AWE NUCLEAR SECURITY TECHNOLOGIES

Connecting with Academia and Industry

ANNUAL REPORT 2023/24

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About AWE

For over 70 years, AWE has played a vital role in the defence and security of the UK, guarding against the most severe threats to our nation and way of life.

AWE develops, manufactures and maintains the warheads for the UK's Continuous at Sea Deterrent (CASD), as well as providing unique skills and expertise to support counter-terrorism and Nuclear Threat Reduction activities.

AWE is currently at the start of a once-in-a-generation programme to design and produce the Replacement Warhead for CASD. The delivery of this programme, and AWE's overall mission to support national security, is dependent on continuing to build effective, collaborative and trusting relationships with the Ministry of Defence, and UK academia and industry.

AWE's strategic partnerships with the academic and industrial sectors are critical to STEM research and innovation, increased capability, knowledge and skills – and inspiring future generations to contribute to the defence of our nation.

Foreword

The foundations of AWE's mission in national defence and security are based on the expertise of our people coupled with the strength of our partnerships and collaborations with academia and industry.

Nick Elliott
CEO, AWE

Those links with academics and industry professionals are vital to our scientists, engineers and other experts being able to access knowledge and skills that enhance our core capability.

The importance of leveraging capability, through partnering with industry and academia, is fundamental to developing new and furthering emerging technologies that will support AWE's contribution to STEM in the UK.

And by collaborating and engaging with our partners, we are creating a talent pool from which we can recruit future generations – that will lead to greater opportunities in the future.

In this annual report, you will see examples and highlights of AWE's work with academia and industry and there are testimonies and insights from those with whom we partner – delivering mutual benefit to our programme and wider defence.

Professor
Andrew Randewich
Executive Director
Science, AWE

Academic partnerships

Experts and specialists at AWE, some of whom are world renowned, collaborate with universities across the UK – delivering technical research projects and creating innovations. We also pursue new opportunities for the benefit of national defence and security and the government's STEM agenda.

5 Strategic Alliances

University of Bristol

University of Cambridge

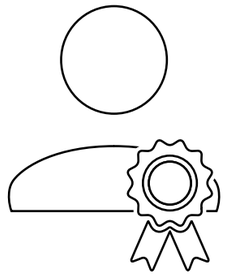
AWE Nuclear Security Technologies

Cranfield University

Heriot-Watt University

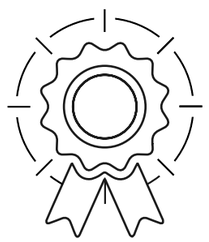
Imperial

11 William Penney Fellows



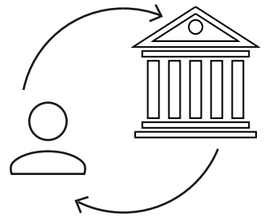
William Penney Fellows act as ambassadors for AWE, working at the top of their respective disciplines in the communities they represent

6 Centres of Excellence



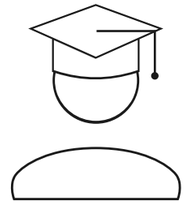
Centres of Excellence provide opportunities for research and innovation through a unique blend of academic, postdoctoral and postgraduate level activity

Engaged With **37** Universities



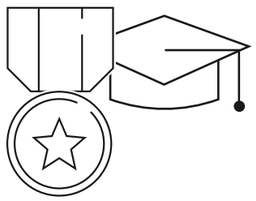
Engaged with 37 universities across the UK

93 Postgraduate students (PhD or above)



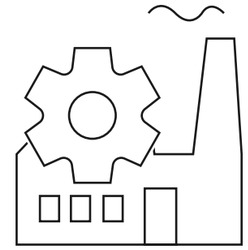
Each student is undertaking valuable AWE sponsored work spanning a diverse range of STEM subjects

42 Honorary Academic positions at **12** Universities



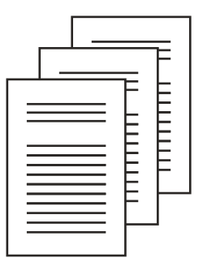
Honorary Academics are AWE members who are working as visiting professors, fellows, researchers and scientists at different levels, providing technical expertise and knowledge to our programme

