CAPABILITY STATEMENT

QUEENSLAND DEFENCE
SCIENCE ALLIANCE

FOREWORD

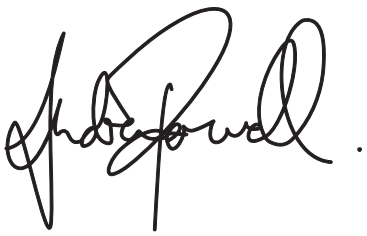
MINISTER'S STATEMENT

The Queensland Government is continuing to play a key role in the Queensland Defence Science Alliance (QDSA), working alongside the Australian Government's Defence Science and Technology Group and current member universities, The University of Queensland, Griffith University, James Cook University, Charles Darwin University, University of the Sunshine Coast, and University of Southern Queensland.

QDSA underscores Queensland's prime position to fulfil the future needs of Australian defence by fostering knowledge exchange and building productive partnerships across local research and business.

With an eye to the future, the Government will support QDSA to identify and activate defence industry investment opportunities that leverage Queensland's leading reserach domains such as quantum technologies, trusted autonomous systems, communications, and hypersonic flight.

I strongly recommend seizing the opportunities presented by QDSA to help meet our collective defence needs and objectives, including those relevant to Northern Australia.



The Honourable Andrew Powell MP
Minister for the Environment and Tourism
and Minster for Science and Innovation

