

Science Landscape Seminar Series: Representative UK Robotics and Autonomous Systems (RAS) Infrastructure

Notes to reader

This document is to inform discussion only and is subject to the following caveats:

- Inclusion, non-inclusion or otherwise is not intended to reflect on the standing of any organisation or infrastructure.
- We did not include classified defence and intelligence assets.
- Assignment of Research Areas, Eight Great Technologies and Industrial Strategy sectors was based on desk research and may be subject to error. Categories are designed to inform the general discussion and not reflect on individual organisations or infrastructure. Absence of icons in category tables indicates that (in the project team's opinion) a piece of infrastructure cannot be easily categorised.
- If any mistakes have been made, please inform the seminar secretariat on cstinfo@go-science.gsi.gov.uk.

Logo key

Location		Research Area	Eight Great Technologies		Industrial Strategy
	UK	 Arts and humanities		Energy Storage	 Life Science
	EU	 Biological and medical sciences		Big Data	 Aerospace
	Global	 Earth sciences		Satellites	 Professional Business Services
Funding		 Engineering		Robotics and Autonomous Systems	 Education
	Research Councils	 Physical, mathematical and computer sciences		Synthetic Biology	 Nuclear
	Departmental	 Social and economic sciences		Regenerative Medicine	 Oil and Gas
	Private Sector			Agri-Science	 Automotive
	Charity			Advanced Materials	 Offshore Wind
	Academic			Quantum Technologies	 Information Economy
	European				 Construction
					 Agri-tech

List of infrastructure

The infrastructure identified has been categorised in to the lists below. There will be instances when items could fit in to multiple lists and in these cases we have tried to place the infrastructure in the most appropriate list.

Collaborative Research Centres and Institutes

Centres and institutions that represent collaboration between more than one organisation (frequently industry and academia)

Bristol Robotics Laboratory (University of Bristol and University of West of England)

Dyson Robotics Lab at Imperial College London

Edinburgh Centre for Robotics (Heriot-Watt and Edinburgh Universities)

EPSRC Centres for Innovative Manufacturing

Hamlyn Centre (Imperial College London and the Helen Hamlyn Trust)

National Automotive Innovation Centre (NAIC), University of Warwick - *due for completion 2016*

Sheffield Robotics (University of Sheffield and Sheffield Hallam University)

Academia (with critical mass in RAS research)

In addition to the collaborative centres outlined above, many academic institutions have thriving RAS groups, which undertake research. The first 12 institutions are those defined as the top 12 by the EPSRC Robotics Area:

Heriot-Watt University

Imperial College London

Loughborough University

University College London

University of Bristol

University of Edinburgh

University of Glasgow

University of Leeds

University of Oxford

University of Sheffield

University of Southampton

University of Warwick

Other capacity

Birmingham University

Cranfield University

King's College London

Sheffield Hallam University

University of Liverpool

University of Manchester

University of Nottingham

University of Plymouth

University of Surrey

University of Sussex

University of the West of England

£35m Eight Great Technologies RAS Capital Investment

Natural Environment Research Council
EPSRC capital investment in RAS equipment

Industry

A selection of the companies who contribute to UK Robotics and Autonomy Research.

BAE Systems
Rolls-Royce Plc.
OC Robotics
SciSys Ltd
Shadow Robot Company Ltd
Schlumberger Gould Research
Ford Motor Company
Renishaw Plc.
Manufacturing Technology Centre
Airbus Operations Ltd.
Touch Bionics
KUKA Robotics UK Limited
Dyson
Intuitive Surgical
Jaguar Land Rover
Microsoft Research
QinetiQ
Selex
Siemens
BP
Shell
Subsea7
Ocado
GKN
Thales

Learned societies

British Computer Society
Institute of Electrical and Electronic Engineers (IEEE)
Institute of Mechanical Engineers (IMECHE)
Institution of Engineering and Technology (IET)
Royal College of Surgeons
Royal Academy of Engineering
Royal Society
Society for Underwater Technology (SUT)

Leadership forums and networks

These are groups and networks, which help facilitate and co-ordinate RAS research

ASTRAEA
Automotive Council
Autonomous Intelligent Systems Partnership
Autonomous Systems National Technical Committee (ATI)

British Automation and Robot Association (BARA)
Cross Government RPAS Working Group
EPSRC UK-RAS Network (The EPSRC UK Network for Robotics and Autonomous Systems)
Knowledge Transfer Network
London Robotics Network
Maritime Autonomous Systems
MIA Maritime Industry Alliance
Northern Robotics Network
Robotics and Autonomous Systems Special Interest Group

National facilities and equipment

These are facilities, which are used by both national bodies and more generally by the academic community.

Airbus Mars Yard, Stevenage
Advanced Manufacturing Research Centre, Sheffield
Aerospace Technology Institute
Defence Science and Technology Laboratory
Diamond
European Marine Energy Centre (EMEC)
EPSRC National Facility for Innovative Robotic Systems
Future Cities Catapult
Harwell Robotics and Autonomy Facility (HRAF)
Hamlyn Centre for Medical Robotics
Long Term Partnering Agreement (LTPA)
Mira
National Automotive Innovation Centre (NAIC), *due for completion 2016*
National Nuclear Laboratory (Sellafield)
National Oceanography Centre, Marine Autonomous and Robotic Systems Innovation Centre
National Physical Laboratory
Nottingham Innovative Manufacturing Research Centre
Nuclear AMRC
Oxford Mobile Robotics Group
RACE Remote Application Challenging Environment
ROBOTARIUM – Edinburgh Centre for Robotics
Robotics Innovation Facility (RIF) based at Bristol Robotics Laboratory
SAMS Centre for Smart Ocean Observation
Scottish Association for Marine Science (SAMS) for smart ocean observation
Sheffield Robotics
Transport systems Catapult
UAS CDC
Underwater Centre, Fort William
University of Hertfordshire's Robot House, for assistive RAS
VEC Virtual Engineering Centre
Warwick Manufacturing Group
Warwick Mobile Robotics
West Wales UAV Centre (WWUAV)

International facilities

Facilities which are either partly funded by UK institutions or important to UK research.

Association for Computing Machinery (ACM)

Commissariat à l'énergie atomique (CEA LIST), Paris, France

Scuola Superiore Sant'Anna (SSSA) The Biorobotics Institute, Pisa, Italy.

