



UK YOUTH ROCKETRY CHALLENGE 2017

TEAM MANUAL





ABOUT UK YOUTH ROCKETRY CHALLENGE

ADS are the proud organisers of the UK Aerospace Youth Rocketry Challenge (UKRoC) and have been running the event annually since 2006. The epic challenge is aimed at students aged 11 – 18 from any secondary schools, colleges, educational facilities or youth groups to design, build and launch a model rocket with a fragile payload. The rocket must reach a set altitude with specific total flight duration and must adhere to the specific set rules. The competition's rules and scoring parameters change each year to challenge the students' ingenuity and encourage a fresh approach to rocket design.

This competition is all about shaping and inspiring the UK's future aerospace engineers! What better way to learn about science, maths and technology (and of course space rockets) than taking part in this fun, interactive and hands on competition with your friends?

Rocketry is a great opportunity for young people aged 11 – 18 who...

- **Have a strong interest in design, maths, art and/or science**
- **Thrive when working in a team environment**
- **Enjoy problem solving**
- **Would relish the opportunity to meet with industry aviation, space leaders and experts**

Why enter?

- It's free to enter and it's fun! Teams just need to cover the cost of the rocket build and associated equipment (approx. £200-£300 per team).
- An extension to what students are already learning in Science, Technology and Maths – but in an interactive and engaging way.
- In 2016 Major Tim Peake presented the International Award Presentation and former Apollo 13 astronaut Al Worden attended the competition.
- It's a great way for young people to gain hands-on engineering and presentation skills.
- Positive media and press opportunities for your youth group or school.

This competition has a truly international presence with France, Japan and the United States of America also taking part. So not only will you be representing your education facility, but also your country. This is a fantastic opportunity and will stand out on any CV, job or university application for many years to come!

What are the prizes?

The team that comes **first** in the UK National Final will receive a £500 cheque, an award, a certificate and a paid-for trip to Paris International Airshow 2017 to compete in the International Rocketry Competition (includes a return flight to Paris, transfers from airport to the hotel, accommodation in hotel). Any additional costs outside of those listed here are not liable for by ADS Group Ltd.

The team that comes **second** in the UK National Final will receive a £200 cheque, an award, a certificate. The team that comes **third** in the UK National Final will receive a £100 cheque, an award, a certificate. All remaining teams will receive a certificate.



What do I need to do next?

- Complete the registration form and return it to [Jemma Keen](#) by **Tuesday 28 February 2017**.
- Review the rules – this is really important! Make sure you understand exactly what you need to do to build the ultimate winning rocket.
- Read this team manual thoroughly – Everything you need to know about the competition is in here.
- Let us know if you are interested in our free webinars – we will then let you know when they will be taking place.
- If you have any questions at all, always let us know – were here to help!

Regional Events

The regional events are where we will host a day in each region of the country, for all teams in that region, to launch their rocket for the chance of winning the regionals, and potentially entering the UK National Finals.

The best scoring team from each Regional Event will automatically go through to the UK National Final.

In order for teams to attend the UK National Finals at the end of May they **must attend** a regional event, however, please let ADS know if you are unable to do this.

If you need any financial help, contact ADS and visit our website. The website includes sponsorship template letters, which can be personalized and distributed to local businesses to seek financial assistance.

UK National Finals

The UK National Finals is where will see the top 20 teams from the regional events compete, by launching their rocket for the chance to win the UK National Finals.

International Rocketry Competition at Paris International Airshow 2017

The International Finals will be held at the Paris International Airshow, one of the largest and most prestigious events in the aerospace industry. This is where business happens for the industry, with over 2000 exhibiting companies and nearly 140,000 visitors over the 5 days, making this a truly global event.

You will attend the Paris International Airshow during a trade day, which we want to stress, is an extremely unique and almost unheard of opportunity as members of the public are not allowed to attend on these days! So you will see all of the major global companies in the aerospace industry doing business, as well as the opportunity to watch the amazing flying display.