ABOUT QDSA

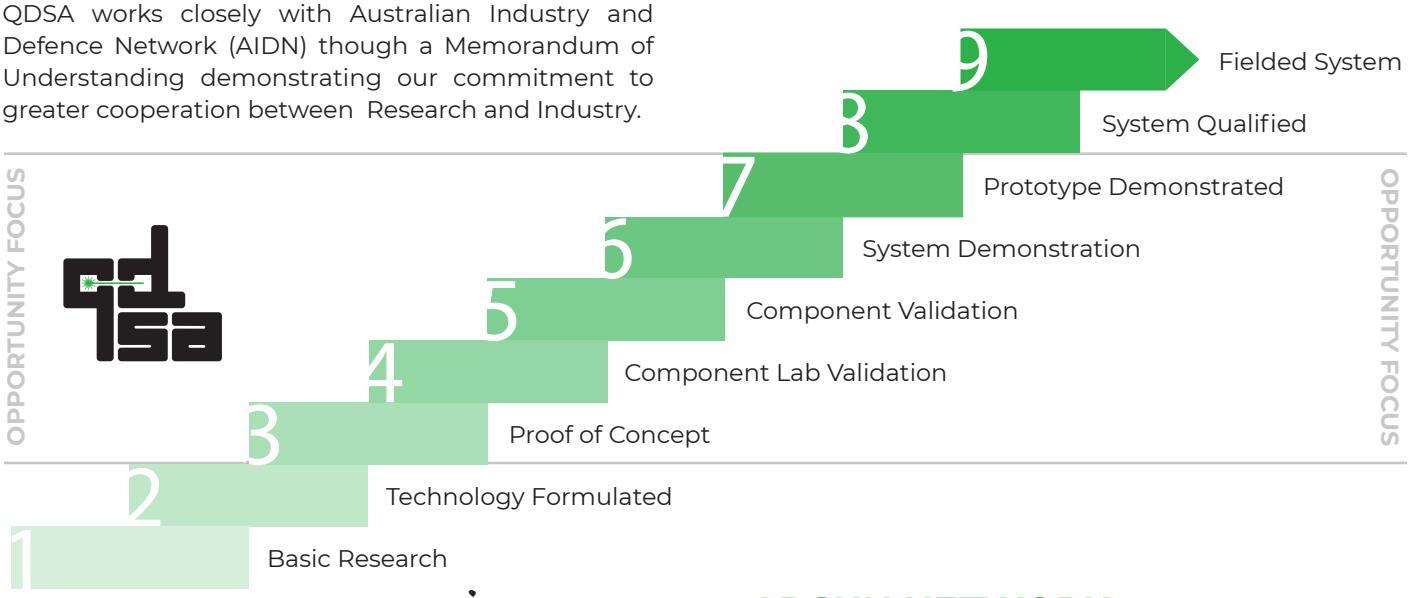
OUR MISSION

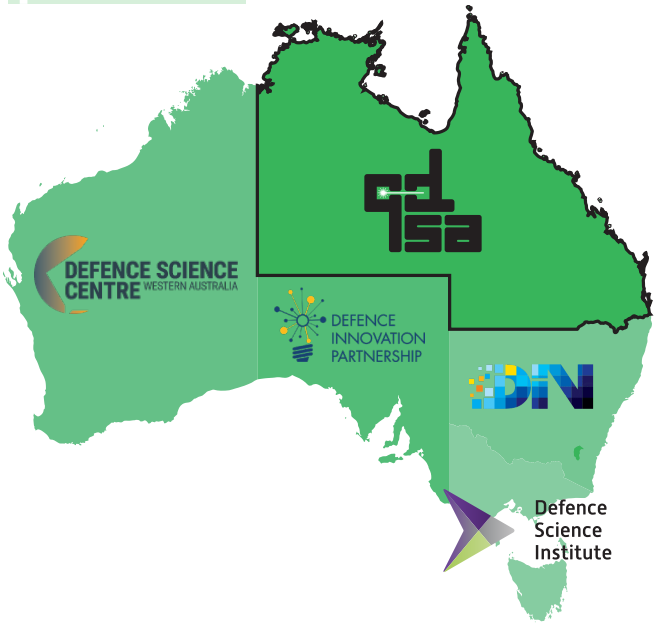
Our mission is to foster the growth and connection of an agile Defence innovation ecosystem by leveraging Queensland and the Northern Territory's (NT) unique strengths. We help accelerate the local innovation pipeline to deliver sovereign capability to the Australian Defence Force (ADF). Connection, collaboration, and communication is the foundation of our Alliance members below.

QDSA works closely with Australian Industry and Defence Network (AIDN) though a Memorandum of Understanding demonstrating our commitment to greater cooperation between Research and Industry.

TECHNOLOGY READINESS LEVELS

Technical Readiness Levels (TRL) help define the maturity of technology from TRL 1 - Basic Research to TRL 9 - a fully fielded and operational system. At QDSA we focus on proof of concept (TRL 3) up to prototype demonstrated (TRL 7) and seek out game changing research that can deliver asymmetric advantage. Collaborative research projects bring together the best research minds and industry partners to "pull through" new technology to prototype stage, propelling the innovation forward.





ADSUN NETWORK

At the National level DSTG facilitates the Australian Defence Science and Universities Network (ADSUN). ADSUN connects Defence with researchers from universities, industry and the broader research community, providing Defence with best research and development capabilities in Australia. The role of the ADSUN nodes is to:

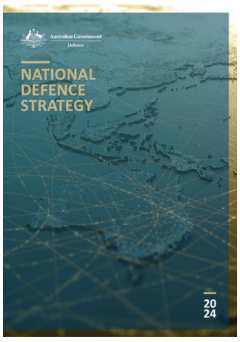
- Promote engagement between universities, industry and Defence
- Identify opportunities for technology and research and development
- Provide advice on Defence priorities, capabilities, needs and gaps
- Promote and showcase Defence research and innovation

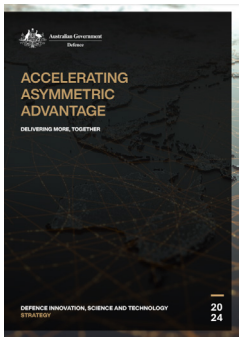
ALIGNMENT TO DEFENCE STRATEGY

Central to Defence policy, four key documents define Defence Strategy and Priorities, those being National Defence Strategy (NDS), an Integrated Investment Program (IIP), the Defence Industry Development Strategy (DIDS), and the Defence Innovation, Science & Technology (IS&T) Strategy. These critical documents set the strategy to be implemented by Defence and identify the key programs to be funded over the following decade. The NDS puts forward a fundamentally new approach to the defence of Australia and our interests, while the IIP outlines the Government's capability investment priorities.

The DIDS reaffirms the importance of collaboration between Defence, Industry, and Academia. Innovation pathways are critical to accelerating the development of new asymmetric capabilities and the Advanced Strategic Capabilities Accelerator (ASCA) is a $3.8B pathway established to rapidly translate disruptive new technologies into Defence capability in close partnership with Australian industry and research organisations. The DIDS also identifies ADSUN as a key enabler to supporting this pull-through of technology from research to industry.

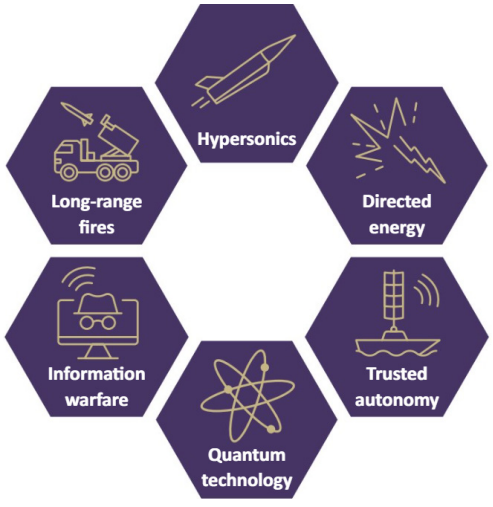
QDSA is uniquely placed to support academia and industry engagement with Defence and ASCA around opportunities for Queensland and the Northern Territory in IS&T. The Defence IS&T Strategy focuses on supporting the NDS strategy of denial through accelerated innovative solutions and growing the IS&T ecosystem through strategic partnerships.





Understanding these strategic level documents has allowed QDSA to focus on two key themes: **Innovative asymmetric technologies** and **Northern Australian capabilities.**

The first theme is drawn directly from the six IS&T priorities identified in the NDS, as shown below. QDSA is well placed to support these six IS&T priorities as they relate to leading capabilities within our member network.



