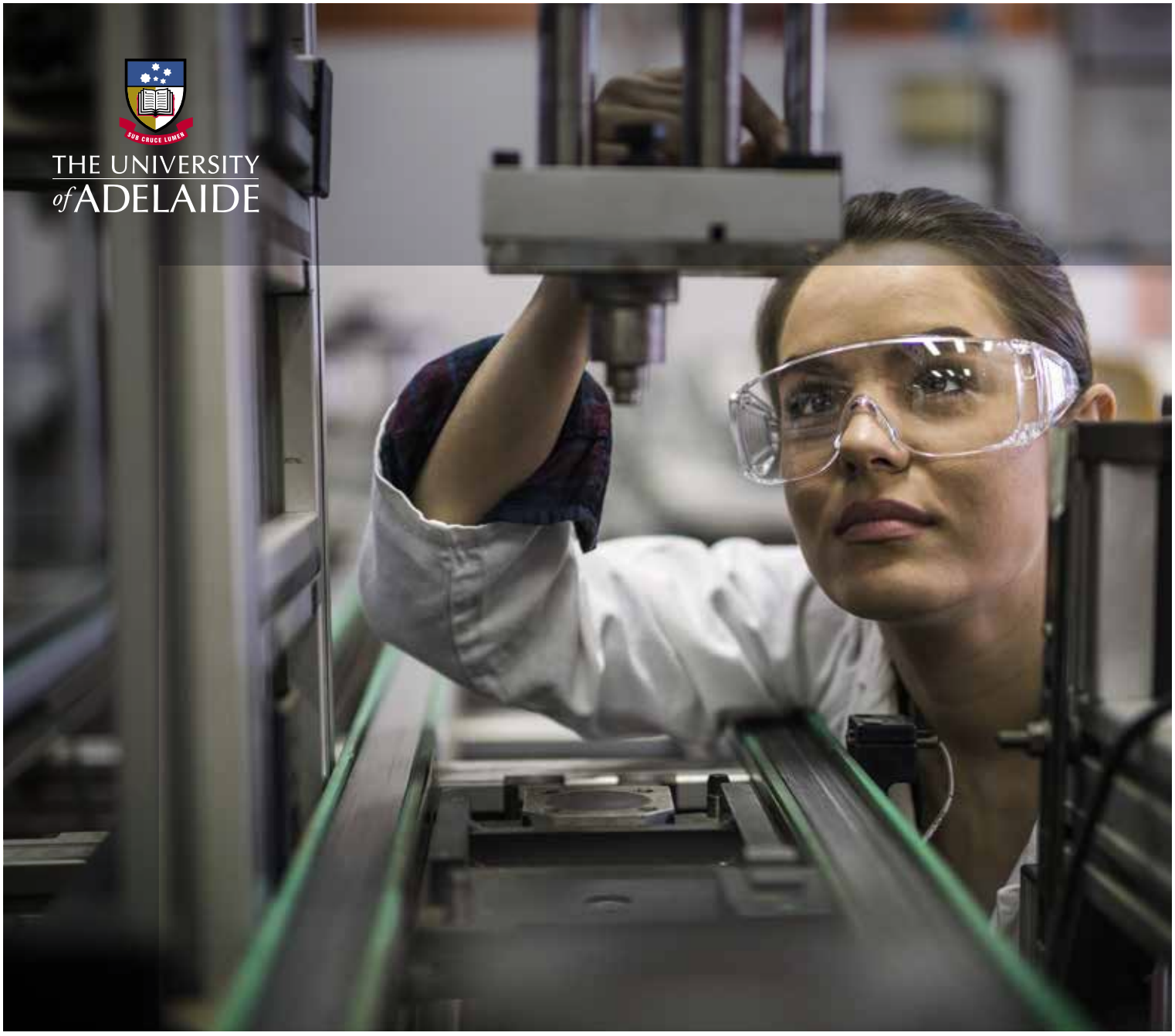

DEFENCE

An open invitation to partner with the University of Adelaide

adelaide.edu.au

"Australia will have tremendous opportunities for greater prosperity and development over the coming decades, but at the same time will face complex security challenges and greater uncertainty in our strategic environment... The Indo-Pacific is in a period of unprecedented transformation as the distribution of economic and political power shifts to our region."

2016 Defence White Paper

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At the University of Adelaide, we have a long and proud history of partnering with Australia's defence sector. Our involvement has ranged from co-developing Australia's first satellite and rocket-launch capability with Defence in the 1960s, to working with Defence and industry on game-changing autonomous systems research and radar-enhancing technology today.

The University contributes to defence, cyber and space enterprise in many different capacities. We conduct world-leading research across multiple disciplines; work as a trusted advisor on key capability programs; and produce highly skilled, industry-ready graduates, keenly sought by employers and frequently found at the sector's highest levels.

Importantly, we understand Defence's unique sensitivities. Many Adelaide staff are cleared for national security work, and our institution is part of the Defence Industry Security Program. We also routinely collaborate with Defence Science and Technology Group researchers to deliver vital Defence outcomes.

Whatever national security challenges should arise in future, the University of Adelaide is well prepared, and determined, to meet them.

We invite you to join us.

PROFESSOR MIKE BROOKS
Provost and Deputy Vice-Chancellor (Research)

Australia and the Indo-Pacific are experiencing a period of significant economic transformation, with almost half the world's economic output expected to come from the region by 2050. This growing prosperity, of course, relies on the maintenance of peace and stability, as does the rules-based global order on which Australia depends for open access to trading partners.

On both counts, the Australian Government recognises that our entire Defence ecosystem—including government, industry and academia—has a critical role to play. It has taken important steps to underpin this national imperative, including developing a new approach to innovation in Defence; equally importantly, these steps have been resourced. Cyber and space capabilities are also particularly critical to safeguarding Australia's way of life.

