The University of Tasmania’s Defence Network connects academia with industry to enhance Australia’s defence capability and support our nation’s security

> utas.edu.au/defence-network
Through its Defence Network, the University of Tasmania has aligned significant research and workforce development resources with national defence interests.

The University has co-invested with key partners to establish a suite of unique facilities and innovative technical platforms purposed to meeting modern defence needs.

The Defence Network is the portal through which collaborators gain access to these specialist facilities and the pool of researchers and technical personnel who enable our defence-aligned research and development agenda.

The University is contributing to the development and application of emerging and future technologies across all four of Australia’s defence-oriented science and technology streams – Land, Sea, Air and Joint.

Our multidisciplinary strengths in meeting current and future market demand are illustrated across three core defence themes – Naval Systems and Maritime Assets, Remote Sensing and Platforms, and Human Systems and Resilience.

The themes are the foundation for a performance testing and evaluation site – a Defence Innovation and Design Precinct – which will offer support for industry and partners to enable current and future collaborations.

The University collaborates locally, nationally and internationally with many different organisations to ensure we are closely connected to defence needs.

We are linked intimately with local small and medium-sized enterprises who offer services and products into the global defence supply chain.

The Defence Network is the Tasmanian gateway for access to world-class R&D efforts and workforce development opportunities supporting Australia.

Professor Rufus Black
President and Vice-Chancellor
E Vice.chancellor@utas.edu.au
Core themes contribute to Australia’s national defence agenda

The University of Tasmania is a national leader in industry-led research. We have a proven track record of working with industry and government in defence and related fields to devise innovative technology-enabled solutions for the global stage.

Through the University’s Defence Network, key linkages exist across all research and education areas of the institution to ensure an integrated approach to innovative problem solving within a defence-aligned context.

These linkages form the multidisciplinary strengths of our expertise across three core defence themes – Naval Systems and Maritime Assets, Remote Sensing and Platforms, and Human Systems and Resilience.

Naval Systems and Maritime Assets

Digitally integrated platform stewardship bringing industry 4.0 and integrated sustainment to the fifth Generation of naval capability. New policy and technology will bring industry 4.0 and integrated logistics to strengthening Australia’s naval capabilities. The University’s Defence Network is poised to support navy and defence in key areas of this transition with a proven track record in ship and component design, logistics, maritime modelling and simulation, experimentation, and testing and evaluation. State-of-the-art testing and research facilities further strengthen the Network’s offerings.

Remote Sensing and Platforms

There is a growing need in defence to adopt effective and proven methods to deploy assets and capture, aggregate, distribute and act on remote sensor data. A core foundation to the University’s Defence Network is its strength in design, testing and operation of remote and autonomous vehicles, as well as sensor processing (including hyperspectral). The Network offers extensive expertise and experience in remote sensors and vehicles, data fusion and communications across sea, land and space environments.

Human Systems and Resilience

The physical health and cognitive performance of persons under demanding situations is paramount to defence force operations. The University offers cross-disciplinary capability of cognitive psychology, modelling, sports therapy and rehabilitation, food innovation, chemical detection and medical research to understand, predict and improve the wellbeing and performance of defence personnel to maximise operational effectiveness.

The Australian Maritime College (AMC) is globally recognised as a centre for excellence, and is a specialist Institute of the University of Tasmania. The College’s multi-million dollar suite of specialist teaching, learning and research facilities are internationally acclaimed and are used by Defence, industry and government organisations world-wide to answer leading edge research questions.
University of Tasmania
Defence Network
The ongoing evolution and transition of the Australian Maritime College’s extensive suite of research and training facilities into an Innovation Precinct at the University’s Newnham Campus will focus on joint academia and industry development, testing and performance evaluation of seagoing and sea-based systems.

It will also support ‘wet’ shore infrastructure in the emerging needs of the Naval Shipbuilding Enterprise.

The Australian Maritime College (AMC) is home to the Australian National Hydrodynamics Research Centre and operates three complementary testing facilities including the Cavitation Research Laboratory (offering a unique ability to control bubble content), a Towing Tank (highly utilised for naval surface vessel and submarine research), and Model Test Basin (conducting major research into ship-to-ship interactions and manoeuvring in shallow and confined waters).

It has played a key role in Naval capability development, including hydrodynamic modelling and simulation as part of the design and risk reduction for the re-development of critical Naval Base port infrastructure.

AMC continues to enhance its capability in contemporary maritime engineering research with the recent introduction of a Maritime Autonomy Laboratory, current development of a Sonar Testing Facility in collaboration with Thales and DSTG, and near-term commissioning of an Underwater Collision Research Laboratory for understanding the structural survivability of submarines and underwater vehicles.