EU Robotics

Collaborative Research Centres and Institutes

The Dyson Robotics Laboratory



The Dyson Robotics Laboratory, a £5m collaboration between Imperial College London and Dyson, was established in 2014 to develop computer vision programs that will enable robots to move beyond their controlled environments and successfully navigate the real world. The Laboratory at Imperial College focuses on advancements in real-time 3D computer vision and perception technology to enable the next generation of smart real-world robots. (More info: www3.imperial.ac.uk/dyson-robotics-lab)

Location



UK

Funding



Research Councils



Private Sector

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

EPSRC Centres for Innovative Manufacturing in Intelligent Automation



Intelligent Automation

The EPSRC Centre for Innovative Manufacturing in Intelligent Automation is a collaboration between Loughborough University and Cranfield University with partners from industry and the HVM Catapult. Research is focused on difficult to automate manufacturing processes and tasks, combining human factors and automation expertise to create intelligent solutions, often featuring human-automation collaboration with industrial scale robots. The centre provides proof of concept solutions and an established development pathway to industrial partners and outreach SMEs. (More info: www.intelligent-automation.co.uk)

Location



UK

Funding



Private Sector



Research Councils



European



Academic

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy



Aerospace

The Hamlyn Centre

Imperial College London

The Hamlyn Centre was established to develop safe, effective and accessible imaging, sensing and robotics technologies to improve the future of healthcare and to address global health challenges

associated with demographic, environmental, social and economic change. The Centre focuses on technological innovation but also maintains a strong emphasis on clinical translation and providing direct patient benefits. (More info:

www3.imperial.ac.uk/roboticsurgery)

Location



UK



Research
Councils

Funding



Charity



Private Sector

Research area



Biological and
medical
sciences

Eight Great



Robotics
and
Autonomous
Systems

Industrial Strategy



Life Sciences

Sheffield Robotics



Founded in 2011, Sheffield Robotics operates dedicated research facilities for robotics in both the University of Sheffield and Sheffield Hallam

University. These facilities cover a broad spectrum of

research in robotics and autonomous systems, including industrial, field, and service robotics. Sheffield Robotics has one of the largest portfolios of on-going publicly-funded robotics research in the UK, supported by both the UK Research Councils and the European Union with partners from industrial, commercial and government organisations. Sheffield Robotics is a member of the Northern Robotics Network and of the EPSRC UK-RAS Network. More info: www.sheffieldrobotics.ac.uk/)

Location



UK



Research Councils

Funding



European

Research area



Engineering

Eight Great



Robotics and
Autonomous
Systems

Industrial Strategy

Academia

Many academic institutions have thriving RAS group and undertake independent research in the field. The first 12 Institutions described below are the top 12 according to the EPSRC Robotics Area. The remainder are a sample of other institutions with significant RAS research programmes.

University of Oxford

Conducts research into Active Vision, Machine Learning, Mobile Robotics and Visual Geometry. The Oxford Mobile Robotics Group research many aspects of mobile autonomy with a particular emphasis on navigation, perception and understanding of large workspaces. Application areas include road and off-road mobility, energy management, survey, light transport, warehousing, inspection, digital rail and Space. The University also hosts a Centre of Doctoral training in RAS.

Loughborough University

The academic lead for the EPSRC Centre for Innovative Manufacturing in Intelligent Automation, working alongside Cranfield University. Within the EPSRC Centre, Loughborough takes a systems integration approach to building adaptive intelligent solutions to automate manufacturing process challenges. These include welding, polishing, die-less panel forming, assembly, 3D inspection and metrology. Resources include a range of industrial scale robots housed in research cells. Loughborough University also leads the CDT for Embedded Intelligence and has significant research capability in autonomous ground and aerial vehicles through the Centre for Autonomous Systems (LUCAS).

Heriot-Watt University

The university focuses on interdisciplinary research applied to the state of the art autonomous marine robotics, human-robot interaction, autonomous, embedded, bio-inspired robotics and robot vision. Research includes cross-disciplinary investigations in several areas such as persistent autonomy, automatic target recognition, tracking and fusion, biologically inspired algorithms, evolutionary algorithms, swarm intelligence, psychology, machine learning, data mining among others. The University jointly hosts a Centre of Doctoral training in RAS with University of Edinburgh and the DSTL University Defence Research Collaboration (UDRC), in Signal Processing. Strong links also exist with the oil and gas sector. Successful company creations include SeeByte, Hydrason, Coda-Octopus and Ice Robotics.

University of Southampton

Researchers at the university aim to develop novel technologies using rapid manufacturing processes, for unmanned systems that are reliable, lightweight and low cost, with integrated sensors and structures. Research also focuses on enabling the development of structronics (integrated structures and electronics) for autonomous system, for example integrated wireless sensors that would be fabricated at the same time as the structure using additive manufacturing techniques.

Universities of Bristol and the West of England

The university's research portfolio spans over a number of different themes as follows: Aerial Robots, Assisted Living, Bioenergy & Self Sustainable Systems,

Biomimetic and Neuro-robotics, Medical Robotics, Non-linear Robotics, Robot Vision, Safe Human Robot Interaction, Self-Repairing Robotic Systems, Smart Automation, Soft Robotics, Swarm Robotics, Unconventional Computation in Robots, Verification and Validation for Safety in Robots. The University of Bristol also jointly hosts a Centre of Doctoral training in RAS with UWE.

University of Sheffield

Covers a broad spectrum of research in robotics and autonomous systems, including industrial, field, and service robotics and forges strong links between research into new robotic technologies, human-robot interaction, and the impacts of robotics on human society. In collaboration with University of Liverpool, the University of Sheffield conducts research into areas of ground and air autonomous vehicles and systems biology as these are important technologies that are applicable to multiple industry sectors. The university conducts research in service robotics, particularly in the area of assistive technologies and systems. Key underlying technologies for both areas, supported by this bid, include co-operation, flexible adaptive manipulation, and sensorimotor and social intelligence.

Imperial College London

Research covers various aspects of basic and applied robotics research including mechatronics systems design and control, autonomous systems and artificial intelligence, medical and rehabilitation robotics, computer vision, neuromechanics and social robotics. The Hamlyn Centre focuses on micro-engineering facilities for medical robotics at Imperial, focusing on: multi-material, precision 3D rapid prototyping, micro-machining and fabrication equipment.

University of Glasgow

Research includes the development of configurable chemical-robotic platforms for discovery, optimisation and scale-up using a range of approaches including flow systems, 3D printing and hybrid robotic platforms. Work is also underway to print high-mobility materials with embedded sensors for “tactile touch” sensing.