The University of Adelaide is committed to using its extensive research and educational capacity, in partnership with Defence and industry, to meet these national challenges.

PROFESSOR MICHAEL WEBB
Director – Defence, Cyber and Space

WORLD-LEADI
DEFENCE RES

The University of Adelaide is a destination of choice for world-leading defence-focused researchers, high-achieving students, and government and industry partners.

Broad interdisciplinary capabilities

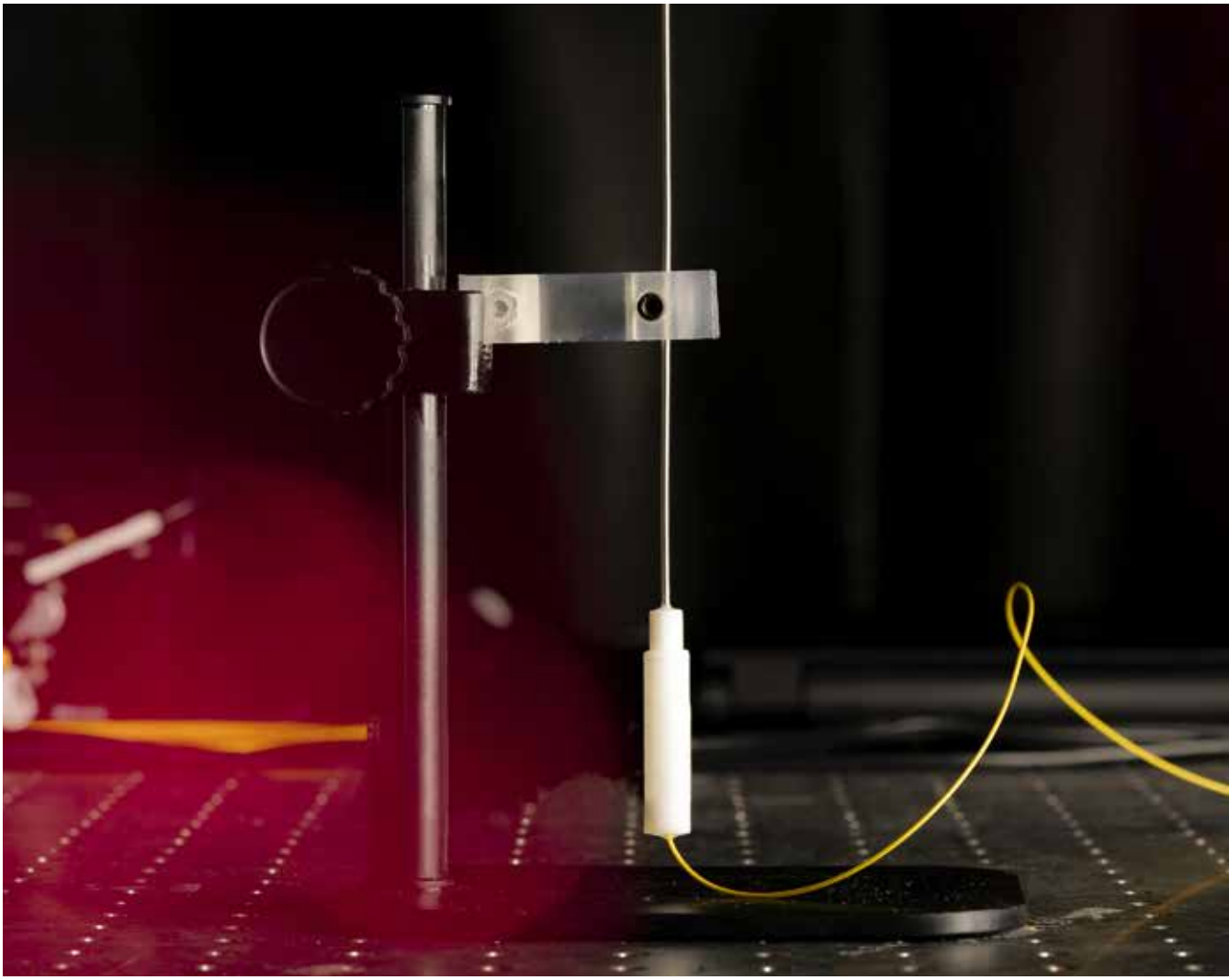
Many academic staff across all University of Adelaide faculties are actively involved in defence-related education and research. This vast pool of expertise includes:

- scientists working on advanced sensing technology, including radar, photonic sensors and ultra-high-precision cryogenic sapphire clocks
- mathematicians and computer scientists analysing large data sets through machine learning and advanced statistics, and developing optimisation techniques for defence and space applications
- engineers focusing on communication networks, autonomous systems, robots, noise cancellation and advanced materials
- lawyers and policy researchers looking at contemporary challenges in global security, and military and space law
- psychologists and health scientists working on human factors and veterans' post-traumatic stress
- researchers in arts and social sciences looking at regional defence and security policy.

NG EARCH

KEY R&D EXPERTISE

- Sensing
- Space
- Systems
- Law
- Technologies
- Policy
- Cyber
- Facilities
- Platforms
- Engagement
- Human performance
- Education and Future Workforce



SENSING

Advanced sensing and measurement technologies

The University's Institute for Photonics and Advanced Sensing (IPAS) brings together physicists, chemists, material scientists, biologists, theoretical scientists and medical researchers to develop cutting-edge technologies such as:

- high-precision clocks for enhanced radar capability
- soft glasses enabling infrared laser power delivery through fibre optics
- next-generation radiation, biological and chemical sensing devices
- fibre-based quantum memory for secure communications.

