Research and innovation at Cranfield

A guide for researchers

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Welcome

As a Cranfield researcher, you've joined an exciting and vibrant multi-disciplinary research community. Cranfield is a significant contributor to global innovation; our influence on specialised sectors has changed the way that society thinks, works and learns, and your research will help continue this.

This booklet provides a general overview of the Cranfield research environment and will help to kick-start your research journey.

I hope you find your time here both rewarding and stimulating, and I wish you luck in taking forward your research at Cranfield.

Dr Christine Thompson
Director of Research and Innovation

Research and innovation at Cranfield

Organisational structure

Cranfield's research and innovation environment is different to that of most universities. We are organised into eight themes, headed by a Director of Theme who provides leadership and development for research and learning across the theme.

Our themes are grouped together into four Schools, each headed by a Pro-Vice-Chancellor who has overall budgetary responsibility for the School and sets its strategy:

• Cranfield Defence and Security,
• School of Water; Energy and Power; Environment and Agrifood,
• School of Aerospace; Transport Systems; Manufacturing,
• School of Management.

Each School has a dedicated Director of Research, supported by a Deputy Director of Research, responsible for the operational elements of research and innovation, including policies, processes and practices within the Schools, and whom can support and guide you in your research pursuits.

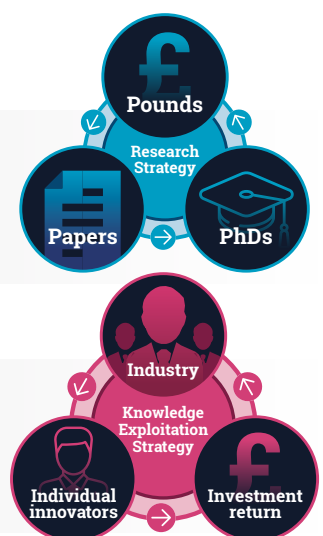## Research and Innovation Office

The Schools are supported by a number of Professional Services, including the Research and Innovation Office (RIO) which reports into the Pro-Vice-Chancellor for Research and Innovation. RIO works closely with other Professional Services to offer help and support in the following key areas:

• research funding and researcher development,
• industrial research relationship development,
• knowledge exchange funding,
• Research Excellence Framework,
• intellectual property and commercialisation,
• improving student monitoring and evaluation,
• ethics and governance,
• Research Costing and Bid Management (RCBM),
• research contracts.

Further information on each of these areas can be found on the Research and Innovation at Cranfield intranet page.

RIO is responsible for Cranfield's Research Strategy and its successful delivery. The Strategy focuses on the three 'P's as a means to achieve Cranfield's corporate and research performance objectives - **Pounds** (research income), **PhDs** (quality of our PhDs), **Papers** (research outputs).

RIO is also responsible for the Knowledge Exploitation Strategy which utilises the three 'I's to deliver Cranfield's vision in achieving maximum value, impact and influence – **Industry** (client engagement), **Individual innovators** (staff and students), **Investment return** (finance).

The Pro-Vice-Chancellor for Research and Innovation chairs the Research Committee and sits on the University Executive. These bodies develop strategy and policy arising from Cranfield's Corporate Plan and ensure that the work we do is safe, environmentally acceptable and ethically sound. The Cranfield University Ethics Committee oversees the University's research ethics policy.

Importance of research and innovation

Research and innovation is a significant characteristic of higher education environments, leading to a thriving, creative and exciting atmosphere which drives thought leadership and delivers quality graduates trained in the very latest thinking and technologies.

It underpins an innovative and problem-solving ethos, generating new academic concepts and theories while identifying and solving 'real-world' problems, thereby producing benefits for everyone. On an institutional level, it supports a high profile reputation among peers and industry for excellence which leads to funding opportunities and income, important collaborations and partnerships, and national and international awards and recognition of quality.

On a personal level, developing a track record in research and innovation enables the pursuit of topics of interest and the opportunity for new thinking and solutions, increases the chance of quality research outcomes and income, improves personal profiles and esteem, and supports career progression as well as enhancing the currency of teaching material.

Research and innovation at Cranfield is an integral part of our mission, with activity ranging from Technology Readiness Level (TRL) 1 (challenging existing academic concepts and/or creating new thinking) to Level 9 (a technology or methodological solution becomes fully integrated into everyday practice after a series of prototype, demonstration and validation stages).

This technology readiness pipeline ensures that novel basic science concepts are then developed into successful, practical applications. Cranfield researchers work at different TRLs depending on their interests, expertise and partnerships, but all are expected to deliver outputs and outcomes that generate transformative impact – whether academic, industrial, societal or economic.

Funding landscape

Overview

The research and innovation funding landscape is varied and depends largely on the type of work you are planning to deliver. It can broadly be differentiated by two types of funding:

• public sector funding – usually has an open remit focused on creating new academic knowledge, driven by investigator ideas, and may fund larger and riskier projects;
• private sector funding – this tends to be bounded and focused on sector needs, with projects being less risky and answering specific questions.

There are also opportunities available which require both private and public sector funding, helping to de-risk research and innovation for companies while creating a route to non-academic exploitation for the Government. The diagram below shows which funding agencies support research and innovation at each TRL.

Technology Readiness Level (TRL)

1	2	3	4	5	6	7	8	9
Basic research idea	Concept developed	Proof of concept	Laboratory validation	Field validation	Field demo	Operational demo	System completed and qualified	System proven in operation

UKRI/Research Councils →

European Commission →

Government agencies and charities →

Innovate UK →

Companies →

Identifying funding opportunities

RIO can help you identify public sector funding opportunities (including knowledge exchange) that match your specific idea and career stage.

RIO produces an electronic fortnightly funding bulletin through [Research Professional](#) highlighting opportunities by research theme which you will receive into your inbox. The Research Excellence team can also support you with setting up personal alerts and provide training on using Research Professional, which will allow you to directly receive information on funding opportunities tailored to your specific needs and interests.

RIO also monitors tender opportunities, sends notices of new tenders to individual researchers, supports the development of tender content and can manage the submission process, if required, for all colleagues in Defence and Security; Water, Energy and Power, Environment and Agrifood and Aerospace, Transport and Manufacturing.