The second theme relates to the increased focus on Defence in the north of Australia. A significant number of Army amphibious and land capabilities are located in Queensland and the Northern Territory, providing an opportunity to innovate and accelerate the pull-through of new technologies for Defence in the north of Australia. The increased opportunities around trusted autonomy as a force multiplier in the maritime and land domains provide an excellent example of doing more with limited resources. Our Alliance membership is ready to solve the challenging research needs of Defence and industry priorities. This capability statement aims to map the key capabilities our network can offer to prospective industry partners looking to accelerate innovation under these two themes.

CAPABILITY MAPPING

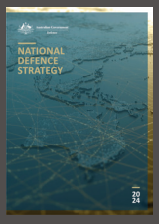
This diagram shows areas of university world-leading capability against key defence priorities suited for R&D support. Detailed information on QDSA members' specific capabilities against each priority is contained in their respective overview statements on pages 8-15.

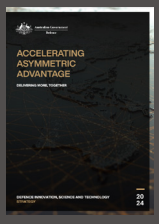
	Queensland & NT (QDSA)						Defence Strategic Policies					
QDSA Priority Areas	University of Queensland	Griffith University	James Cook University	Charles Darwin University	University of the Sunshine Coast	University of Southern Queensland	AUKUS Pillar II Advanced Capabilities	ASCA Key Priority Areas	DSTG STaR Shots	Defence Health & Logistics Research Priorities	National Defence Strategy 2024	Integrated Investment Program 2024
Undersea Capabilities, including Surveillance	■		■		■		■		■		■	■
Quantum Technologies, including Sensing and Communication	■	■	■			■	■	■	■		■	■
Autonomous Systems, including Trusted Autonomy	■	■	■	■	■	■	■	■	■		■	■
Artificial Intelligence, including Generative AI	■	■	■	■	■	■	■	■			■	■
Information Warfare and Cyber	■	■		■	■		■	■			■	■
Agile Command and Control	■	■	■		■				■		■	■
Hypersonics and Counter-Hypersonics	■		■			■	■	■			■	■
Electronic Warfare and Directed Energy	■			■			■	■	■		■	■
Long-Range Fires, GWEO and IAMD	■					■		■			■	■
Space Capabilities, including Launch	■				■	■			■		■	■
Workforce and Sustainment, including Data Intelligence	■	■	■			■				■	■	■
Logistics Networks and Supply Chain Resilience	■	■	■		■	■				■	■	■
Fuel Supply, Storage and Disposal and Renewable Energy	■	■	■		■	■				■		■
Advanced and Remote Manufacturing	■	■	■	■		■					■	■
Multidisciplinary Material Sciences	■	■	■	■	■	■	■	■	■			■
Personnel Protective Measures, including CBRN-D	■	■							■			■
Biotechnology and Human Enhancement	■	■	■		■	■				■		
Deployed Health, including Evacuation	■	■	■	■	■	■				■	■	

WHAT WE DO

Understand and **COMMUNICATE** defence needs from strategic guidance

Australian Government
Defence





CONNECT industry with university research

Industry

Alliance Members

Support **COLLABORATION** projects to boost needed defence innovation

Collaborative Research Grants (CRG)

