should not be the Certifying Safety Officer.

Following the Flight Test, a completed UKRA Certification Application form should be signed by the Safety Officer. This must be sent by the applicant, to the Membership Secretary with the correct fee, within thirty days of the flight test. This is the responsibility of the applicant, and no Certificate or updated year card can be issued until the form is received.

1.7 The UKRA Certification Exam

The UKRA Certification Exam is a multiple-choice paper of fifty questions covering flight principles, the safety code, UK legal issues, etc..

There is a Study Guide for preparing for the exam that can be obtained from the UKRA website, or by post by writing to the Secretary or Membership Secretary.

An applicant should contact a Certification Officer (who is at least Level II Certified) to arrange a time and place for the member to sit the exam.

The pass mark is 90%, and there is no time limit when sitting the exam. Each paper is marked on-site and so the result should be known within a few minutes, depending on the number other candidates in the exam session.

After the exam, by the Certification Officer should complete a UKRA Certification Exam form. The Certification Officer should then send this to the Membership Secretary, along with the examination answer sheet, and any fee.

If an applicant has reading or writing difficulties, then it will be possible for them to take the examination orally.

If the exam is not successful, the member must wait one day before trying again.

1.8 Safety Officer Certification

Safety Officer Certification is open only to Full Senior Members of UKRA; Junior, Temporary or Associate Members can not apply.

It is a requirement that any Safety Officer applicants that are not Level II certified must pass the UKRA Certification Exam, although the applicant does not have to have full Level II certification. Details of the exam can be found in Section 1.7 of this document.

To certify as a UKRA Safety Officer, the member must successfully complete a Safety Officer Interview.

The member should first contact the Safety and Technical Committee in order to arrange an appointment for the interview in a mutually convenient time and place.

The interview will be conducted by two UKRA officials, at least one of these officials will be a member of the UKRA Safety and Technical Committee (the other may be a certified Safety Officer). The interview will concentrate on issues such as rocketry experience, technical and safety issues, etc. The interview should be informal and short. An applicant will be informed of the result of the interview after a brief period.

Following a successful Interview, the chairman of the interview panel should sign off a UKRA RSO Application form. This must be sent by the applicant, to the Membership Secretary, within thirty days. This is the responsibility of the applicant, and no Certificate or RSO year card can be issued until the form is received.

Safety Officers may only oversee launches that fall within the combined impulse of their own personal certification. If a Safety Officer has no certification then launches of up to 'G' class may be supervised.

If a Safety Officer increases the level of his or her personal certification then the level of launches which they may oversee is automatically increased.

The Safety and Technical Committee may set a limit on the level of launches that any Safety Officer (especially one who is newly qualified) can oversee.

If a Safety Officer allows their UKRA Membership to lapse for more than one year, then their Safety Officer status will be revoked. Upon rejoining, the Safety and Technical Committee may require that the member retakes any or all parts of the Safety Officer Certification process before Safety Officer status is granted.

There is no charge for Safety Officer Certification.

- The role of the Safety Officer is a critical one within UKRA, is a responsible office, and is not taken lightly by UKRA. The certification process reflects this.

1.9 Charges

Certification attempts will be charged at the rates set by the UKRA Council. The current rates may be found on the UKRA website or obtained by writing to the Secretary.

2 Legal Requirements for Rocket Motors

The sport of High Power Rocketry has proven to be a safe past time. However, there are a few legal requirements that must be followed in the UK due to our more vigorous Explosives laws. We would also like to encourage everybody to be aware of general safety precautions to follow when flying rockets.

The following guidelines are for the commonly available motors, others are available but, the general outline is the same. Contact UKRA if you require more details on these.

2.1 Legal Requirements

Although Rocket Motors have proven to be safe through many years of operation in the US, the rocket fraternity is not yet large enough to be able to encourage a change in the law to treat rocket motors in a similar manner to fireworks. Until then, Motors are treated by the government as explosives and so to operate within the law anyone wishing to purchase / handle and / or fly the motors must obtain three documents from the relevant authorities. None of these are difficult to acquire and should be simply a matter of routine. All the authorities we have spoken to having be friendly and only too willing to help applicants through the process.

