

The United Kingdom Rocketry Association



**UKRA**

**Information Pack**

***Version 1.4***

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**Please Note: This pack is in the process of review and will be subject to significant revision in the coming months**

**UKRA, Chacksfield House, 31 St Andrews Road,  
Leicester, LE2 8RE.**

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



## Contents

<b>UKRA INFORMATION PACK.....</b>	<b>3</b>
1 Certification Guide .....	3
2 Legal Requirements for Rocket Motors .....	9
3 Quick Guide to UK Airspace for Model and High Power Rockets.....	10
4 Sources of Information for Model and High Power Rockets. ....	12
5 UKRA Event Flight Procedures.....	12
6 Duties and Responsibilities of a UKRA Safety Officer .....	13
7 Club Affiliation.....	14
8 Radio Frequency Information.....	14
11 Flight Registration Card .....	17



## 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 Senior levels of flight certification:

- Level 1 - 'H' to 'I' combined impulse motors.
- Level 2 - 'J' to 'L' combined impulse motors.
- Level 3 - 'M' and above combined impulse motors.

Senior flight certification is only available to Full Members of UKRA over the age of 18. Temporary or Associate members cannot apply for certification.

UKRA also currently operates two Junior levels of flight certification:

- Junior Level 1 - 'H' to 'I' combined impulse motors.
- Junior Level 2 - 'J' to 'L' combined impulse motors.

Full Junior Members between the Age of 12 and 18 can apply for Junior flight certification, but the Certifying Officer should carefully assess the maturity of the candidate before allowing any certification attempt and in any case a parent/guardian or other responsible adult must be present. UKRA recommends that the responsible adult should be a person other than the RSO.

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.

A member under the age of 12 may not obtain HPR certification.

#### 1.2 Senior 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 1 Certified). The guidelines for the flight test are detailed below in Section 1.8.

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

### **1.3 Senior Level 2 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 2 Certification, a member must have been Level 1 Certified for at least one-day.

The Level 2 Certification process has two stages; the UKRA Certification Exam, and the Level 2 Flight Test.

The member must pass the Certification Exam before attempting the Flight Test. Details of the exam can be found in Section 1.9 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 1.8.

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

### **1.4 Senior Level 3 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 3 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 3 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 at 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 1.8.

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 Junior Level 1 Certification**

This level of certification is required to fly rockets with a combined impulse between 'H' and 'I' class (between 160Ns and 640Ns), in the presence of a parent/guardian or responsible adult 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 1 Certified). The guidelines for the flight test are detailed below in Section 1.8.

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

## **1.6 Junior Level 2 Certification**

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

In order to obtain Level 2 Certification, a member must have been Level 1 Certified for a least one-day.

The Level 2 Certification process has two stages; the UKRA Certification Exam, and the Level 2 Flight Test.

The member must pass the Certification Exam before attempting the Flight Test. Details of the exam can be found in Section 1.9 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 1.8.

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

## **1.7 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 1 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.

## 1.8 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 1 - 'J' to 'L' if Level 2 - 'M' or above if Level 3).

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.

Junior members must be accompanied by a parent/guardian or other responsible adult. UKRA recommends that the responsible adult should be a person other than the RSO.

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.

## 1.9 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 2 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.

## **1.10 Safety Officer Certification**

Safety Officer Certification is open only to Full Senior Members of UKRA; Junior, Temporary or Associate Members may 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 1.9 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.

## **1.11 Charges**

Certification attempts may be charged at the rates set by the UKRA Council from time to time. 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 pastime. 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 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 been 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 Legal 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:

### **2.2 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.

### **2.3 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.

### **2.4 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 number

## **2.5 Recipient Competent Authority Transfer Approval**

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 suppliers 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.

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. In some police forces the RCA is included automatically with the 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

### **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 spectator's 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 from 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. Anybody 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 photogrammetry 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					
<b>FLIGHT REGISTRATION CARD</b>					
<b>UKRA No</b>	<b>Name</b>			<b>Date</b>	
				...../...../.....	
<b>Site Location</b>					
<b>UKRA Certified</b>	Yes	No	<b>Level</b>	None	1 2 3
<b>Rocket Name</b>					
<b>Rocket Type</b>	<b>Kit Built</b>		<b>Modified Kit</b>	<b>Scratch Built</b>	
<b>Staged</b>	Yes	No	<b>Number of Stages</b>	1	2 3
<b>Motor(s)</b>	1 <sup>st</sup>		2 <sup>nd</sup>	3 <sup>rd</sup>	
<b>Total Impulse of motor(s)</b>					
<b>Motor Manufacturer</b>					
<b>Recovery System(s)</b>					
<b>Flight comments</b>					
<b>Additional comments (see over)</b>					