It is envisaged that the Innovation Precinct will enhance AMC’s ability to support integrated capability development and sustainment and provide innovative technology-enabled and collaborative solutions with industry to cater for modern Defence needs.

It will also continue to service the contemporary and emerging needs of the broader maritime industry, including the renewable energy sector.

The College offers extensive training facilities within its Maritime Simulation Centre, Emergency Response Centre and fleet of training vessels and watercraft.

> A testing and evaluation Defence Precinct will provide end-to-end solutions through world-class facilities and capabilities.
The Defence Network provides testing and evaluation to deliver end-to-end solutions for Australia’s defence industries.

Key capabilities include:

Maritime autonomy
- Unmanned maritime systems
- Magnetic and payload sensors

Port and vessel modelling and simulation
- Integration of training and development with ships, tugs and VTS operations

Surface and underwater vehicle hydrodynamics
- Fluid dynamics and fluid structure interaction of ship and submarine structures
- Cavitation physics and hydroacoustics
- Acoustic signature, acoustic monitoring

Intelligence analytics
- Language technology and fusion
- Human and social modelling and analysis
- Analytic interaction
- Biometrics

Intelligence systems
- Advanced geospatial intelligence exploitation
- Radar processing and exploitation
- Electro-optic processing and exploitation

Clear skies and geodesy
- Radio astronomy
- Optical astronomy
- Radio communications
- Space geodesy
- Analytical geoscience
- Geodetic GPS (Global Navigation Satellite System)
- Geospatial modelling

Big Data
- New algorithm and visualisation approaches
- Human/computer interaction
- 3D modelling
- Geophysical modelling

Next generation hybrid autonomous vehicles – underwater and unmanned aerial
- Drone systems – surveillance of ocean and sea ice conditions
- Autonomous underwater vehicles – training, use in ocean, industry, engineering and defence applications (platform autonomy and sustained operations)

Human systems
- Cognition and behaviour
- Food and nutrition
- Automation and situational awareness

Weapons and combat systems assessment
- Advanced modelling and simulation
- Weapons modelling and analysis
- Explosive detection technology

Key infrastructure includes:
- Centre for Food Innovation (Tasmanian Institute of Agriculture)
- Human Interface Technology Laboratory (HITLab) for advanced human-computer interface (HCI) technologies
- Australian Research Council Training Centre for Portable Analytical Separation Technologies (ASTech)
- Institute for Marine and Antarctic Studies (IMAS)
- Southern Ocean Observing System
- Maritime Simulation Centre
- AuScope Array – $x$ 12 m radio telescopes (TAS, WA, NT) including Very Long Baseline Interferometry, enabling integrated spatial measuring system to support GPS and GNSS. 30m ex-telecommunications telescope near Ceduna, SA.
- Unmanned aircraft systems (UAS)
- Cavitation Research Laboratory
- Diesel Spray Test Facility
- Underwater Collision Research Facility
- Towing Tank Research Facility
- Model Test Basin
- Autonomous Underwater System Research Facility
Partners of choice

The University has and continues to support Australian industry and government agencies to develop and build defence and security capacity and capabilities.

We have more than 400 business partners sector-wide, helping to create over $500 million of benefits to industry. Our success has led to being ranked 12th in Australia for defence-aligned R&D investment through proven partnering.

Companies are opting to take advantage of our collaborative excellence, specialised facilities and know-how in the development, assessment, and commercialisation of new technologies to be deployed in challenging environments.

The development of a modern defence force requires different modes of workforce abilities, and the University is making key contributions to capacity-building in this sphere.

We are one of 22 Australian universities who have forged an alliance with Defence Science and Technology Group (DST) and we are now part of the Defence Science Institute network.

The University also works in close partnership with the Tasmanian Government to foster the unique and specialist capabilities of state-based industry and their contributions to the global defence supply chain.

We are deeply embedded in warfare development working in a new partnership with TAFE South Australia and Hunter TAFE to help support the National Shipbuilding College.
The University of Tasmania is proud to be associated with each of our partners across the industry, government and research sectors:

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Designing for the next generation of naval capability

Australia has an ambitious multi-billion dollar naval shipbuilding program and the University of Tasmania is right at the forefront.

The ARC Research Training Centre for Naval Design and Manufacturing (RTCNDM) is the only Defence-centred ARC Industrial Transformation Training Centre and it is based at the University of Tasmania’s Australian Maritime College.

The RTCNDM is training the next generation of industry focused, highly skilled engineers and engineering researchers through a combination of research and professional training in an industrial environment.

These researchers focus on developing advanced techniques to efficiently design, construct, and sustain the naval platforms, providing significant economic benefits to the nation. This is the first time specialist Work Integrated Learning has been added to higher degrees by research, giving postgraduate students and postdoctoral researchers critical industry experience while contributing to Australia’s Defence goals.