The Business and Innovation Partnerships team identifies major strategic funding opportunities with industry and will discuss them with you directly.

UK Government funding

UK Research and Innovation organisation (UKRI)

UKRI is a single, non-departmental public body operating at arm's length from Government that brings together the seven Research Councils, Innovate UK and Research England. The UKRI Explainer provides a comprehensive summary of the structure, aims and funding of UKRI.

Its aim is to integrate research and innovation activities and maximise Government investment. This means that the Research Councils and Innovate UK are required to work in a consistent fashion and present a single united voice to Government. UKRI is responsible for the Global Challenges Research Fund, the allocation of annual grant funding for teaching and research in England, and the new Industrial Strategy Challenge Fund as part of the UK's Industrial Strategy.

UK Research Councils

The UK's Research Councils invest around £3 billion in research across the spectrum of academic disciplines. They support excellent research and researchers and seek to achieve an impact on the growth, prosperity and wellbeing of the UK as well as drive academic thinking, develop research leaders, and generate a skills base of trained researchers. There are seven Research Councils:

- Arts and Humanities Research Councils (AHRC)
- Biotechnology and Biological Sciences Research Council (BBSRC)*
- Economic and Social Science Research Council (ESRC)*
- Engineering and Physical Sciences Research Council (EPSRC)*
- Medical Research Council (MRC)
- Natural and Environmental Research Council (NERC)*
- Science and Technology Facilities Council (STFC)

*key research councils for Cranfield, reflecting the focus of our research.

Innovate UK

Innovate UK is the UK's innovation agency. It funds industry-led research in strategically important areas of science, engineering and technology from which successful new products, processes and services can emerge. Universities are typically collaborating partners in these industry-led projects, creating new or building on existing industrial relationships but in some cases, can lead on applications.

Governmental agencies and departments

Many governmental agencies and departments issue contracts and tenders for research into specific topics. Those worth over £10,000 are published on the Government website where you can create a search for specific areas of interest and for 'Research and Development Services'.

Some of the key funders include:

- Department of Environment, Food and Rural Affairs (DEFRA)
- Defence Science and Technology Laboratory (Dstl)
- Environment Agency (EA)
- Department for Business, Energy and Industrial Strategy (BEIS)
- The Ministry of Defence (MoD)
- Department for International Development (DFID)

Cranfield also has a strategic charter agreement with Dstl which supports greater cross-working of the two organisations and enhances the sharing of information, knowledge and expertise as well as facilities for research, consultancy, test evaluation and educational purposes.

Dstl provides a variety of the routes to market for research including bespoke contracts, preferred supplier agreements (R-Cloud, MoD FATS) and Dstl frameworks (e.g. EWC (QinetiQ) – Electronic Warfare and Cyber). In addition the Defence and Security Accelerator replaces the Centre for Defence Enterprise (CDE) funding scheme and is designed to be the first point of contact for both academics and business organisations that have a disruptive technology, new process or innovation with a potential defence application.

EU research initiatives

The European Commission provides funding to support cross-Europe research and development.

Horizon 2020 (H2020) is currently the EU's main funding programme for research and innovation. H2020 contains a number of different funding programmes and mechanisms for research and innovation on a larger scale, based on three pillars:

- Excellent Science: provides largely bottom-up funding for individual researchers or teams, within 4 schemes.
- Industrial Leadership: funding to speed up the development of technologies and innovations that will underpin tomorrow's business, within 3 schemes.
- Societal Challenges: top-down funding for collaborative projects, determined through two-year work programmes within the seven identified societal challenges.

Other schemes also include funding for fellowships (European Research Council), science and technology networks (COST Actions), and training networks for postdoctoral staff and PhD students (Marie Sklodowska-Curie).

Cranfield partners with UKRO which provides access to a National Contact Point for H2020 queries. Sign up to receive funding update bulletins and news updated on the EU funding environment.

European funding remains open to UK researchers until the UK formally leaves the European Commission. The UK Government has agreed to underwrite the funding for UK organisations leading or partnering in Horizon 2020 research and innovation activities or for proposals in the process of review that are subsequently successful. It also includes funding support for all successful competitive bids to Horizon 2020 call open to 3rd country participation submitted after EU exit until the end of the H2020 programme. All funding will be provided for the lifetime of the project.

Charities

There are many charities that fund research – some with specific research interests (e.g. Perry Foundation for agriculture and food production, Lloyds Register Foundation for risk, and the Joseph Rowntree Foundation for social change), others open to any discipline (e.g. Leverhulme Trust).

All charities aim to generate knowledge that benefits the public good, tackling societal challenges or wide-spread issues. Some companies such as AXA and BUPA have set up independent trusts for funding research (AXA applications are coordinated centrally within Cranfield) by RIO.

Learned bodies and societies

Learned societies tend to provide funds for fellowships, small pump-priming grants, networking events and travel. Some of the key organisations include:

- British Academy: Humanities and social sciences.
- Royal Society: Natural sciences and engineering.
- Royal Society of Edinburgh: STEM and Arts and Humanities.
- Royal Academy of Engineering: Engineering research.
- Royal Commission for the Exhibition of 1851: Sciences and engineering.

Professional bodies

Many professional bodies/societies (e.g. Royal Society of Chemistry, European Association of Social Psychology, Institution of Engineering and Technology) have funding for small projects, research visits, conference travel, event management, education and outreach activities etc., but, typically for members only.

International funding bodies

Some international bodies provide funding for UK researchers, such as the Japan Society for the Promotion of Science (JSPS), the Humboldt Foundation and the Volkswagen Foundation, although they tend to have stipulations regarding partners or the requirement to work in the funder country of origin. Others have established links through the Research Councils, such as FAPESP, the NSF and FNR, as well as act as matched funding partners for Newton Funding calls and Global Challenges Research Fund (GCRF) initiatives.

For advice on these opportunities and funding bodies, please contact RIO.

Industry funding

Cranfield has a number of strategic partnerships, such as with Airbus, AWE, BAE Systems, Boeing, Rolls-Royce and Unilever, as well as strong industry relationships with key organisations including Anglian Water, MBDA Missile Systems, QinetiQ, Subsea7 and Thales.

These enable the submission of collaborative proposals to other funders (e.g. Research Councils) as well as facilitate the placing of research or consultancy contracts or the provision of MSc/PhD student support.