University of Edinburgh

Research into different aspects of physical interaction, including a high mobility test facility for investigating full body contact dynamics and control, autonomous sensing, planning and navigation in clutter. Areas of research include ‘soft robotics’, with compact actuation and sensitisation, mobile robots, investigating collaborative decision making, state-of-the-art prototype articulating prosthetic hands for controlled experiments for human augmentation and prosthetics, for (e.g.) gait analysis and grasp dexterity studies for upper limb prosthetics. The University jointly hosts a Centre for Doctoral training in RAS with Heriot-Watt.

University of Warwick

Technology innovations come from research within the simulation environment enabling the ‘intelligent’ vehicle with ever increasing levels of driver assistance and active safety, enabled by all-round sensing and electronic actuation. Vehicles will learn driver behaviour, optimise to the driver to reduce emissions and fuel consumption, assist monotonous tasks and react to hazards. Strong links the Jaguar Land Rover.

University of Leeds

Research activities include the development of novel robotic systems at small to medium scale. This multi-faculty endeavour capitalises on the University's expertise in the fields of Mechanical, Electronic & Electrical and Materials Engineering as well as Computer Science and Medicine. The university develops novel robotic systems and the underpinning technologies for robot design and construction. It focuses on applications in exploration, therapy, assistive robotics, surgical technologies and enabling technologies.

University College London

A key focus in robotics at UCL is the development of technologies for manipulating and inspecting objects remotely. They have built a system of robotic and computer interfaces to let humans touch, explore and manipulate structures far above and below normal human spatial and temporal scales. Research draws on a team from across UCL Computer Science, UCL Centre for Medical Image Computing, UCL Civil, Environmental and Geomatic Engineering and the UCL Bartlett School of Architecture. From molecules to the aircraft scale, these technologies for telemanipulation with applications in many fields, including healthcare, synthetic biology, advanced manufacturing, and beyond.

Other capacity

Other academic institutions undertaking research in RAS

- Birmingham University: Architectures and Methods for Planning, Reasoning and Learning in Autonomous Agents,
- Cranfield University: Autonomous Vehicles (including airborne, ground and marine)
- King's College London: Medical Robotics, Handling and Manipulation, Kinematics and Mechanisms, Artmimetics, Inspection Systems, Neural, Cognitive and Biomimetic Systems. Planning Systems
- Sheffield Hallam University: Machine Vision, Modelling, Automation and Robotics
- University of Hertfordshire: Adaptive Systems Research Group
- University of Liverpool: Validation of Safety and Ethics in Robotics, Human-Robot cooperation, Academic lead for Virtual Engineering Centre
- University of Manchester: Lab Automation Systems (that use artificial intelligence techniques for scientific experimentation.)
- University of Nottingham: Aerospace Automation
- University of Plymouth: Cognitive Systems and Personal Robotics
- University of Surrey: Advanced Autonomous Systems and Robotics for Space
- University of Sussex: Computational Neuroscience and Robotics
- University of West England: Bristol Robotics Lab partner

Eight Great Technologies RAS Capital Investment of £35M

When the 8 Great Technologies were announced, a capital investment of £35m was made to RAS and allocated as follows:

£10m Natural Environment Research Council:

- Marine Autonomous and Robotic Systems Innovation Centre (MARSIC) at the National Oceanographic Centre

Engineering and Physical Sciences Research Council £25m capital investment in RAS equipment, including:

- Micro-Engineering Facility for Medical Robotics, Hamlyn Centre Imperial College London
- Human-Machine Co-operation in Robotics and Autonomous Systems, University of Sheffield and University of Liverpool
- Mobile Robotics: Enabling a Pervasive Technology of the Future, Oxford University
- National Facility For Innovative Robotic Systems, University of Leeds
- Robotics and Autonomous Systems: Southampton University Capital Proposal, University of Southampton
- Robotics and Autonomous Systems: The Smart and Connected Vehicle, University of Warwick
- Robotic Teleoperation for Multiple Scales: Enabling Exploration, Manipulation and Assembly Tasks in New Worlds Beyond Human Capabilities, University college London
- ROBOTARIUM: A National UK Facility for Research into the Interactions amongst Robots, Environments, People and Autonomous Systems. Edinburgh Centre for Robotics (Heriot-Watt University and University of Edinburgh)







Further information on each of these investments can be found at the following address: www.epsrc.ac.uk/files/research/capital-for-great-technologies-call-robotics-and-autonomous-systems-panel/

Industry

Airbus Group












The Airbus Group is a European multinational aerospace and defense corporation. Airbus Operations Ltd. has identified 7 lines of work to optimise its industrial system by 2020 including the increased use of automated techniques, for identifying and diagnosing faults, issues or defects on the aircraft production line. Airbus is leading the development of Europe's first Mars Rover with capability to autonomously navigate across the planet's surface (More info: www.airbusgroup.com/int/en.html)

Location	Funding	Research area	Eight Great	Industrial Strategy	
 Global	 Private Sector	 Engineering	 Robotics and Autonomous Systems	 Advanced Materials	 Aerospace

BAE Systems



BAE Systems plc. is a British multinational defence, security and aerospace company headquartered in London with operations worldwide. Products and services cover air, land and naval forces, as well as advanced electronics, security, information technology, and support services. BAE employ 34,800 people and work with more than 7,500 British companies. (More info: www.baesystems.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy				
 Global	 Private Sector	 Engineering	 Physical, mathematical and computer sciences	 Robotics and Autonomous Systems	 Advanced Materials	 Big Data	 Aerospace	 Information Economy

Ford Motor Company



The Ford Motor Company is an American multinational automotive manufacturer headquartered in Dearborn, Michigan, a suburb of Detroit. The company sells domestic and commercial vehicles under the Ford brand. Robots undertake a range of tasks in Ford factories. (More info: <http://corporate.ford.com/homepage.html>)

Location	Funding	Research area	Eight Great	Industrial Strategy
 Global	 Private Sector	 Engineering	 Robotics and Autonomous Systems	 Automotive

KUKA Robotics UK Limited









KUKA KUKA is a German manufacturer of industrial robots and solutions for factory automation. Kuka's latest technical advance is the creation of cells, in which robots of different sizes and in different constellations can "cooperate" and work together as a team. (More info: www.kuka-robotics.com/united_kingdom/en/company/)

Location	Funding	Research area	Eight Great	Industrial Strategy
 EU	 Private Sector	 Engineering	 Robotics and Autonomous Systems	 Construction

Manufacturing Technology Centre (MTC)



The MTC represents one of the largest public sector investments in manufacturing in the UK. It is a partnership between some of the UK's major global manufacturers, the universities of Birmingham, Nottingham and Loughborough, and TWI Ltd. The MTC specializes in a range of manufacturing technologies and processes that are particularly important to the high value manufacturing sector: Intelligent Automation, Advanced Tooling and Fixturing, Electronics Manufacturing, High Integrity Fabrication, Manufacturing Simulation and Informatics, Metrology and NDT and Net Shape and Additive Manufacturing. (More info: www.the-mtc.org/)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Research Councils	 Private Sector	 Academic	 Engineering
		 Physical, mathematical and computer sciences	 Robotics and Autonomous Systems	 Advanced Materials

OC Robotics



Formed in 1997, OC Robotics specialises in confined space automation. Their snake-arm robots are designed specifically for remote handling operations within confined or hazardous spaces and have been applied to fields, such as nuclear, aerospace and defence. (More info: www.ocrobotics.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Private Sector	 Engineering	 Robotics and Autonomous Systems	

Renishaw Plc.



