



## National Rocketry Championship 2016-2017

### Introducing the 2016-17 UKSEDS Rocketry Championship.

Teams are challenged with designing, building and launching a mid-power rocket with the primary goal of reaching the greatest apogee possible. Motor selection will be limited to ensure a fair competition between teams.

### Teams will be scored on the following criteria:

1. Maximum altitude of a successful flight.
2. Quality of technical reports.
3. Build and finish quality, including adherence to original design.
4. Mentor relationship

Teams wishing to enter the competition must [register](#). Please direct any [rocketry@ukseds.org](mailto:rocketry@ukseds.org) for any enquires.

### Mentorship

Teams will be assigned a mentor once they have registered. Mentors are there to offer guidance and as a safety checker. The level of guidance and involvement a mentor has should be agreed between teams and their mentors. However, it is highly recommended as a minimum that teams have their Mentor check their rocket at the design stage to verify the safety and compliance of their rocket to avoid it being disqualified or denied to launch by a UKRA Range Safety Officer.

### Motor Selection:

Motor selection is limited to any sized '29mm Cesaroni reloads'. Due to the possibility of different grain lengths, altitude will be normalised to total impulse based on the function below:

$$y\% = \frac{30 \times \text{Raw Altitude}}{(175.6x^{0.3314} + 31.4x^{0.5849})(\text{Max Score})}$$

Where  $y\%$  = percentage towards your overall score (0% – 30%)

Raw Altitude is the apogee altitude reached in meters

$x$  is the total impulse of your motor in Newton – seconds

Max Score is the highest value reach of (Raw Altitude)/(175.6 $x^{0.3314}$  + 31.4 $x^{0.5849}$ ) reached by any team.

### Key Dates:

- Registration: Monday 21<sup>st</sup> November 2016
- Design and build report due: Monday 27<sup>th</sup> March 2017
- Teams must launch by: Monday 3<sup>rd</sup> July 2017
- Launch Report due: Monday 17<sup>th</sup> July 2017

The scoring criteria, competition rules, and document deliverables tables are included below.

### **Deliverables**

The format required for each deliverable has been specified in the 'Deliverables table' below. Images should be put into sub folders related to their deliverable e.g. images of rocket design drawings should be in a folder called DRB2.

Where we request a report you should produce no more than two A4 pages, font size 12. Any images, calculations or data you cannot fit into the report can be put in an appendix. Title pages are not included in this limit. If you feel you need more space for report please contact us.

All deliverables are to be sent as a zip file to [rocketry@ukseds.org](mailto:rocketry@ukseds.org)



## **UKSEDS National Rocketry Championship Rules**

The UKSEDS N.R.C. is organised in the spirit of healthy competition. Rules & regulations have been drawn up to maintain a high standard of safety and fairness for all participants.

1. This competition is open to all UK Students for the Exploration and Development of Space branches. Other teams wishing to participate are welcome but must get consent by e-mailing [rocketry@ukseds.org](mailto:rocketry@ukseds.org).
2. All rocketry activities must abide by the United Kingdom Rocketry Association (UKRA) Safety Code, which can be found [here](#).
3. All rockets must be original designs and scratch built by members of the team. Commercial kits are not permitted.
4. All designs must be capable of measuring altitude. The altimeter needs to be tested and calibrated prior to installation to ensure it is in working condition. This process should be documented in the technical report. Teams are allowed to make their own altimeter or buy a commercially available device. Contact us if you need any assistance.
5. The competing team is responsible for organising a suitable launch venue. Teams should contact the UKSEDS at [rocketry@ukseds.org](mailto:rocketry@ukseds.org) if they require assistance in identifying a suitable site.
6. A certified Range Safety Officer (RSO) must certify any launches. Should one not be available, teams must contact the UKSEDS at [rocketry@ukseds.org](mailto:rocketry@ukseds.org) to arrange an alternative solution. The competing team is responsible for having the launch certified.
7. All launches must be performed entirely through the motor's own power. No specialty launch systems (i.e., Rockoon, projectile launching) are permitted.
8. All rockets must be successfully recovered with minimal damage. Minimal damage shall be defined as being able to be flown again and effectively 'motor ready'. The team and the certifying person (RSO) must document successful recovery.
9. All teams must take video and/or photographs of the design and construction of their vehicle, as well as its launch, which should be submitted with the relevant documentation.
10. All teams and launches must abide by local laws and CAA regulations for unmanned rocket launches. Safety must take the highest priority in launch preparations and flight operations. UKSEDS retains no responsibility for the launch rules and regulations that the competing teams shall be required to follow.
11. If a group wishes to use their own telemetry system then the equipment to be used at the launch site must be certified by the Radio Standards Authority and subsequent documentation submitted to the RSO on the day of the launch as part of the pre-launch checklist.