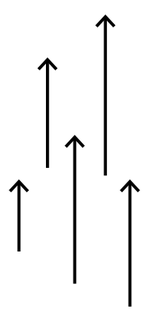
42 Industrial Advisory positions at **17** Universities and five CDTs



Industrial Advisors are AWE members of the advisory boards for university departments, courses, Centres for Doctoral Training (CDTs), and Centres of Excellence, advising on interests in industrial research

205 Published papers in STEM journals





up from **185** the year before

Postgraduate student awards

Two of AWE's sponsored postgraduate students won prestigious awards for their outstanding contribution to the company's programme.

Marleen Vetter, CRANFIELD UNIVERSITY

Marleen Vetter from Cranfield University won the Kings Norton Medal for being recognised and celebrated as the outstanding doctoral student of the year.

Marleen said: "I am very grateful to receive this award that recognises not only my hard work, but also all those people who supported me in the background within our close Shrivenham community.

"My fellow PhD students and my supervisor were extremely supportive and I could rely on my research sponsor at AWE for assistance."

Mateen Mirza, University College London

Mateen Mirza won the prestigious Materials Science Thesis Prize – jointly sponsored by AWE and the Worshipful Company of Armourers and Brasiers.

Mateen said: "It is an honour to be awarded the AWE-Armourers and Brasiers' Company Thesis Prize. My research makes a small contribution to the growing need to recycle valuable materials using molten salts and has much broader relevance to nuclear materials reprocessing.

"I am extremely grateful for the support I have received from my supervisors at UCL and AWE and collaborators at the National Nuclear Lab. I look forward to continuing my collaboration with the Armourers and Brasiers' Company as a member of the alumni community and AWE in the future."

Major outreach events

To promote partnerships and collaborations across the academic and industrial sectors in support of AWE's mission, the company hosted a number of high-profile events and conferences.

PHYSICS STUDENT CONFERENCE

Around 25 AWE sponsored postgraduate students attended the Physics Student Conference – held at St Hilda's College, University of Oxford – which provided the students with the unique and exciting opportunity to showcase their research, achievements and aspirations in science – and how they have contributed to AWE's programme.

Physics is vital to underwriting and certifying the performance, reliability and safety of the UK's nuclear deterrent.

WILLIAM PENNEY FELLOW CONFERENCE

Eight of AWE's William Penney Fellows (WPFs) gathered at the William Penney Fellow Conference, held in Armourers' Hall in London, to discuss and debate technical areas of mutual interest and considered vital to AWE's work now and in the future.

Sponsored by AWE, the WPFs act as ambassadors for the company in the scientific and technical communities in which they operate – at the top of their respective fields.

Those WPFs who attended were Professor Jeremy Chittenden, Imperial College London; Professor Ian Hall, The University of Manchester; Professor Paul Sellin, University of Surrey; Professor Paul Stevenson, University of Surrey; Professor Tom Scott, University of Bristol; Dr Hugh Goyder, Cranfield University; Professor James Marrow; University of Oxford; and Professor Justin Wark, University of Oxford.

During the event, the WPFs were split into various groups and debated a diverse range of 'grand challenges' in STEM for AWE. These included emerging technologies like AI, machine learning, supercomputing, smart sensors, and digital twins. They spoke about specific areas of STEM and where investments should be made at AWE to support the future programme – as well as UK academia and the private and public sectors.