Radar for surveillance and monitoring

The Adelaide Radar Research Centre collaborates internally with the School of Electrical and Electronic Engineering and the Discipline of Physics, and externally with the DST Group, Bureau of Meteorology and Australian Antarctic Division to investigate problems in:

- maritime synthetic-aperture radar and small-target detection
- automatic target recognition from inverse synthetic-aperture radar
- high-resolution imaging
- sensor-array signal processing
- locating interference and spoofers to global navigation satellite systems.

Laser diagnostics and combustion engineering

The School of Chemical Engineering has a well-equipped laser diagnostics laboratory for specialist research, diagnostics and measurements. The facilities feature and enable:

- multiple lasers and time-gated cameras
- non-intrusive, precise probing
- high temporal and spatial resolution.

Robotic vision technologies

The University of Adelaide is a key partner in the world-renowned Australian Centre for Robotic Vision (ACRV). The ACRV's technologies span a wide range of topics, with those of particular application to defence including:

- algorithms to visually control active head/eye robotic platforms for surveillance and navigation
- visual geometry and camera self-calibration for measurement, augmented reality (AR) and virtual reality (VR)
- visual simultaneous localisation and mapping (SLAM)
- human motion capture
- activity analysis
- novel view synthesis.

Robotic vision expands robots' capabilities, allowing them to see and understand the world in which they work. These technologies can be applied in several defence arenas, including tracking, monitoring, and enabling protection in natural and built environments.

Sensing and biomarkering technology

The University partners the Australian Research Council (ARC) Centre of Excellence for Nanoscale BioPhotonics, which produces technologies capable of:

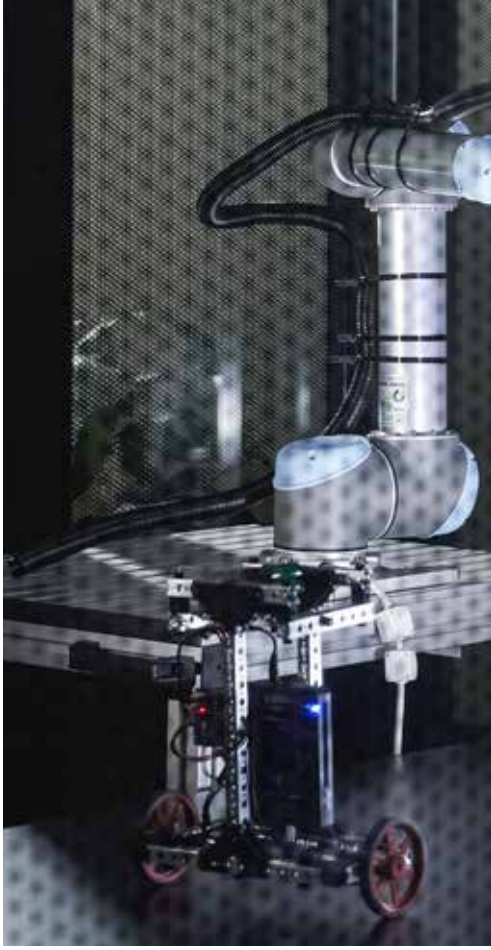
- safeguarding deployed personnel
- rapid detecting and identifying threats
- monitoring physical and mental performance
- enabling practice refinement during planning and training stages
- providing individuals' field status.

THE SAPPHIRE CLOCK

Twenty years of research and engineering in the University's Institute for Photonics and Advanced Sensing (IPAS) has produced a cryogenic sapphire oscillator capable of providing a step-change in a vital Australian defence asset's performance.

'The Sapphire Clock' offers a 1000-fold improvement in timing precision, potentially improving Australian defence's ability to identify threats using the Jindalee Over-The-Horizon Radar Network. The clock is so good its performance is the equivalent of only losing or gaining one second every 40 million years. Its IPAS developers were recognised for their remarkable innovation in 2018, receiving the Defence Science and Technology Eureka Prize for Outstanding Science in Safeguarding Australia.

SYSTEMS



Machine learning

The University's Australian Institute for Machine Learning (AIML) has over 100 high-quality research staff working on cutting-edge approaches to problem-solving using artificial intelligence (AI). This world-leading team conducts pure and applied research under four key themes: Machine Learning Theory; Trusted Autonomous Systems; Robotic Vision; and Visual Question and Answering.

AIML is among the global elite in the competitive research areas of machine learning and AI. In high-quality research translation, its innovative capabilities enable the University to collaborate with and support domestic and international partners in areas relating to:

- intelligence, surveillance and reconnaissance
- tracking and behaviour analysis
- identifying patterns in large, complex data sources
- predicting future behaviour of people and systems
- electronic warfare
- situational awareness
- producing computer vision and robotics applications
- deep learning and pattern recognition
- autonomous systems and navigation.

Autonomous systems

The University of Adelaide is able to offer expertise in autonomous systems formation control, supporting wireless sensor network security and control theory. Examples of defence-related capabilities include:

- systems and control—networked control systems, neural network control and fuzzy control systems
- autonomous systems—swarm intelligence, multi-agent formation, and application of genetic fuzzy trees for responsive decision-making
- cyber-physical systems—wireless sensor network security and machine learning
- data ferrying for multi-mission in urban areas
- resource allocation with genetic fuzzy decision-making for ship defence
- fuzzy modelling and event-triggered control of complex networked control systems
- low-cost EMP-equipped predatory unmanned aerial systems
- identification of emergent behaviour within a multi-agent system
- machine learning capability for target detection and object recognition
- modelling software-centric and interaction-oriented system-on-chip
- autonomous light hybrid vehicles for defence applications and energy management
- intelligent-agent modelling using conditioned Markov processes.

Mathematical modelling

In the University's School of Mathematical Sciences, the Stochastic Modelling and Operations Research group addresses important defence-related problems by fusing mathematical theory, computation, data and decision science. It plays key roles in the:

- ARC Centre of Excellence for Mathematical and Statistical Frontiers
- Cyber Security Cooperative Research Centre.

