



The University of Sheffield.



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UK RACE TO SPACE

Enabling the UK Space Sector to compete on the world stage.

Dramatically increasing the number of highly-skilled graduates entering the UK Space industry.

Significantly growing the number and diversity of students taking STEM degree subjects.

Dr Alistair John

UK RACE TO SPACE





RACE TO SPACE

Background

What is the Race to Space?

Competition

Outreach

Progress

Support

Background

- The UK space sector is growing rapidly (worth £15 billion per year, aiming for 10% of global space market by 2030)
- A dramatic increase is needed in the number of passionate, **highly skilled** graduates entering the sector to fill the skills gap
- Graduates currently lack **practical** experience and the skills industry needs
- The sector suffers from a lack of diversity
- Space and STEM subjects are not attracting enough young people





Motivation

The UK will not be able to compete on the world stage if we do not increase the number of highly-skilled graduates entering the space sector and students taking space-related degrees.

The solution?

Supporting and developing practical extra-curricular student rocketry and space activities



Extra-curricular student rocketry in the UK

- The UK has a number of rocketry activities available for young people
- These are not properly interconnected however
- We need more people to get involved
- There is limited interaction between industry and students, and students and school children



MACH-22

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UKROC



ESERO CANSATS



UKSEDS ⁶

Top UK university teams

- Imperial Karman Space Program – “becoming the first student-led team to reach space using a reusable rocket”
- Cambridge University Spaceflight – “coming soon to a Karman line near you”
- Sheffield (Sunrldc) – current UK altitude record holders (**11km**)
- Not forgetting Southampton, Glasgow, Kingston and many others



Student-built rocket engines at Sheffield

- Project SunFire
- Bi-propellant, regeneratively cooled liquid rocket engine using Nitrous Oxide and Isopropanol
- Collaboration between Sheffield and Hallam on SunFire 1, cold-flow tested
- University of Sheffield now working on SF2 - first AM parts have been printed
- Working closely with industry to hot fire this winter





UK students are falling behind

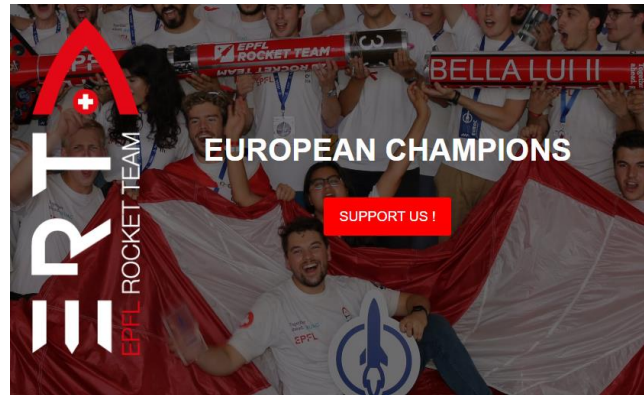
- Despite our ambition, the best student teams around the world are way ahead of the UK.
- US teams are better funded
- European teams are better organized (greater collaboration with each other and industry)
- The UK needs to work together to upskill UK students as a whole

Top European teams

- Danish Student Association for Rocketry

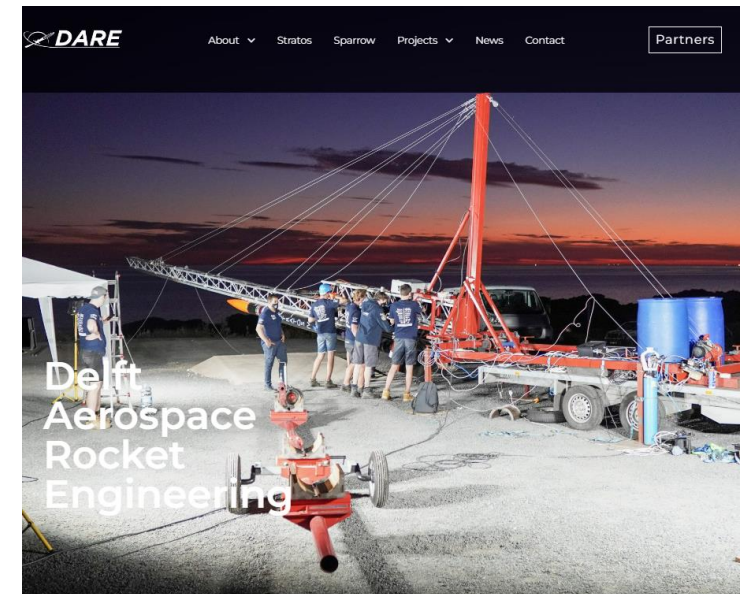


- EPFL



- Delft (20km)