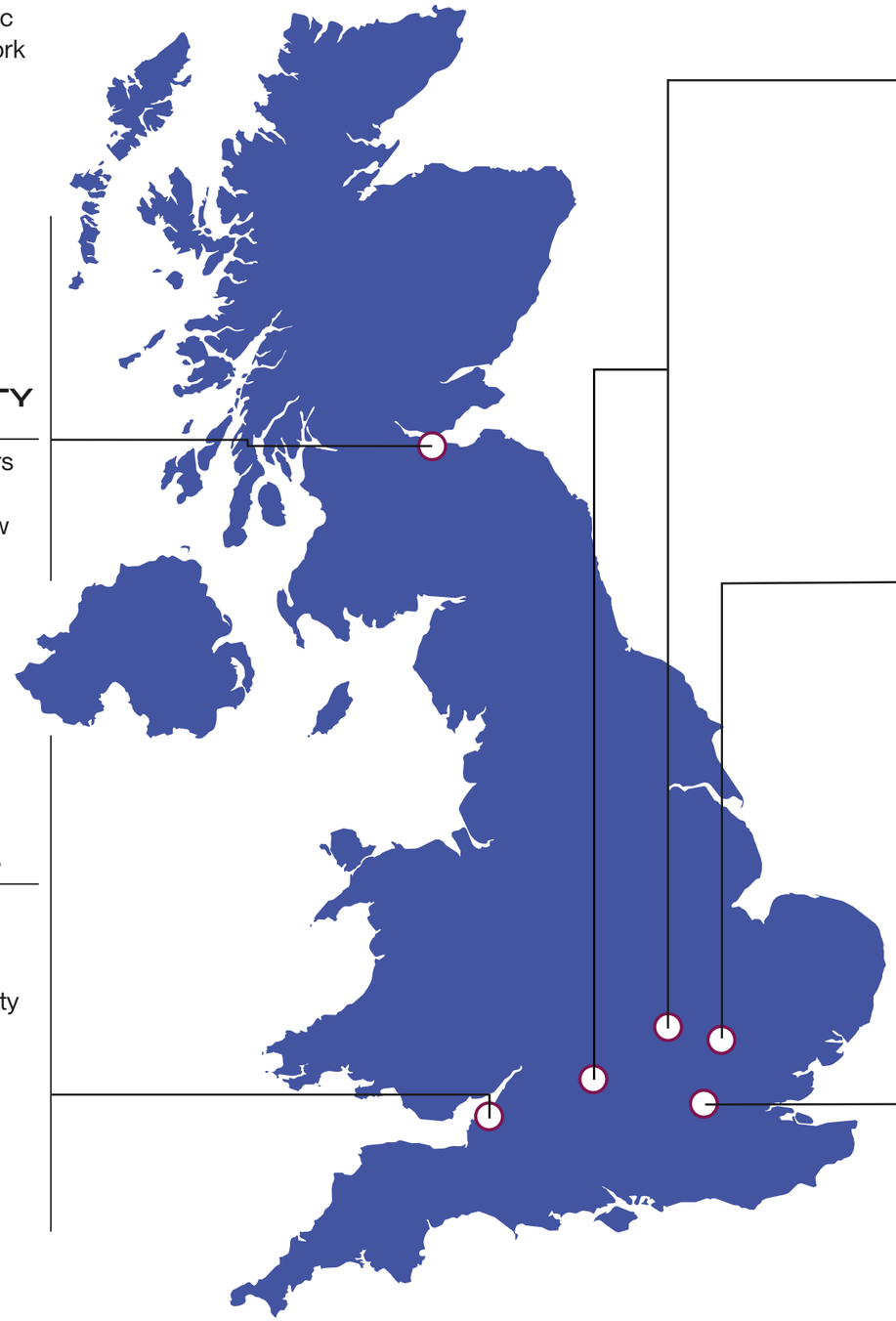
DSEI EXHIBITION

For the first time, AWE exhibited at the prestigious DSEI Exhibition at London's ExCeL to showcase the company's manufacturing capability, engage with innovative suppliers from across the defence sector, and explore emerging methods of complex programme delivery – through the lens of supporting of our current and future work.

AWE
DSEI
EXHIBITION

COLLABORATION ACTIVITY ACROSS ACADEMIA: STRATEGIC ALLIANCES

AWE has Strategic Alliances with five universities:
University of Bristol, University of Cambridge, Cranfield University, Heriot-Watt University and Imperial College London. Each of the universities provide important and invaluable technical expertise that is mutually beneficial. The Strategic Alliances also create opportunities for further work in various fields of interest to the university, AWE and wider academia.