Similarly, the Dynamics, Modelling and Computation group models significant problems in science and engineering; many defence-related. Its strengths are in:

- classical mechanics, particularly fluid dynamics
- modelling deterministic systems.

Managing randomness and uncertainty

The University is a partner in the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS), which brings together Australia's top researchers in applied mathematics, statistics, mathematical physics and machine learning.

Focusing on systems involving randomness and uncertainty, ACEMS combines innovative data analysis methods with advanced mathematical and statistical modelling.

DEEP-LEARNING AUTONOMOUS SYSTEMS

Using a subset of machine learning called deep learning, the Australian Institute for Machine Learning (AIML) has developed algorithms capable of object recognition and scene segmentation in images. In some domains, the algorithms' performance approaches human level.

In collaboration with the DST Group's Land Division, AIML is now applying this knowledge to assist autonomous military vehicles in sensing, understanding and interacting with their environment in the land domain.

EMULATING NATURE'S PERFECT PURSUIT

University of Adelaide researchers in robotic vision have built an autonomous robot capable of effectively and efficiently pursuing targets in unstructured environments. The robot uses computational models bio-inspired by dragonflies' remarkable ability to focus on a single moving target and shut out all else.

Underpinning the models is a novel University-developed algorithm. When tested in various nature-mimicking virtual reality environments, the algorithm performed every bit as accurately as other state-of-the-art algorithms, but while running up to 20 times faster, so requiring less relative processing power.

COMBAT SYSTEMS' EARLY PERFORMANCE PREDICTION

The University of Adelaide's Centre for Defence Communications and Information Networking has developed novel modelling environments to enable early performance-metrics prediction when designing large, software-intensive networked systems. This was previously not possible until system components' functionality and high-level behaviour were fully defined.

Created in collaboration with the Defence Science and Technology Group (DSTG), the modelling environments allow design trade-offs to be explored much earlier in systems' design lifecycles, while ensuring their fitness for purpose. They're being used to inform design choices for SEA1000 (future submarine), JP2072 (land battlespace communications) and AIR6500 (integrated air and missile defence).

TECHNOLOGY

Electromagnetic devices and interactions

The Adelaide Applied Electromagnetics Group provides innovative solutions to industry involving:

- low-profile, integrated, reconfigurable and wearable antennas
- conductive textiles, novel conducting materials, metamaterials and plasmonics
- ultra-high-speed short-path communications
- terahertz waveguides
- optical nano-structures inspired by radio-frequency devices.

High-performance microelectronics engineering

The Centre for High Performance Integrated Technologies and Systems (ChiPTec) has expertise in:

- mixed analogue-digital, very-large-scale integration systems
- high-speed digital circuits
- low-power wireless systems and integrated radio-frequency systems
- parallel architectures and algorithms
- digital hardware for artificial intelligence.

High-energy lasers and photonics

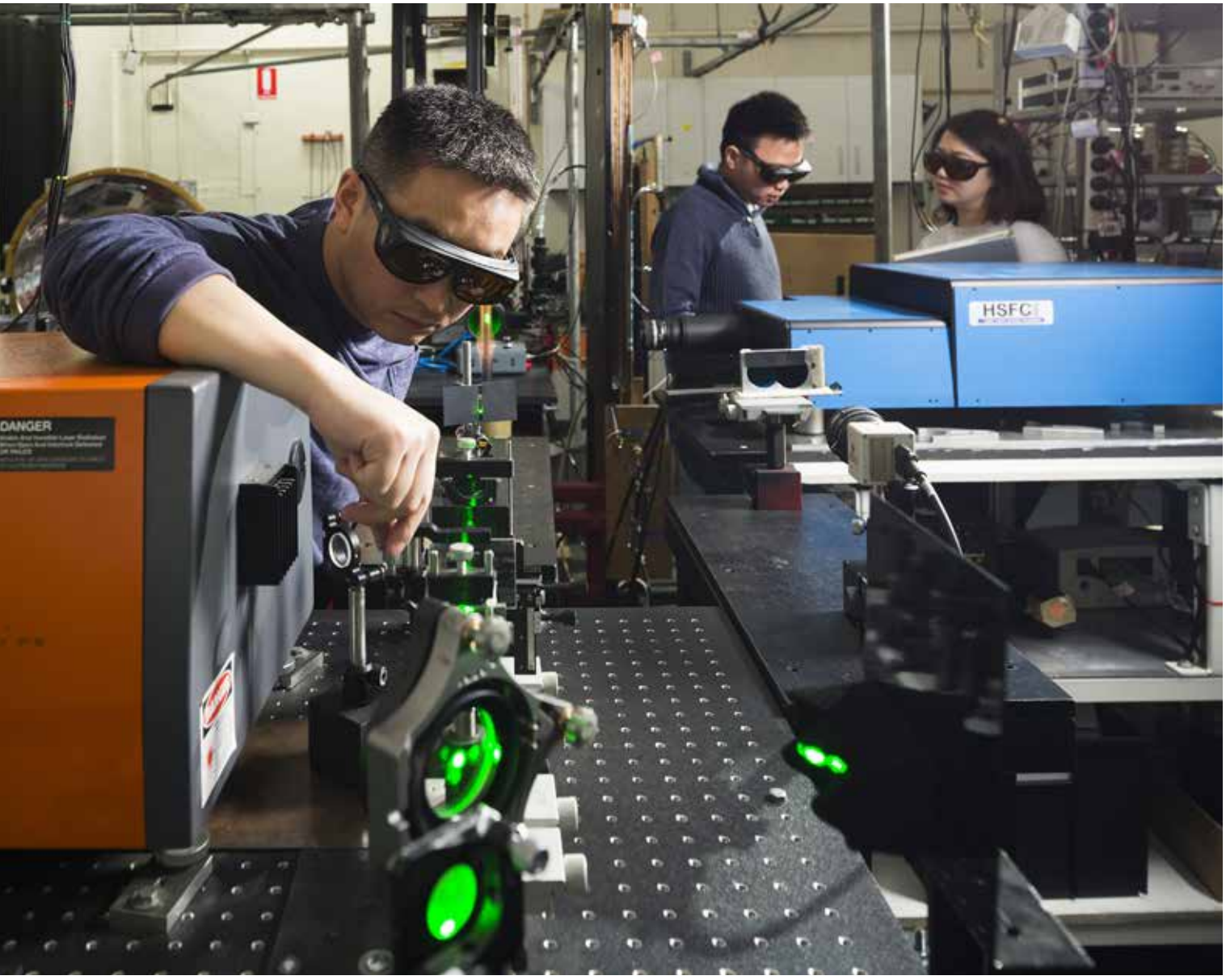
In collaboration with the DST Group, the University's Dual-use Laser Technology Centre has developed state-of-the-art, high-power, continuous-wave and pulsed infrared lasers. This technology is critical for enabling:

- DIRCM (directed infrared countermeasures) pump sources
- LIDAR (light detection and ranging) scanning, measurement and mapping
- high-fluence extreme UV and soft-X-ray pulses in the water window.

Nanomaterials and catalysts

The Centre for Materials in Energy and Catalysis specialises in fundamental and applied research in a number of energy and material-related fields, including:

- energy production, storage (including batteries and fuel cells) and conversion
- photocatalysis
- nanoparticles for drug and gene therapy.


DANGER
HSFC

CYBER

Telecommunication systems and networks

The University of Adelaide's Centre for Defence Communications and Information Networking applies its state-of-the-art research skills and international operational experience to problems relating to telecommunication systems' and networks':

- robustness and reliability
- efficiency and effectiveness
- security.

Software engineering

Cyber Security Adelaide (CSA) integrates key skills in secure software engineering capability—from analysing and designing threats, through to developing defensive mechanisms embedded in software and networked systems. A core partner in the national Cyber Security CRC, CSA's capabilities include:

- socio-technological security aspects
- autonomous systems
- automated network security configuration
- offensive security and forensic analysis.

Distributed information systems

The School of Computer Science's Defence Information group conducts research, in collaboration with the DST Group, into the challenges of building the large, complex distributed systems required in defence.

Counter cyber-terrorism

The University's CSA is a core partner in the national Cyber Security CRC, where cyber experts develop innovative solutions to predict, prevent, detect and respond to cyber threats from nation states and individuals.

PLATFORMS

Maritime engineering

The University of Adelaide's Shipbuilding Hub for Integrated Engineering and Local Design collaborates with industry and Defence, particularly DST Group, to foster R&D initiatives in the maritime domain. This includes identifying and implementing niche, high-value technical initiatives for:

- Defence projects, such as for Collins class or SEA1000 submarines, and SEA5000 Future Frigates
- allied industries, such as renewable marine energies.

Maritime structural monitoring

The Structural Health Monitoring group provides powerful, cost-effective and time-efficient tools to detect reinforced-plate and shell-structure defects. The group is particularly focused on:

- fatigue, fracture, integrity and strength of welded, fibre and sandwich composite structures
- life prediction and extension techniques
- finite element analysis
- impact dynamics
- guided wave-, vibration- and acoustic-based damage detection.

Acoustics, vibration and control

The Acoustics Vibration and Control group has diverse research expertise, spanning:

- advanced acoustic materials
- underwater, aero-, thermo- and vibro-acoustics
- active noise and vibration control, and vibration isolation
- signature management and condition monitoring
- dynamics and control
- ultrasound.

Structures and advanced materials

The Structures and Materials group owns and shares state-of-the-art experimental facilities with: micro-, full-field and high-speed 3D digital image correlation systems; 3D scanning laser vibrometer; and advanced sensors for non-linear guided-wave research. The group accommodates and coordinates interrelated research activities in:

- advanced manufacturing
- fracture and fatigue, damage/defect evaluation and structural life assessment
- composites and coating technologies
- bio-mechanics.

Aerospace engineering

The University's Aerospace Research group conducts research in such areas as:

- satellite, space and hypersonic vehicle design, control and navigation
- fixed- and rotary-wing vehicles
- unmanned aerial vehicles
- flapping and morphing wing devices
- pulse-jet, scramjet, and rocket engine design
- aerodynamics
- heat transfer and flow control
- composite-structure design for aerospace applications.

Specialised structural materials

The School of Civil, Environmental and Mining Engineering's Structural Engineering group specialises in:

- developing ultra-high-performance fibre-reinforced concretes, and design guidelines for their use
- strengthening existing concrete, steel and masonry structures using advanced retrofitting techniques
- modelling materials and structures using innovative finite element modelling
- simulating structural materials' blast and impact-loading responses
- monitoring structures' health.

BLAST-RESISTANT CONCRETE

From a defence viewpoint, standard reinforced concrete has a big weakness; the world's most widely used construction material is highly susceptible to damage and failure as a result of blast and impact loading. DSTG-funded research at the University of Adelaide, however, has solved the problem.

The University's researchers have developed ultra-high-performance fibre-reinforced concretes that significantly outperform conventional reinforced concrete structural elements when subjected to conventional blast and fragmentation loading. With further funding from the Asian Office of Aerospace Research and Development, they've also developed design guidelines for the unique materials' use in standard and defensive construction.

ADAPTIVE TUNED VIBRATION NEUTRALISER

As part of a DST Group Capability Technology Demonstrator program, the University developed an adaptive tuned vibration neutraliser (sometimes called an adaptive tuned mass damper) for application on Collins Class submarines.