Renishaw plc. is a British engineering company based in Wotton-under-Edge, Gloucestershire with core skills in measurement, motion control, spectroscopy and precision machining. (More info: www.renishaw.com)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	Engineering	Robotics and Autonomous Systems	

Rolls-Royce



Rolls-Royce

Rolls-Royce Holdings is a British multinational that designs, manufactures and distributes power systems.

Headquartered in Westminster, London, the company works on power systems in the fields of civil aerospace, defence aerospace, nuclear and marine. It is the world's second-largest maker of aircraft engines. (More info: www.rolls-royce.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
Global	Private Sector	Engineering Physical, mathematical and computer sciences	Robotics and Autonomous Systems Advanced Materials	Aerospace Nuclear

Schlumberger Gould Research



The Schlumberger Gould Research Center based in Cambridge, England, houses multidisciplinary research teams of more than 100 scientists and technicians.







Research focuses on drilling, chemistry, fluid mechanics, and seismics, through a combination of theory, experiment, and computational simulation. In 2012, Schlumberger launched a joint venture with Liquid Robotics to deploy the latter's ocean-going robots to provide exploration and monitoring services for the offshore oil industry. (More info: www.slb.com/about/rd/research/sgr.aspx)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	Engineering Earth Sciences	Robotics and Autonomous Systems	Oil and Gas

SciSys Ltd



The SCISYS Group is a developer of IT services founded in 1980, now with more than 400 employees. With robotics experience originating in planetary exploration, SciSys also provide services for terrestrial applications. (More info: www.scisys.co.uk/)

Location	Funding	Research area	Eight Great	Industrial Strategy	
 EU	 Private Sector	 Engineering	 Physical, mathematical and computer sciences	 Robotics and Autonomous Systems	 Information Economy

Shadow Robot Company Ltd



Shadow Robot Company Ltd was founded in 1987 and consists of approximately 20 R&D and production engineers based in London, Brest and Shanghai. It designs and manufactures anthropomorphic robot hands and related systems. It also offers consultancy services in the field of robotics. (More info: www.shadowrobot.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Private Sector	 Engineering	 Robotics and Autonomous Systems	 Information Economy

Touch Bionics



Touch Bionics is a provider of world-leading prosthetic technologies and supporting services for people with upper limb deficiencies. Products include myoelectric prosthetic hand and prosthetic finger solutions, as well as highly realistic passive silicone prostheses that match the natural appearance of the wearer. (More info: www.touchbionics.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Private Sector	 Engineering	 Robotics and Autonomous Systems	

Many other companies also do extensive research in to robotics and autonomous systems and a brief list is provided below with links to their websites.



- Dyson (www.dyson.co.uk)
- Intuitive Surgical (www.intuitivesurgical.com)
- Jaguar Land Rover (www.jaguarlandrover.com/gl/en/)
- QinetiQ (www.qinetiq.com)
- Selex (www.selex-es.com)
- Siemens (www.siemens.co.uk)
- BP (www.bp.com)
- Shell (www.shell.co.uk)
- Subsea7 (www.subsea7.com)
- Ocado (www.ocadogroup.com)
- GKN (www.gkn.com)
- Thales (www.thalesgroup.com)

Learned societies

British Computer Society



BCS, The Chartered Institute for IT champions the global IT profession and the interests of individuals engaged in that profession. The Institute collaborates with government, industry and relevant bodies to establish good working practices, codes of conduct, skills frameworks and common standards. It also offers a range of consultancy services to employers to help them adopt best practice. (More info: www.bcs.org)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Private Sector	 Physical, mathematical and computer sciences	 Robotics and Autonomous Systems	 Big Data

Institute of Engineering and Technology (IET)







The IET was formed in March 2006 by a merger of the Institution of Electrical Engineers (IEE) and the Institution of Incorporated Engineers (IIE). It now has nearly 160,000 members worldwide in 127 countries. The IET provides expert advice to the UK's Parliament, Government and other agencies, produces a range of publications, awards a number of professional registration qualifications as well as £500,000 in prizes, scholarships and medals each year. (More info: www.theiet.org)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK		 Engineering	 Robotics and Autonomous Systems	

Institute of Electrical and Electronic Engineers (IEEE)



IEEE is the world's largest professional association for the advancement of technology. IEEE publishes nearly a third of the world's technical literature in electrical engineering, computer science and electronics and has more than 430,000 members in more than 160 countries with 38 Societies and ten technical Councils representing the wide range of IEEE technical interests. (More info: www.ieee.org/index.html)

Location	Funding	Research area	Eight Great	Industrial Strategy
 Global		 Engineering	 Physical, mathematical and computer sciences	 Robotics and Autonomous Systems

Institution of Mechanical Engineers (IMEchE)



The Institution of Mechanical Engineers (IMEchE) is a professional engineering institution with over 110,000 members in more than 140 countries. Working with leading companies, universities and think tanks, the IMechE creates and shares knowledge to provide government, businesses and the public with guidance on all aspects of mechanical engineering. The Institution, which has its headquarters in London, focuses on five principal themes: energy, environment, transport, manufacturing and education. (More info: www.imeche.org/home)

Location



Global

Funding

Research area



Engineering

Eight Great



Robotics and
Autonomous Systems

**Industrial
Strategy**

Royal Academy of Engineering (RAEng)



As the UK's national academy for engineering, RAEng has over 1500 Fellows and 30 Academy Research Chairs in post, each with the support of an industrial co-sponsor. RAEng aims to “advance and promote excellence in engineering” with its activities including

providing analysis and policy support; taking a lead on engineering education; investing in the UK's research base to underpin innovation; and working to improve public awareness and understanding of engineering. (More info: www.raeng.org.uk/)