AWE-HERIOT-WATT UNIVERSITY

Focussing on photonics including optical sensors and analysis, and collaborating with the National Robotarium on robotics research to develop new and emerging technologies

AWE-UNIVERSITY OF BRISTOL

Collaborating with experts in nuclear threat reduction, chemistry and supercomputing, and through the NTR-Net (Nuclear Threat Reduction Network) community to safeguard national security

AWE-CRANFIELD UNIVERSITY

Specialising in energetic materials including formulation and lifetime testing of explosives to research and understand how materials behave in different and often extreme conditions

AWE-UNIVERSITY OF CAMBRIDGE

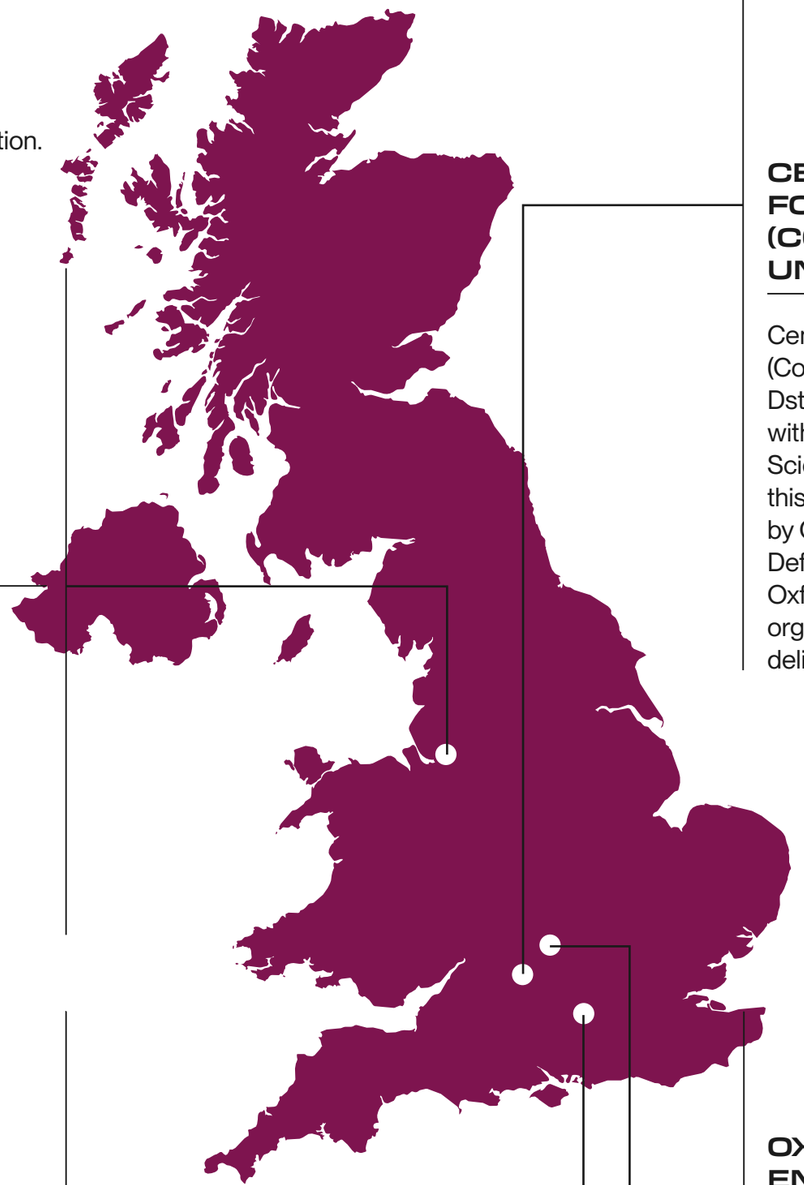
Working on various physics and engineering phenomena to support the performance, reliability and safety of the nuclear deterrent

AWE-IMPERIAL COLLEGE LONDON

Engaging with scientists and engineers on areas concerning fusion, testing of materials and seismology

COLLABORATION ACTIVITY ACROSS ACADEMIA: CENTRES OF EXCELLENCE

AWE has Centres of Excellence at various universities across the UK, each of which provides strategic research and key services to our programme. Delivered through academic, postdoctoral and postgraduate activities, the centres cover physics, materials and analytical sciences, engineering and nuclear threat reduction.