The $3.8 million centre, funded through the ARC’s Industrial Transformation Training Centres scheme, is a collaboration between the University of Tasmania, the University of Wollongong, Flinders University, ASC Pty Ltd, Babcock Pty Ltd, Defence Science and Technology Group (DST), Defence Materials Technology Centre, Thales Australia Ltd, Austal, Serco Defence, and PMB Defence Engineering Pty Ltd.

The RTCNDM delivers innovative research solutions by supporting and connecting a postgraduate equipped network of engineering researchers with industry, the tertiary sector, and Defence, feeding into the Australian naval manufacturing industry.

> The University of Tasmania is uniquely positioned to contribute to the evolving needs of national and international defence sectors.
Meeting 21st century power challenges for sustainable energy options

Researchers at the University of Tasmania are taking a lead role in meeting the power challenges and needs of modern combat vehicles and related technologies.

As the price of diesel fuel continues to rise, so too does the need to provide long-term and sustainable solutions for reliable power supply. The Centre for Renewable Energy and Power Systems (CREPS) is working in conjunction with the US Office of Naval Research to explore the low load capabilities of modern diesel engines and how the maximum amount of renewable energy could be integrated into a hybrid remote power system.

Based on the success of various projects, CREPS has also collaborated with the US Navy to improve the efficiency of variable diesel generators with completely new technology, potentially saving twice as much fuel.

New technology surrounding increasing renewable energy uptake used in isolated and remote communities has been developed in partnership with Hydro Tasmania, a pilot project completed on King Island off the North West coast of Tasmania, has led to the development of a new diesel generator which is now in situ. This technology has applications to support defence functions in remote and extreme environments.
Naval Systems and Maritime Assets

Capabilities

**Maritime autonomy**
- Unmanned maritime systems
- Magnetic and payload sensors

**Maritime platform performance**
- Naval architecture and platform system analysis
- Power and energy systems
- Electrical systems integration
- Fuels, spray dynamics and emissions of internal combustion engines
- Materials performance and structural integrity
- Naval platform survivability

**Non-acoustic signature**
- Environmental signatures and protective systems

**Maritime safety**
- Emergency response training

**Command and control**
- Human systems and information integration
- Port design, development and management

**Port and vessel modelling and simulation**
- Integration of training and development with ships, tugs and VTS operations

**Logistics and supply chains**
- Port and terminal management
- Ship operations management

**Maritime trade and security**
- Maritime economics

Reliability and risk analysis
- Risk-based design for survivability
- Smart sustainment

Surface and underwater vehicle hydrodynamics
- Fluid dynamics and fluid structure interaction of ship and submarine structures
- Cavitation physics and hydroacoustics
- Acoustic signature, acoustic monitoring

Damage analysis and control
- Shock and blast response
- Damaged stability
- Risk-based design

Infrastructure

- Cavitation Research Laboratory
- Thermodynamic Laboratory
- Hydrodynamics Centre
- Training Vessels
- Towing Tank

- Model Test Basin
- Diesel Spray Test Facility
- Renewable Energy Laboratory and software for simulation and modelling

- Power Laboratory
- Solar Research Facility
- Underwater Collision Research Facility

Tech Transfer and Partnerships

- Office of Naval Research
- Cavitation Research Centre Aus-US Multi-disciplinary University Research Initiative (MURI) with US – MIT, John Hopkins University, CalTech, UC, University of Minnesota, University of Iowa, and University of Michigan.
- The University has a long track record as a service provider to the Maritime Defence Enterprise. The AMC has a long history of collaboration with the Australian Defence Organisation (ADO), particularly DSTO/DSTG, DMO/CASG and the RAN, the key in research areas of maritime engineering, design, and fluid dynamics.
- Office of Naval Research
- Developing variable speed diesel technology to improve energy resilience and power security.

Examples of analysis undertaken include Collins Class Submarine flow noise reduction, LPA and LCM8 stern ramp operation, LHD LCME performance with heavy dynamic loads in damage conditions, ship-to-ship interactions between new ship classes, Jet RHIB launch and recovery, and Future Submarine design. Research activities related to future acquisitions, particularly submarines, have also extended to collaboration with the ADO’s international partners including the US Navy and Office of Naval Research (ONR), and Defence Industry (e.g. Austal, ASC, Babcock).
- Cooperative education programs combining studies with practical experience in specialisation; Naval Architecture, Ocean Engineering, Marine and Offshore Engineering.