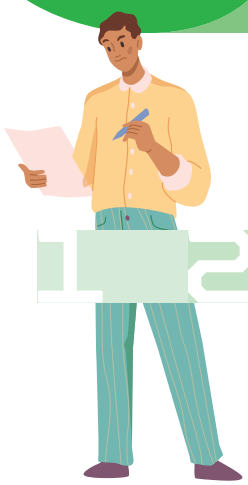
Industry Collaboration

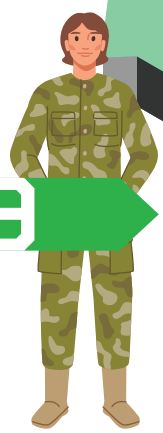
Australian Government
Defence

STaR Shots

ASCA
Advanced Strategic Capabilities Accelerator

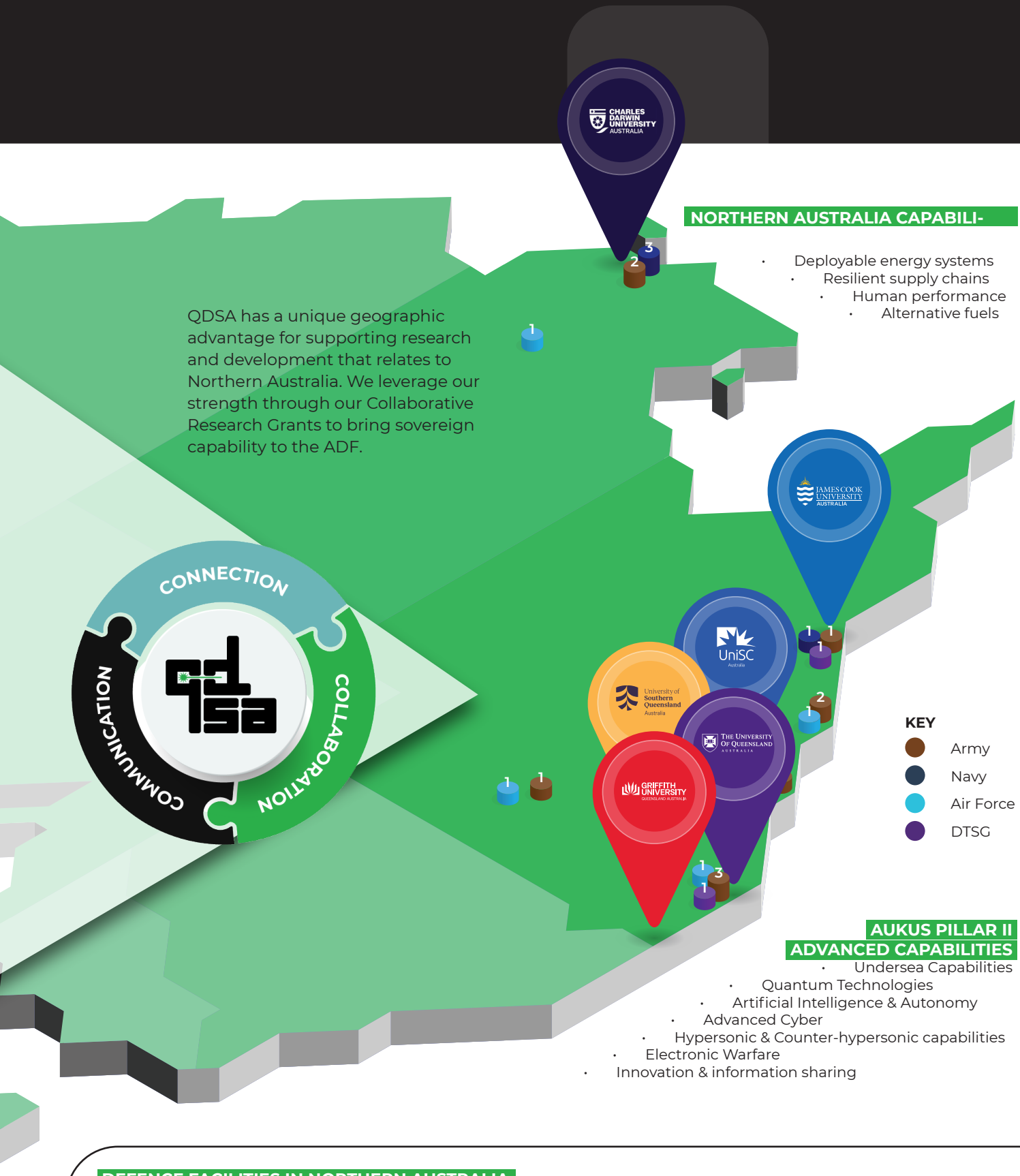
Missions
Innovation Incubations
Emerging and Disruptive Technologies





1 2 3 4 5 6 7 8 9

MATURITY (TECHNOLOGY READINESS LEVEL)



QDSA has a unique geographic advantage for supporting research and development that relates to Northern Australia. We leverage our strength through our Collaborative Research Grants to bring sovereign capability to the ADF.

NORTHERN AUSTRALIA CAPABILI-

- Deployable energy systems
- Resilient supply chains
- Human performance
- Alternative fuels

AUKUS PILLAR II ADVANCED CAPABILITIES

- Undersea Capabilities
- Quantum Technologies
- Artificial Intelligence & Autonomy
- Advanced Cyber
- Hypersonic & Counter-hypersonic capabilities
- Electronic Warfare
- Innovation & information sharing

DEFENCE FACILITIES IN NORTHERN AUSTRALIA

- HMAS Coonawarra (Darwin)
- Headquarters NORCOM (Larrakeyah)
- RAAF Amberley (Brisbane)
- RAAF Garbutt (Townsville)
- RAAF Darwin
- Mt Bundey Training Area (NT)
- Ross Island Water Transport (Townsville)
- Townsville Field Training Area
- 1st Brigade (Darwin)
- 3rd Brigade (Townsville)
- 7th Brigade (Enoggera)
- Deployed Joint Force Headquarters (Enoggera)
- Headquarters 1st Division (Enoggera)
- Aviation Training Centre (Oakey)
- Borneo Barracks (Cabarlah)
- HMAS Cairns (Cairns)
- Shoal Water Bay Training Area (Rockhampton)
- Bradshaw Range (NT)
- Delamere Range (NT)
- Shoal Bay Receive Station (Darwin)
- US Marine Expeditionary Force Rotation (Darwin)
- DSTG Eagle Farm
- DSTG Innisfail