MANCHESTER 1824
The University of Manchester

CENTRE OF EXCELLENCE FOR MATERIALS MODELLING RESEARCH, THE UNIVERSITY OF MANCHESTER

An internationally recognised Centre of Excellence, building a long-term partnership operating across industrial and academic institutional boundaries, developing innovative modelling and simulation solutions addressing complex scientific challenges. Through close collaboration and interaction, the Centre will inspire current and future generations of mathematicians and scientists to join AWE in its mission to support the defence and security of the UK

UNIVERSITY OF SURREY

CENTRE OF EXCELLENCE FOR MATERIALS AGEING PERFORMANCE AND LIFETIME PREDICTION, UNIVERSITY OF SURREY

Creating a unique and world-leading capability to address the technical issues associated with materials ageing, including model-based lifetime prediction – as well as providing robust and cost-effective solutions and strategic advice to AWE and MOD

Cranfield University

CENTRE OF EXCELLENCE FOR ENERGETIC MATERIALS (COEEM), CRANFIELD UNIVERSITY

Centre of Excellence in Energetic Materials (CoEEM) is a government-led initiative, through Dstl, DE&S (DOSG) and AWE, in collaboration with other government bodies (CPNI/GO Science/DoT), to pull together and champion this essential national capability. Administered by Cranfield University at its secure site at the Defence Academy of the United Kingdom in Oxfordshire, CoEEM will draw upon UK-wide organisations, facilities, and academic centres to deliver its mission

UNIVERSITY OF OXFORD

OXFORD CENTRE FOR HIGH ENERGY DENSITY SCIENCE (OxCHEDS), UNIVERSITY OF OXFORD

Now in its 10th year, OxCHEDS brings together research groups from across the Atomic and Laser Physics areas, with an interest in the study of matter under extreme temperature and pressure conditions

Industrial collaborations

AWE is exploring and identifying innovative technologies, methodologies and processes in the external marketplace to deliver our mission for the long-term. By promoting a culture of collaboration, sustainability, agility and continuous improvement, the company is striving to create a resilient and diverse supplier base to support national defence and security.

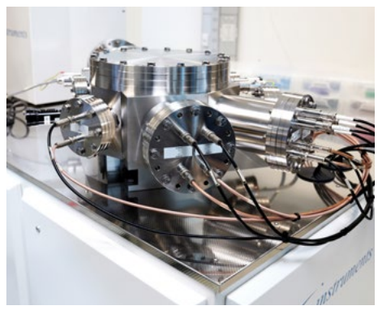
Effective engagement with industrial partners is essential. Identifying, understanding and connecting with national and international technological developments ensures AWE is able to fulfil its mission – through adopting novel capabilities, sharing best practice and attracting high calibre people to join the nuclear industry.

AWE's industrial collaborations are a vital part of the company's approach to external engagement and our role in building the UK's defence and nuclear security capabilities.

NATIONAL NUCLEAR LABORATORY

NATIONAL NUCLEAR LABORATORY

As Government looks to align civil and military nuclear programmes to achieve our collective UK missions and drive value for money, AWE and NNL are collaborating on joint challenges and opportunities to further the purpose of both organisations. By jointly identifying areas for collaboration, we can share resources and capabilities, and in doing so we can implement efficiencies and ensure taxpayers' money is spent in the most effective and responsible way. Our partnership has already delivered significant benefits across the nuclear enterprise.



NDA · Department for Business, Energy & Industrial Strategy · Sellafield Ltd · ONR · National Nuclear Laboratory · Nuclear Skills Strategy Group (NSSG) · AWE · Dounreay

UK'S ALPHA RESILIENCE AND CAPABILITY (ARC)

AWE has developed an industrial relationship with the UK's Alpha Resilience and Capability (ARC) programme, which is a proactive, long-term collaboration between the UK government, nuclear industry and wider nuclear sector. ARC seeks to identify targeted projects and investments in specialist skills, expertise and facilities to sustain and enhance the UK's world-leading Alpha capabilities.