Personal industrial contracts are also a valuable source of collaboration and income and so researchers are encouraged to develop their own industry networks. Industry-sponsored Master's projects, either of individuals or groups, as well as PhD studentships are a good way to initiate a formal but small-scale relationship.

Cranfield is also linked in with a number of SME (Small-Medium Enterprises) networks in support of specific Cranfield research themes and within the regional area, such as the Manufacturing Co-operative, South East Midlands Local Enterprise Partnership (SEMLEP), Cambridge and Oxford Cleantechs and Milton Keynes Entrepreneurial Spark. RIO can provide details of these partnerships and offer help in identifying and brokering relationships with industry if needed. Indeed, there are key Strategic Partner Ladders of Engagement in place that identify which individuals are responsible for communicating with the companies with which we have strategic partnerships. Please contact RIO before you engage industry so that we can ensure the appropriate enquiry lines are followed.

Government-funded industry networks

The Government has established a number of not-for-profit, independent Catapult Centres comprising a network of UK businesses, scientists and engineers, with the aim of transforming UK innovation capability in specific areas and helping to drive economic growth. Innovate UK has also established a number of Knowledge Transfer Networks, each operating in sector themes, to bring together businesses, entrepreneurs, academics and funders to develop new products, processes and services. More information on the Knowledge Transfer Networks is available here.

Innovate UK is responsible for the Catapults, so the emphasis is on connecting businesses with UK research and academic communities to solve key problems and develop new commercial products or services. The most relevant of the eleven centres to Cranfield, and with whom it has connections, are the High Value Manufacturing Catapult, Digital Catapult, Future Cities, Offshore Renewable Energy, Satellite Applications and Energy Systems. Each Catapult uses a variety of means to encourage engagement and collaboration. More information on all Catapult centres is here.

Public and private funding schemes

To encourage businesses to fund research and innovation with reduced risk and costs, improve the link between industry and academic research, and to support the translation of research into commercial advantage, there are a number of external funding schemes available that require private funding to release public monies. The aim of these schemes is to maintain or develop UK leadership in specific capabilities and to improve the economic wealth of the nation.

There is a wide variety available but the main opportunities are:

- UKRI fund a range of activities directly including the Strategic Priorities Fund for multidisciplinary and interdisciplinary high quality R&D priorities, the Global Challenges Research Fund which supports research that addresses challenges faced by developing countries, a fellowship initiative for Future Leaders in any discipline, and the Strength in Places Fund seeking to support regional economic growth through research and innovation activities.
- Innovate UK: fund business-led activities including collaborative research and development, feasibility studies, and demonstrators. Universities can be partners on each project. It also funds Knowledge Transfer Partnerships (KTPs) where a university graduate employee works at a company on a defined project to help the business innovate and grow.

- **Research Councils:** support co-funded PhD studentships with industry, knowledge exchange fellowships and internships, specific competitions which specify industrial partners (although ALL projects can have industrial partners who provide cash or a contribution-in-kind), commercialisation and innovation funding of research, and impact acceleration (IAA) funds that aim to move a research output up the TRL spectrum. Cranfield holds an EPSRC IAA fund which is distributed via an internal application process.
- **European Commission:** all proposals to their Horizon2020 research and innovation programme can include industrial partners but targeted initiatives include industrial research fellowships, staff exchanges, and PhD training networks between commerce and academia.
- Focused opportunities: such as the Royal Society Industry Fellowships or the Royal Commission for the Exhibition of 1851 Industrial Fellowships.

These opportunities are included in the funding bulletins published by RIO and can be viewed on Research Professional.

Supporting your funding bids

Research Excellence team

- supports you with any public sector bids and proposals, advises on developing public sector bids and proposals, the content and quality, conducting application reviews and representing the non-expert panel members of funding bodies.

Business Development and Innovation team

- provides Intellectual Property Management advice and technology Transfer services,
- provides strategic steer and support for key strategic industrial relationships,
- enterprise support and spin-out advice.

Research Costing and Bid Management (RCBM) team

The team provides a costing and pricing service for all Cranfield proposals – see Activity costing and pricing.

It leads on supporting defence and public sector tenders; small and medium value commercial proposals; all consultancy, miscellaneous large non-research and teaching-focused contracts; identifying and promoting tender opportunities.

For very large value commercial bids and tenders, Business Development and RCBM work together to support the proposal, with Business Development taking the lead on business development, pulling together the team and providing support with ideas generation; and RCBM providing costing and pricing expertise and early stage programme management support to get to a point where the research programme can begin.

Research Contracts team

The Research Contracts team will work with you and our other Professional Services to determine the most appropriate terms and conditions for your proposed transaction. Transactions range from contract research, consultancy and sponsored student projects to confidentiality agreements, hiring of equipment or facilities, or the exploitation of University intellectual property. These may take the form of standard agreements, bespoke contracts or require the Research Contracts team to negotiate with the commercial partner. Please note: it is the responsibility of the Research Contracts team to negotiate terms, not an individual researcher.

Activity costing and pricing

The University uses a set formula and classification of cost types to calculate the basic costs associated with undertaking research and innovation activity. This underpins the financial pricing strategy of the activity, which may differ from the cost.

Universities apply a system known as Full Economic Costing (FEC) when calculating the cost of undertaking a piece of research or innovation activity. FEC costs are calculated according to a number of different categories.

- **Directly Incurred (DI) –** costs that are only incurred by the activity itself and so would not be incurred if the activity did not take place E.g. staff only employed by the activity to work on the project, consumables, travel and subsistence, equipment purchase and research facilities where hire rates have been calculated. These costs are specific to the project and can be supported by an audit record and time sheets.
- **Directly Allocated (DA) –** costs of resources, both staff and non-staff, that are shared between several activities or projects and are charged to specific activities on the basis of the allocation of the resource to the activity in question E.g. currently employed staff time (researchers and pooled technicians), the use of research facilities where FEC rates have been calculated, and estates costs (the cost of the space required to conduct the activity).
  These costs include Investigators time, estates and infrastructure technicians.
- **Indirect Costs –** non-specific costs charged across all activities not otherwise included as Directly Allocated costs. These costs are necessary for underpinning the undertaking of research and innovation activities, but cannot be allocated to individual projects and incorporate general University facilities, corporate services, and institutional infrastructure costs. These costs are based on full time equivalent hours staff spend on the project and this figure is fixed if the proposal is accepted.

