Agenda Item 3 Appendix 3

Title:	**Race to Space Student Rocket Competition Funding**
Purpose:	**To update on plans to establish Race to Space as an annual undergraduate rocketry competition hosted at Westcott and seek approval of funding to help establish the initiative longer-term.**
Recommendation(s):	**That board members:** **a) Allocate a total of £60k of funding from the existing EZ Programme support budget (£30k 2024/25 and £30k 2025/26) to establish Race to Space as an annual event for the long-term. This will contribute to an overall budget of around £400k attracted across three years.**

1. Background

The UK space industry has trebled since 2,000. It generates £14.8 billion per year and supports 42,000 jobs UK-wide. The Government aspires to capture 10% of the global space market by 2030. If this growth is to be achieved, a key requirement is an increase in the number and quality of graduates entering the sector. Current experience from industry is that they struggle to find graduates with the right skills and practical experience. This issue is replicated at Westcott. Our employers need ways to connect with and inspire talented STEM students. Westcott's profile among university students is also relatively low nationally, compared to other Space related testing sites and Clusters.

The UKSA Space Sector Skills Survey (2023) showed two-thirds of businesses experienced difficulty hiring and skill gaps were identified by 51% of businesses. 44% of respondents surveyed stated there is insufficient appropriate specialist training supplied by UK educational institutions (i.e., propulsion design, prototyping, and testing). The specialist skills required to meet the diverse needs identified by industry is difficult for university courses to cover, or not financially viable. This is where extra-curricular activities like Race to Space can provide opportunities to develop those key skill sets.

Developed and organised by University of Sheffield, the vision for Race to Space is to provide experienced undergraduate students with a practical educational experience solving real-world, complex, open-ended engineering problems through a hands-on competition designing, manufacturing, and testing rocket engines. This in turn aims to;

- Provide the sector with the better trained, prepared graduates to continue ambitious growth
- Connect with other student rocketry activities to generate a coordinated pipeline of talent (see figure 1)
- Encourage young people to develop interest and passion for space and pursue STEM degrees.
- Link industry and academia to transfer knowledge and support teams around the UK.
- Increase the diversity of engineering and space talent in the UK.

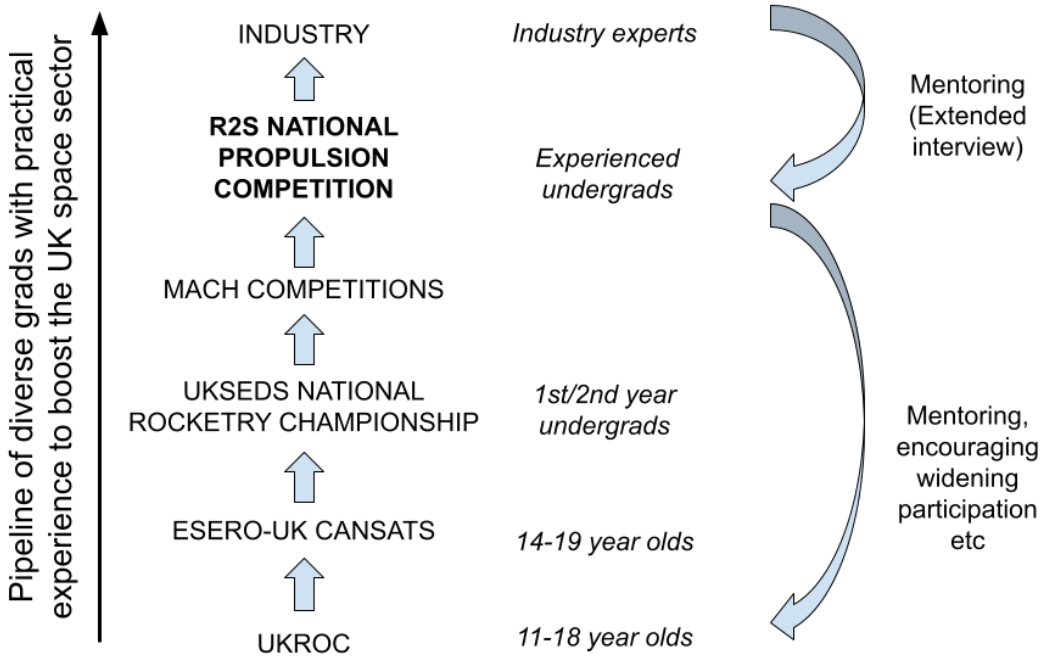

Figure 1: Race to Space fit with wider rocket competition in UK and Europe

The inaugural competition was held in July 2023 at Westcott. It was the first worldwide to specifically focus on the testing of bi-propellant and hybrid rocket engines. Students from ten UK universities took part where the rocket engines they had designed and built were fired up on test stands. Collectively, the students set an unofficial world record for the number of different hybrid/liquid rocket engines hot-fired for the first time on one site in one week. Examples of this testing and the competition are found below;

[Video: Students from the University of Sheffield successfully test their 3D printed liquid rocket engine the most powerful student-built engine of its type]

2. Plans for 2024 onwards

After a successful inaugural event, supported by the University of Sheffield and a range of smaller sponsors, there is an opportunity for Race to Space to become established long-term and develop a home at Westcott. For Buckinghamshire, the aim of supporting Race to Space for the longer-term, is aligned the organisers, but is also to inspire students with the opportunities Westcott will offer to work, locate, or start a business as it grows. Two weeks of testing at Westcott, plus visits throughout the year, provides opportunities to highlight the cluster's employment and entrepreneurial potential and innovative technology. If funded, there will be other Westcott based testing opportunities across the calendar year for student teams, further embedding the association and enhancing practical skills. The key message for students is that we are creating a collaborative community of innovators at Westcott. You can be part of it now and in future.