Meeting all target performance measures, the device automatically adapts to changes in disturbing vibrations' frequencies and, importantly, requires no power amplifiers or vibration actuators. As the technology is essentially passive, it's extremely reliable and carries no danger of vibration feedback.

HUMAN PERFORMANCE

Visual processing

The School of Psychology's Active Vision Lab investigates how people use visual information to interact with their environment. Employing techniques such as eye and hand tracking and psychophysics, the lab team researches the mechanisms underlying sensorimotor control and active vision, informing:

- applied research in human factors
- novel approaches to human-machine interfaces and human-system integration.

Neurobotics

The University's Visual Physiology and Neurobotics Laboratory investigates visual processing at the behavioural and physiological levels, with a multidisciplinary team covering the fields of neuroethology, neurobiology, psychology, computer vision and engineering. The lab's researchers use electrophysiological techniques to:

- explore how flying insects see the world
- build autonomous robots emulating neuronal principles.

Health and wellbeing

The Centre for Traumatic Stress Studies seeks to improve evidence-based practice by informing and applying scientific knowledge in the field of trauma, mental disorder and wellbeing in at-risk populations. It has expertise in the aetiology, neurobiology and epidemiology of:

- mental/physical disorders
- disasters, accidents
- early-life stress
- occupational health (including military and first responders).

Aerospace medicine

The University holds a long association with the Royal Australian Air Force Institute of Aviation Medicine (RAAF IAM). The RAAF IAM regularly hosts the University's medical students for elective terms in aerospace medicine, giving them the opportunity to conduct mentored research projects and participate in postgraduate courses with Defence Force medical officers.

INVESTIGATING ROBOT RELATIONS

The University of Adelaide's Active Vision Lab, in collaboration with the DST Group and the US Army Research Lab, has developed a simulation environment paradigm that can investigate human-autonomy teaming's cognitive implications.

The work has produced novel findings about robots' use—both for individual operators and teams—which will inform human-machine interface development and autonomous vehicle use cases for the Australian and US Army.

SPACE

Broad interdisciplinary capabilities

Researchers across the University of Adelaide are actively involved in space-related R&D through many avenues in science, technology, health, policy and practice. This vast pool of expertise includes:

- scientists working on advanced technology, including radar, space situational awareness and cryogenic sapphire clocks
- mathematicians and computer scientists analysing large data sets through machine learning, advanced statistics and optimisation
- engineers focusing on designing and integrating nanosatellites, communication networks, autonomous systems and advanced materials
- medical scientists investigating and advancing aerospace medicine education
- practice lawyers and policy researchers looking at contemporary challenges in global security, and military and space law.

Our academic staff work closely with Defence (including DSTG), the Australian space industry and the South Australian Government to build Australia's space capability, and ensure the University's innovations are ready for application and commercialisation. Our current research projects and programs directly address the current challenges faced by the space sector and its vast service network.

OVER 50 YEARS' SPACE R&D

Some of the University's most notable space R&D achievements include:

- launching WRESAT (Weapons Research Establishment Satellite) in 1969, Australia's first satellite, making Australia only the third country to build and launch its own satellite
- undertaking research in high-energy astrophysics since the mid-1960s, culminating in the discovery of blazars as well as present-day collaborations in a number of large-scale international efforts, including HESS (gamma rays), IceCube (neutrinos), and the Pierre Auger Observatory (cosmic rays)
- contributing to the Laser Interferometer Gravitational-Wave Observatory's (LIGO) 2015 discovery of gravitational waves, by co-developing and installing ultra-high-precision optical sensors to correct distortion of the LIGO detectors' laser beams
- supporting an alumnus's space R&D start-up (among many others), which designed and built a nanosatellite launched by NASA in 2017, making it one of the first Australian-built satellites in space in 15 years.
- with UNSW Canberra, University of Exeter, and University of Nebraska College of Law, drafting The Woomera Manual on the International Law of Military Space Operations, which will become the definitive document on military and security law as it applies to space

Space situational awareness (SSA)

This research is focused on developing new and novel algorithms—inspired by AI and space-based computational platforms—to detect, map and track resident space objects (RSO).

High-speed space-based positioning and navigation

Our researchers are developing algorithms for event sensors and smart cameras to realise low-power/high-efficiency space-based capabilities, including attitude estimation, positioning, simultaneous localisation and mapping, and 3D reconstruction.

Multi-sensor platform for SSA

University researchers are developing a multisensory platform, consisting of optical and radio frequency (RF) sensors, to provide highly accurate SSA and extremely-low-latency satellite internet.

Earth observation analytics using modern machine learning

We're developing deep-learning-based and graphics-processing-unit-enabled algorithms to detect and count objects in space, perform instance-level and semantic segmentation, and generate 3D reconstructions and analyses of satellite imagery.

Miniaturised orbital electronic sensor system (MOESS)

In this Defence Innovation Partnerships project, the University is working in collaboration with DEWC Systems to develop a small, but effective, electromagnetic sensor system for space-based intelligence, surveillance and reconnaissance.

Advanced microelectronics for space applications

We're developing new, high-performance sensing and microelectronic systems for use in a range of integrated-circuit technologies (including CMOS, SOI, GaAs and GaN) for space applications. These new systems are being developed with a specific focus on optimising size, weight, power and performance in the space environment.

Nanosatellite technologies – CubeSat design

University of Adelaide researchers are working on the design, building and testing of a functional three-unit CubeSat with the capacity for multiple payloads. These CubeSats are being designed with launch-ready qualifications for rapid deployment and operation.

SmartSat Cooperative Research Centre (CRC)

The University is key member of the new SmartSat CRC. Our key capabilities being applied to the centre's research programs include:

- machine learning and AI for SmartSat systems
- cyber security in space operations
- advanced satellite communications, including antenna design and signal processing
- space microreactors for space manufacturing.