Exceptions: This will consist of items that would otherwise come under the 'Directly incurred' heading but which will be separated out because UKRI will fund them at 100%. Conditions of the call will state if an item can be classed as an exception.

All Universities use the following formula for calculating proportional costs associated with **salaried** time:

> **A full time equivalent (FTE) member of staff works for 1650 hours =
> 220 days = 44 weeks per year (equivalent to 37.5 hours per week)**

Costs linked to salaried time include the **direct costs** of employing that person (actual salary plus 'on-costs' – i.e. personal costs to the institution such as National Insurance, pension contribution, apprenticeship levy etc.) as well as proportionate amount of **estates** and **indirect costs** for running the University.

The Principal Investigator (PI) for each activity compiles the equipment, travel, subsistence, consumable and dissemination costs. The RCBM are responsible for compiling the salary costs, Directly Allocated and Indirect Costs for each proposal.

Once the costs have been collated, a pricing strategy will then be devised based on market comparisons, existing agreements, funding agency budget models, and changes in relevant regulations and governance. This comprises the final price of the activity which is submitted to the funder, sponsor or contractor.

Approvals process

Pre-award funding applications and contract bids

The specific approvals process required before submitting any funding proposal is dependent upon the type of funding being sought. You should address each stage well ahead of the deadline.

The table below outlines the general stages of approval required for each type.

Application type /approval gates	Line manager approval?	Peer review approval?	RIO Research Support or Business Development Support review /approval?	RCBMT review?	Research Contracts review?	B3.1 required (theme and School approval)?
Research – outline	Yes	Yes	Yes	Yes	No – unless funder is new to CU	Yes – if costs are required
Research – full	Yes	Yes	Yes	Yes	No – unless funder is new to CU	To check with RCBMT
Research – other (e.g. equipment / travel / network / training)	Yes	No	Preferred	Yes	No – unless funder is new to CU	No – unless staff salary costs are required
Research where CU is not the lead	Yes	No – although is preferred	Preferred	Yes (for CU costs)	No – unless funder is new to CU	Yes
Outline tender	Yes	No	No	Yes	Yes	Yes
Full tender	Yes	No	No	Yes	Yes	Yes
Outline Industrial proposal	Yes	No	Preferred	Yes	Yes	Yes
Full industrial proposal	Yes	No	Preferred	Yes	Yes	Yes
Consultancy	Yes	No	No	Yes	Yes	Yes

Key:

■ = public sector funding activities　　■ = private sector activities

Proposals with a value of over £1 million require the Chief Operating Officer's approval which will be sought for you through the RCBM team.

It is your responsibility to obtain line manager approval and peer review, and engage the appropriate RIO team. The lead team will then ensure that the Contracts team is contacted as necessary, with RCBM also responsible for ensuring a B3.1 form (a template form used to obtain the necessary School signatures for the finances associated with your activity) is compiled and approved before bid or proposal submission.

Point to note

All research proposals take much longer than you might think to prepare. It's a good idea to plan ahead and to seek advice from your line manager, finance support and RIO as soon as possible. If you would like help with application drafts or initial costs, you must inform RIO and provide the relevant material at least ten working days before the submission deadline to be guaranteed help. Ideally you should allow much longer for a high quality finished product. Final version documents must be submitted to RIO at least three working days before the funding deadline to allow time for submission processing, validity checks and securing any outstanding approvals.

The timelines for support are outlined in the Research Grant Preparation: Approval and Support Timelines policy which can be viewed on the intranet.

Approval of institutional letters of support

Research proposals often require the inclusion of letters of support from the host institution and/or department. At Cranfield, the signatories for these letters depend on the specific requirements of the call, so the process for receiving the signed letter varies.

A template letter of support is available on the intranet – find it under the 'templates' tab. You can use this as a starting point to draft your initial letter of support. Any financial commitments within the letter (e.g. studentships, % time, financial contribution) need to be approved by your Director of Theme prior to sending on the letter for signature.

Signatories

Required signature	Cranfield signatory	How to contact the signatory	Information required
Head of Department	For CDS, SATM, SOM: Pro-Vice-Chancellor School SWEE: Director of Theme	Through PA/thematic administrator	1. Draft Letter of Support 2. Approval trail for B3.1 3. Call details (link/ call document) 4. Draft Proposal
PVC/Dean Research	Professor Tom Stephenson	Through Research Grant Facilitator. Please contact researchoffice@cranfield.ac.uk if you are unsure how to proceed.	
Head of Institution	Professor Sir Peter Gregson	Through Emma Butterwick in the Executive Office	Please send these documents at least ten working days prior to the deadline.
Approved/designated signatory	Chris Buckland (escalating to Ian Sibbald and Philip Aspinall)	Via email: c.buckland@cranfield.ac.uk	

If you are unsure about who the most appropriate signatory might be, please contact your relevant RIO research grant coordinator.

Ethics and governance

Governance

The University Governance is primarily managed through the Executive Office with a committee structure in place to ensure wide consultation on relevant matters. For research matters the main committee is the Research Committee, chaired by the Pro-Vice-Chancellor for Research and Innovation. The Research Committee reports into Senate.

A full list of Senate Handbooks, with a link to University Regulations, can be found on the intranet.

Research integrity and ethics

Policies

The University has adopted Universities UK's 'The Concordat to Support Research Integrity', and upholds its principles. Cranfield's Research Integrity Policy Statement, which directly references the Concordat, is also supported by a guide to implementing and monitoring the policy. These documents are important in outlining the University's expectations of staff to take responsibility for developing and maintaining a culture in which sound research practices are adopted. Each year, the University publishes its Annual Statement on Research Integrity in line with the Concordat.

Closely aligned is the University's Research Ethics Policy. Ethical behaviour in research is of paramount importance to the University. Staff and students must obtain ethical approval before starting to collect research data. The Cranfield University Research Ethics Committee (CUREC), on behalf of the University, represents the interests of participants and other stakeholders who take part in, or are otherwise affected by, research conducted by staff or students of the University, and in particular ensures that research ethics are maintained and enhanced.