GRIFFITH UNIVERSITY

GRIFFITH UNIVERSITY
QUEENSLAND AUSTRALIA

Campus Locations

South Bank
226 Grey St,
South Brisbane QLD 4101
07 3735 7111

Nathan
170 Kessels Rd,
Nathan QLD 4111
07 3735 7111

Mt Gravatt
176 Messines Ridge Rd,
Mount Gravatt QLD 4122
07 3735 7111

Logan
68 University Dr,
Meadowbrook QLD 4131
07 3735 7111

Gold Coast
1 Parklands Dr,
Southport QLD 4215
07 3735 7111

DEFENCE CAPABILITIES

Quantum Technologies, including Sensing and Communication
- Integrated quantum photonics
- Chip-based waveguides
- Quantum superconductor technologies
- Trapped-ion techniques for bioparticle/biomolecule research

Logistics Networks and Supply Chain Resilience
- Catalysts for synthetic fuels and renewables
- Power and energy Systems including microgrids
- Logistic systems, enterprise architecture, distributed manufacture, and workforce development

Multidisciplinary Material Sciences
- Silicon carbide, micro/nano sensors and hybrid materials
- Carbon dots for water quality monitoring, sensing heavy metals, developing drug molecules

Deployed Health including Evacuation
- Mental health, wellbeing and suicide prevention
- Human performance and decision making
- Biomedical and rehabilitation engineering

Other Defence Science Capabilities
- Critical defence and regional security issues
- Public policy design and delivery

FACILITIES & INFRASTRUCTURE

Quantum Technologies, including Sensing and Communication
- Cohabitated Brisbane-Gold Coast lab-to-lab fibre link for long-distance quantum communication testing
- Australian Attosecond Science Facility for ultrafast and intense-field laser development

Advanced and Remote Manufacturing
- Advanced Design and Prototyping Technologies Institute (ADaPT)
- National Hydrogen Materials Reference Facility
- Queensland Micro and Nanotechnology Centre (QMNC)

Biotechnology and Human Enhancement
- Physical containment (PC) bioanalysis facility at Biosafety Level 3
- NatureBank (20k natural product extract, 112k natural product fractions, 30k biota samples)

Other Defence Science Facilities
- Australia Institute for Suicide Research and Prevention (AISRAP)
- Griffith Asia Institute

The Griffith University Defence Network co-creates solutions for Defence and Defence industry needs, enabling unprecedented access to world-class research expertise. Our Veterans Pathway Program offers recognition for defence service and provides current and aspiring Defence personnel with practical skills and knowledge to accelerate career progression.

ACHIEVEMENTS & ACTIVITIES

The Institute for Biomedicine and Glycomics is a world leader in the discovery and development of next generation drugs, vaccines and diagnostics. Key discovery areas include cancer, infectious diseases, Parkinson's disease, drug resistance and spinal cord injury repair. Our Biospine program integrates the most promising advances in human history for spinal cord injury, using thought control, electrical simulation, and drug therapy in an attempt to restore function in paralysis.

Our QMNC expertise in materials development, silicon carbide microelectronics, micro-electromechanical systems and microfluidics help develop cutting-edge technologies such as "lab-on-a-chip" and a variety of sensors.

The Centre for Quantum Dynamics comprises both theory groups and experimental laboratories, where our cutting-edge research encompasses ultrafast quantum processes, quantum computing, quantum networks, quantum metrology, quantum foundations and quantum biophysics. Research into human performance includes optimising task performance and cognitive abilities in real-world decision making as well as mental health, wellbeing and suicide prevention.

JAMES COOK UNIVERSITY

JAMES COOK UNIVERSITY AUSTRALIA

Campus Locations

Townsville
1 James Cook Dr,
Douglas QLD 4811
1800 246 446

Cairns
88 McGregor Rd,
Smithfield QLD 4878
1800 246 446

DEFENCE CAPABILITIES

Undersea Capabilities, including Surveillance
- Remote sensing through acoustic monitoring and radar
- Littoral systems autonomy
- Remote undersea sensing and processing
- Sensors and battery materials
- Anti-biofouling materials

Artificial Intelligence, including Generative AI
- Human-centred AI and large language modelling
- AI for autonomous systems

Agile Command and Control
- C2 and decision sciences
- Wireless communication technologies
- Simulation systems and environments

Multidisciplinary Material Sciences
- Microgrids and renewables
- Advanced additive high-temperature materials – high-speed systems/space
- Green hydrogen generation and waste-to-energy
- Material testing under tropical conditions

Biotechnology and Human Enhancement
- Human performance in the tropics
- Medical countermeasures
- Socioeconomic impacts of Defence policy

FACILITIES & INFRASTRUCTURE

Undersea Capabilities, including Surveillance
- Centre for Tropical Biosecurity
- Centre for Tropical Water and Aquatic Ecosystem Research

Artificial Intelligence, including Generative AI
- AI@JCU

Advanced and Remote Manufacturing
- Advanced Materials & Manufacturing Hub
- Waste-to-Resource Facility

Multidisciplinary Material Sciences
- Marine Geophysics Laboratory
- Cyclone Testing Centre

Deployed Health, including Evacuation
- Australian Institute of Tropical Health and Medicine (AITHM)
- Centre for Tropical Bioinformatics and Molecular Biology
- Indigenous Education and Research Centre

Other Defence Science Facilities
- Links to the NQ SPARK Advanced Environmental Simulation Facility

JCU is a research-intensive regional institution in tropical Northern Australia with strong Pacific links and campuses in Townsville, Cairns and Singapore. World-leading researchers collaborate within state-of-the-art facilities to drive innovation and impactful solutions that advance regional and national security interests for Defence industries and communities.