When applying for all three documents, you will need to explain that you need the document for Model Rocket Motors. You will also need to specify the UN classification number of the motors you intend to purchase. Every type of explosive is given a number by the UN to identify the explosive. When you fill in your application, you will need to know the UN classifications of the motors you intend to use / buy:

UN Number Motor Class Motor Type

UN Number classifications for rocket motors can be obtained from your rocketry supplier or from the HSE (Health & Safety Executive).

In order to obtain the documents you may have to satisfy the Police / Fire Service (depending on area) that the motors are stored responsibly. The favoured method of storing the motors is to use a locked ex-army ammunition box which has been wood-lined. The box must be kept in a place where it may be easily removed in the event of a fire. The exact requirements differ with different authorities.

2.2 Registered Explosives Store

The first step is to register an explosive store. This is normally done through your local Fire Service or Trading Standards Department. Contact one of these two bodies and ask if they handle the registration of explosive stores. Once you have found out which one handles the registrations for your area ask for an application form to register an explosives store. Explosive stores are normally given one of two different classifications either Mode A or Mode B. Most people will be applying for the smaller Mode B store.

Registering a store normally costs around £14.00 per annum.

2.3 Explosives Certificate

After registering an explosives store, the next step is to obtain an Explosives License. Your local Police Headquarters will issue an Explosive License. It is issued free of charge and is normally valid for at least three years. To obtain an Explosive License, you will have to request an application form from the Firearms/Explosive's Officer at your local Police headquarters. The Police should have been issued with a directive from the Health and Safety Executive that these are low risk items. You should fill in your application to Acquire-And-Keep explosives, this will allow you to buy and store the motors. If you do not have a registered store, it is possible to apply for an Acquire Only license. This will allow you to buy and fly on the same day, at the same location. The only downside to this is that any unused motors left at the days flying session must be handed back to the vendor as this license is limited and you are not permitted to keep any motors, even overnight. In the section marked TYPE AND QUANTITY OF EXPLOSIVES TO BE KEPT, it would be useful to mention model rocket motors and the relevant UN classification numbers.

2.4 Recipient Competent Authority Transfer Document

Once you have received an Explosives Certificate, you must also apply for a Recipient Competent Authority Transfer Approval Document (RCA or POMSTER). This is a certificate, which gives you permission to transport your explosives anywhere in Great Britain. It is vital you possess one of these, as we cannot send the explosives to you and you cannot transfer/transport your explosives without one (you can't even move the motors in your own car without an RCA).

An RCA must be obtained from the Health and Safety Executive. To obtain an RCA, you must send a copy of your explosives license along with the UN Classification numbers for which you wish to have an RCA, again mention that this is for Model Rocket Motors. An RCA is issued free of charge and is valid for the life of your explosives certificate.

Health and Safety Executive
SPD A2, Rose Court,
2 Southwark Bridge, London, SE1 9HS

3 Quick Guide to UK Airspace for Model and High Power Rockets

This guide is written to give a brief understanding of the types of airspace available in the UK. It is not an authoritative document but is meant to give a clear understanding of UK airspace.

The UK airspace comprises of controlled and uncontrolled airspace. This information can be found on aeronautical charts at a scale of 1:500 000 published by the CAA (Civil Aviation Authority). Three of these charts cover all of the UK. The charts show both military and civilian airports as well as areas of intense air activity. These may range from gliding activity, parachuting to weapon range danger areas.

Controlled and uncontrolled airspace is also shown. Controlled airspace does not go from ground level all the way up. In the immediate vicinity of an aerodrome the controlled space starts from ground level. This can take on a variety of shapes ranging from circles to oblong boxes with curved ends. There is very often a much larger area above this zone, which often links to other aerodromes. Air corridors also exist in this airspace and can often go from 5500ft to 24500ft.

Uncontrolled airspace is largely free from these constraints. However, if you launch in uncontrolled airspace then remember that you have a responsibility to other air users.