Gaining ethical approval

To ensure all our research conforms with appropriate ethical principles and standards, all staff and students undertaking research as part of their studies, or under contract, must submit their research proposal through the University's ethical approval system, CURES, for review. In most cases, ethics approval can be secured very quickly, but more complex cases, for example involving human subjects, can take up to two months, so we encourage you to plan well ahead.

All students are required to complete online ethics training to help develop their understanding of research ethics and integrity. Completion is essential before they can submit any applications through CURES. It is available through Blackboard (Cranfield campus) and Moodle (Shrivenham).

Responsible innovation

Responsible Innovation seeks to promote creativity and opportunities for research and innovation that are socially acceptable and undertaken in the public interest. Innovation often raises questions and the potential impact can sometimes be unpredictable.

Researchers should reflect on their personal and professional motivations for conducting their research and be able to anticipate, reflect and engage on the wider ethical and societal impacts, implications and value of their work, engaging with the public and other stakeholders where appropriate.

The Engineering and Physical Sciences Research Council has recently promoted their Framework for Responsible Innovation which is available on their website.

Laboratory notebooks

All staff and students undertaking research in a lab or similar environment, should use a physical (printed) laboratory notebook to record research information, ideas, observations, experiments and analysis of data.

This is important because of issues relating to intellectual property, prevention of fraud and legal obligations, as well as being an essential component of assuring quality research processes and outcomes.

It is also important that your lab notebook is kept up to date and includes details of conception of your idea, experiment, approach, technique, as well as experimentation, observations and results in a chronological order.

The Lab notebook policy and guidance sheet is available on the intranet.

Accessing facilities

The University has a host of equipment and facilities available to researchers. To ensure equipment use is optimised and to prevent the purchasing of duplicate items, an internal equipment database is available to search and/or add new items.

Information from the database also feeds into the EPSRC equipment sharing repository, which is open to researchers from all research institutions and universities to review in order to encourage open access to large and strategic facilities across the country. If you require access to very large or niche facilities, please check the EPSRC repository as preferential rates may be available to researchers who use this system.

Post-award support

The <u>Research Monitoring and Claims team</u> provide support for all grants, contracts and awards once they are fully approved and have been allocated a job code.

How they can support you

Financial information can be provided at any point, showing the budget awarded by expenditure category, the expenditure incurred or committed to date and funding remaining.

In addition, each grant/contact/award is monitored on a monthly basis. The team will liaise with the Principal Investigator (PI) throughout the duration of a contract to ensure income and expenditure is correctly forecast and to check technical progress is being made. They will provide claims or invoices and audit reports for sponsors or clients as required, ensuring that PIs are aware of the schedule and can indicate achievement of technical milestones if appropriate.

Completion of a project

On completion of a project, the team will liaise with the PI to check that there is no further expenditure to come, that all purchase orders have been cleared and that all invoices/claims have been raised.

RIO Post Award Manager

Suppport is also provided for the non-financial aspects of post-award management, aiding you in your delivery, reputation and project risk activies.

The service is for both publicly and privately-funded research activity.

Publishing your research

Where to publish

Publication of your research is extremely important to your profile as an academic as well as to the reputation of the University.

Dissemination of knowledge is a core responsibility of universities, given their charitable status, and so researchers should seek opportunities to publish all of their research in the most important peer-reviewed journals of their disciplines as well as ensure their outputs reach the most relevant non-academic beneficiary groups.

RIO produces a Leading Academic Journals List that should be used as a guide for researchers when considering where to publish or what to aim for; it highlights the top 10% of journals according to impact factor (citations) in subject categories most aligned to Cranfield's research. The top 25% of journals are also listed on the same intranet page. The list should be used to inform your personal publication plan in conjunction with discussions with your line manager. In addition, various seminars and lectures are run throughout the year to share best practice and academic experience in publishing in influential journals – these are highlighted on the intranet.

Cranfield Research Information System (CRIS)

The University hosts CRIS which is the central repository of research publications generated by research active staff as well as other professional information.

All staff are required to generate a CRIS profile and add their publications to it; as well as providing a record of their professional activities it also feeds your personal profile on the University's website so it is important that the data is accurate and up to date.

If you need help with CRIS, please email cris-support@cranfield.ac.uk or access the user guides on the intranet.

ORCID and publishing

ORCID (an Open Researcher and Contributor ID) is a personal identifier associated with you and your individual work. It prevents name ambiguity, improves discoverability of your research across various bibliographic and full-text resources, stays with you throughout your career, maps to Researcher ID and Scopus ID, and is free of charge. As such, Government and funding bodies support its use.

All Cranfield researchers should register for an ORCID ID and connect this to their CRIS profile (see above). Register for an ORCID here.

Making your research open access

Open access is unrestricted, online access to the published findings of research. By making your research publicly accessible you are opening it up to a wider non-scholarly audience, such as practitioners, policymakers and others who work in industry, Government and NGOs who often do not have access to traditional subscription journals.

Research England and UK Research and Innovation (UKRI)

Both Research England and the Research Councils fully support open access. Research England's position is that research arising from its funding should be freely accessible. The funding criteria in UKRI's open access policy stipulates that anyone who has received a Research Council grant or studentship, or who works in an EPSRC-funded research centre, is expected to publish their research via open access.

An important requirement for REF 2021

For journal papers to be eligible for submission to REF 2021, they should be deposited in an institutional repository following acceptance by the publisher.
The University operates two externally facing open access repositories:

- **Cranfield CERES:** for publications, primarily journal and conference papers, research theses, and book chapters,
- **CORD:** for research data.

Achieving this requirement

On confirmed acceptance of your journal article, please forward publisher notification email to accepted@cranfield.ac.uk. The Library will add the details of your paper together with your accepted manuscripts to CRIS and CERES, and will check and ensure the open access requirements are met.
Please attach the final Word copy that was sent to the publisher. This needs to be the post-review copy of the manuscript. This is normally a version which lacks the copyright statement, journal logo and final layout. If you haven't got a post-review version, please send the submitted manuscript to accepted@cranfield.ac.uk.

