University of South Australia

Australia's University of Enterprise for Defence

Defence Industry Expertise and Engagement at the University of South Australia

Associate Professor Siobhan Banks, with Jared Heenen, conducting cognitive testing in a submarine sleeping berth redesigned by UniSA's industrial design team led by Dr Peter Schumacher.

Is the most potent weapon a sharper brain?

Enterprising Design Team Delivers a Good Sleep to Submariners

Engaged by Defence Science and Technology (DST), UniSA conducted research into onboard living conditions to improve the welfare, and raise the endurance and performance of submariners.

UniSA's industrial design team, working closely with the Royal Australian Navy's (RAN) Submarine Force investigated the crew's daily activities, habits, physical requirements and psycho-social needs. The research explored the impact of fatigue and the most effective sleep environment.

Drawing on data from an anthropometric survey of RAN personnel, the design team created digital human mannequins for a VR environment to develop and evaluate design proposals.

UniSA's research resulted in a new design methodology for the construction of sleeping berths and cabins making better use of space and improving the living conditions for the future submarine crews.

Defence Industry Engaged Research

Our research strengths and partnerships with the defence sector include:

- **The Future Industries Institute** (FII);
- **The Institute for Telecommunications Research**;
- **The Advanced Computing Centre**;
- **The Data Analytics Group**;
- **The Defence and Systems Institute** (DASI);
- **The Laser Physics and Photonics Devices Laboratories** (LPPDL).

UniSA is a foundation member of the **Defence Innovation Partnership** designed to generate defence-related research and development activity for South Australia.

UniSA has one of the longest running formal relationships with the **Australian Defence Science and Technology Group** of any Australian university and is continuing to hone its defence industry engagement through both education and research.

UniSA is a founding member of the **Defence Industry Education and Skills Consortium** (DIESC). DIESC, a cross-state initiative of universities, vocational education providers and industry bodies provides a practical and effective solution to the coordination of education and skills provision in the defence industry sector.

UniSA's Defence Research Capability

Artificial Intelligence & Complex Systems	Knowledge-based systems / System integration and interoperability
Autonomous Systems	Robotics and mechatronics / Advanced controls
Biodefence Countermeasures	Vaccine platform technologies
Materials Engineering	Thin film coating / Microfabrication
Data Analytics	Data mining and machine learning / Large-scale data visualisation
Energy & Advanced Manufacturing	Energy capture, storage and systems / Advanced materials
Human Factors	Human mental and physical performance
Human Machine Interface	Augmented and virtual reality / Wearable and empathetic computing
Industrial Design	Ergonomics / Human-technology interaction
Organisational Psychology	Organisational learning / Organisational culture and climate
Space Science	Signal processing and coding / Planetary science
Sensors & Laser Engineering	High energy laser and materials / Spatial and spectral sensing
Telecommunications	Wireless communications / Signal processing

Education and High Level Skills

- As the largest university in South Australia, we meet the defence industry's needs to develop and transform Australia's future workforce.
- We have a proven track record of education and capacity building, research and development and industry partnering.
- We offer an extensive range of key defence-related degree programs in:
  - Defence Systems Integration;
  - Industrial Design;
  - Data Analytics;
  - Cybersecurity;
  - Complex Project Management;
  - Computer Networking;
  - Data Management System Integration;
  - Leadership and Management Development;
  - Executive Education.
- Our flagship **Master in Defence Systems Integration**, developed in conjunction with defence companies has educated generations of defence sector professionals.
- Graduate programs include:
  - Multidisciplinary material sciences;
  - Trusted autonomous systems, sensors, communications and signal processing;
  - Cybersecurity;
  - Data analytics;
  - Artificial intelligence;
  - Space science;
  - Enhanced human performance;
  - Augmented reality;
  - Human/systems interaction.

UniSA is developing a pre-degree **Defence Industry-Focused Foundation Program**, designed to provide pathways through STEM skills to careers in the maritime, aviation and defence sectors.