- Stuttgart (30km)

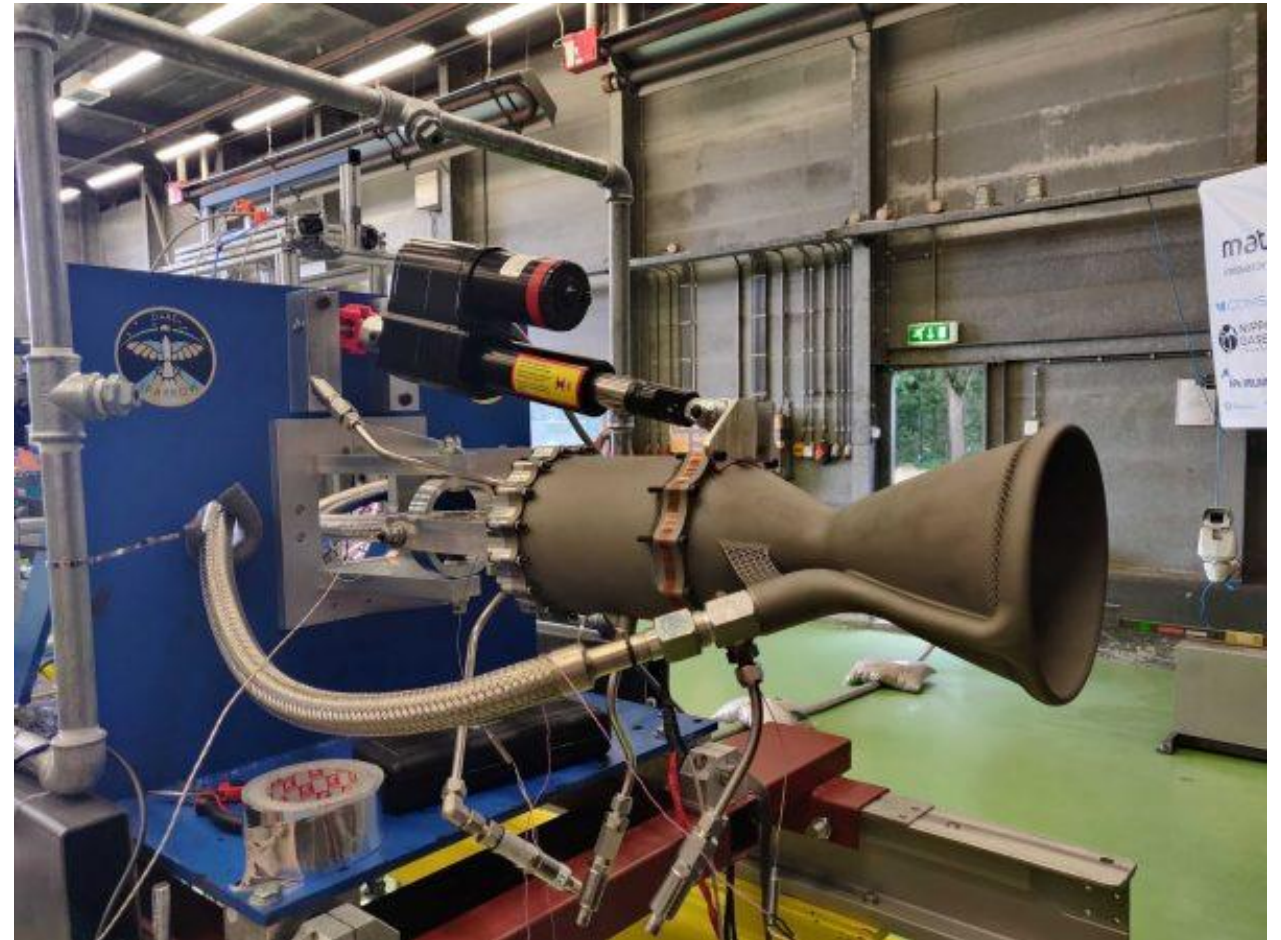


Top European teams



- Delft sparrow
- Advanced liquid rocket engine with thrust vector control
- Undergoing test fires

- Delft want to become the first student organisation to send a rocket into orbit around Earth.