Location



UK

Funding

Research area



Engineering

Eight Great



Robotics and
Autonomous Systems

**Industrial
Strategy**

The Royal College of Surgeons (RCS)



The Royal College of Surgeons of England is a professional membership organisation and registered charity, which “exists to advance surgical standards and improve patient care”. The RCS supports 20,000 members in the UK and internationally by improving their skills and knowledge, developing policy and guidance, and carrying out projects to improve surgical care. The Royal College of Surgeons has two full-time surgical research units working in offices based at the College which look into a range of research areas including the use of robotics in surgery. (More info: www.rcseng.ac.uk)

Location



Global

Funding

Research area



Engineering

Eight Great



Robotics and
Autonomous Systems

**Industrial
Strategy**



Life Sciences

Royal Society



THE ROYAL SOCIETY

Founded in 1660, the Royal Society is the national academy of science in the UK. A major activity of the Society is identifying and supporting the work of outstanding scientists. The Society supports researchers through its early and senior career schemes, innovation and industry schemes, and other schemes. The Society facilitates interaction and communication among scientists via its discussion meetings, and disseminates scientific advances through its journals. The Society also engages beyond the research community, through independent policy work, the promotion of high quality science education and communication with the public. (More info: <https://royalsociety.org/>)

Location	Funding	Research area	Eight Great	Industrial Strategy	
 UK		 Engineering	 Biological and medical sciences	 Physical, mathematical and computer sciences	 Robotics and Autonomous Systems

Society for Underwater Technology (SUT)



The Society for Underwater Technology (SUT) is a multidisciplinary learned society that brings together organisations and individuals with a common interest in underwater technology, ocean science and offshore engineering. The SUT, which has its headquarters in London and members from more than 40 countries, includes a number of special interest groups which consider aspects of technology applied to specific areas, including a group dedicated to Underwater Robotics. (More info: www.sut.org)

Location	Funding	Research area	Eight Great	Industrial Strategy
 Global		 Engineering	 Robotics and Autonomous Systems	 Life Sciences

Leadership forums and networks

These are groups and networks, which help facilitate and co-ordinate RAS research.

ASTRAEA



ASTAREA (Autonomous Systems Technology Related Airborne Evaluation & Assessment) is a UK industry-led consortium focusing on the technologies, systems, facilities, procedures and regulations that will allow autonomous vehicles to operate safely and routinely in civil airspace over the United Kingdom. Led by a consortium of seven companies, the aim of the ASTREA programme is to enable the routine use of UAS in all classes of airspace without the need to restrictive or specialized conditions of operation. (More info: <http://astraea.aero/>)

Location



Funding



Private Sector



Departmental

Research area



Engineering

Eight Great



Robotics and
Autonomous
Systems

Industrial Strategy

Autonomous Intelligent Systems Partnership



The Engineering and Physical Sciences Research Council (EPSRC) and a number of industrial partners have formed a strategic partnership to fund novel research in autonomous and intelligent systems. Funds of up to £6 million have been made available for a number of research areas. (More info: www.epsrc.ac.uk/files/funding/calls/2011/autonomous-and-intelligent-systems/)

Location



Funding



Private Sector



Research
Councils

Research area



Engineering

Eight Great



Robotics and
Autonomous
Systems

Industrial Strategy

Automotive Council



The Automotive Council was established in 2009 to enhance dialogue and strengthen co-operation between UK government and the automotive sector. It is jointly chaired by the Secretary State for Business, Innovation and Skills and Richard Parry-Jones, former Group Vice President and Chief Technology Officer of Ford on behalf of industry. The Council is made up of senior figures from across industry and government. The activities of the Automotive Council are channeled through three working groups: Technology; Supply Chain; and Business Environment and Skills. (More info: www.automotivecouncil.co.uk)

Location



Funding



Private Sector



Departmental

Research area



Engineering

Eight Great



Robotics and
Autonomous
Systems

Industrial Strategy



Automotive

Autonomous Systems National Technical Committee (ATI)



The Autonomous Systems National Technical Committee aims to raise the profile of autonomous systems with governments, industry and academic bodies to enable UK wealth creation, competitiveness and deliver societal benefit. The Committee is an official group of the Aerospace Technology Institute. (More info: <https://connect.innovateuk.org/web/autonomous-systems-ntc>)

Location



UK

Funding



Private Sector

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

BARA (British Automation and Robot Association)



The aim of the BARA is to promote the use of, and assist in the development of industrial robots and automation in British industry. In 2009 BARA joined with the PPMA (Processing & Packaging Machinery Association) to become a special interest focus group. BARA provides a voice for the robot and automation industries, when dealing with government, industry, financial and academics institutions. (More info: www.bara.org.uk)

Location



UK

Funding



Private Sector

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

Cross Government Remotely Piloted Aircraft Systems (RPAS) Working Group



The cross-government RPAS working group's vision is to provide a consistent government message on RPAS issues. Focused on the coordination of the UK Governments RPAS related activities, the cross government working group is tasked with identifying synergies, opportunities and addressing barriers to a successful UK industry base.

Location



UK

Funding



Private Sector

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy



Aerospace

EPSRC UK-Robotics and Autonomous Systems Network



A nationwide RAS Network was established to coordinate and strategically grow the research base, act as a portal to interface with industry and deliver technological advances with the potential for translational uptake, maximise the impact of Centres for Doctoral Training (CDTs) and provide flexible access to state-of-the-art capital equipment.

Location



UK

Funding



Departmental

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

Knowledge Transfer Network (KTN)



The Knowledge Transfer Network comprises a number of communities that stimulate innovation in the UK's key technology sectors by promoting collaboration, best practice and knowledge sharing between industry and academia. By encouraging partnerships and teamwork, these communities aim to position the UK as the innovation engine for Europe. (More info: <https://connect.innovateuk.org/web/materialsktn>)

Location



UK

Funding



Departmental

Research area



Advanced Materials

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

London Robotics Network

London Robotics Network
Official Group



The London Robotics Network is an open network of people around London interested in robotics. They organise meetings, events and networking for the London robotics community. Their vision is to bring together all of London's robotics community to exchange ideas, find opportunities, mentor and support each other in enjoying and driving forward robotics projects. The founders of the network come from industry, academia, and government, and represent a diverse range of robotics interests. The LRN is open to everyone interested in robotics. (More info: <https://connect.innovateuk.org/web/london-robotics-network/>)