AWE'S ARC PROGRAMME MANAGER, KIERRA DESAY

"AWE continues to mature its engagement with the ARC programme, which provides a joint and vibrant working environment that can accelerate engagement between partnering organisations. Arrangements for the secondment of staff between these organisations have been developed to enhance necessary individual skills and organisational learning that deliver real benefit to the nuclear industry as a whole".

Space Park Leicester

SPACE PARK LEICESTER

Space Park Leicester has established a collaboration with AWE, focussing on manufacturing development, testing and qualification methods to support future missions in space science and exploration. The collaboration will bring additional employment opportunities to Leicester and the wider region.

Space Park Leicester Executive Director, Professor Richard Ambrosi

"Space Park Leicester launched with the aim of fostering scientific collaborations in the interest of space science and exploration. The focus is on opportunities that break new ground and bring new partners into the civil space domain. AWE's team working alongside our researchers and established partners will unlock new scientific insights and establish a fertile environment for the creation of high-tech jobs and supercharge the already flourishing space industry in our region."

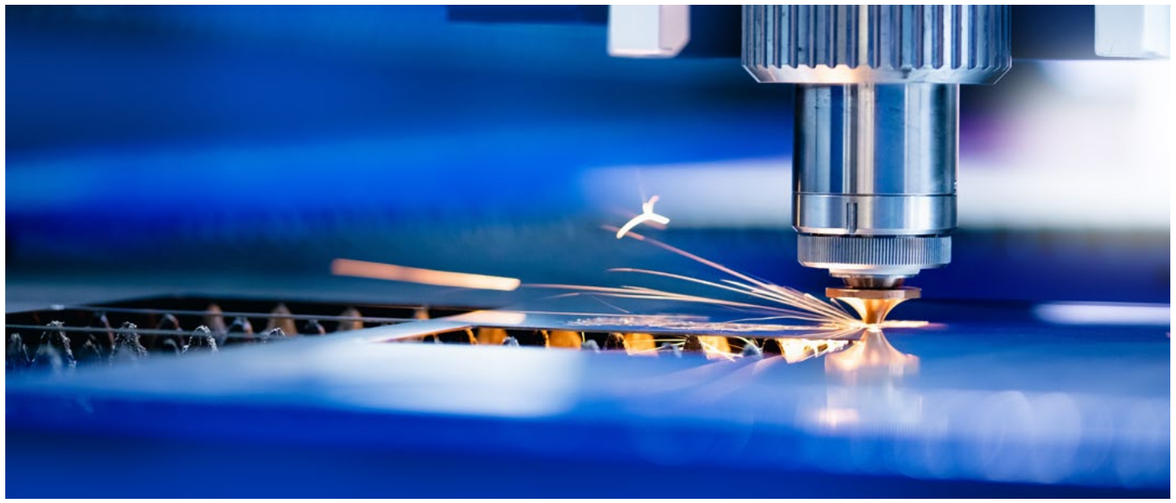
CATAPULT
High Value Manufacturing

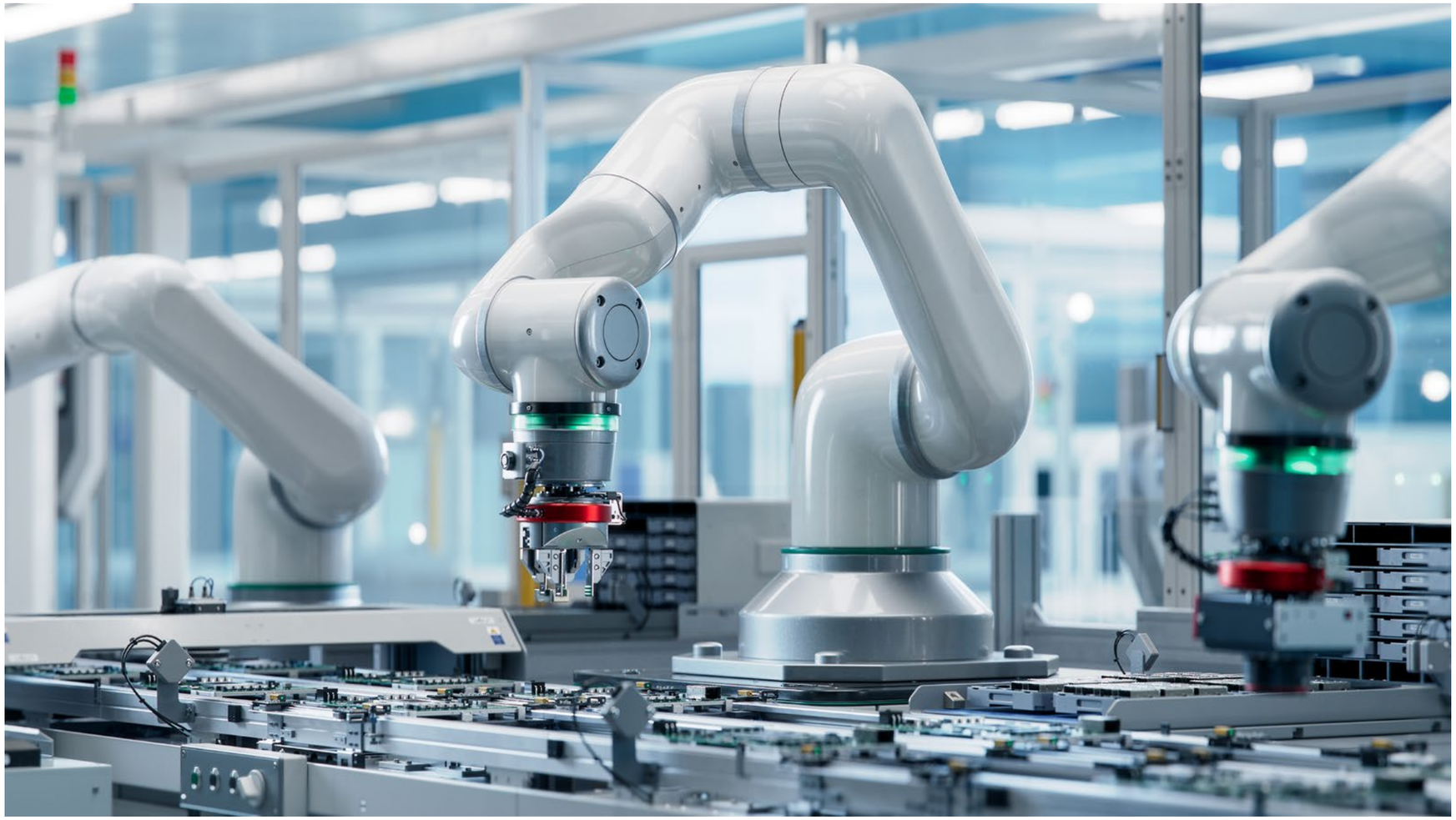
HIGH VALUE MANUFACTURING CATAPULT

HVM Catapult is a strategic research and innovation hub for industry, commercialising the UK's most advanced manufacturing ideas. AWE is proud to work with its network of centres, helping businesses transform the products they make and the skills of their workforce to remain competitive.

AWE Chief Technologist, Giles Hartill

"By working with the HVM Catapult centres, we can drive future R&D and innovate together to solve problems and create opportunities. These important collaborations will also see AWE further strengthen its partnerships with UK industry."





What AWE offers

By working in collaboration with academia and industry, we are investing in knowledge, skills and expertise for the defence sector and the UK's STEM pipeline.

CONTACT US

We want to expand our links with academia and industry to support the future of national defence and security.

If you wish to find out more about AWE's external technical partnerships and want to come and work with us, please email

etp@awe.co.uk

www.awe.co.uk

@AWE_plc