Working under the supervision of professional engineers in companies such as Taylor Bros., Haulmax, Serco Defence, BMT Design and Technology, and BAE Systems UK.
- Hobart based shipbuilder, INCAT, builds some of the world’s largest and fastest high speed aluminium catamaran ferries for civilian and defence fast transit. Critical to the success of INCAT’s vessels has been their ability to operate at high speed in heavy seas and INCAT’s position as worldwide leaders in their market niche which has been assisted over more than two decades by ongoing collaborative research with the University of Tasmania.
A new surveillance landscape is exposed underwater with autonomous and robotic vehicles

The addition of a new underwater robot to the University of Tasmania’s autonomous underwater vehicle (AUV) fleet is increasing the Defence Network’s focus on marine and maritime surveillance, security, and stewardship.

Autonomous vehicles and robotic devices are key components of modern defence and security platforms both on land and at sea. The Autonomous Underwater Vehicle (AUV) fleet at the University of Tasmania is designed, maintained, and operated by a team of specialist research engineers, scientific staff, and technical resources at the University’s Australian Maritime College (AMC) Autonomous Maritime Systems Laboratory and through the Institute for Marine and Antarctic Studies (IMAS). The AUV fleet enables a broad range of scientific, industry, and defence-related research projects by facilitating exploration and data collection in remote and inhospitable locations.

AUVs are becoming vital outside academia and are increasingly utilised for marine security and surveillance. The oil and gas industry is now looking to AUVs to carry out vital underwater tasks like surveying and mapping of the ocean floor, remote detection and management of marine-based resources, and surveillance in a variety of environments.

The recent addition of a new robot (nupiri muka), capable of diving up to 5000 metres, has increased the University’s ability to explore deep waters over a wide deployment range, equipping researchers to answer high priority science questions and explore the limits of autonomous systems. The University is now part of a growing global network of AUV experts, and this capability opens up future opportunities in cybermarine applications for Australia as leaders in AUV and robotics research.

nupiri muka is funded by the Australian Government through the Antarctic Gateway Partnership, a $24 million Special Research Initiative of the Australian Research Council. The University contributed $7 million to the cost of the vehicle and related infrastructure.
## Remote Sensing and Platforms > Marine

### Capabilities

**Data analysis, data inference**
- Data mining, data exploration
- Hierarchical modelling
- Data security

**Machine learning**
- Inductive logic
- Clustering
- Neural networks

**Next generation hybrid autonomous vehicles – underwater and unmanned aerial**
- Drone systems - surveillance of ocean and sea ice conditions
- Autonomous underwater vehicles – training, use in ocean, industry, engineering and defence applications (platform autonomy and sustained operations)

**Oceanography**
- Ocean modelling, including coupled sea ice, ocean and atmosphere
- Remote sensing of the oceans, especially use of satellite altimeter data (sea level, ocean circulation, ocean dynamics, wave climatology)
- Biogeochemical modelling
- Geoengineering
- Marine ecosystems

**Ocean Data portal**
- Australian marine data – IMOS
- Southern Ocean data – SOOS
- Tasmanian Partnership for Advanced Computing
- Analysis and visualisation of large ocean data sets

**Southern Ocean and polar environments**
- Physical oceanography, biogeochemical oceanography, and marine geophysics.
- Sea ice forecasting
- Climate modelling of oceans and cryosphere
- Paleoclimates
- Detection and attribution of climate change

### Infrastructure

- Institute for Marine and Antarctic Studies (IMAS)
- Integrated Marine Observing System (IMOS)
- Autonomous Underwater Vehicle Laboratory (AMSL) – Mallayea, REMUS, ISE Explorer

- Maritime Simulation Centre
- Human Interface Technology Laboratory (HITLab)
- Computing cluster – Tasmanian Partnership for Advanced Computing (TPAC)

- Satellite altimeter calibration facility at Burnie
- Sense-T data platform
- Southern Ocean Observing System

### Tech Transfer and Partnerships

- Antarctic Gateway Partnership (University of Tasmania, Commonwealth Scientific and Industrial Research Organisation, Australian Antarctic Division are the partners)
- IMOS (lead agency)

- Australian Ocean Data Network Southern Ocean Observing System (host agency)
- Canadian company, International Submarine Engineering (ISE), are partners in the Antarctic Gateway Partnership with the acquisition of an ISE Explorer.

- The University of Tasmania has a Memorandum of Understanding (MOU) with ISE for bidirectional knowledge transfer.

> Our researchers voyage to the Southern Ocean aboard the Marine National Facility to collect hydrographic, oceanographic and marine geoscience data.
Data capture in real time for improved security management

‘Eyes in the sky’ technologies have revolutionised the way we access real time data and information, playing a vital role in surveillance to manage security options.

The Defence Network contributes to the growing need for rich environmental surveillance through a growing cluster of technology supported R&D projects working across a number of industries.