Most of the east and a large part of Wales Devon and Cornwall are uncontrolled airspace. Along the East side of the UK a lot of Military low level flying takes place. The uncontrolled airspace on the eastern side of the country goes down to Cambridge and Felixstowe. The remainder of the south east of England is under controlled airspace.

It would normally be recommended that a NOTAM (Notice to Airmen) be placed if launching in a known area of fast jet low level flying, particularly during the week. If launching under controlled airspace, please make sure of the available height and ensure that no launches would violate the height restriction. Please be aware that light aircraft may well be flying in this airspace beneath a controlled region, and a good lookout should always be made before launch.

It is recommended that you launch only from a UKRA recommended site which will have the height availability. Should you require further information, please contact UKRA Safety & Technical team who will have available up to date air charts and be able to give the necessary information.

REMEMBER, IT IS YOUR RESPONSIBILITY TO ENSURE THE SAFE FLIGHT OF YOUR ROCKET AND OTHER AIR USERS.

4 Sources of Information for Model and High Power Rockets.

4.1 Books and Magazines

There are a number of very good books and magazines covering all aspects of Model and High Power Rocketry, all of which are available via mail order or through the UK's rocketry suppliers.

4.2 WWW and the Internet

There are a huge number of web sites dedicated to Model and High Power rocketry. The UKRA web site should be your first port of call!

[HTTP://WWW.UKRA.ORG.UK](http://www.ukra.org.uk)

4.3 Rocket Kits and Rocket Motors

Suppliers should advise not only on appropriate kits to purchase, given the purchasers level of experience, but also on the matter of explosive licences and the law.

5 UKRA Event Flight Procedures

5.1 Introduction

All UKRA events will operate in accordance with the UKRA Safety Code and Certification scheme.

Flyers will only be able to fly at UKRA events if their flights are insured. At UKRA organised events they should also be a UKRA Member. **Model Rockets** – Combined Impulse of 'G' or less

High Power Rockets – Combined Impulse of 'H' or above (also all hybrid flights)

These rockets will operate from separate launch areas, which will be clearly marked; each area will have its own Safety Officer. The operation of each area is described below. However, details may change please make sure that you refer to the on-site timetable for the latest information.

5.2 Model Rocket Flights

If a flyer wishes to fly a model rocket, they should first complete a Flight Registration card. The completed card should be handed to the flight registration desk.

After inspecting your rocket, the Safety Officer will tell you where to set up your rocket for the next flying session. When flyers are invited to set-up their rockets in the Model Rocket Launch Area, you may do so if you have been seen by the Model RSO; otherwise you must wait for the next session. When all the rockets have been set-up, the Safety Officer will clear the Launch Area and invite each flyer to launch their rocket in sequence.

Before launching the rocket, the launch will be announced over the site PA system from the details on the Flight Registration Card and the Safety Officer will check that the sky is clear with the Duty Watch. The Flyer will be the person to launch the rocket (this is not done by an LCO at UKRA events). The sequence is then repeated with the next set of model rockets.

5.3 High Power Flights

The process for High Power Rockets is identical to that for Model Rockets, except that High Power Rockets have a separate Launch Area and Safety Officer.

High Power Rockets do not fly while Model Rockets are flying; however they may be inspected during that time. Therefore the sequence for High Power Rockets will be:

1. Fill in a Flight Registration Card and hand in to the flight registration desk.
2. Show the rocket to the High Power RSO informing him of power and predicted height.

3. The RSO will then allocate a launch pad for your usage.

A number of High Powered vehicles may be set up within the launch area. The igniters should only be installed immediately prior to the vehicles launch. The RSO will then clear the area to the safe distance. For high powered flights, the RSO should ensure that everyone is standing and will issue a "heads up" to ensure all eyes are on the sky. After making final checks with "watch", the RSO will inform the flyer that it is safe to launch after a clear ten seconds countdown.

Once all the rockets are set up in the high powered area have been launched, the RSO will open the range for flyer to begin the procedure again.

6 Duties and Responsibilities of a UKRA Safety Officer

The following is a guide to the duties and responsibilities of a UKRA certified Safety Officer.