LAW AND POLICY

Military law and ethics

The Adelaide Law School's Research Unit on Military Law and Ethics (RUMLAE) facilitates creative interdisciplinary dialogue on contemporary challenges in military law and justice, international law and relations, national security and strategic policy. The unit is particularly focused on matters relating to the:

- lawful and ethical application of military force in tactical and strategic contexts
- understanding and mitigation of violence-centred discourse
- exploration, security and use of outer space
- promotion and protection of human rights
- conduct of commercial transactions in times of crisis and emergency
- conduct of legal transactions and models for legal optimisation across multiple transnational jurisdictions
- achievement of meaningful justice outcomes across the globe.

Regional rights and governance

The University's Indo-Pacific Governance Research Centre investigates issues of social and political governance—often transnational in scope and origin—pertaining to key problems and issues confronting states, civil society, and citizens in the region. These include questions of:

- institutional reform and development
- inequalities and human rights
- financial and economic governance
- environmental and human security.

WRITING CONFLICT-RELATED SPACE LAW

It's widely held that the prospect of conflict in outer space is not a question of 'if', but 'when'. However, the legal regime governing the use of force—and actual armed conflict—in space is currently unclear. The few international treaties dealing with outer space provide very little regulation of military and commercial activities.

In response, the University of Adelaide, together with UNSW Canberra, University of Exeter, and University of Nebraska College of Law, is drafting The Woomera Manual on the International Law of Military Space Operations. Drawing on the knowledge of dozens of legal and space operations experts from around the world, the manual will become the definitive reference on military and security law as it applies to space.

ANGELS GUIDING SPACE ENTREPRENEURS

The University of Adelaide is collaborating with Brisbane's International Aerospace Law and Policy Group to create the Australian Navigational Guide Explaining Laws for Space (ANGELS) website.

The ANGELS site will provide space entrepreneurs and start-ups throughout Australia with a readily accessible, step-by-step online guide to the many Australian and international legal and regulatory requirements they must satisfy to lawfully conduct commercial activities in space—encouraging growth in our space industry and helping to ensure the sustainable use of space for future generations.

FACILITIES

High-performance computing

The University's eResearch SA provides high-performance computing facilities and expert user support, enabling South Australia's research community to conduct advanced research and development locally, and to collaborate in national partnerships.

Optical fabrication

Optofab, an Australian National Fabrication Facility, is committed to the micro- and nano-fabrication of cutting-edge optical components and materials. The facility's state-of-the-art manufacturing technology enables accelerated product development and validation testing, with defence and security applications including:

- high-power laser transmission fibres
- mid-infrared fibre-lasers
- corrosion sensors
- 3D metal printing
- 5-axis ultrasonic exotic-materials milling.

Testing instrumentation and analysis

The University's EngTest unit has provided industry access to the advanced facilities and significant expertise in the Faculty of Engineering, Computer and Mathematical Sciences for over 20 years. Its specialist offerings include:

- the Adelaide Wind Tunnel facility, the second largest wind tunnel in Australia, comprising three working sections for aeroacoustic research, and accommodating automotive models up to 1/4 scale
- earthquake testing (including through a uniaxial shake-table capable of testing equipment up to 2T and 2 m3, a six-degrees-of-freedom 'hexapod' for kinematic and multi-directional load testing, and fixed and portable shakers and testing to AC 156 and AS 60068.3.3)
- Instron and MTS load testing machines for static, cyclic and dynamic load testing using displacement, load and strain control
- instrumentation and measurement, including strain gauging and full-field strain measurement by digital image correlation.

Forensics

The Advanced DNA, Identification and Forensic Facility integrates various research areas with applied outcomes for government, the criminal justice system and industry. Its researchers apply DNA technology, chemical analysis, and cyber detection tools to answer questions related to:

- crime scene investigation
- missing persons
- illegal trade
- biosecurity
- conservation management and environmental crime.

RF Anechoic Chamber

Our electromagnetic anechoic chamber and instrumentation supports research in transformative products and services, including:

- antennas and systems for defence applications
- high-speed next-generation wireless communications
- high-resolution 'see through' radar imaging.

Advanced acoustics laboratories

The University's advanced acoustics, vibration and control laboratories specialise in:

- active noise and vibration control
- structural health monitoring
- dynamics and control
- thermoacoustics
- ultrasound
- underwater acoustics
- vibration isolation
- vibro-acoustics
- waves and oscillating systems.

Advanced sensing laboratories

The University of Adelaide has many multidisciplinary laboratories hosting researchers in fields such as quantum technologies, optics, chemistry and biology, all collaborating to create advanced sensing technology. Their co-location greatly enhances the speed of innovation.

Multi-agent control for trusted autonomy laboratory

This laboratory supports research in:

- control signal and image processing
- sensory embedded systems
- autonomous vehicles and robotics
- vision-dependable software-intensive systems
- machine learning
- game theory
- hybrid system design and analysis.

Microscopy and microanalysis

Adelaide Microscopy provides access to a broad range of the most technologically advanced instrumentation for microscopy and microanalysis. Its scientific support services are available to universities, other institutions and the private sector. Particular capabilities include:

- scanning electron, and transmission electron microscopes
- atomic force, and scanning near-field optical microscopes
- electron microprobes
- inductively-coupled plasma mass spectrometers
- biophotonic imaging system and X-ray micro-tomography.

Medical simulation

Adelaide Health Simulation provides practical training for health professionals and students, using advanced technology to simulate medical and surgical emergencies and teach critical decision-making. It also operates a satellite site at Lyell McEwin Hospital, and a mobile team.