Real time data capture is increasingly a key requirement across many applications of relevance to defence and security issues. Through the TerraLuma research project at the University of Tasmania, the technology and data analytics team have created unique opportunities to map and interpret the terrestrial environment in greater detail than ever before using unmanned aircraft systems (UAS). They have developed innovative tools and processes for environmental remote sensing applications and aerial surveys.

The TerraLuma team is at the forefront of new data capture and analysis applications which are having a huge impact on the way agencies access information, especially in the environmental and agricultural sectors. The related application of these techniques to defence and security is also proven.

The team specialises in UAS sensor integration blended with image processing for earth observation applications. This includes mapping and monitoring, and object identification in harsh and remote terrestrial and marine environments. A unique aspect to the team’s work is operating and integrating multiple sensors – visible, multispectral and hyperspectral (VNIR), thermal, and LiDAR – to map and monitor different aspects of the environment at ultra-high resolution on demand.

The research has applications that inform modern environmental management, terrain assessment, and image simulation applications relevant to modern security and defence scenarios.
Remote Sensing and Platforms > Terrestrial

Capabilities

Intelligence systems
- Advanced geospatial intelligence exploitation
- Radar processing and exploitation
- Electro-optic processing and exploitation

Intelligence analytics
- Language technology and fusion
- Human and social modelling and analysis
- Analytic interaction
- Biometrics

Information security and integration
- Strategic systems analysis
- Data and information fusion
- Intrusion detection

High frequency radar
- Signal processing and propagation
- Geophysical phenomenology and performance assessments

Spectrum sensing and shaping
- RF techniques

Cyber assurance and operations
- Cyber and crypto-mathematics research

Cyber sensing and shaping
- Communications signal processing

EW operations
- Electro-optic countermeasures
- RF electronic attack
- Unmanned aircraft system (UAS) sensor integration (VNIR, thermal and LiDAR)

Infrastructure

- College of Sciences and Engineering (COSE)
- High Performance Computing Cluster technology
- TerraLuma research group
- Sense-T
- Unmanned aircraft systems (UAS)

Tech Transfer and Partnerships

- Tasmanian Partnership for Advanced Computing (TPAC)

The University has considerable capability in collecting, interpreting and visualising data that has potential for application in the field of cyber security.
International excellence reaches to the skies

The University of Tasmania sits at the intersection of world-leading research in space science as the only University in the world to operate a continental-scale telescope array.

Our unique position in the Southern Hemisphere and proven track record of working with industry and government will help to underpin Australia’s future space capability and the global space sector.

The University’s Southern Skies Network has proven capabilities in geodetic and telemetry data collection, analysis and interpretation, connecting world-class space and sensing research expertise with specialist infrastructure and international space partnerships.

The Network has developed long-term partnerships with major international companies such as SpaceX, and national and international bodies including NASA and the European Space Agency.

The University has long been regarded as an international centre of excellence in radio astronomy and space geodesy. Accurate geospatial positioning is central to the performance of defence and security functions that require accurate and reliable navigation data.

The University is contracted through GeoScience Australia to develop, support and manage the AuScope array comprising three radio telescopes – one in Tasmania, one in Western Australia and one in the Northern Territory. AuScope is part of the Australian Government’s National Collaborative Research Infrastructure Strategy.

The AuScope facility includes a Very Long Baseline Interferometry (VLBI) Array. The VLBI Array provides unprecedented detail of the structure and evolution of the Australian continent and the Earth and enables the integrated spatial measuring system that supports global geospatial positioning.

The facility’s strength in millimetre-accurate positioning, particularly supporting Global Navigation Satellite Systems (GNSS) for aerospace, space and other research, continues to gain international recognition.

Our unique southern position, and proven track record of working with industry and government, makes us ideally positioned to support Australia’s future space capability and the global space sector.
Remote Sensing and Platforms > Space

Capabilities

Big Data
- New algorithm and visualisation approaches
- Human/computer interaction
- 3D modelling
- Geophysical modelling

Clear skies and geodesy
- Radio astronomy
- Optical astronomy
- Radio communications
- Space geodesy
- Analytical geoscience
- Geodetic GPS (Global Navigation Satellite System)
- Geospatial modelling

Remote sensing and spatial sciences
- Unmanned aircraft systems and drone technology
- Optical remote sensing
- Ionosphere and troposphere studies

Infrastructure

- AuScope Array – 3 x 12m radio telescopes (TAS, WA, NT) including Very Long Baseline Interferometry enabling integrated spatial measuring system to support GPS and GNSS. 30m ex-telecommunications telescope near Ceduna SA
- 2 x satellite altimeter calibration facilities (in Burnie and Cambridge)
- Greenhill Observatory – optical astronomy and spacecraft up-and-down-link station
- Associated data support through Integrated Marine Observing System (IMOS), Tasmanian Partnership for Advanced Computing (TPAC) and Sense-T
- Unmanned aircraft systems (UAS)