KEY DATES & DEADLINES

28 February 2017 Deadline for regional event registration

REGIONAL EVENT DATES

Region	Date	Venue
Scotland	Monday 20 March (TBC)	Prestwick (an exact location TBC)
North	Wednesday 29 March	Elvington Airfield, York YO41 4AU
Northern Ireland	Friday 31 March	RLC Langford, Belfast BT29 4RT
Midlands	Monday 3 April	Midlands Rocketry Club, Twycross CV9 3QH
South West & Wales	Saturday 8 April	Abbeyfield School, Chippenham SN15 3XB
South East	Monday 24 April	Stow Maries, Chelmsford CM3 6RN
W/C 22 May 2017	UK National Finals	
22 – 23 June 2017	International Finals at Paris International Airshow 2017	

Stages of the competition

1. Complete and return the registration form - please select the regional event you would like to attend
2. ADS will then contact you to confirm your space at the regional event and confirm dates.
3. Go away and start building your rocket ready for the regional events! ADS will also run free webinars during this time to help you on any technical advice and support.
4. It's the big day – the regional events! If you're in the top 20 you get through to the UK National Finals!
5. If you're in the top 20, continue to build and improve on your rocket to greater your chance to be the winner at the UK National Finals!
6. The UK National Finals – you've done it! You've won! Now it's just the International Finals you need to compete in...
7. ADS will fly you to Paris International Airshow 2017 to compete against France, Japan and America!



FAQ'S

What is the age limit for competing in UKRoC?

11 – 18 years old

What are the costs associated with UKRoC?

To enter the competition is FREE. But you will need to cover the costs to build your rocket – this should be no more than £200-£300. You will need to obtain BMFA Insurance to cover your participation in the competition – contact BMFA for more information: Tel: +44 (0) 116 244 0028 Email: admin@bmfa.org

What other equipment will I need for the regional events/ UK National Finals?

You will be required to bring your team, mentor and your rocket, all launching equipment (rods etc.) will be supplied.

How many people can be in a team?

We would recommend teams of around 4 – 5 students, however teams can be made up of 3 to 10 members.

How many teams can enter from one school?

There is no limit on the number of teams that can enter from one school/youth group.

Is there a prize for the winning team?

Yes, not only does the winning team get to attend the International Finals but there are also multiple prizes available.

Who can attend the regional events and UK National Finals?

We want to encourage parent/ family engagement within the competition as we believe your parents and family can help motivate and support you throughout the different competition stages. So if you would like your parents or a brother/ sister to support you at the regional events or the UK National Final, you will need to let us know for registration purposes.

I've never entered this before; can someone talk me through what is required?

All the information you need should be in this manual, however, if have any further questions please feel free to contact us.

What if I can't attend a regional event?

Please contact Jemma Keen at ADS if you're unable to attend a regional event.

Can I test my rocket before the regional event?

Yes test your rockets whenever possible to ensure the best result at the regional event; however you will need to obtain BMFA insurance to do this.

Is there a regional event in my area?

We are planning regional events all across the UK and will do our best to ensure all interested teams can attend one.

What support can ADS provide me?

We have the following recourses:

- Template sponsorship documents
- Template risk assessment documents
- Free webinars
- Template press release documents
- Test practise guides



REGISTER YOUR TEAM AT A REGIONAL EVENT

Please complete and return the below form to Jemma Keen at ADS Jemma.Keen@adsgroup.org.uk by **Tuesday 28 February 2017**.

Team Information

School/ Organisation Name: _____

Address 1: _____

Address 2: _____

City: _____ County: _____ Post Code: _____

1. How many teams are you registering? _____
2. How many members are in your team? _____

Please note: a team may have a minimum of 3 and a maximum of 10 members. At this stage we do not need your team member's names; we will contact you nearer the time of the regional events for all names with your team.

Regional Events

The Regional Events will take place at the below locations. Please tick the location you would like to attend. The date for each Regional Event is stated in the table below.

- | | |
|---|--|
| <input type="checkbox"/> South East (Essex) | <input type="checkbox"/> South West and Wales (Chippenham) |
| <input type="checkbox"/> North (York) | <input type="checkbox"/> Midlands (Twycross) |
| <input type="checkbox"/> Northern Ireland (Belfast) | <input type="checkbox"/> Isle of Man (TBC) |
| <input type="checkbox"/> Scotland (Prestwick) | <input type="checkbox"/> Jersey (TBC) |
| | <input type="checkbox"/> Other |

Region	Date	Venue
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Please note: wet weather contingency dates are scheduled and you will be asked to diarise these within your event information email, which will be sent once you send your application.



Do you have a local venue you use for rocketry? If so, please could you let us know where, we're always seeking new venues for regional events.....

