R2T2 Newsletter

Welcome to our second newsletter!

We have completed the first year for our first cohort of students, and their main event has been our summer school at Race 2 Space.

SCAPE training, first aid courses, and access to the hotfires at the symposium all made for a memorable week. We were also pleased to welcome students from our parallel programme in Australia.

We are also very pleased to welcome the students of Cohort 2!

Thank you for joining us, and we hope that you will soon be starting to shape your group design project with Krzysztof.

Finally, we are starting to look ahead to next year, with the potential of an R2T2 stall at the Space Propulsion Conference in Italy.

Thank you, everyone, for making this team possible.

Patrick Harkness, Principal Investigator

R2T2 is funded by an award from the UKSA – Reference: ST/X006093/1

R2T2 News

Launch of Cohort-2 Studentships

We are pleased to announce that our second cohort of nine new PhD Students joined R2T2 in October. This is in addition to the ten students in Cohort-1 who started with us last year.

As with Cohort-1, each student's project includes a training package that will include small-bore tubing, propellant handling, first aid, and much more besides.

There will be annual opportunities to attend the Race2Space event and make partnerships with students from Australia, South Africa, and beyond.

Each student will also have the opportunity to help build and hotfire a biprop training engine, and each studentship comes with a consumables pot of around £50k to support the development of research engines or hardware in collaboration with an industrial partner.

You can find out more about our Cohort-2 students at:
https://www.r2t2.org.uk/cohort-2students

R2T2 Summer School

In July, our Cohort-1 students attended the first R2T2 Summer School for a full week of activities.

The School was hosted at Westcott Venture Park in Aylesbury, Buckinghamshire. Westcott is home to the Westcott Space Cluster.

The students enjoyed a training programme that included SCAPE and first aid training, courses on pressurisation, propellant handling, and cleanroom skills; guest lectures; and full access to the Race2Space symposium.

Students also made their first poster presentations, and were able to meet with rocketry societies from across the UK. There was also an opportunity to engage with industry, UKSA, and the wider ecosystem.

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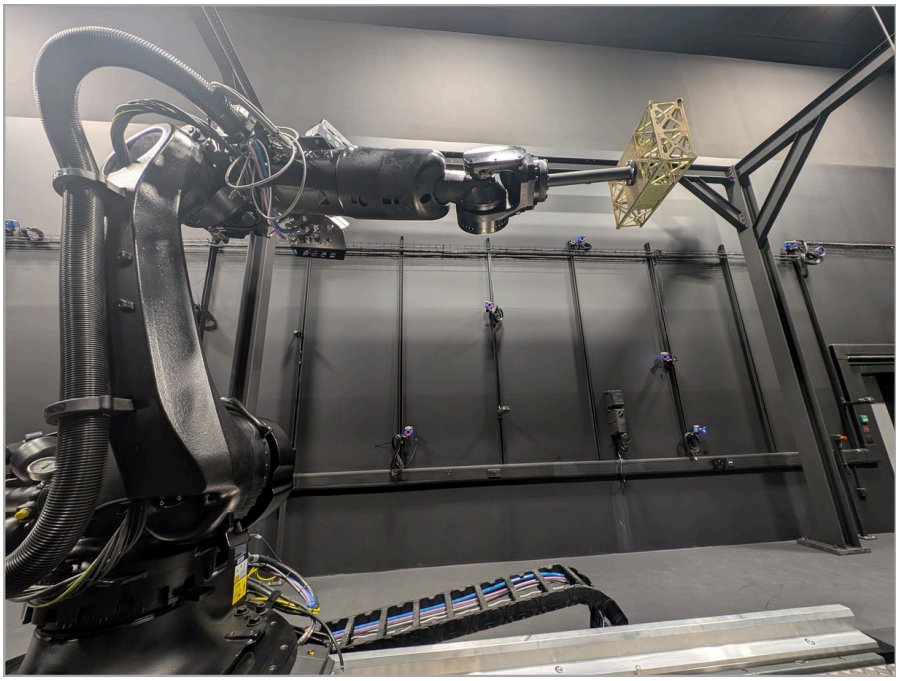
"The R2T2 July summer school was extremely exciting to attend.
It was a great opportunity to meet and gain experience from the industry's propulsion experts."

Matthew Norrie - R2T2 Student at University of Strathclyde



"It was very useful to have a large amount of time around the other members of the R2T2 program, since we're at separate universities it's difficult to have a sense of teamwork or camaraderie.

"Spending time together in person really helped with getting to know the other members of the cohort and will definitely aid us going forwards, especially for our collaborative rocket engine."

Jack Cunningham - R2T2 Student at University of Bristol

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"I really enjoyed meeting up with the rest of the cohort and chatting to everyone about their PhDs and the cool research they've done so far.

"Interacting with the student teams and seeing their rocket engines was also really impressive."