Tech Transfer and Partnerships

Government
- Government contracted by Geoscience Australia to develop, support and manage AuScope Array under the National Collaborative Research Infrastructure Strategy (NCRIS)
- Member of consortia to use the European Southern Observatory (ESO)
- European Space Agency (ESA) scientific Earth Explorer FLEX (Fluorescence Experiment) mission
- Partnerships through Integrated Marine Observing System and the ARC Antarctic Gateway Partnership with the Bureau of Meteorology. Also with Australian Antarctic Division and with the Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- French Space Agency (CNES) and the National Aeronautics and Space Administration (NASA) Goddard Space Flight Centre partners on the discrete radiative transfer model (DART) project
- Associate Member of the International GNSS (Global Navigation Satellite Systems) Service
- Contracted by CSIRO Astronomy and Space Science to support the operation of the Long Baseline Array national facility for very long baseline interferometry (VLBI)
- Scientific collaborator in multiple space missions that have required high-precision tracking, including ESA Huygens and Mars Express, JAXA HALCA, SELENE, Ikaros, CNSA (China) Chang’e 3, APOD, NASA – NICER ; Russia – RadioAstronPLANET consortium-exoplanet detection
- International Earth Rotation and Reference Systems Service (IERS)
- International VLBI Service (IVS)

Industry
- Partnerships including SpaceX and Altium
- Callisto Space – Broadband receivers with low-maintenance cooling systems
- Elson Space Engineering – Australian Research Council (ARC) funded world-first high altitude scientific observations from a long-range stratospheric glider with British Ordinance Survey (BOS)
- Frontiers SI (on behalf of Geoscience Australia) – satellite based augmentation systems (SBAS) for positioning of drone sensors

Education, training and workforce development

The University has established a pipeline from undergraduate to PhD education, with courses in the following:

- Mathematics and Physics (Radio Astronomy, Optical Astronomy, Theoretical Physics)
- Earth Sciences (Analytical Geoscience)
- Spatial Sciences (Remote Sensing, Geodesy, Precise Positioning)
Micro meals for sustainment of personnel in operational environments

The University of Tasmania’s Centre for Food Innovation is focussed on conducting cutting-edge food and nutritional research.

The Centre has recently acquired Microwave Assisted Thermal Sterilisation (MATS) facilities, to enable the development of new, high quality ready-made meals.

This emerging R&D programme aims to create food with a longer shelf life, defined by fresh taste and high nutrient load. The innovative microwave technology preserves the fresh eating quality, to assist people in consuming the optimum quantity of food as a function of need out in the field. The work is a collaboration between the University of Tasmania, the Commonwealth Government’s Defence Science and Technology Group (DST), and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

University researchers work in close partnership with the Defence Food Research facility in Scottsdale, Tasmania. It has been purpose-designed to develop long-life foods and to test the nutrition and health properties of these innovative foods. The facility hosts specialised facilities to test the shelf-life of foods over the extended two-year period required for operational deployment and combat support. This facility, along with the food safety and quality-measuring capabilities of the University and CSIRO, comprises an integrated R&D team focussed on world-class, globally relevant translational research.

Among the Australian Maritime College’s research and learning capabilities is an Emergency Response Centre. The Centre incorporates a number of training facilities including Survival Centre, Marine Firefighting Training Centre, Damage Control Unit and Fast Rescue Boat Training.

The Microwave Assisted Thermal Sterilisation (MATS) innovation is giving defence personnel quality rations. The technology is being distributed by 915 Labs in the USA.
Human Systems and Resilience

Capabilities

Chemical and biological defence
- Synthesis and analysis
- Biosurveillance and biodetection
- Medical countermeasures including paramedicine and Antarctic/Polar environment medical training

Combat and mission systems
- Information systems and human sciences

Chemical, biological, radiological and nuclear defence
- Hazard assessment and radiological defence

Energetic materials and systems
- Explosive detection technology

Human systems
- Cognitive workload measurement
- Rapid decisions under time pressure
- Exercise and decision making
- Food and nutrition
- Automation and situational awareness
- Emergency response training

Statistical genetics
- Medical applications
- Population genetics

Capability analysis
- Land mathematical sciences
- Land simulations, experimentation and war-gaming
- Land systems analysis
- High precision GNSS positioning

Weapons and combat systems assessment
- Advanced modelling and simulation
- Weapons modeling and analysis