UK National Finals

For the UK National Finals, we would like to know if either a week day or a weekend would better suit your personal commitments. Please tick below which option you would prefer:

- A day during the working week A day at the weekend

How did you hear about UKRoC?

- Website Social Media
- Word of Mouth Other
- Committee Member Please specify _____
- Email

Supervising Teacher/Adult

First Name: _____
Last Name: _____
Work Phone Number (with area code): _____
Mobile Phone Number: _____
Supervisor's Email: _____

I understand that the students on my team are responsible for the creation, design, and flight of the rocket without the assistance of any other adult, teacher, or non-member of the team.

- I acknowledge that it is my responsibility to make sure that ADS Group Ltd receives all updated contact and student information.
- I understand that the organisers have the right to make all last and final contest determinations.
- I will be responsible for obtaining BMFA insurance for any test flights undertaken in relation to the UKRoC competition.
- I have read and understand all of the rules of the contest.
- All information submitted is true to the best of my knowledge.
- I have obtained all relevant parental/guardian consent for the team to attend all events associated with the competition.

SIGNATURE: _____ **DATE:** _____

Jemma Keen | Event Coordinator | Jemma.keen@adsgroup.org.uk | +44 (0) 207 091 7815





ABOUT ADS

ADS is the Premier Trade Organisation for all companies operating in the UK Aerospace, Defence, Security and Space sectors. Farnborough International Limited (FIL) which runs the Farnborough International Airshow is a wholly owned subsidiary.

The industries represented by ADS are vital to the UK economy and are major drivers of growth and prosperity. The sector activities within ADS are designed to respond to the priority needs indicated by Members. It is also important to bring the sectors into focus for senior policy makers. The following priority objectives are designed to give focus to the work ADS undertakes:

- Improve the image and profile of our industries
- Influence the policy debates of most importance to our industries
- Support UK manufacturing and our industries' supply chains
- Encourage investment in technology and innovation
- Support business development opportunities nationally and in priority international markets
- Increase Members value

CONTACT US

Please do not hesitate to contact us if you have any questions or queries:

All competition queries:

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admin@bmfa.org



UKROC 2017 RULES - SUMMARY

PLEASE READ THESE RULES CAREFULLY AND ABIDE BY ALL TO ENSURE SUCCESSFUL PARTICIPATION IN THE COMPETITION. NON-COMPLIANCE WITH ANY OF THE UKROC RULES WILL RESULT IN DISQUALIFICATION AT ANY STAGE OF THE COMPETITION.

- The rocket must not be less than 25.6" (650mm) in length
- The rocket must not exceed 650 grams gross weight at lift-off
- Motors up to 'F' power may be used and/or clusters not exceeding 80 n/s in total
- The combined egg & altimeter portion of the rocket must be separate to the motor section and return safely using a single parachute of any size
- The motor section can have any type of safe recovery system
- Rockets must contain and completely enclose one raw hen egg of 55 to 61 grams weight, a diameter of 45 millimetres or less, and a length of 60 millimetres or less.
- Duration score is based on the average time of the altimeter/egg portion of the rocket. For qualification flights and first flight at the finals the target time is 41-43 seconds but at the finals the target time for the second flight, if required, is 42-44 seconds
- Target altitude is 775 feet for qualification flights and the first flight at the finals, the target time for the second flight at the finals, if required, is 800 feet

UKRoC LIST OF APPROVED MOTORS

All rocket motors must comply with the UKRoC list of approved motors, which can be found by [clicking here >](#)

UKRoC APPROVED ALTIMETERS

Rockets must contain one electronic altimeter of the specified commercial types approved, which are; Perfectflite APRA, Pnut, or Firefly.

UKROC 2017 RULES - FULL

1. SAFETY

All rockets must be built and flown in accordance with UKRoC Best Practice, any applicable local fire regulations, and Civil Aviation Authority Regulations. Rockets flown at the Finals must have previously flown safely and successfully using only those motors allowed in section 2.3. Rockets will be inspected before launch and observed during flight by an official, whose judgment on their compliance with UKRoC Best Practice and with these rules will be final. Teams are encouraged to consult with designated officials who are running this event well to resolve any questions about design, safety, or these rules.