ACHIEVEMENTS & ACTIVITIES

JCU has developed links with Defence and is located in close proximity to Australia's largest military bases and training areas and with strong regional links across a wide range of capability inputs. JCU recent Defence related achievements and activities include:

- Medical training and research simulation
- Agile C2 STaR Shot – decision and team performance research
- Human Performance Optimisation with ADF personnel
- Remote Undersea Surveillance STaR Shot
- Simulation-enabled incident HUM-T test and evaluation
- Adverse weather and facilities test and evaluation

THE UNIVERSITY OF QUEENSLAND

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Campus Locations

St Lucia
280-284 Sir Fred Schonell Dr, St Lucia QLD 4067
07 3365 1111

Gatton
5391 Warrego Hwy, Gatton QLD 4343
07 5460 1276

Herston
11 Wyndham St, Herston QLD 4006
07 3365 1111

Dutton Park
20 Cornwall St, Woolloongabba QLD 4102
07 3346 1900

DEFENCE CAPABILITIES

Quantum Technologies, including Sensing and Communication
- Magnetic field sensors
- QA-PNT and situational awareness
- Secure quantum communications
- Nano-photonic computing

Artificial Intelligence, including Generative AI
- AI applied to autonomous vehicles
- Human-centered AI
- Legal, ethical and social implications of autonomous systems
- Responsible automated decision-making

Information Warfare and Cyber
- Cyber security, autonomy and automation
- Data privacy and user data control
- Cyber law, ethics and criminology

Hypersonics and Counter-Hypersonics
- Computational fluid dynamic analysis
- Hypersonic electric propulsion and magnetohydrodynamics
- Flight testing experimentation and analysis

Multidisciplinary Material Sciences
- High-temperature polymer and ceramic matrix composites

Deployed Health, including Evacuation
- Human cognition, neuroscience, mental health, stress, and fatigue
- Medical countermeasures

FACILITIES & INFRASTRUCTURE

Autonomous Systems, including Trusted Autonomy
- UQ Robotics Design Lab (RDL) - drone control and flight systems
- Centre for Future Autonomous Systems and Technologies (FAST)

Information Warfare and Cyber
- Agile Security Operations Centre (ASOC)
- Device TestLab
- Cyber War Rooms

Hypersonics and Counter-Hypersonics
- Australian Program Office for Advanced Hypersonics (APOAH)
- Centre for Hypersonics
- T4, X2, X3 and X3R shock tunnels
- Custom made furnace – heating materials to 3000°C

Multidisciplinary Material Sciences
- Australian National Fabrication Facility Queensland (ANFF-Q)
- Centre for Advanced Materials Processing and Manufacturing (AMPAM)

Biotechnology and Human Enhancement
- Australian Institute of Bioengineering and Nanotechnology (AIBN)
- Queensland Brain Institute
- Quantum Centre of Excellence in Biotechnology (QUBIC)

> UQ Strategic Partnerships supports researchers in the development of major initiatives informed by national industry and defence policy priorities, and broader commitments to strategic frameworks with allies and partners.

ACHIEVEMENTS & ACTIVITIES

As Queensland's largest and most comprehensive university, the University of Queensland (UQ) is well-placed to contribute its science and technological innovation, advanced testing infrastructure and knowledge leadership to achieve the priorities outlined in the National Defence Strategy. UQ's research excellence and talent pipeline translates into capability and commercial outcomes in a broad range of areas.

Some of these include:

- Autonomous systems software development
- Hypersonic science and high-temperature materials for defence and space
- Design and fabrication of advanced superconducting devices for quantum computing
- Handheld Chemical, Biological, Radiological and Nuclear (CBRN) detection
- Magnetic & acoustic quantum sensors for GPS-denied navigation on autonomous vehicles
- Quantum Key Distribution (QKD) countermeasures
- Nano-phonic computing
- Quantum Error Correction

CHARLES DARWIN UNIVERSITY

CHARLES DARWIN UNIVERSITY AUSTRALIA

Campus Locations

Casuarina
Ellengowan Dr,
Brinkin NT 0810
1800 061 963

Palmerston
80 University Ave,
Palmerston NT 0830
08 8946 7800

Darwin
54 Cavenagh St,
Darwin City NT 0800
1800 654 865

Katherine (Rural)
Lot 5626 Stuart Hwy,
Katherine NT 0850
1800 779 577

Alice Springs
10 Grevillea Dr,
Alice Springs NT 0871
1800 654 865

Sydney
Levels 8 – 11 815 George St,
Haymarket NSW 2000
02 8047 4100

DEFENCE CAPABILITIES

Autonomous Systems, including Trusted Autonomy
- Remote-area drone operations including medical deliveries