Location



UK

Funding



Departmental

Research area



Robotics and Autonomous Systems

Eight Great

Industrial Strategy

Maritime Autonomous Systems



This Maritime and Autonomous Systems sub-group of the Robotics and Autonomous Systems Special Interest Group has been established to encourage networking around maritime applications of Robotics and Autonomous Systems. (More info:

<https://connect.innovateuk.org/web/maritime-autonomous-systems>)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Research Councils	 Engineering	 Robotics and Autonomous Systems	

Northern Robotics Network (NRN)



The NRN is an open network of people from across the north of the UK interested in robotics and autonomous systems. They organise meetings, events and networking for the Northern robotics community. Building on the recent UK strategy for Robotics and Autonomous Systems, NRN will identify ways in which the northern RAS community, through research, cutting edge companies and innovative application, can help drive the future of robotics in the UK. (More info:

<https://connect.innovateuk.org/web/northern-robotics-network>)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Departmental	 Engineering	 Robotics and Autonomous Systems	

The UK Marine Industries Alliance



The UK Marine Industries Alliance, setup by the Marine Industries Leadership Council, is a free to join strategic collaboration of UK Marine companies and related stakeholders bringing together all aspects of the sector with the goal of “working together to secure the maximum opportunity for the industry to flourish”. (More info:

www.ukmarinealliance.co.uk)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Departmental	 Engineering	 Robotics and Autonomous Systems	

Robotics and Autonomous Systems Special Interest Group



The Robotics and Autonomous Systems Special Interest Group was established on 1 January 2013 in a partnership between the then Technology Strategy Board (TSB, now InnovateUK) and the Knowledge Transfer Networks. Drawing on a core group of experts, leading industrialists and academics, the SIG's aim is to stimulate collaboration and innovation in RAS capabilities, which are required to underpin multiple industrial sectors, leading to increased productivity and growth. (More info: <https://connect.innovateuk.org/web/ras-sig>)

Location



UK

Funding



Departmental

Research area

Research area

Eight Great



Robotics and
Autonomous Systems

Industrial Strategy

National facilities and equipment

Airbus Mars Yard



Located in Stevenage, the Airbus Mars Yard is a 30m by 13m test area to simulate conditions on Mars and provide a test environment for driving and navigating autonomously. The site contains 300 tonnes of specially selected sand and includes design features to ensure that the environment is the closest match possible to Mars. It was built to support the development of the ExoMars rover. (More info: <http://airbusdefenceandspace.com/airbus-defence-and-space-opens-state-of-the-art-extended-mars-yard-rover-test-area/>)

Location	Funding		Research area	Eight Great	Industrial Strategy	
 UK	 Private Sector	 Departmental	 European	 Engineering	 Robotics and Autonomous Systems	 Aerospace

Advanced Manufacturing Research Centre (AMRC)



Funded by the High Value Manufacturing Catapult (HVM) and based at the University of Sheffield, the AMRC focuses on advanced machining and materials research for aerospace and other high-value manufacturing sectors. It employs over 200 highly qualified researchers and engineers. Key areas of research include advanced structural testing of components and innovative manufacturing techniques for composite materials. (More info: www.amrc.co.uk)

Location	Funding		Research area	Eight Great	Industrial Strategy
 UK	 Private Sector	 Departmental	 Engineering	 Robotics and Autonomous Systems	 Aerospace

Aerospace Technology Institute



The Aerospace Technology Institute exists to protect, exploit and position leading advanced UK capabilities, preserving design and manufacturing jobs in the UK. ATI is currently a 'virtual' centre, in that it does not as yet host onsite research and development projects.

(More info: www.ati.org.uk/the-centre/)

Location	Funding		Research area	Eight Great	Industrial Strategy
 UK	 Private Sector	 Departmental		 Robotics and Autonomous Systems	 Aerospace

Defence Science and Technology Laboratory (DSTL)



DSTL is a Trading Fund of the Ministry of Defence which provides government with research and technical support for UK defence and security. DSTL research is wide-ranging, including for example, the development of bomb disposal robots. In November 2014, DSTL launched a competition to design a new generation of ‘bomb-proof’ robots for the UK armed forces. DSTL has four bases, with headquarters at Porton Down, Wiltshire, and employs around 3,300 people. (More info: www.dstl.gov.uk)

Location	Funding	Research area	Eight Great			Industrial Strategy		
 UK	 Departmental	 Physical, mathematical and computer sciences	 Engineering	 Advanced Materials	 Big Data	 Automation and Robotics	 Satellites	 Aerospace

Diamond Light Source (DLS)



DLS is the UK’s Synchrotron and is operated by Diamond, a not-for-profit limited company funded as a joint venture by the UK Government through the Science & Technology Facilities Council (STFC) in partnership with the Wellcome Trust. The synchrotron, which uses a BioSAXS™ small angle X-ray scattering sample changer robot for some of its experiments, is free at the point of access through a competitive application process, provided that the results are in the public domain. Over 3000 researchers from both academia and industry use Diamond to conduct experiments, assisted by approximately 500 staff. (More info: www.diamond.ac.uk/Home.html)

Location	Funding	Research area	Eight Great		Industrial Strategy	
 UK	 Research Councils	 Departmental	 Engineering	 Physical, mathematical and computer sciences	 Advanced Materials	 Robotics and Autonomous Systems

European Marine Energy Centre (EMEC)



Established in 2003 and based in Orkney, The EMEC provides developers of both wave and tidal energy converters – technologies that generate electricity by harnessing the power of waves and tidal streams – with purpose-built, accredited open-sea testing facilities. (More info: www.emec.org.uk)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Departmental	 Earth Sciences	 Robotics and Autonomous Systems	

EPSRC National Facility for Innovative Robotic Systems



The facility is a national resource for the fabrication of complex systems. This facility is located within the University of Leeds School of Mechanical Engineering and uses a small research facility (SRF) model that allows academics and industrialists easy access to the

facilities. (More info: <http://robotics.leeds.ac.uk/>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Academic	Engineering	Robotics and Autonomous Systems

Future Cities Catapult



One of seven catapults launched by InnovateUK, the Future Cities Catapult aims to bring together cities, firms and academics to develop new commercial solutions for integrated city systems. It does this by demonstrating opportunities and proving what works, enabling

innovation through collaboration and removing barriers to scaling-up. The June 2014 report 'Connecting Research With Cities' compiled on behalf of the catapult identified the potential for the use of teams of robots which could reduce costs and errors while speeding up the construction process. (More info:

<https://futurecities.catapult.org.uk/>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental	Social and economic sciences	Engineering	Robotics and Autonomous Systems

Harwell Robotics and Autonomy Facility (HRAF)