Joe Leicester - R2T2 Student at University of Sheffield

As a researcher in 'green' hypergolic propellants for in-space propulsion, my favourite part of the summer school was the visit and training at European Astrotech, which gave me some really useful insights into handling of the traditional hypergolic propellants that 'green' propellants seek to improve on.

Rose Swears - R2T2 Student at University of Southampton

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Introducing our Cohort-1 Students

We have ten students in our first student cohort, working across nine different universities and starting at various times since October 2024.

In each issue of the R2T2 Newsletter the students will introduce themselves and give some information on their area of research and why they wanted to be part of R2T2.

Mohammed Deera - University of Glasgow & Orbex

I studied at Queen Mary University of London, earning a Bachelor's degree in Material Science followed by a Master's in Aerospace Engineering, where I focused on green monopropellant engine design.

After university, I joined the Satellite Applications Catapult as a Technical Engineering Graduate, working on satellite architecture, rocket propulsion systems, and additive manufacturing.

Outside of work, I'm passionate about all things space and enjoy reading comics and sci-fi novels - it's a fun way for me to relax and get inspired.

What attracted you to joining R2T2?

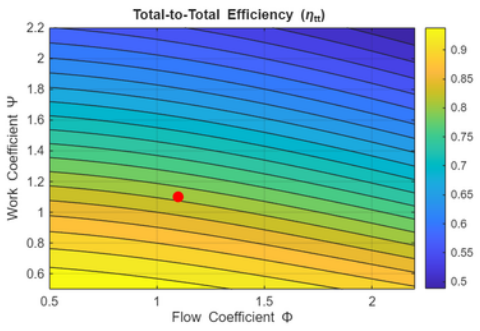
I've always been driven by a deep curiosity for research and a passion for rocketry. The R2T2 program offered the perfect opportunity to delve deeper into these interests while working on innovative propulsion technologies.

What have you been working on?

Over the past year, I've been developing a turbine design and optimisation tool for rocket engine turbomachinery. Now in its third version, it models turbine meanline performance and sets the stage for future shape optimisation to boost turbine stage efficiency. Working closely with Orbex has been key in making sure the tool aligns with real industry design methods and can be adapted to future engine concepts.

How has your first year been?

It's been a busy but very rewarding start, balancing research with hands-on training. A couple highlights include the R2T2 Summer School, where I got practical experience with SCAPE suits and P&ID design, and a Radial and Axial Pump training course in US that which helped consolidate much of the theory developed during my first year.



Smith chart illustrating the total-to-total efficiency contours of 1 stage turbine, plotted as a function of flow coefficient (ϕ) and work coefficient (ψ)

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Maleha Khan - Cranfield University & Newton Launch Systems

Hi! My background is in Aerospace and Aviation. I studied Aeronautics and Astronautics at the University of Southampton, where I specialised my Masters in Spacecraft Engineering and gained a real interest in rockets.

After university I explored my other passions, travelling and flying, and gained my pilots license as well as explored teaching in Saudi Arabia. I then joined the UK Space Agency and acquired a valuable network of space professionals with exposure to fantastic national projects.

What attracted you to joining R2T2?

For me, the answer is simple, who gets opportunities like this? The world of rocket engineering is of course expansive but has somewhat remained limited to those lacking experience or still studying. R2T2 stands to break that down and in addition, provide rare opportunities for cutting edge research to those who are also still learning.

What have you been working on?

I am working on finding a solution for the long term storage and use of hydrogen fuel for chemical rockets. This is an exciting and cutting edge project due to the opportunities and challenges that hydrogen provides.

I started on R2T2 in March this year, so I am still undertaking the initial research for a literature review focusing on previous hydrogen rockets, opportunities and challenges of using hydrogen for spacecraft propulsion, the current hydrogen storage techniques and avenues to explore. Whilst traditional methods use liquid storage in cryogenic tanks, emerging research on chemical binding or physisorption in metal hydrides or organic frameworks is emerging.

What will you be doing next?

I aim to select a particular mission avenue to research taking into the consideration the space environment that could also be utilised to enhance hydrogen infrastructure, for example, a lunar infrastructure utilising water electrolysis.

What else have you been upto this year?

In addition to developing a foundation of knowledge, I spent two months with the International Space University (ISU), completing the Space Studies Course (SSP) with candidates from 40 nations across the world. The course was held at Hanyang University, South Korea.

The experience led to a collaborative opportunity to work on a Lunar habitat and spaceport proposal in which I was able to explore hydrogen production and use from the south pole ice caps on the moon.

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Join the growing network:

Are you interested in a PhD in rocket propulsion? Or perhaps you represent an organisation that would be interested in becoming an industrial partner?

We can provide the project opportunities, training, and test infrastructure you need to succeed.

Visit r2t2.org.uk to find out more

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UK SPACE AGENCY

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