Top US teams

- University of Southern California RPL - First to Karman line, reached **100km** in **2019**.
- Purdue Space Program launched liquid methane rocket twice in one weekend (this year). Have been firing liquid methane engines since **2017**!
- Countless others

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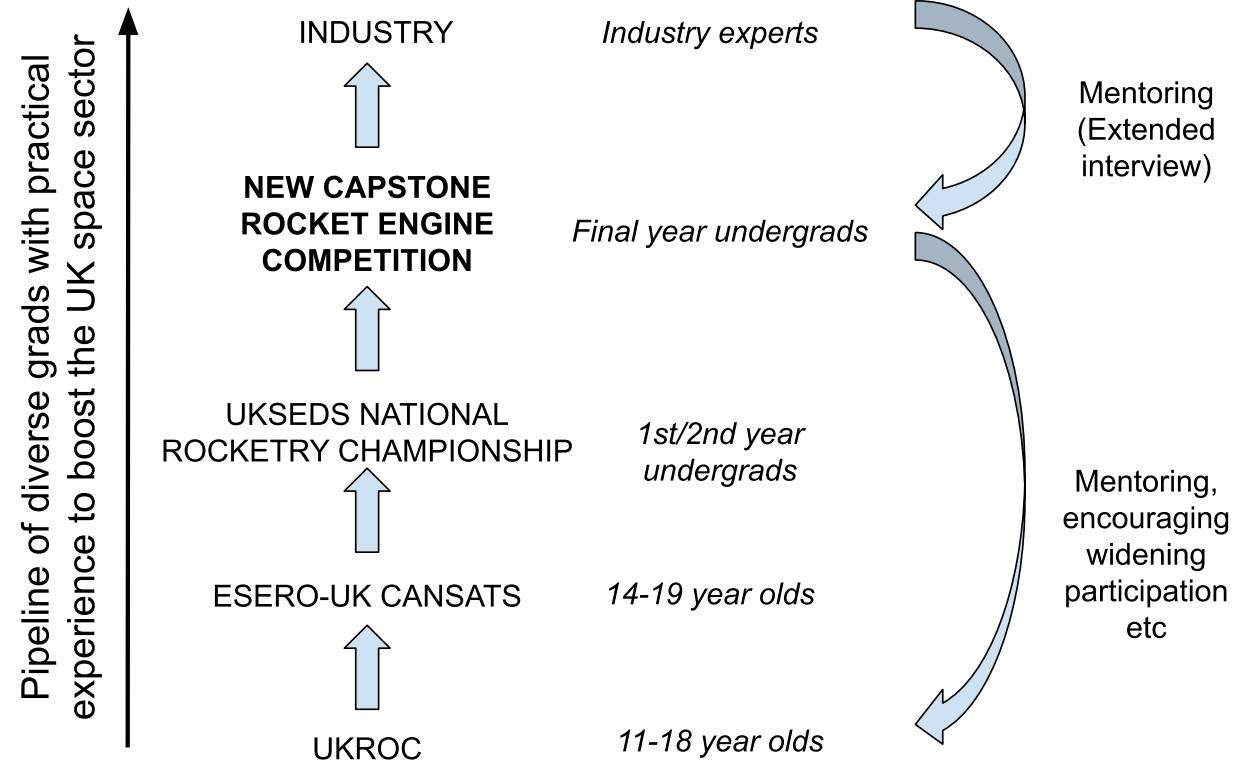
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UK RACE TO SPACE

The Race to Space initiative

- An integrated approach to connect current rocketry activities and competitions
- Inspiring younger generations
- Fostering industry and academia links
- Supporting the growing sector with the skills needed
- Using a new capstone competition to create a pipeline of talent



Race to Space competition

- Aiming to launch UK student-built rockets to the edge of space (the Kármán line) within five years
- The extra-curricular competitions will bring together industry, academia, students and school children to boost the UK space sector
- It will progress from building rocket engines and designing payloads/ avionics to integrating and launching rockets to record-breaking altitudes





YEAR ONE



Start a new national propulsion competition

Introduce the Kármán challenge

Launch a pilot UKROC mentoring scheme



National Propulsion Competition

- 1st step in the race to space
- Students design, build and test liquid/hybrid rocket engines
- Teams produce design documentation & meet various gates through the year
- All safety and testing handled by experts, reduced burden on students and universities, removes barriers
- Industry mentoring
- UKROC mentoring compulsory aspect of competition



Annual testing and networking event

- Engine testing competition week at Westcott Space Cluster
- Making use of multiple rocket engine test stands
- Strengthen industry-academia links, knowledge sharing between teams, industry can meet and recruit graduates



UKROC mentoring

- 11-18 schools rocketry competition
- Brilliant opportunity to generate passionate students and encourage them to take STEM degree subjects
- Need to significantly increase the number and diversity of schools entering
- University teams will act as **STEM ambassadors** going into schools and contributing to the **One Million Interactions** initiative
- Universities will provide support (materials, manufacturing, travel bursary, open days) to schools
- Universities ideally places to work with less-advantaged, inner-city schools