HRAF is a facility funded by the European Space Agency to provide advanced capabilities to support the development and testing of complex autonomous systems for the exploration of our Solar System. The facility has three elements; a flexible simulation environment allowing models and real hardware to

be combined and compared in a plug and play mode, a service to run field trials and a data archive of the results acquired. Although built for space activities this facility could be used to support other sectors. (More info: <http://harwellcampus.com>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	European	Engineering	Robotics and Autonomous Systems
			Satellites	Aerospace

Hamlyn Centre for Medical Robotics



The Centre is developing robotic technologies that will transform conventional minimally invasive surgery and explore new ways of empowering robots with human intelligence and miniature 'microbots' with integrated sensing and imaging for targeted therapy and treatment. It has a strong focus on technological innovation with emphasis on clinical translation and direct patient benefit. (More info: www3.imperial.ac.uk/roboticsurgery)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Academic	Charity	Biological and medical sciences	Robotics and Autonomous Systems

Long Term Partnering Agreement QinetiQ (LTPA)



The LTPA is a 25-year contract between MOD and QinetiQ to deliver Test and Evaluation (T&E) and training support services to the UK military. The LTPA runs until 2028, with the option of a 25-year extension. The contract is designed to be an innovative partnering arrangement, which will enable long-term planning to meet MOD's current, evolving and future technology and engineering needs. (More info: www.ltpa.co.uk/site_range/index.asp)

Location	Funding	Research area	Eight Great	Industrial Strategy		
UK	Departmental	Engineering	Physical, mathematical and computer sciences	Robotics and Autonomous Systems	Advanced Materials	Aerospace

MIRA



MIRA provides engineering innovations and testing solutions that aim to change the way people think about the future of vehicle and systems technology.

MIRA is a customer focused independent vehicle engineering consultancy, which frames what they do around partnerships. They aim to harness skills, experience and knowledge of their workforce to provide customers with intelligent solutions to their problems. (More info: www.mira.co.uk)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector		Robotics and Autonomous Systems	Automotive

National Automotive Innovation Centre (NAIC) (due for completion in 2016)



The NAIC is a proposed building at the University of Warwick. It is a £100m joint venture between the University's Warwick Manufacturing Group, Jaguar Land Rover and Tata Motors. The NAIC will be a focus for automotive research, combining expertise from industry, university academics and supply chain companies. It is intended to support advances in technology to reduce dependency on fossil fuels, and vehicle emissions. (More info: www2.warwick.ac.uk/fac/sci/wmg/about/capitalprojects/naic/)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Departmental	 Private Sector	 Engineering	 Robotics and Autonomous Systems  Advanced Materials  Automotive

National Nuclear Laboratory (NNL)



Founded in 2008 the NNL is a UK government owned nuclear services provider covering the whole of the nuclear fuel cycle. The three core areas on which their operations focus are: waste management and decommissioning, fuel cycle solutions and reactor operations support. They have a number of sites, the largest of which is The Central Laboratory, located at Sellafield. RAS technology is essential to all stages of the nuclear fission and fusion life-cycle, in particular the decommissioning stage. (More info: www.nnl.co.uk)

Location	Funding	Research area	Eight Great	Industrial Strategy
 UK	 Research Councils	 Physical, mathematical and computer sciences	 Advanced Materials  Robotics and Autonomous Systems	 Nuclear

National Oceanography Centre, Marine Autonomous and Robotic Systems Innovation Centre (due to open Spring 2015)



The National Oceanography Centre (NOC), headquartered in Southampton, is a Centre for oceanographic science and undertakes integrated ocean research and technology development from the coast to the deep ocean. The NOC provides a national capability to the Natural Environment Research Council, which includes Royal Research Ships, deep submersibles, autonomous underwater vehicles, advanced ocean sensors and instruments. The Marine Autonomous and Robotic Systems Innovation Centre will open in spring 2015 on the Southampton site, to provide additional resource and capability. (More info:

<http://noc.ac.uk/research-at-sea/nmfss/mars>)

Location



Funding



Research Councils

Research area



Earth Sciences

Eight Great



Robotics and Autonomous Systems

Industrial Strategy



Nuclear

National Physical Laboratory (NPL)



Established in 1900, the NPL is the national measurement standards laboratory for the United Kingdom, based at Bushy Park in Teddington, London, England. It is the largest applied physics organisation in the UK and employs over 550

scientists. NPL also offers a range of commercial services, applying scientific skills to industrial measurement problems, and manages the MSF time signal. NPL utilises robotics across a range of different research fields, including for example the development of an intelligent harvesting robot designed to reduce wastage. (More info: www.npl.co.uk)

Location



Funding



Departmental

Research area



Physical, mathematical and computer sciences

Eight Great



Advanced Materials

Industrial Strategy

Nottingham Innovative Manufacturing Research Centre (NIMRC)



The NIMRS works with industry to research and develop technologies, processes and systems that give UK and international manufacturing businesses a competitive advantage. The Centre at the University of Nottingham has

expertise in mechanical, materials and manufacturing engineering and operations management. It provides extensive facilities for manufacture, testing and computation. (More info: www.nottingham.ac.uk/nimrc/index.aspx)

Location



Research Councils,



Private Sector



Academic

Research area



Engineering

Eight Great



Advanced Materials,



Robotics and Autonomous Systems

Industrial Strategy



Aerospace



Automotive

Nuclear Advanced Manufacturing Research Centre (NAMRC)



NUCLEAR AMRC

Also funded by the High Value Manufacturing Catapult and based at the University of Sheffield, the NAMRC is a collaboration of academic and industrial partners from across the civil nuclear manufacturing supply chain, with the mission of helping UK manufacturers win work at home and worldwide. Key areas of research include large scale welding and cladding, robotic machining and large-scale metrology. The NAMRC also provides a range of targeted support programmes in skills and training. (More info: <http://namrc.co.uk/>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	European	Departmental	Engineering
			Advanced Materials	Robotics and Autonomous Systems
				Nuclear

Oxford Mobile Robotics Group (MRG)



Founded in 2003 the MRG is a research group based at Oxford University. It researches many aspects of mobile autonomy and particularly focusses on navigation perception and understanding of large workspaces. (More info: <http://mrq.robots.ox.ac.uk/>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils, ,	Academic	Departmental	Private Sector
			Engineering	Robotics and Autonomous Systems
				Automotive

Remote Application Challenging Environment (RACE)

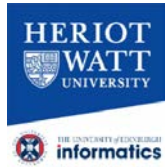


RACE is a new Centre at Culham Science Centre in Oxfordshire. It is currently only partially operation. When fully operational, RACE will conduct R&D into remote applications and will offer access to extensive facilities, remote handling equipment and expertise to design, implement and operate complete solutions.