Routes to open access

There are two routes to open access:

Gold – An Article Processing Charge (APC) is paid to your publisher so that it releases your paper for free publication on its journal website. The University has a small fund to cover these charges, which is currently restricted to work arising from Research Council grants or is supported by an industrial partner and the article must be published in a title on the Leading Academic Journals List. Typical APC charges range from £1,600 for an article in a science journal to £800 in the humanities. Even if your work is not funded by RCUK or involves an industrial partner, please contact the Library for advice because the journal in which you are publishing might offer discounts on the cost of an APC or even waive the fee entirely.

Green – An Article Processing Charge does not need to be paid and you deposit the post-refereed accepted version of the article via the accepted@cranfield.ac.uk route above. However, an embargo period imposed by your journal publisher may delay its publication in CERES. The embargo period may vary between six and 48 months.

Open access requirement for Horizon 2020

All research projects funded under Horizon 2020, the European Union's Framework Programme for research and innovation, must satisfy open access requirements that apply to all peer reviewed publications. Funded projects must also deposit research data, code, models, etc. in a research data repository, unless access restrictions are pre-agreed.

Read more about open access at Cranfield.

Research Data Management

Good management of research data is vital in underpinning research excellence and integrity, enabling reuse and collaboration, and broadening the impact of our research.

Research data is the evidence that underpins your findings; often digital, it may include experimental results, interview responses, observational data, videos or images, models, code, and lab notebooks.

Research data management (RDM) refers to how we look after data throughout the project lifecycle, including appropriate participant consent, storage and security, and long-term preservation.

In recent years, RDM has become increasingly important to many research funders and a data management plan (DMP) or RDM statement is usually required in an application for funding. For grants awarded, funders have obligations for data management that you must comply with, many including the requirement to share data and link to your data from any publications.

What you need to know

- Cranfield has a Research Data Management Policy and Strategy to set out our expectations and support in helping researchers meet funder requirements on RDM.
- We have a dedicated Research Data Manager offering RDM support.
- There are templates, tools, and a review service to help you write a DMP.
- CORD (Cranfield Online Research Data) is our institutional data repository, where you can deposit any research data that must be preserved and make it open or restrict access as necessary.
- Various training sessions are available, including a full online RDM training module, or you can request a one-to-one with the Research Data Manager at any time.
- Further information is available on the Research Data Management intranet page.

The Research Data Manager, based in the Library, working alongside RIO, can help you prepare information for applications.

Showcasing your research through public engagement and outreach

As well as publishing your research, there are additional ways of showcasing your work to a broader audience including getting involved in public engagement and outreach events. These may include;

- through case studies, news items and pages published on our website,
- sharing it with the media,
- selling it into magazines/publications as features,
- through our social media channels,
- in video format,
- through University events, such as those organised during science week, or as part of our outreach activities
- presenting to policy and decision makers,
- engaging with politicians, civil servants, local communities, trade associations, think tanks and charities,
- through our internal communications channels.

The Communications and External Affairs team can support you with the wider dissemination of your work and help raise your profile as a subject matter expert.

Research Excellence Framework (REF)

The Research Excellence Framework (REF) assesses the quality of research in UK universities.

REF 2014

REF was last held in 2014 and used research information from the preceding period 2008-2013. The results are used to distribute around £1.6 billion per year of UK Government research funding to universities. The assessment also provides accountability for public investment in research and produces evidence of the benefits of this investment together with reputational benchmarking information within the higher education sector.

Assessed in 2014
- Research Outputs (65% of the overall score) - usually journal articles generated by individual researchers submitted to the REF.
- Non-academic impact from Research (20%) – evidence of the use of research by non-academic groups (e.g. industry, public, government) through specific case studies.
- Research Environment (15%) – evidence of the quality of the environment to supoort research (e.g. research income, doctoral degree completions etc.).

REF2014 was the first exercise to assess the impact of research outside of academia. In total, 6,975 impact case studies were submitted from all participating universities demonstrating the impact of their research on the wider society. 154 UK institutions made submissions in 36 subject-based units of assessment (UoAs); UoAs are discipline-focused. The submissions were assessed by panels of experts, who produced an overall quality profile for each submission grading on a scale from 4* (world-leading), 3* (internationally excellent), 2* (international recognised) 1* (national quality), to U (unclassified).

Cranfield's results
The University's research was submitted to REF2014 in three UoAs:
- Agriculture, Veterinary and Food Science,
- Aeronautical, Mechanical, Chemical and Manufacturing Engineering,
- Business and Management Studies.

Key highlights
- 81% of research at Cranfield was rated as world leading (4*) or internationally excellent (3*).
- Cranfield was in the Top 10 in the UK for research quality in Aeronautical, Mechanical, Chemical and Manufacturing Engineering.
- We were number one in the UK for research income from UK and EU industry, commerce and public corporation sources in all three units of assessment.
- The University awarded over 700 doctoral degrees in the period 2008-2013.

The University's quality profile and staff volume in REF2014 for each UoA submission

UOA	4*	3*	2*	1*	U	FTE Staff
6 - Agriculture, Veterinary and Food Science	23	49	27	1	0	26.3
12 - Aeronautical, Mechanical, Chemical and Manufacturing Engineering	26	58	16	0	0	156.7
19 - Business and Management Studies	31	43	24	2	0	40.8

You can read more about our performance in REF and a number of research case studies on our website.

REF2021

The REF2021 will cover the assessment period 2014-2020. The submission date for REF2021 is 27 November 2020, with the results published in December 2021.