6.1 Duties

To facilitate easy and safe rocket flying, within a sensibly applied set of rules. (see the UKRA Safety Code).

A Safety Officer should not officiate whilst feeling unwell or whilst under the influence of alcohol or prohibited drugs.

6.2 Responsibilities

- The Safety officer is the final arbiter of safety issues on the flight day.
- The Safety Officer authorises each and every flight.
- The Safety Officer has the power to stop any and every flight.
- The safety officer should inspect any rocket that falls outside usual parameters For example, strange design, size of rocket, materials used etc. See section 6.3 What You Should Do, for more details
- At any time there will be only one Safety Officer "active" in a given launch area.
- The Safety Officer must be careful not to prevent interesting or unusual flights unnecessarily.
- The Safety Officer will be the final arbiter of the rules at the time of any launch. (There has to be one person who is ultimately responsible for dealing with conflict of meaning.)
- The Safety Officer is also responsible for the crowd safety. This is more complex, as it involves enforcing minimum distance as well as making sure that the "more interesting" flights do not pass directly over spectators heads.
- The safety officer must ensure everyone is standing during a high powered flight.
- Prior to countdown, the Safety Officer must check in with any "sky watch" to ensure that the flight area is free form aircraft.
- The Safety Officer is responsible for ensuring that all flying takes place within the scope of the UKRA Safety Code.
- Safety Officers should deal with minor infringements of the UKRA Safety Code as they occur. The Safety Officer should inform the offender(s) as to the nature of the infringement and offer guidance on how not to repeat the offence.
- Safety Officers should report any serious infringement of the UKRA Safety Code, to the UKRA Safety and Technical Committee, in accordance with the Rules And Regulations, Item 6

6.3 What You Should Do - Rocket Inspections

The guidelines below are to aid safety officers when inspecting rockets or when deciding whether or not to allow a flight that falls outside the usual parameters.

Rocket Inspections : The main purpose of a rocket inspection is to ensure that the flight can be safely made judged on the airframe, motor type and configuration, recovery system, flight calculations and launching method.

When inspecting a rocket the following areas should be examined :-

The airframe material – This is the primary tubing and any internal bracing, is it strong enough, is it of the correct material for the job in hand?

The fin material and shape – Is it strong enough, are the fins the right shape for the rockets predicted velocity?

The recovery system - Is it suitable and sufficient for the job, will it bring the rocket down safely, are the recovery attachment points strong enough, is it deployed by pyrotechnic or electronic means? Any backup systems, are the systems homemade or commercial, are they proven?

Gluing - Are all the visible glued joints filleted, has the correct type of glue been used in the rockets fabrication?

Motor Mount - Is it strong enough for the motor(s) being used, is the mount appropriately secured inside the airframe?

Launch Method - Rod or rail. Are the lugs or tabs up to the job, is the rod or rail of the correct length and thickness. Is the launcher stable considering ground conditions, rocket weight and wind speed?

Flight Calculations - What is the rockets predicted altitude, have the CP (centre of pressure) and CG (centre of gravity) been accurately modelled / calculated and subsequently marked on the rocket? Is the CP at least one body diameter behind the CG, is the launch / recovery area large enough, based on the predicted altitude, to launch safely.

7 Club Affiliation

In order to apply for affiliation, a club must have at least two full UKRA members of which one must be a certified UKRA Safety Officer. Applications should be made to the UKRA Membership Secretary. There is no charge for club affiliation.

UKRA affiliated clubs should follow the UKRA Constitution, Rules & Regulations and Safety Code. Also, ALL FLIGHTS at a UKRA affiliated club should be insured.

Some of the benefits of being a UKRA Affiliated Club are:

- They can have space reserved for Club articles in the UKRA newsletter.
- They can collect UKRA Membership Fees from their members, and the member will immediately have insurance cover.
- They will have precedence when borrowing or renting UKRA equipment.
- They can organize special flying sessions for First Time Flyers.

Full details of Club Affiliation can be found in the UKRA Rules & Regulations Section 6.