2. TEAMS

The application for a team must come from a single school or a non-profit youth or educational organization. There is no limit to the number of teams that may be entered from any single school or organization, but no more than three teams containing students who attend the same school or who are members of the same organization, regardless of whether the teams are sponsored by that school or organization, can be invited to attend the Finals. Team members must be students who are currently enrolled in school years 7 to 12. Teams may have members from other schools or other organizations and may obtain financing from any source, not limited to their sponsoring organization. Teams must be supervised by an adult approved by the principal of the sponsoring school, or by an officially-appointed adult leader of their sponsoring organization. Minimum team size is three students and maximum is ten students. Each student member must make a significant contribution to the designing, building, and/or launching of the team's entry. No part of any of these activities for a rocket used in a qualification flight or at the Finals may be done by any adult, by a company (except by the sale of standard off-the-shelf components available to the general public, but not kits or designs for the event), or by any person not a student on that team. No student may be on more than one team. The supervising teacher/adult may supervise more than one team.



3. ROCKET REQUIREMENTS

Rockets must not exceed 650 grams gross weight at liftoff. They must use body tubes of two different diameters for their exterior structure. The diameter of the upper body tube must not exceed 66mm (corresponding to rocket tube BT80). The upper body tube must be at least 15% greater in diameter than the lower. Each tube must have no less than 150 millimeters (5.91 inches) of exposed length, and the overall length of the rocket must be no less than 650 millimeters (25.6 inches) as measured from the lowest to the highest points of the airframe structure in launch configuration. The rocket must have only one stage.

Rockets must not contain any pyrotechnic charges except those provided as part of the basic commercially-made rocket motor used for the flight, and these must be used only in the manner prescribed in the instructions for that motor. The rocket must separate into at least two pieces for recovery, with one piece containing the egg payload and the altimeter and not the expended rocket motor. This piece must be recovered by a single parachute and must not be connected in any manner to the other piece or pieces of the rocket during recovery. The rest of the rocket may use any safe means of recovery. All rockets flown at the Finals must have a surface finish with a different color or colors than the basic construction materials of the rocket which has been applied over all or most of the outer surface of the rocket's nose, body, and fins by means such as paint, ink, adhesive wraps, etc. Rockets may not be commercially-made kits designed to carry egg payloads with the only modification being the addition of an altimeter compartment.

4. PAYLOAD

Rockets must contain and completely enclose one raw hen egg of 55 to 61 grams weight (no more than 45 millimeters in diameter as measured perpendicular to the long axis of the egg), and must return this from the flight without any cracks or other external damage. The egg will be issued to the teams by event officials during finals. Rockets must be allowed to land at the end of flight without human intervention (catching) and will be disqualified if there is such intervention. Any external damage to the egg is disqualifying.

5. DURATION SCORING

Scores shall be based on total flight duration of the portion of the rocket containing the egg and altimeter, measured from first motion at liftoff from the launch pad until the moment of landing or until the rocket can no longer be seen due to distance or to an obstacle. Times must be measured independently by two people not on the team, one of whom is the official adult observer, using separate electronic stopwatches that are accurate to 0.01 seconds.

If one stopwatch malfunctions, the remaining single time will be used. The flight duration goal is a range of 41 to 43 seconds. Flights with duration in the range of 41 to 43 seconds get a perfect duration score of zero. Duration scores for flights with duration below 41 seconds will be computed by taking the absolute difference between 41 seconds and the measured average flight duration to the nearest 1/100 second and multiplying this by 4. Duration scores for flights with durations above 43 seconds will be computed by taking the absolute difference between 43 seconds and the measured average flight duration to the nearest 1/100 second and multiplying this by 4. These duration scores are always a positive number or zero. For those teams at the Finals that are invited to make a second flight based on their first-flight performance, the target duration for the second flight at that event will be 42 to 44 seconds and scoring for flights with durations above or below this range will be aligned to match the procedures for the 41-43 second range.

6. ALTITUDE SCORING

Rockets must contain one and only one electronic altimeter of the specific commercial types approved for use in UKRoC. These types are the Perfectflite APRA, Pnut, or Firefly. The altimeter must be inspected by officials both before and after the flight, and may not be modified in any manner. The altimeter must be confirmed by this official before flight to not have been triggered and to be ready for flight. The peak altitude of the rocket as recorded by this altimeter and sounded out on its audible transmission post-flight will be the sole basis for judging the altitude score and this altimeter may be used for no other purpose. The altitude score for every qualification flight and for the first flight at the Finals will be the absolute difference in feet between the 775 feet (236 meters) target altitude and the altimeter-reported actual flight altitude in feet (always a positive number or zero). For those teams at the Finals that are invited to make a second flight based on their first-flight performance, the target altitude for the second flight at that event will be 800 feet (244 meters).