### ***UKSEDS National Rocketry Championship Deliverables***

<b>Deliverable</b>	<b>Document #</b>	<b>Requirements</b>	<b>Format / Due Date</b>
<b><i>Design &amp; Build Documentation</i></b>			<b><i>Monday 27<sup>th</sup> March 2017</i></b>
Rocket design drawings	DBR 1	Please submit design drawings of your rocket. Images from Rocksim or OpenRocket or any other rocketry simulation software are suggested.	Images
Launch simulations	DBR 2	Please submit launch simulations of the rockets predicted flight. Including graphs of altitude, speed and acceleration vs. time with clear scales and units, plus time to apogee and velocity at parachute deployment.	Images
Recovery system schematics	DBR 3	Please submit details of any electrical on board recovery systems	Include in report
Build process validation	DBR 4	Please submit a document detailing the build process of your rocket i.e. what you did and how you did it. Include details of the construction of the motor mount, fins, payload bay, and airframe. Pictures and videos are recommended.	Report
Launch Ready Rocket	DBR 5	Please submit pictures of your rocket showing construction is complete.	Images
<b><i>Launch Report Deliverables</i></b>			<b><i>Monday 17<sup>th</sup> July 2017</i></b>
Launch summary	LR 1	Please provide a brief description about your launch and experience i.e. flight data, what when well? What did not?	Report
Flight Data	LR 2	Please submit data on your maximum altitude, and any other data recorded during the flight.	Include in report
Rocket Preparation Summary	LR 4	Images of rocket preparation before flight such as, engine retention with loaded motor, payload, packing of the recovery systems and rocket on pad.	Images
Recovery Operations Summary	LR 5	Images of undisturbed rocket at the landing site, deployed parachutes, airframe, & any damage.	Images
Flight Verification Form	LR 6	The person certifying your flight must verify the flight and sign the flight certification form, found <a href="#">here</a> .	Image



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<b>UKSEDS National Rocketry Championship Scoring Criteria</b>		
<b>Scoring Component</b>	<b>Possible Points</b>	<b>Notes</b>
<b>Flight Scoring</b>	<b>62.5%</b>	
Launch	7.5%	Successful launch off the pad
Maximum altitude	30%	Altitude will be normalised against motor grain length then points will be awarded relative to the rest of the competition.
Successful parachute deployment	12.5%	Recovery system deployed successfully.
Successful recovery with minimal damage*	12.5%	The rocket is recovered successfully and is in flyable condition
<b>Documentation</b>	<b>25%</b>	
Reports	12.5%	Teams are awarded points for the quality and detail of document deliverables.
Videos and Picture	12.5%	Teams are awarded points for pictures and videos documenting the projects entirety
<b>Mentorship</b>	<b>12.5%</b>	
Design review	5%	Teams will be awarded points for having a design review meeting with their mentor.
Team effort	7.5%	Mentors will mark their team's effort.
<b>IMPORTANT: Teams will be assessed a penalty of 5% points per missing deliverable.</b>		
<b>The scoring committee reserves final judgment on all competition scoring.</b>		

\* Minimal damage shall be defined as being able to be flown again and effectively 'motor ready'. The team and the certifying person (RSO) must document successful recovery.