Guidance issued by Research England details the key elements of the REF submission, some of which are a change to the way in which the previous REF was conducted. These elements are:

- Research quality profiles at an organisational level will be determined by three consistent profiles, each weighted differently;
  - outputs 60% (assessed by the originality, significance and rigour of each);
  - impact 25% (assessed by the reach and significance of the impact);
  - environment 15% (assessed by the vitality and sustainability of the environment).
- All academic staff with a significant responsibility for research, including research staff that meet the criteria for an independent researcher, employed on the census date of 31 July 2020 will be returned.
- Research outputs produced during the publication period 1 January 2014 to 31 December 2020 will be eligible.
- Outputs have been partially decoupled from individual staff so that the number of outputs required per Unit of Assessment (subject areas aligned to Panels) is based on an average 2.5 outputs per FTE per Unit of Assessment. Each individual is required to have one output, unless individual circumstances have significantly impacted on their ability to conduct research during the REF assessment period, with a maximum of 5 outputs attributed to an individual.
- Outputs are portable and can be submitted by both the current institutional employer on the census date and the institution where the research was demonstrably generated.
- To comply with the REF open access policy, outputs should be deposited in a repository as soon as possible following the date of acceptance from 1 April 2016 and within three months if accepted from 1 April 2018.
- Impact case studies should describe specific examples of impact achieved between 1 August 2013 to 31 July 2020 that are based on research conducted between 2000 and 2020 at the submitting institution.
- Relevant data such as the number of doctoral degrees awarded and the volume and type of research income achieved between 1 August 2013 to 31 July 2020.
- Institutional-level and subject specific (Unit of Assessment) environment narratives about the quality of the research environment.

Code of Practice

Our REF Code of Practice sets out how we will develop a submission that is fair, transparent and does not adversely affect those with protected characteristics under the Equality Act 2010 or other personal circumstances.

Each institution is required to publish their CoP and this will be robustly scrutinised. If a CoP is found to be insufficient after three attempts, that institution will be prevented from submitting to the REF.
To ensure our CoP is fit for purpose, we undertook a comprehensive staff consultation to make sure our processes and procedures do not directly or indirectly negatively impact specific groups of individuals.

Translation of research

Intellectual Property (IP)

Intellectual Property (IP) includes, but is not limited to, patents, registered designs, registered trademarks, data, and applications and the right to apply for any of the foregoing, copyright, design rights, topography rights, database rights, brands, trademarks, utility model rights, rights in the nature of copyright, know how, rights in proprietary and confidential information and any other rights in inventions. Cranfield has an IP Policy which outlines the University's approach to the legal ownership of IP created by those working in the University.

Management of IP should be an active consideration for all researchers. Part of Cranfield's charitable core purpose is for the advancement of knowledge and to ensure the wide dissemination of knowledge. Retaining the use of knowledge and information for academic purposes is a key element of any IP management conversation with potential partners, including in industrial contracts, and so careful consideration of IP ownership issues should be taken into account prior to entering into any agreement.

IP training and support
RIO provides support and training in regards to IP and contracts, to support IP management during technology development. Please contact: innovations@cranfield.ac.uk

Commercialisation

Cranfield actively encourages the pursuit of commercialisation of research where appropriate, including the licensing of IP or the formation of new companies. Support for this is provided through IP protection (RIO holds the University patenting budget) with a defined process in place for gaining protection. Please contact Cranfield University's Business and Innovation team: innovations@cranfield.ac.uk

Support for entrepreneurship

There are various forms of support:
- the Bettany Centre delivers activities such as the Business Growth and Development Programme, the Cranfield Venture Day, the i2i programme and Start-up Weekends.
- the Cranfield University Business Incubation Centre (CUBIC), based on the Cranfield campus, offers subsidised rates and provides staff, students and alumni with the opportunity to develop new start-up companies.
- the Cranfield Eagle Lab, a joint partnership between Cranfield University and Barclays, offers a co-working space for ambitious entrepreneurs in the aviation technology sector to scale and grow, and features facilities to support rapid prototyping, product development and specialised avtech equipment.
- Find out more on our website.

Your personal development

To ensure you have the support you need to fulfil your aspirations and that Cranfield delivers an excellent programme of development, we have a Researcher Development Strategy and a linked Researcher Development Programme.

We are committed to ensuring a quality of provision and so the Strategy has been validated using the requirements set out in the national Concordat to Support the Career Development of Researchers, the European HR Excellence in Research initiative, and the Vitae Researcher Development Framework as well as aligning to the Cranfield Career Pathways model.

The Strategy details the representative work, skills and experience researchers should achieve after two to three years at each level, and a list of associated development options. Some courses are mandatory (e.g. health and safety) while others are seen as essential (if equivalent experience is not in place), or optional, depending on your specific interest.

Find out more.

Useful links

Strategies, policies, governance

Cranfield University Corporate Plan
https://intranet.cranfield.ac.uk/Pages/CorporatePlan2014-2019.aspx

Research Strategy
https://www.cranfield.ac.uk/research/rio/research-strategy

IP Policy
https://intranet.cranfield.ac.uk/IP/Pages/default.aspx

University Health and Safety Policy
https://intranet.cranfield.ac.uk/safety/Pages/default.aspx

Research Ethics Policy
https://intranet.cranfield.ac.uk/researchethics/Pages/default.aspx

University Governance
https://www.cranfield.ac.uk/about/governance-and-policies

Research Committee
https://intranet.cranfield.ac.uk/researchcommittee/Pages/default.aspx

Senate Handbook and University Laws
https://intranet.cranfield.ac.uk/EducationServices/Pages/AdviceAndGuidanceToStaff.aspx

Management of Research Data Policy
https://library.cranfield.ac.uk/knl/research-data-management

Open Access Policy
https://www.cranfield.ac.uk/about/governance-and-policies/policies-and-regulations

Funding, grants and bids

Funding opportunities and support
https://intranet.cranfield.ac.uk/RFS/Pages/default.aspx

Research Professional
https://www.researchprofessional.com/0/rr/home

Approvals process for public sector funding
https://intranet.cranfield.ac.uk/RFS/Pages/Approvals-process-for-public-sector-funding.aspx

Guidance documents
https://intranet.cranfield.ac.uk/RFS/Pages/Research-and-Innovation---Guidance-Documents.aspx

Research ethics, governance and integrity
https://intranet.cranfield.ac.uk/researchethics/Pages/default.aspx

Research Data Management
https://library.cranfield.ac.uk/knl/research-data-management

RCUK Research Outcomes
https://intranet.cranfield.ac.uk/Pages/RCUK-Research-Outcomes.aspx

Cranfield Research Information System (CRIS) and user guides
https://intranet.cranfield.ac.uk/rltp/cris/Pages/default.aspx