7. FLIGHTS

Team members cannot be changed after the first qualification flight, with one exception as noted below for the UK National Finals. Only team members on record with valid parental consent are eligible to receive prizes. In order to be eligible for the UK National Final, a team is required to attend an ADS regional event.

Each team may conduct a maximum of three qualification flights at an ADS regional event, and will be ranked based on the sum of the best two qualified flights. More than two qualification flights are not required if the team is satisfied with the results of their first two flights. A qualification flight attempt must be declared to the observer before the rocket's motor(s) are ignited. Once an attempt is declared, the results of that flight must be recorded even if the flight is unsuccessful. A rocket that departs the launch pad under rocket power is considered to have made a flight, even if all motors do not ignite. If a rocket experiences a rare "catastrophic" malfunction of a rocket motor (as determined by the official observer), a replacement flight may be made, with a replacement vehicle if necessary. Flights which are otherwise fully safe and qualified but which result in no altimeter reading despite correct usage of the altimeter by the team, or that result in a reading of less than 50 feet despite a nominal flight will be counted as "no flight" and may be re-flown without penalty.

Based on the scores from qualification flight attempts the organizers will select 20 teams (with a limit of no more than the best three made up of students from any single school or organization) for the UK National Final. Teams will be selected on the basis of lowest combined scores for their best two flights. If a school has more than three teams whose flight score is better than the cut-off score for UK National Finals selection, they may adjust the membership of the three best teams invited to attend the UK National Finals to include students from other teams with scores that met the UK National Finals cut-off, up to a limit of ten students on any single team. Teams will be notified by ADS of these results and will be invited to participate in the UK National Final to be held at the end of May 2017.

8. SAFE RECOVERY

The rocket must separate into at least two pieces for recovery, with one piece containing the egg payload and the altimeter and not the expended rocket motor

9. RETURNS

Return of the rocket with egg and altimeter is required by the deadline time on that same day that was established at the beginning of the day's flying. If the rocket cannot be returned after an otherwise safe and stable flight because it cannot be located or because it landed in a spot from which recovery would be hazardous (as determined by an official), a replacement vehicle may be substituted for a replacement flight. Once the UKRoC official has declared that a rocket has landed in a place from which recovery would be hazardous, the results from that rocket's flight may not subsequently be used even if it is recovered.

10. LAUNCH SYSTEMS

Teams may use the electrical launch system and the launch pads (with six-foot long, 1-inch rails or 1/4-inch diameter rods) provided by the event officials at the regional events and UK National Final, or may provide their own system. Systems provided by teams for their own use must be inspected for safety by an official before use, and must provide at least 6 feet of rigid guidance, including use of a rod diameter of at least 1/4 inch, if a rod is used. All launches will be controlled by the event Range Safety Officer and must occur from the ground.

11. FLIGHT CONTROL

Rockets may not use an externally-generated signal such as radio or computer control (except GPS navigation satellite signals) for any purpose after lift-off. They may use autonomous on board control systems to control any aspect of flight as long as these do not involve the use of pyrotechnic charges. Any on board flight-control electronics must use only commercially-made altitude and/or timing devices that are available to all participants.



12. PLACES

Places in the UK National Final will be determined on the basis of the sum of the altitude and duration scores. At the UK National Final, the top 3 teams will be invited to make a second flight based on the results of their first flights. In these second flights, rockets which have issues which would otherwise rate a replacement flight will not receive a replacement flight. Prizes awarded to the top places will be awarded only to those teams that make a second flight.

The top final places will be ranked on the basis of the scores from the two qualified flights made at the UK National Final. Remaining places will be awarded based on the scores from the first flight. Ties will result in pooling and even splitting of the prizes for the affected place(s) -- for example, a two-way tie for 4th place would result in a merger and even division of the prizes for 4th and 5th places. If there is a tie for one of the top three places, the teams involved in the tie will be required to make a third flight to determine final places. ADS reserves the right to make all last and final contest determinations.

13. QUERIES

Questions and enquiries can be made to UKRoC, full details to be published on the UKRoC 2017 web site.