Artificial Intelligence, including Generative AI
- Data analysis and decision support
- Explainable AI (trusted autonomy)

Information Warfare and Cyber
- Human-centric cyber security
- Digital forensics and cyber criminology
- Explainable AI-enabled cybersecurity
- Malware detection and attribution

Electronic Warfare and Directed Energy
- Gigahertz/terahertz photonics in communication and radar systems
- Photonic signal processing
- Optically controlled phased arrays

Advanced and Remote Manufacturing
- Cold spray metal 3D printing
- Combat-proven deployable parts fabrication in remote/austere conditions

Multidisciplinary Material Sciences
- Advanced alloy development and certification
- Nanofibre materials development
- Tropical equipment development and testing

Deployed Health, including Evacuation
- AI-enabled automated in-theatre health monitoring and diagnostics
- Tropical health

FACILITIES & INFRASTRUCTURE

Autonomous Systems, including Trusted Autonomy
- North Australian Centre for Autonomous Systems
- Katherine Flight Test Range

Artificial Intelligence, including Generative AI
Information Warfare and Cyber
- NT Academic Centre for Cyber Security and Innovation

Electronic Warfare and Directed Energy
- Fibre-optics and Photonics Laboratory

Advanced and Remote Manufacturing
Multidisciplinary Material Sciences
- Industry 4.0 Testlab
- Nanofibre Fabrication Laboratory
- SPEE3D Warp Speed 3D Printer
- Pavement Laboratory

Deployed Health, including Evacuation
- Biomedical Engineering and Health Informatics Research Laboratory
- Menzies School of Health Research

Your partner for Defence in the North and beyond.

As Australia's only university headquartered in the NT, CDU is a unique contributor to Australia's defence ecosystem. With a history of support to Defence, world leading research capabilities, and vast experience working in northern Australia, CDU supports rapid and effective R&D in a key ADF operational environment.

ACHIEVEMENTS & ACTIVITIES

CDU's recent achievements and activities include:

- Austere infrastructure CASA-compliant drone operations
- Computational algorithm development and AI model hardware performance optimisation
- Human centric cyber security (countering social engineering), forensic linguistics, privacy and security in edge computing
- Microwave photonic signal processing
- United States Navy pressure vessel components and ultra-large printed metal items (2400mm diameter, 4000kg)
- Corrosion and marine growth resistant alloys, flame and impact-resistant nanofibre materials development
- Health monitoring and disease diagnosis via AI-enabled analysis of biosignals (ECG, EEG, APG) and imagery using edge computing.

UNIVERSITY OF THE SUNSHINE COAST

UniSC
Australia

Campus Locations

Sippy Downs
90 Sippy Downs Dr,
Sippy Downs QLD 4556
07 5430 1234

Moreton Bay
1 Moreton Pde,
Petrie QLD 4502
1800 064 702

Fraser Coast
16 University Dr,
Hervey Bay QLD 4655
1800 074 721

Caboolture
Cnr Manley and Tallon St,
Caboolture QLD 4510
1800 074 721

Gympie
40 Cartwright Road,
Gympie QLD 4570
1800 074 721

Adelaide
Reserve Bank Building
182 Victoria Square,
Adelaide SA 5000

DEFENCE CAPABILITIES

Autonomous Systems and Trusted Autonomy
- Advanced robotics and automation laboratory with industrial robotics
- Mechatronic engineering systems development and control
- AI-enabled autonomous vehicle research and development
- Trusted autonomy applications for defence systems
- Human Factors and Ergonomics theories, models, methods, and principles to support the design of autonomous systems

Artificial Intelligence and Machine Learning
- Smart Computing research cluster focusing on AI, IoT, and Big Data applications
- Machine learning algorithms for sensor data analysis and decision support
- Intelligent sensors and circuits development for defence applications
- AI applications in cybersecurity and digital forensics

Information Warfare and Cyber Security
- Cyber security research and education programs
- Digital forensics and cyber criminology capabilities
- Information systems security and risk management
- Gamified cyber security training platforms
- Human Factors and Ergonomics methods in cyber security

Advanced Materials and Manufacturing
- Advanced Materials and Manufacturing research cluster
- 3D printing and additive manufacturing (including metal printing capabilities)
- CNC manufacturing and rapid prototyping facilities
- Materials characterisation and testing under harsh conditions

Agile Command and Control
- Design and evaluation of command and control systems
- Effective command and control, such as situation awareness, teamwork, decision making, and distributed cognition

FACILITIES & INFRASTRUCTURE

Advanced Engineering and Technology
- Engineering Learning Hub with 3D visualisation facilities
- CAVE2™ immersive 3D visualisation space
- Manufacturing laboratory with CNC machines and rapid prototyping
- Robotics and automation laboratory with industrial robotics