UKROC pilot scheme

- Pilot scheme at Sheffield University
- Our students mentor a few local and diverse schools
- Give taster lessons and basic workshop skills to get them started and form teams
- Provide funding for parts, access to our facilities & travel bursaries
- This will enable teams that otherwise wouldn't have to enter
- Roll out nationwide next year



Kármán challenge

- Challenge to encourage UK student rocket teams to be extra-ambitious
- Competing to be the first UK student team to launch a rocket to the Kármán line
- Not really about competing - but improving industry-academia links, networking, knowledge sharing, upskilling, working together

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WHAT OTHERS ARE DOING

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Base-11 space challenge

- Competition for US teams
- \$1M! prize for first student-built liquid rocket launched to 100km



BASE 11 SPACE CHALLENGE: \$1 MILLION+ STUDENT ROCKETRY PRIZE

Are You Ready to Launch to Space?

Launch Canada

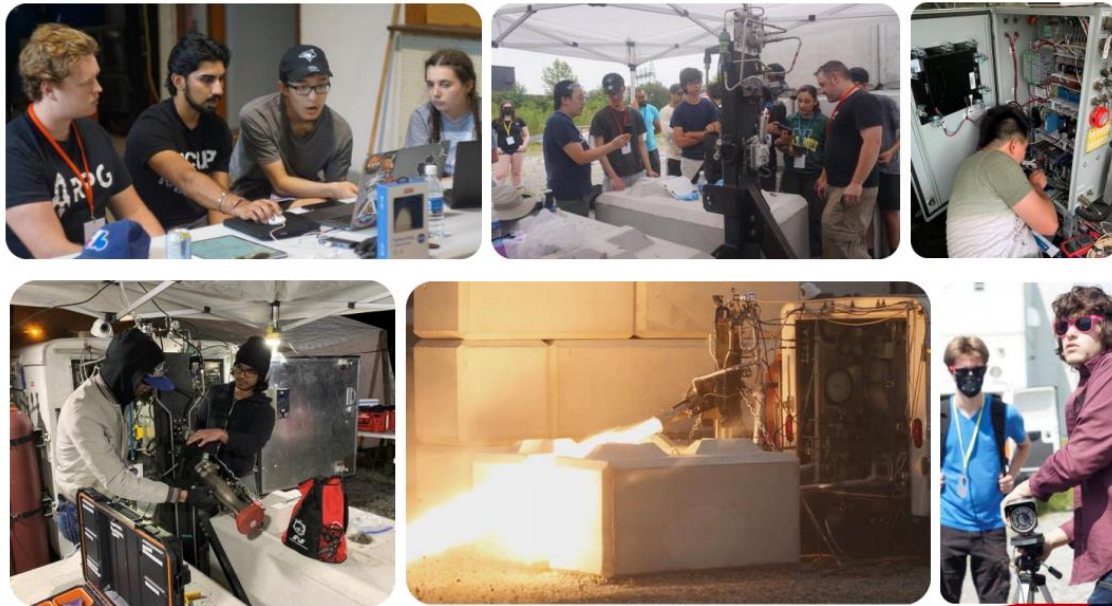


The competition has several high-level goals:

- Create launch opportunities for amateur rockets in Canada
- Support diversity and inclusion in STEM education through the use of rocketry
- Develop a pipeline of highly skilled, knowledgeable and experienced aerospace professionals through challenging hands-on rocket engineering projects
- Provide a unique forum for Canada's rocket community (students, professionals, researchers and amateurs) and all interested stakeholders to come together, network, collaborate, learn and compete.
- Elevate the profile of rocketry in Canada, and amateur rocketry in particular, and providing a highly visible showcase of Canadian exceptionalism

Launch Canada

- Lots of endorsement, funding and support
- Beginner, subsystem and advanced launch challenges
- Liquid rocket engine training sessions



Euroc (European rocketry challenge)

Euroc aims:

- Contribute to the development of technological skills and the promotion of a scientific and innovational culture among young university students
- To attract and involve national and international partners in supporting the expansion of the aerospace industry
- To stimulate synergies between academia and the aerospace industry
- To demonstrate that Portugal is in a position to hold a unique European-level event in the field of aerospace engineering
- Motivate and encourage young people to pursue careers based on STEM

15/09/2022





PROGRESS



Current status

- Competition date and location confirmed – 3-7th July 2023, Westcott Space Cluster
- Hot firing to be carried out by Airborne/Protolaunch
- Propellant handling training provided by Plastron
- Applying for UKSA and Knowledge Exchange funding
- Looking for sponsors
- 7 university teams already on board
- Working with ADS and local schools to set up UKROC mentoring pilot
- Rocketry competition working group set up
- First version of website launched

15/09/2022





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www.racetospace.org.uk

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