Open Access

https://intranet.cranfield.ac.uk/rltp/openaccess/Pages/default.aspx

Intent to Submit

https://intranet.cranfield.ac.uk/rltp/Pages/Intent-to-submit.aspx

Research Excellence Framework (REF)

https://intranet.cranfield.ac.uk/ref/Pages/default.aspx

Knowledge exploitation

https://intranet.cranfield.ac.uk/IP/Pages/default.aspx

Accessing facilities

https://intranet.cranfield.ac.uk/cranfieldnano/Pages/equipment.aspx

Supporting the publication process

https://intranet.cranfield.ac.uk/ref/Pages/Supporting%20the%20publication%20process.aspx

Cranfield University Business Incubation Centre (CUBIC)

https://www.cranfield.ac.uk/business/access-our-world-class-facilities/business-incubation

Intellectual Property Assessment flow chart

https://intranet.cranfield.ac.uk/RFS/Documents/Flow%20chart%20for%20RIO%20IP%20assessment%20procedure%20(2).pdf

Case for the establishment of UKRI

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/527803/bis-16-291-ukri-case-for-creation.pdf

Internal approval process for public sector opportunities

https://intranet.cranfield.ac.uk/RFS/Pages/Approvals-process-for-public-sector-funding.aspx

CURES online ethics system

https://intranet.cranfield.ac.uk/researchethics/Pages/Gaining-ethical-approval.aspx

Leading Academic Journal List

https://intranet.cranfield.ac.uk/ref/Pages/Supporting%20the%20publication%20process.aspx

EPSRC Impact Acceleration Account (IAA)

https://intranet.cranfield.ac.uk/RFS/Pages/IAA-funding-oportunities.aspx

Recruiting research students

https://intranet.cranfield.ac.uk/RI/Pages/Advertising-Research-Student-Opportunities.aspx

Personal development

Researcher Development Programme

https://intranet.cranfield.ac.uk/hrd/development/Pages/Researcher-Development-Programme.aspx

Doctoral Researchers Core Development

https://intranet.cranfield.ac.uk/ResearchLearnTeach/EdSupp/CAAS/Pages/DRCD.aspx

Post-doctoral Training Programme

https://intranet.cranfield.ac.uk/hrd/development/Pages/Workshops-and-development-opportunities.aspx

Performance and Development Review

https://intranet.cranfield.ac.uk/hrd/pdr/pages/default.aspx
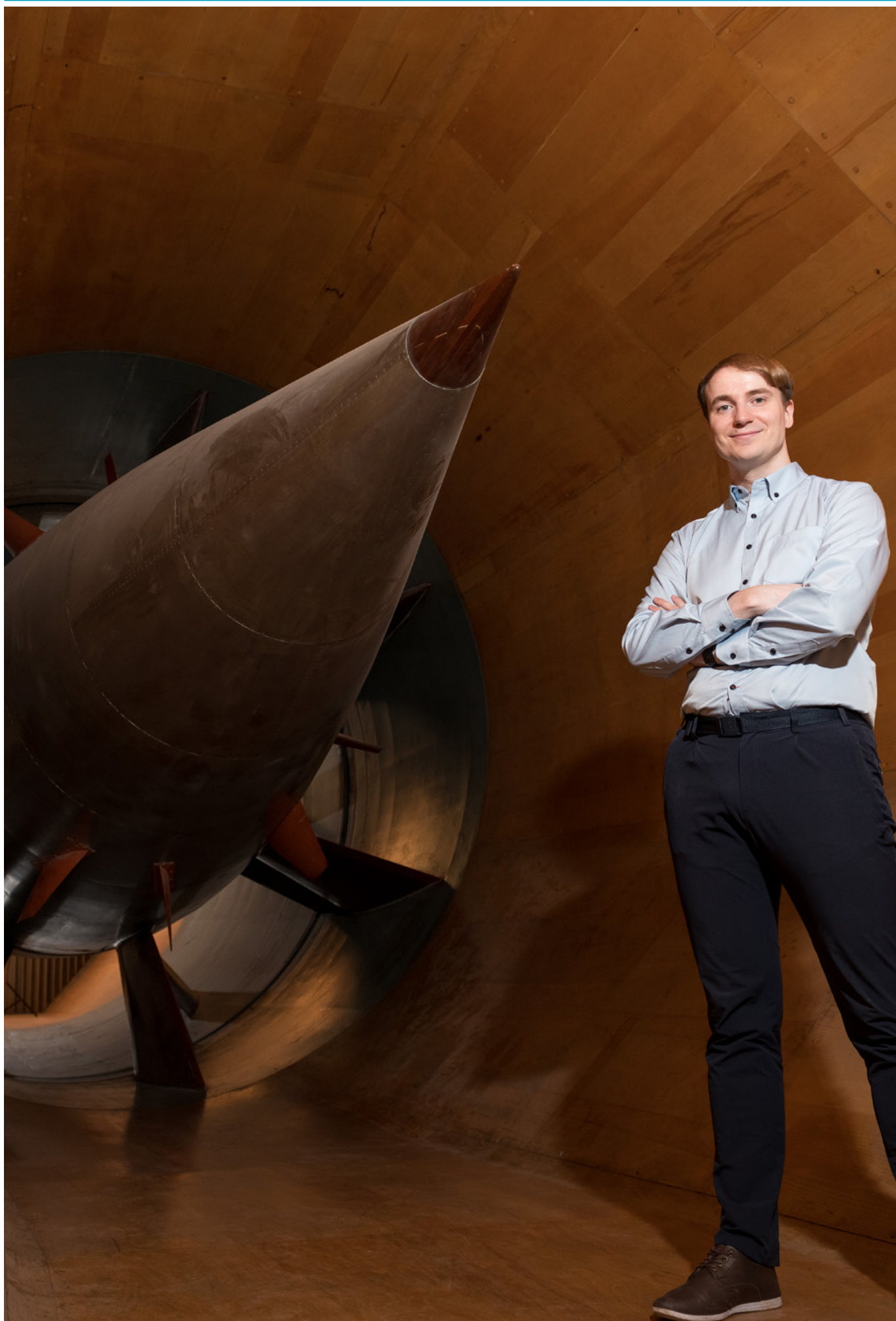
Support

Research and Innovation Office

https://intranet.cranfield.ac.uk/Documents/ResearchInnovationOffice-HowItCanHelpYou.pdf

Research and Innovation key contacts

Key people to get in touch with can be found [here.](#)

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