UniSA Programs

Undergraduate:

- **Bachelor of Engineering (Honours)**
  - Civil and Project Management
  - Civil and Structural
  - Electrical
  - Electronic
  - Mechatronic
  - Mechanical
  - Mechanical and Advanced Manufacturing
- **Bachelor of Software Engineering (Honours)**
- **Bachelor of Aviation (Flight)**
- **Bachelor of Design (Product Design)**
- **Bachelor of Information Technology**
  - Networking and Cybersecurity
  - Mobile Application Development
  - Software Development
- **Bachelor of Mathematical Science (Data Science)**
- **Bachelor of Science**
  - Science and Mathematics
  - Advanced Materials

Postgraduate:

- **Master of Cybersecurity**
- **Master of Data Science**
- **Master of Design**
  - Industrial Design
  - Design and Construct
- **Master of Engineering**
  - Autonomous Systems
  - Military Systems Integration
  - Civil and Infrastructure
  - Engineering Management
  - Telecommunications
  - Electrical Power

- **Master of Information Technology (Enterprise Management)**
- **Master of Project Management**
- **Master of Surveying**
- **Graduate Certificate and Graduate Diploma in Human Factors and Safety Management Systems**
- **University of South Australia degrees with University College London** (UCL)
  - Master of Applied Project Management (Defence Industries)
  - Master of Science in Naval Architecture
  - Master of Science Marine Engineering
  - UCL-UniSA Master of Data Science

RANKED 25TH IN THE WORLD'S TOP 50 UNDER 50
2019 QS Rankings

#1 UNIVERSITY IN AUSTRALIA FOR INDUSTRY INCOME
2018 THE Rankings

WORLD-CLASS RESEARCH IN AI AND COMPUTING & INFORMATION SYSTEMS
2015 Excellence in Research for Australia

RATED 8TH IN AUSTRALIA FOR RESEARCH EXCELLENCE
2015 Excellence in Research for Australia

WELL-ABOVE WORLD STANDARD RESEARCH IN ENGINEERING
2015 Excellence in Research for Australia

WORLD TOP 10 FOR COMPUTER SCIENCE AND MATHS RESEARCH
2018 Leiden Rankings

Augmented and Virtual Reality

UniSA is undertaking cross-disciplinary research to advance the performance of Australia's military personnel, both physically and cognitively using Virtual Reality (VR) to increase the potency of soldiers in real warfare. The four-year $4-million project, a collaboration between the Australian Army and six other Australian universities is part of the Human Performance Research network (HPRnet).

UniSA's Prof. Mark Billinghurst and his team use Virtual and Augmented Reality, wearable computing devices and cognitive neuroscience in the selection and training of people to perform complex tasks in challenging situations.

Volunteers enter VR simulations of vehicle control, tactical and command situations wearing head-mounted display units, immersed in surround sound while every millisecond of their brain activity is monitored on state-of-the-art mobile EEG recorders.

Operating autonomous systems in VR, could train soldiers for real-world operations. Imagine a single 'pilot' controlling a simulated swarm of drones in a virtual environment. Eventually, training may be delivered via mobile apps improving cognitive function for specific activities at much lower cost.

In the future, personnel could be monitored during operations to detect their cognitive state, fatigue and heightened emotional states. Easily wearable monitoring technology that doesn't impede a soldier's ability isn't far away.

A Culture of Innovation

- With a commitment to innovation at the heart of our research, we're ready to play a pivotal role in building the defence industry capability in Australia.
- Innovative new defence projects include **passive submarine tracking systems, anthropometric modelling submarine internal spaces, behaviour modelling systems for testing combat strategies,** and **nano-engineered colour changing camouflage coatings** that can be applied to vehicles.

Partnerships with Defence Industry

- As Australia's University of Enterprise for Defence, we translate the knowledge generated by our research into real world outcomes. With more than 2,500 successful industry collaborations around the world, UniSA is a leading research and development partner.
- Our focus on supporting defence industry excellence and innovation is demonstrated in our collaborative relationships with the industries related to defence including:
  - **Naval Group**
  - **Siemens**
  - **Dassault Systèmes**
  - **Saab (via the joint UniSA/Saab Defence Technology Institute)**
  - **BAE Systems**
  - **Lockheed Martin**
  - **Rheinmetall**
- UniSA collaborates closely with industry, business, the professions, government and other community groups to ensure our education programs and research meet the needs of the 'end-user'.
- Our industry partnerships include a strong strategic partnership forged with **University College London** (UCL).
- UniSA brings UCL's acknowledged world leading strengths in Naval Architecture and Maritime Engineering to Australia.
- We also collaborate with other international institutions including, **Ensta Bretagne, IMT Atlantique, KTH Royal Institute of Technology, Chalmers University of Technology** and the **University of Southern Brittany** on student and research exchange and joint research projects.

Partner with us

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Opportunities to collaborate on grants, workshops, infrastructure and testing, funded research, joint R&D, sponsorships, adjuncts, staff exchange, internships, co-chair and PhD.

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