Infrastructure

- Australian Centre for Research on Separation Science (ACROSS)
- Food and Nutrition Research Laboratory
- Centre for Food Innovation, Tasmanian Institute of Agriculture
- ARC Training Centre for Innovative Horticultural Products
- Tasmanian Cognition Laboratory
- College of Health and Medicine (Paramedicine and Antarctic/Polar environment medical training)
- Menzies Institute for Medical Research
- Sports Performance Optimisation Research Team (SPORT)
- Emergency Response Centre
- High performance computing for health and medical research
- Human Interface Technology Laboratory (HITLab) for advanced human-computer interface (HCI) technologies
- Very Long Baseline Interferometry (VLBI)/ AuScope
- Australian Research Council Research Training Centre for Portable Analytical Separation Technologies (ASTech)
- Grey Innovation
- Commonwealth Science and Industrial Research Organisation (MATS)
- Defence Science and Technology Group (MATS and human factors)
- GreyScan (pre and post blast explosive detection)
- Rockwell (hardware and software optimisation of night fighting and situational awareness systems)
- AuScope
- SpaceX

Tech Transfer and Partnerships
Technology to make the world safer

Cutting-edge explosive testing technology developed by the University of Tasmania is being rolled out around the world to support security and safety objectives in a number of scenarios.

An innovative explosive detection technology developed by the Australian Centre for Research on Separation Science (ACROSS) at the University of Tasmania has enabled the rapid detection of trace levels of explosives.

The technology underpins the world’s first portable, high resolution instrumentation to detect inorganic explosives, overcoming the limitation of existing screening techniques that struggle to detect these materials.

The ground breaking intellectual property behind this breakthrough invention was created by a team from the University’s College of Sciences and Engineering. Their research was supported by co-funding from agencies including the National Security Science and Technology Centre and the US Department of Homeland Security.

In a good example of a long term industry relationship, the University initially licensed the technology in 2014 to a Melbourne-based technology commercialisation firm Grey Innovation, who created the dedicated spin-out company GreyScan to take the opportunity forward.

Having raised millions to refine and test the technology, GreyScan is now working with the largest security agencies in the world to make the technology the new global standard for pre and post blast inorganic explosive detection.


> GreyScan’s Capillary Zone Electrophoresis technology is set to become the global benchmark for the detection of pre and post blast explosives.
Our suite of specialist research and learning facilities is used extensively by students, researchers, and defence organisations alongside government bodies and international industry partners to innovate and develop new designs, undertake research to improve efficiency and safety, undertake professional development activities, and to develop modern workforce credentials. We have established a global reputation in the maritime sector for human resource and logistics management and naval and maritime workforce development.

The University of Tasmania has strong partnerships with industry, government, and the Australian Department of Defence to provide quality education and training pathways to support every level of modern workforce development for Defence and its industry supply chain.

Through the University’s Defence Network and the affiliated AMC Search, we are an established provider of bespoke workforce training. The University of Tasmania was selected as the lead university partner to support Kellogg Brown & Root and US shipbuilder Huntington Ingalls Industries in developing the new Australian Naval Shipbuilding College.

Our campuses in Tasmania and New South Wales provide educational opportunities ranging from Higher Degrees by Research directly supporting the development of Defence R&D to a suite of bachelor courses to help train the next generation of educated professionals and skilled tradespeople for future Defence industry needs.

We also offer alternate academic pathways at both associate degree and bachelor level, including work integrated learning options and industry supported VET training in conjunction with TAFE Tasmania.

For a full list of courses aligned to a career in Defence, please visit utas.edu.au/defence-network
Education and Training

Capabilities

Higher Degrees by Research
- Australian Centre for Research on Separation Science
- College of Sciences and Engineering
- National Centre for Maritime Engineering and Hydrodynamics
- ARC Research Training Centre for Naval Design and Manufacturing
- ARC Training Centre for Innovative Horticultural Products
- ARC Training Centre for Portable Analytical Separation Technologies
- ARC Training Centre for Forest Value

Bachelor courses
- Bachelor of Engineering (Specialisation) with Honours (P4D and P4F)
- Bachelor of Engineering (Specialisation) with Honours (P4F)
- Bachelor of ICT with Honours (P3B)
- Bachelor of Science with Honours
- Bachelor of Surveying and Spatial Sciences
- Bachelor of Marine and Antarctic Science (specialisations in Physical Oceanography, Marine Biology, Marine and Antarctic Governance)
- Master of Maritime Engineering (Specialisation)
- Master of Engineering (Maritime Design)
- Mathematics and Physics (Radio Astronomy, Optical Astronomy, Theoretical Physics)
- Earth Sciences (Analytical Geoscience)
- Spatial Sciences (Remote Sensing, Geodesy, Precise Positioning)