New-venture collaboration space

ThincLab is home to more than 50 new ventures in a diverse range of industry sectors. It's the meeting place for local, national and international entrepreneurs, government, industry, venture capital, investors and academics, and a popular networking event venue. ThincLab provides:

- unique access to the University's brightest academic minds and business mentors
- purpose-built collaboration spaces
- access to the Australian eChallenge 12-week new-venture accelerator
- a prototyping lab and design studio housing the latest release 3D printers and fabrication technology.

EDUCATION AND FUTURE WORKFORCE

The University of Adelaide has an outstanding reputation for industry-oriented education, and works closely with the defence sector to produce high-quality, work-ready graduates with broad, applied knowledge.

Undergraduate engineering

Our undergraduate engineering degrees emphasise STEM courses and include opportunities to complete a Defence Systems major. Final-year projects are often co-supervised with industry, and are exhibited in 'Ingenuity', South Australia's largest student showcase, in which defence is always a major theme.

The University also recognises current, past and reserve Australian Defence Force members' professional military studies, experience and skills, allowing potential entry into a wide range of programs.

Postgraduate coursework

Our postgraduate coursework degrees are highly practical and skill-based, with flexible delivery modes. Offerings are available in:

- computer science
- aerospace engineering
- marine engineering
- electrical engineering
- cyber security
- data science
- materials engineering
- computing and innovation
- machine learning
- mathematical sciences.

Postgraduate research

University of Adelaide postgraduate research degrees are highly focused and research-intensive, with frequent one-on-one mentoring from leading researchers. Specialised intensive-delivery courses can also be developed on request.

Research relationships

We provide a range of options for government and industry to collaborate and/or supervise on student projects, including scholarships, internships and project sponsorships.

Government co-funding for projects can be obtained via programs such as the: Australian Research Council Linkage Grant program; Defence Innovation Partnerships; Next Generation Technology Fund; and the Sovereign Industry Capabilities Fund.

MASTER OF MARINE ENGINEERING – INTENSIVE

The Master of Marine Engineering is offered in a new intensive mode of study, designed with busy working professionals in mind. Students can complete the degree in steps, with a graduate diploma (one-year) or graduate certificate (six-month) qualification.

DUAL MASTER OF MARINE ENGINEERING WITH ENSTA BRETAGNE

We also offer students the opportunity to undertake a Dual Master of Marine Engineering degree with ENSTA Bretagne in France. Students spend one semester in Brest (France), one in Adelaide, and a third in a jointly-supervised industry internship. Graduates are awarded two internationally-recognised qualifications: a Master of Marine Engineering from the University of Adelaide, and a Master of Science in Marine Engineering, Surface Ships and Submarines from ENSTA Bretagne.

PROFESSIONAL CERTIFICATE IN DEFENCE INDUSTRY LEADERSHIP

With the Australian defence industry set to boom, this postgraduate qualification prepares professionals to become major players in the industry by developing their core leadership and collaboration skills in a defence-specific context.

Designed in conjunction with the Defence Teaming Centre, it builds on the successful South Australia Defence Industry Leadership Program. Key areas covered include: self-leadership, ethics, networks, collaboration, dealing with complexity, and managing change. Successful completion may also provide credit into the University's prestigious MBA program.

ENGAGEMENT

The University of Adelaide is committed to working with government, industry and the wider community to link groundbreaking research with real-life applications, and make the transformative effect of a university education as accessible as possible.

By partnering with us, your organisation will gain opportunities to access innovative research, ground-breaking discoveries and the very best students—the sector's next generation of leaders. We offer a broad range of engagement models and have decades of experience partnering with small and large organisations to deliver:

- multidisciplinary expertise at the centre of leading and emerging research
- access to world-class technologies and infrastructure
- dedicated organisational units, including the Institute for Photonics and Advanced Sensing (IPAS), Teletraffic Research Centre (TRC) and Australian Institute for Machine Learning (AIML)
- highly effective partnership models, including research strategy advice and support
- collaborative research leveraging third-party and government funding
- access to our national and global research partners, including our fellow Group of 8 universities and the DSTG
- access to University of Adelaide students through professional development programs, projects and our industry placement program
- customised and bespoke initiatives.

We look forward to working with you.

Government and industry strategic partnerships

The University has a proud history of defence-sector collaboration. We've worked extensively with both the Department of Defence and defence industry to: assist with workforce needs; provide specialised capabilities; and conduct high-quality, collaborative research programs. In relation to the latter, we also have extensive experience in transitioning our research into high-impact practice.

Our Defence stakeholders include:

- DSTG
- Vice Chief of the Defence Force Group
- Defence Chief Information Officer Group
- Deputy Secretary Capability Acquisition and Sustainment Group
- Australian Geospatial-Intelligence Organisation
- Australian Signals Directorate
- US Air Force Office of Scientific Research
- Direction générale de l'armement, France
- BAE Systems Australia
- Lockheed Martin Australia
- Boeing Defence Australia
- Dassault-Systèmes
- Australian Submarine Corporation
- Naval Group (France)
- Raytheon
- Inovor Technologies
- Defence Teaming Centre
- ASC.

The University is also a key member of South Australia's Defence Innovation Partnership.

National research centre participation

- Defence CRC for Trusted Autonomous Systems
- Data to Decisions CRC
- Cyber Security CRC
- Innovative Manufacturing CRC
- SmartSAT CRC
- ARC Centre of Excellence for Robotic Vision
- ARC Research Hub for Graphene Enabled Industry Transformation
- ARC Centre of Excellence for Mathematical & Statistical Frontiers.

LET'S COLLABORATE

If your organisation could benefit from the University of Adelaide's world-class facilities, resources or extensive research expertise, don't hesitate to get in touch. We look forward to expanding our associations with industry and strengthening our nation's sovereign defence and security capabilities.

In the first instance please contact:

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