Symposia
Symposia at Shrivenham provides a forum to Government agencies, military and civilian, industry and research establishments for the exploration and exchange of experience, knowledge and ideas.

Consultancy
There are a variety of ways your business can benefit from collaborating with Cranfield, from simple consultancy projects to multiple partner collaborations. We can be your conduit to the academic world, giving you access to the latest thinking and knowledge in defence and security.

Master’s degrees
Most of our staff have industry backgrounds and are leading experts in their fields. Industry experts teach alongside our academic team on many of our programmes providing real life challenges.

Facilities
We also have a wealth of specialist facilities and equipment to assist our clients and support our research activities. Many are industrial scale and unique to Cranfield Defence and Security.

Short courses
Diverse suite of Defence and Security professional development courses. A number of our short courses can be used to gain credits to be put towards a Cranfield degree.

Research
Underpinned by leading experts, our research activities help individuals and businesses address defence and security issues and enable real impact returns for your organisation.

Consultancy
There are a variety of ways your business can benefit from collaborating with Cranfield, from simple consultancy projects to multiple partner collaborations. We can be your conduit to the academic world, giving you access to the latest thinking and knowledge in defence and security.
Simulation, experimentation and analysis

Cranfield’s simulation, experimentation and analysis capability comprises world leading educational opportunities – including short courses and Postgraduate Certificate, Diploma and Master’s qualifications – and cutting-edge research with access to specialist facilities and equipment. Symposia provide a forum to engage with government agencies, industry and research establishments, and consultancy services give access to the latest thinking and knowledge in defence and security.

Cranfield is able to offer a unique combination of technology, statistics and mathematics to answer critical and operational defence analysis issues and provide extensive capabilities for defence and security modelling, simulation, decision analysis and scientific computing.

We work closely with the British Army, the UK Ministry of Defence (MOD), Dstl, and BAE Systems, as well as the wider defence industry, while retaining complete academic independence. Governments and industry alike value our analytical and technological expertise.

Cranfield combines academic rigour, real-world applications and consultancy found in few other institutions. We are expert analysts and educators and apply our methods to support wider industry. We have, for example, educated Mercedes AMG Petronas Formula One™ Team in operational research techniques. We are expert facilitators of wargames and have been in the vanguard of the latest resurgence of wargaming methods within the MOD.

Our team are an enviable mix of career academics who are deep experts in their fields and specialists with experience in the business and defence sectors. Our students are drawn from the international military and UK defence industry, and we also welcome applications from private individuals to join our programmes.

We work with organisations such as:
Our full-time graduate programmes in defence and security offer the highest standards of education and address the changing needs of an evolving sector. The modular structure of many of our courses offers students the flexibility to study at their own pace and exit with a Postgraduate Certificate, Diploma or Master’s (PgCert, PgDip, MSc) qualification, or simply to study an individual module.

**Defence Simulation and Modelling**  MSc, PgDip, PgCert
The application of modelling and simulation is transforming both systems development and training. It allows the representation of increasingly complex equipment, systems and scenarios for the purposes of decision support, and helps to reduce wear on live assets and on test and training areas.

This course is for military and civilian personnel, including those from the defence industry and government departments. It examines the design, development, procurement, use and management of models, simulations and wargames, for applications in experimentation, training, testing, analysis and assessment of military forces, systems and equipment.

**Military Operational Research**  MSc, PgDip, PgCert
Operational Research plays an important role in supporting a broad range of decision-making in the military environment.

This course examines the context, issues and methods used to analyse the increasingly complex challenges in the defence environment, and to support decision making. It looks at the types of analysis and allows practical experience of tools and methods such as judgemental analysis through mathematical techniques, to models and simulations. The course includes judgemental elicitation and analysis techniques, mathematical analysis methods, including optimisation, wargaming and combat modelling, logistics modelling and simulation methods.
Industrial Advisory Panel

To ensure that the Military Operational Research programme is relevant and up-to date, there is an Industrial Advisory Panel consisting of members from the Ministry of Defence and industrial partners including Airbus DS Communications, BAE Systems and AWE.

“My postgraduate study with Cranfield has led to greater employability by improving the weaker areas of my skills and knowledge; in particular I now have a deeper understanding of practical project management. The most enjoyable aspect of my course is the freedom to explore and research, formulating new ideas and concepts from what I’ve found.”

Edward Oates, current student
Defence and Security PhD,
Defence Simulation and Modelling MSc, 2007
Cranfield has a diverse suite of defence and security short courses that meet the challenges and requirements of a changing and complex sector. Our portfolio offers the maximum scope for personal development and, at the same time, balances your time and resource pressures.

**Computer Graphics**
Explores modern 3D computer graphic solutions and the fundamentals behind their design and operation, including the use of scene graphs, graphics libraries and relevant standards.

**Computer Modelling Tools in Explosives Ordnance Engineering**
Looks at the tools for explosives modelling including hydrocodes, computational fluid dynamics, molecular dynamics and computer graphics.

**Defence Simulation Introduction**
Offers to members of the defence community an overview of live, constructive and virtual simulation.

**Decision Analysis**
Examines ways to structure and analyse decision making problems, using methods that apply in practical situations.

**Discrete and Continuous Simulation**
Provides an understanding of discrete-event simulation and system dynamics including a variety of methods such as conceptual modelling, input and output analysis, random sampling, among others.
**Experimentation, Analysis and Trials for Simulation**
Provides the skills to design, manage, analyse and assess simulation based trials in support of Training, Experimentation and Acquisition. Exploring the place and utility of simulation based experimentation and trials within Defence Core Business and how to design, plan and execute simulation based experimentation and trials and the analysis of results.