Other
- Lifeboat training for large naval auxiliary vessels
- Pacific Patrol Boat Training
- Pathway programs, flexible delivery, recognition of prior learning, blended learning and accelerated learning programs
- RAN Advanced Navigation Course – large ship manoeuvring and tug handing
- AUV Operator
- Full suite of Australian Maritime Safety Authority (AMSA) mandated short courses for Seafarer certification
- Bespoke short courses to meet specific customer needs
- AMC Search delivers drone technology training to the maritime industry with courses, in partnership with the Institute for Drone Technology

Infrastructure

- **Maritime Simulation Centre**
The state-of-the-art Maritime Simulation Centre offers real time simulation technology for learning and training without the cost and risk of using real vessels. It includes a full-mission ship’s bridge, a tug simulator, six ship operations bridges, and an engine room simulator.

- **Emergency Response Centre**
Providing the training that could mean the difference between life and death, this facility provides front line, real life exposure to department of Defence Pacific Patrol Boat personnel, students, maritime industry staff, and is used by Engineering students for deep water testing.

The Centre includes:
- Survival Centre
- Marine Firefighting Training Centre
- Damage Control Unit
- Fast Rescue Boat Training
Professor Rufus Black
Professor Rufus Black is the President and Vice-Chancellor of the University of Tasmania. He joined the University in March 2018, bringing an extensive background in the private and public sectors as well as expertise in ethics, leadership, and management. Previously, he was Master of the University of Melbourne’s Ormond College, an Enterprise Professor in the Department of Management and Marketing, and a Principal Fellow in the Department of Philosophy at the University of Melbourne. Professor Black’s private sector experience includes nine years as a partner at McKinsey and Company, serving clients in Australia and Asia, and as a Director for national law firm Corrs Chambers Westgarth.

With broad experience in Australian public policy, he has done extensive work on Defence and National Security. He led the Budget Audit of the Australian Department of Defence in 2009, the Accountability and Governance Review of the Department of Defence (the Black Review) in 2010, and the Prime Minister’s Independent Review of the Australian Intelligence Community in 2011.

Professor Brigid Heywood
Professor Brigid Heywood (BSc) (PhD) is Deputy Vice-Chancellor (Research) at the University of Tasmania. Professor Heywood has responsibility for the research and innovation strategy of the University, the University research institutes, research students, research infrastructure, and the R&D and commercialisation services.

As a research scientist, she has worked with international defence-aligned agencies to develop processes for innovative materials fabrication for security and defence purposes. She has also held senior executive positions at universities in New Zealand and the UK where she has worked closely with government, business and industry in support of major projects advancing enterprise and innovation drivers to foster economic and social change and regenerate communities.

In the UK, Africa, South East Asia and New Zealand, she has been associated with many successful spin-outs from universities, developing new science parks and nurturing on-campus incubators for high growth potential businesses as vehicles to foster new modes of interactions between universities and industry.
Associate Professor Jonathan Binns
Academic Lead Defence Network
Director, the ARC Research Training Centre for Naval Design and Manufacturing

Creating vessels that are optimised to perform in the ocean is the focus of Associate Professor Jonathan Binns’ career. He has applied his skills in applied hydrodynamics broadly, having designed yachts for the America’s Cup and built sailing simulators for rehabilitation centres and custom wave pools. He is now turning his skills to solving problems for the naval defence industry for design and sustainment, but more importantly, to making the R&D workforce essential to achieve smart and reliable results.

Associate Professor Binns developed the ARC Research Training Centre for Naval Design and Manufacturing of which he is now the Director. The Centre is training PhD students and postdoctoral researchers to address issues specific to naval defence. The Centre covers design, manufacturing and sustainment across the global supply chain working with Australian and international companies on smart solutions for tech-ready applications.

Associate Professor Michael Woodward
National Centre for Maritime Engineering and Hydrodynamics

Associate Professor Michael Woodward completed his PhD at Newcastle University (UK) in 2005 while employed as a member of academic staff (between 2000 and 2015), culminating as Director of the Hydrodynamic Laboratories. He commenced his current appointment at the Australian Maritime College in 2015, serving between 2015 and 2018 as the Director, National Centre for Maritime Engineering and Hydrodynamics. He is Associate Professor Marine Engineering and his current role includes academic lead in support of the University of Tasmania’s Defence Network. His primary research interests are in maritime platform motion dynamics including stability, manoeuvrability and seakeeping. His current research activities apply augmented reality technologies in naval architecture and ship operations.

Michael is a Fellow of the Royal Institution of Naval Architects, and the Tasmanian section representative. He is a chartered engineer through the UK Engineering Council and a chartered professional engineer and engineering executive through Engineers Australia. Michael sits on the Advisory Council of the international scientific committee responsible for hydrodynamic experimentation (the ITTC).