8 Radio Frequency Information.

8.1 Introduction

The use of onboard transmitters for tracking and telemetry in rockets has been growing over the last few years. Frequency clashes have caused problems in the past, and these guidelines should help to prevent this.

8.2 Radio Transmitters

- If you use a transmitter at a UKRA launch please ensure that it does not conflict with a frequency used in a rocket on the pad or one that is being tracked.
- Only switch on your transmitter immediately prior to your launch.
- Once you have located your rocket switch off the transmitter, as soon as possible.

8.3 Safety in Flight

You **MUST** inform the RSO if: -

- You plan to remotely trigger flight events in rockets such as separation, parachute ejection etc.
- There is another piece of electrical equipment on board that will be used to trigger events in rockets (such as an altimeter).

The launch safety officer may ask the flyer regarding any radio equipment fitted to a rocket or to the launch equipment and if the safety officer is not satisfied with the answer the flight maybe cancelled or postponed. Be prepared to answer questions similar to the following:

- What is the function and operation of the equipment?
- What is its operating frequency?
- How can you be sure that the radio equipment will not interfere with other functions of the rocket, e.g. ejection?
- If there is a receiver in the rocket how can you be sure that false operation will not take place, e.g. from interference.
- If the radio equipment is necessary for correct operation of the rocket how has it been tested?

8.4 Legal operation

It is the operator of radio equipment's responsibility to see that it is operated legally.

8.5 PMR 446 Radio

UKRA officials use channels 6, 7 & 8 to run events. Any body using PMR446 radios must not transmit on these channels.

9 Rules for rockets designed to break the UK non professional rocket altitude record

The rocket must be built by team largely made up of UK citizens.

The rocket must be largely built within the UK.

The rocket does not necessarily have to be flown in the UK if it's predicted altitude would make such a flight impractical.

The team must be non-professional in nature.

No substantial part of the rocket vehicle, for example the propulsion system, may be obtained from a military or governmental source. Governmental or military facilities and ground support / tracking equipment can however be used.

The propulsion system can be amateur made or commercial subject to the relevant safety code and local laws and legal requirements for the country in question. (For example, the 1875 Explosives Act, if the flight is made in the UK)

The individuals / team cannot launch for commercial gain, other than in the event of a prize being offered for a competition.

If the proposed altitude record attempt is predicted to reach an altitude of 50,000ft ASL or less, then a commercially made barometric altimeter should be used for altitude

determination. If the flight is predicted to reach an altitude greater than 50,000ft ASL then a system such as an integrating accelerometer backed up by ground tracking of trajectory or photogrametry will be accepted as an alternative. Any other forms of altitude determination such as ground based optical or radar systems should be discussed with UKRA S&T prior to the launch.

If no UKRA members are there to witness the launch, a written report must be submitted to the S&T committee, stating dimensions weights and propulsion system along with photographic and videographic evidence of the flight with videographic evidence of recovery showing altitude verification by a qualified third party such as a safety officer or board member from one of the below listed organisations. The raw altimeter data should also be included with the written report to the S & T committee.

All relevant safety code, local laws, and legal requirements, for the country in question, must be adhered to.

All parts of the rocket must be recovered, substantially intact, for the record to count.

10 UKRA Recommended Launch Site Guidelines

The UKRA Recommended launch site guidelines can be found in Annex A of the full Safety Code.

If you would like UKRA to assist with this process please contact the UKRA Safety & Technical body.

A form that outlines all the relevant information can be obtained from the UKRA website or by post by writing to the UKRA address.

11 Flight Registration Card

UNITED KINGDOM ROCKETRY ASSOCIATION					
FLIGHT REGISTRATION CARD					
UKRA No	Name			Date	
			/...../.....	
Site Location					
UKRA Certified	Yes	No	Level	None	1 2 3
Rocket Name					
Rocket Type	Kit Built		Modified Kit		Scratch Built
Staged	Yes	No	Number of Stages	1	2 3
Motor(s)	1 st		2 nd		3 rd
Total Impulse of motor(s)					
Motor Manufacturer					
Recovery System(s)					
Flight comments					
Additional comments (<i>see over</i>)					