The University of Sheffield and wider partners have considered ways the event could be hosted again at Westcott in 2024, including growth in participation and earlier engagement across the year with student teams. In 2024, the aim will be to provide

- Access to a rocket engine hot-fire test
- Cold flow testing and training to verify readiness for use
- Expert mentoring and guidance
- Networking and knowledge exchange opportunities
- Direct links with the space industry in the UK
- A critical testing opportunity to enable eventual launch of high-powered rockets.

This should result in a significant acceleration of teams' engine building capabilities, and employability. School outreach opportunities are also being developed alongside the main competition and we would seek to engage school age pupils from Buckinghamshire in this programme.

3. Why should Bucks EZ Support Race to Space

The battle for talent is felt nationally and internationally. There has recently been a growth in sites around the UK setting up new 'spaceports' (North Uist Outer Hebrides, Machrihanish, Prestwick, Snowdonia, Sutherland, Saxavord and Cornwall). All of these areas are interested in attracting business and students with space skills. Therefore, there has been significant interest in ideas for new rocketry / space-based student competitions and conferences/events to attract investors, companies, and students to those sites.

So, although none of them can yet offer exactly what Westcott can with engine testing, there could in the near future be various student rocket-based competitions set up around the country. We want to make sure Race to Space leads the way from Westcott, is fully established and going year on year so it cannot be overshadowed or have the students' interest diverted elsewhere. Therefore, we need to ensure R2S is funded and continues to grow and becomes *the* event in this sector, and Westcott becomes *the* site known for student space propulsion skills development.

There is firm interest in taking part from seventeen teams (see appended sheet) from high quality universities across the UK. It is a real opportunity to establish links both at the level of education but also industry and academic research, building on investments like the Westcott Hub teaching, testing, and conferencing facilities.

4. Funding Requirements and Sources

The requested £60k per annum over two years can be funded from the existing programme support budget of £250k, already agreed as part of the LEP Annual budget. This can continue for the remainder of the MOU period to March 2026 (contributing in 2024 and 2025), to try and establish a strong set of university links with Westcott in that time, alongside an established national competition. The key funding sources to enable the competition to take place and meet higher demand are below.

- Bucks LEP - £60K to March 2026
- MOD - £80k per annum for three years
- UKSA - £30k for year one initially
- University of Sheffield Knowledge Exchange - £28k for one year.

The package of funding identified will allow competition testing in July. It will also pay for extra testing days at other times of year, meaning more access to Westcott and its expertise. It will also allow a more impactful Race to Space symposium, to shape the skills agenda locally and nationally, and create new industry academic links.

5. Recommendation

Board members are asked to:

Allocate a total of £60k of funding from the existing EZ Programme support budget (£30k 2024/25 and £30k 2025/26) to establish Race to Space as an annual event for the long-term. This will contribute to an overall budget of around £400k attracted across three years.

Appendix 1 – Applicant Universities for Race to Space 2024

University	Engine type	Details	Propellants	Thrust
Imperial (ICSS)	Bi-prop	Turbopumped	IPA/LOx	25.4 kN
Kingston	Bi-prop / hybrid	AM regen	IPA/LOx	0.5kN
Glasgow	Bi-prop	Heat sink	IPA/LOx	1kN
Imperial (ICLR)	Bi-prop	Machined	IPA/LOx	3 - 5kN
Southampton	Bi-prop	Semi regen	IPA/N2O	1.5kN
Edinburgh	Bi-Prop	Steel, long duration	IPA/N2O	0.5kN
Sheffield	Bi-prop	AM regen	IPA/N2O	3.5kN
Leeds	Bi-prop	Regen, electric pump fed	IPA/N2O	8.0kN
UCL	Bi-prop	AM regen	IPA/N2O	1.5kN
Trinity College Dublin	Bi-prop	Two layered steel regen	IPA/N2O/LOx	5.0kN
Cranfield	Hybrid	HDPE	N2O	1kN
Nottingham	Hybrid	tbc	N2O	0.3kN
Durham	Hybrid	PVC	N2O	2kN
Surrey	Hybrid	tbc	N2O	0.4kN
Bristol	Hybrid	Simplified aerospike	N2O	0.3kN
Bath	Hybrid	Aerospike, deep throttle	N2O	3kN
USW	Hybrid	tbc	N2O	0.5-1kN