**Fortran Intermediate Programming in Fortran 2003**
Teaches how to write and modify computer programs using intermediate level features of the Fortran 2003 programming language.

**Fortran Introduction to Programming in Fortran 2003**
Teaches how to write simple Fortran 2003 programs, or modify more complicated existing programs.

**Logistics Modelling**
Offers a general understanding of the principles and techniques of logistics modelling with emphasis on the development and application of quantitative models to support logistical analysis.

**Intelligent Systems**
Provides a broad understanding of the basis of intelligent systems including an awareness of the nature of problems in which such systems can be exploited.

**MATLAB Advanced**
Provides a detailed understanding of object-oriented programming in MATLAB. The course is aimed at users with a sound knowledge of MATLAB.
Short courses

**MATLAB Intermediate**
Provides a detailed understanding and a hands-on practical session on the MATLAB computing environment.

**Military Operational Analysis Appreciation**
Introduces defence and operational analysis including use of operational analysis in decision making and an introduction and exposure to the methods and tools used in defence analysis.

**Modelling and Simulation Foundations**
Offers to members of the defence community an overview of Live, Constructive and Virtual Simulation.

**Networked and Distributed Simulation**
Introduces ways in which defence simulation systems use networking technology with emphasis on TCP/IP style networking.

**Operational Research Techniques**
Covers quantitative techniques and softer methods used for operational research and management science such as: mathematical programming, queuing theory, search theory and simulation network analysis.

**Simulation Employment Training**
Covers the capability and application of defence modelling and simulation systems and an appreciation of the domain's underlying technologies and tools.
Statistical Analysis & Trials
Looks at various concepts of probability and statistics techniques, including the design and analysis of trials and classical statistical tests based on the normal distribution to non-parametric methods.

Supply Network Analysis and Modelling
Offers to managers dealing with supply networks an understanding of supply related problems for better informed decision making, using a variety of industry applied soft and hard modelling techniques.

War Gaming and Combat Modelling
Gives an overview of a wide range of war games and combat models including methods used in the modelling of combat and their application in support of key decisions and in the training of military and civilian personnel.

Further details of all our short courses can be found at: www.cranfield.ac.uk/cpd
Short course bookings E: courses.shrivenham@cranfield.ac.uk or T: +44 (0)1793 785810
Research and consultancy

Our expertise combined with excellence in strategic and applied research has enabled us to make significant contributions to the world around us. This is proven in rankings such as the Research Excellence Framework.

Research in action:

**Manual Wargames**

While computer-based games are essential to supporting training, we are discovering manual wargames have many benefits – they are flexible, dynamic, and promote better thinking and decision-making.

The Centre for Simulation and Analytics developed a manual game for a competition run by the Defence Science and Technology Laboratory (Dstl), calling for innovative ideas in defence. The development team made a deliberate decision to opt for a flexible, map-based system that is easy to produce, relatively inexpensive, and quick to configure and play through different options. Players are forced to operate in a dynamic, adversarial, decision-making and story-living environment that forces them to engage with the process and respond to change. They allow for participants to analyse the situations they are facing and explore new ideas. They also receive immediate feedback and are challenged about their choices and decisions.

The game allows users to look at historical events and to play out alternative options without the need to recode as you would with a computer-based game. In our Simulation and Analytics Centre, a team of mathematicians, statisticians, and modelling and simulation specialists develop games specifically to be used by the defence industry. The University is currently researching both manual and computer-based games and incorporating them into our postgraduate training courses and consultancy projects.
Facilities

Our unique partnership with the UK Ministry of Defence allows access to some world class secure capabilities while we are home to a range of facilities not found in any comparable academic institution. We can provide independent expertise, consultancy, research and prototyping directed by renowned academics and supported by experienced technical staff.

Decision analysis and risk management (DARM) laboratory

This is a virtual laboratory focused on the development of probabilistic decision analysis and modelling techniques. It uses decision analytic methodologies within simulations, exploring and applying techniques such as Bayesian belief networks to decision analysis and automated decision systems.

Simulation and synthetic environment laboratory (SSEL)

This facility is used for the teaching of the Defence Simulation and Modelling course where a high proportion of practical work is required. Applications range from networked and distributed systems, constructive wargames and computer-generated forces through to virtual simulations and simpler simulation packages. The laboratory provides focus for education, research, advice and guidance in the emerging applications for defence modelling, simulation and synthetic environments and in their underlying principles and technologies as applied throughout the wider defence and security environments – including training, education, experimentation, analysis and decision support.

For further details on our facilities visit: www.cranfield.ac.uk/facilities
Cranfield University at Shrivenham is located at the Defence Academy, which is a secure Ministry of Defence (MOD) site. It is situated in beautiful countryside, near to Swindon, with quick and convenient links to London and major UK airports.

Full directions are available at www.cranfield.ac.uk/visit

Important information about security clearance for courses that are held in full or in part at Shrivenham
Some Cranfield University courses are delivered at the Defence Academy of the United Kingdom, Shrivenham which is a Ministry of Defence (MOD) site. All applicants to these courses must complete HMG Baseline Personnel Security Standard V4 April 2014 (BPSS) prior to registration on the course or must already hold a security clearance to this level or higher. It will take additional time to process your BPSS clearance application and you will not be able to do this course if you fail to obtain this. Please refer to the course page on the website for full details.