Advanced Computing and Simulation
- High-performance computing facilities
- Interactive visualisation and collaboration studios
- Digital simulation laboratories for engineering and science
- Secure computing environments for defence research

Health and Medical Research
- Thompson Institute with advanced neuroimaging capabilities
- Clinical Trials Centre for defence-related health research
- Sunshine Coast Health Institute with clinical simulation facilities
- Digital Health Productivity Laboratory
- National PTSD Research Centre
- Centre for Human Factors and Systems Science

> UniSC supports defence related research that strengthens connections within local and across national defence ecosystems. Our research community is characterised by experienced and emerging talent in key defence priority areas, with a focus on human behaviour. UniSC partners with industry, government, and other research institutions to deliver innovative solutions that address challenges of national importance.
>
> Air Chief Marshal Sir Angus Houston AK, AFC (Ret'd) (Chancellor, UniSC)

ACHIEVEMENTS & ACTIVITIES

UniSC has established itself as a leading regional university with significant research impact and industry engagement relevant to defence applications. Through the Innovation Centre, the university supports technology commercialisation and industry-focused R&D, with a strong track record of translating research into practical solutions. Defence-relevant research achievements include:

- Advanced robotics and autonomous systems development
- Artificial intelligence applications for decision support and threat detection
- Quantum sensing and materials characterisation research
- Cybersecurity and digital forensics capabilities development
- Environmental monitoring and climate adaptation technologies
- Human Factors and human performance research
- Expertise in systems science and complex systems modelling
- The design and evaluation of new digitised battle management systems
- The analysis of command and control activities
- Safe Introduction of Autonomous Vehicles (SAVI) project with ARC
- Understanding and preventing dysfunctional behavior (Office of Naval Research, US Navy)

UNIVERSITY OF SOUTHERN QUEENSLAND

University of Southern Queensland Australia

Campus Locations

Toowoomba
West St,
Toowoomba QLD 4350
07 4631 2100

Springfield
37 Sinnathamby Blvd,
Springfield QLD 4300
07 3470 4400

Ipswich
11 Salisbury Rd,
Ipswich QLD 4305 07 4631 2100

DEFENCE CAPABILITIES

Hypersonics and Counter-Hypersonics
- Australia's longest duration hypersonic test facility
- Design and testing of propulsion systems, including scramjets and hybrid rocket engines

Multidisciplinary Material Sciences
- Centre for Future Materials provides advanced design, manufacture, and testing capabilities for aerospace and defence
- Automated filament winding and composite repair systems for high-performance applications
- Expertise in ultra-high-temperature ceramics and fire testing up to 3500°C

Space Capabilities, including Launch
- Centre for Astrophysics operates Queensland's only professional teaching and research observatory
- Key support for NASA's TESS mission through MINERVA-Australis telescope array
- Space debris tracking and space situational awareness research with DLR SMARTNet

Artificial Intelligence and Autonomous Systems
- AI-based perception, autonomy, and guidance systems for unstructured environments
- Applications in robotics, machine learning, and data fusion for defence and aerospace operations

Cyber Modelling and Decision Intelligence
- Trusted autonomy and simulation for mission planning and secure communication systems
- Digital twins and predictive modelling for defence system integration

Biotechnology and Human Enhancement
- Human performance research in resilience, cognition, and health technology

FACILITIES & INFRASTRUCTURE

Engineering and Space Research
- Hypersonic Wind Tunnel – national capability for high-velocity testing
- Mount Kent Observatory – planetary research, discovery and object tracking

Quantum and Superconducting Sciences
- Cryogenic quantum hardware test lab – provision of quantum hardware and superconducting test services to industry

Multidisciplinary Material Sciences
- Centre for Future Materials – composites, robotics, additive manufacturing, and thermal labs
- AI and Robotics Laboratories – applied autonomy and data science research centres

Health and Human Science
- Biomedical laboratories and psychology facilities for resilience and performance research

> The University of Southern Queensland delivers world-class research and infrastructure across hypersonics, composites, autonomy, and space science. Positioned as a strategic partner for Defence and industry, UniSQ enables sovereign capability aligned with the priorities of the Defence Science and Technology Group.

ACHIEVEMENTS & ACTIVITIES

The University of Southern Queensland contributes leading expertise, world class facilities and sovereign capability across hypersonics, space systems, advanced materials, autonomy and human performance, aligning directly with Defence Science and Technology Group priorities in emerging and integrated defence technologies.

UniSQ's recent achievements and activities include:

- Establishment of the Australian Cryogenic and Quantum Hardware Test Facility to provide specialised services to industry
- Leads the Innovative Launch, Automation, Novel Materials, Communications, and Hypersonics (iLAuNCH) Trailblazer for advanced space manufacturing
- Defence Science and Technology Group collaborations in hypersonics, AI and materials design
- Recognised leader in composite innovation and repair for aerospace applications
- Global projects with NASA, ESA and JAXA in space and hypersonic science

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