Customers will include both government and industry. (More info: www.gov.uk/government/news/race-is-open-for-business)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	Academic	Departmental	Engineering
			Robotics and Autonomous Systems	

ROBOTARIUM (Edinburgh Centre for Robotics)



ROBOTARIUM is a facility based at the Edinburgh Centre for Robotics and is available to all researchers as well as to industry. It comprises four integrated and interconnected components: interaction Spaces for humans and robots to work together; field robotic systems; a human driven sensorised and connected mobile vehicle; and a set of enabling facilities, including computing accelerators. (More info: www.edinburgh-robotics.org/robotarium)

Location



UK

Funding



Research Councils



Academic

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

Robotics Innovation Facility (RIF) (Bristol Robotics Laboratory)



The Robotics Innovation Facility (RIF) is a European funded programme that brings researchers and industry in direct contact with current and new users of robotic technologies. Located within BRL, the RIF is equipped with a number of robots, vision systems and other items of automation. Three dedicated personnel service

the RIF and support its offerings with additional assistance provided by the BRL technical support team. (More info:

www.brl.ac.uk/echordplusplus/roboticsinnovationfacility.aspx)

Location



UK

Funding



Research Councils



Academic

Research area



Engineering

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

Scottish Association for Marine Science (SAMS) Centre for Smart Ocean Observation



The SAMS Centre for Smart Ocean Observation has a number of smart observation platforms, and an experienced workforce that allows *in situ* observations to be made in even the most challenging environments - often from afar. They also have

autonomous underwater vehicles, seven autonomous underwater gliders and a

number of remotely piloted aircraft. (More info: www.sams.ac.uk/smart-observations)

Location



UK

Funding



Charity



Departmental

Research area



Earth Sciences

Eight Great



Robotics and Autonomous Systems

Industrial Strategy

Transport Systems Catapult



The Transport Systems Catapult is the UK's technology and innovation centre for Intelligent Mobility, harnessing emerging technologies to improve the movement of people and goods around the world. It aims to increase the UK's market share and attract investment - creating jobs and generating long-term growth. Some of the early challenges that will be addressed through the Catapult include seamless journey systems, remote asset management and monitoring, and autonomous vehicles. (More info: <https://ts.catapult.org.uk/>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental	Engineering	Robotics and Autonomous Systems	Automotive

The Underwater Centre – Fort William



Located Fort William, Scotland the Underwater Centre is a subsea training and trials facility comprising a sheltered seawater dive site with multiple dive depths and a range of subsea structures, a private pier complex and a 1.5 million litre indoor seawater dive tank. The centre provides training for Remotely Operated Vehicles (ROVs) pilots. The Underwater Centre also has facilities in Tasmania, Australia. (More info: www.theunderwatercentre.com/fort-william/explore-the-centre/about-the-centre/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	Engineering	Robotics and Autonomous Systems	

University of Hertfordshire's Robot House, for assistive RAS



The Robot House is a facility based at the University of Hertfordshire to enable research in to assistive RAS and human-robot interaction. It is primarily used by the Adaptive Systems Research Group, a multi-disciplinary group of adaptive-systems researchers. (More info: <http://bit.ly/13OAI3d>)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Academic European	Research Councils	Engineering	Robotics and Autonomous Systems

Unmanned Air Systems Capability Development Centre (UAS CDC)



The UAS CDC is an MOD capability set up as an intelligent customer function in the UAS Evaluation space. It serves a wide audience, from researchers to operators across MOD and supports industry and other government departments where appropriate and practicable. The UAS CDC provides a focus for UAS expertise that facilitates the development, delivery and use of enablers to UAS capability development, including training. (More info: www.uascdc.com/Pages/default.aspx)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental	Engineering	Robotics and Autonomous Systems	Aerospace

Warwick Manufacturing Group (WMG)



WMG was founded in 1980 and today has an annual programme of £180m and over 450 people working on the five sites at Warwick University. It also has collaborative centres in India, China and Malaysia and is partly funded by the HVM catapult. Key areas of materials research include lightweight structures and volume integration of polymer structures. (More info: www2.warwick.ac.uk/fac/sci/wmg)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector Departmental	Academic Engineering	Advanced Materials Robotics and Autonomous Systems	Automotive

Warwick Mobile Robotics



Warwick Mobile Robotics is a collection of projects under development at the University of Warwick in the field of mobile robotics. Projects currently range from Urban Search and Rescue (USAR) robots to autonomous, flying robots. It operates out of a laboratory in the International Manufacturing Centre, home of the Warwick Manufacturing Group. (More info: www2.warwick.ac.uk/fac/sci/eng/meng/wmr/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Academic European	Engineering	Robotics and Autonomous Systems	

West Wales UAV Centre (WWUAV)



The WWUAV is an environment created in the UK to both facilitate and accelerate the growth of the unmanned air systems industry in the UK. With safety, management and operational infrastructure delivered by QinetiQ, this European-centric environment is located on the Welsh Government-supported ParcAberporth Technology Park. It provides UAS R&D, infrastructure and test facilities and training. (More info:

www.wwuavc.com)

Location



UK

Funding



Academic



European

Research area



Engineering

Eight Great



Robotics and
Autonomous
Systems

Industrial Strategy

Virtual Engineering Centre (VEC)



The Virtual Engineering Centre (VEC), located at STFC Sci-Tech Daresbury, is a partnership between the University of Liverpool and the Hartree Centre. It provides a focal point for emergent virtual engineering technology, including aerospace and automotive, and works strategically with the University's Centre for

Autonomous Systems Technology to offer a transition from robotics and autonomy research to industrial implementation. Since 2010 the VEC has helped to generate over £30m of investment in the Northwest economy. (More info:

www.virtualengineeringcentre.com/)

Location



UK

Funding



Academic



European

Research area



Engineering

Eight Great



Robotics and
Autonomous
Systems

Industrial Strategy



Automotive



Aerospace

International facilities

There are a number of facilities based outside of the UK, which are important for RAS research in the UK. These are listed below with a website where further information can be obtained:

Association for Computing Machinery (ACM) (More info: www.acm.org)

CEA LIST, Paris, France (More info: www-list.cea.fr)

CERN (More info: <http://home.web.cern.ch>)

SSSA The Biorobotics Institute, Pisa, Italy (More info: <http://sssa.bioroboticsinstitute.it>)

EU Robotics (More info: www.eu-robotics.net)