CHARTING NEW HORIZONS

AEROSPACE AND AVIATION
“Our relationship with the international aerospace and aviation community is of immense importance to us. It has been integral to the University’s standing as a lead educator and researcher in aerospace and aviation for over 60 years.”

Professor Margaret Gardner AO
Vice-Chancellor and President
RMIT University is a global university of technology and design, focussed on creating solutions to transform the future for the benefit of people and their environments.

RMIT is a leader in technology, design, global business, communication, global communities, health solutions and urban sustainable futures. We are ranked in the world’s top 100 universities in communication and media studies, computer science and information systems, pharmacy and pharmacology studies, engineering (civil and structural), and accounting and finance in the 2012 QS World University Rankings*. The University has a global reputation for excellence in professional and practical education programs and high quality outcome-oriented research.

RMIT has grown from an intake of 600 students in 1887 to a truly global university of more than 75,000 students, including over 29,500 international students drawn from more than 100 countries around the world.

*2012 Quacquarelli Symonds' World University Rankings

**DOING BUSINESS WITH RMIT**

RMIT is extremely well equipped to work with companies and organisations in the aerospace and aviation sector – not only in the key areas of design and technical development, but also drawing on diverse expertise and training programs in areas such as business, communications, IT and science.

With specific capabilities in industrial design, logistics, materials science, data retrieval, occupational health and safety, food technology, project and systems management, and many other relevant areas, RMIT offers a wide range of practical support to the industry as it evolves to meet the challenges of competition and demand in the global environment.

As one of the world’s most international universities, RMIT is proud of the strong industry links it has forged over its history. Collaborating with industry to provide solutions and innovations that deliver real outcomes is an integral part of our teaching, learning and research.
As a national leader in aerospace and aviation, RMIT University’s research covers a diverse range of topics – from aircraft design and robotic air vehicles, to new composite structures and aerospace engineering in structural dynamics.

Other projects include aircraft stability and control, aerodynamics, design and manufacture of aerospace vehicles, and vehicle crash simulations.

Collaborative research for structural safety
RMIT and Defence Science and Technology Organisation are working together to advance a scientific basis for autonomous safety prognostics – predicting the time at which a system or a component will no longer perform its intended function. This new health prognostic approach will be developed via predictive models and in-situ damage imaging principles. This will help to overcome the significant challenge of safety assurance of composite structures and in-service damage, which is currently largely hidden and difficult to assess.

How nature is leading the way with Biomimetics
Biomimetics is the study of the structure and function of biological systems as models for the design and engineering of materials and machines.

RMIT researchers are developing biomimetic structures for light-weight aerospace structures that have improved mechanical performance and damage tolerance. Research projects include: biomimetics of damage tolerant composites, self-healing repair of composites and optimisation of skeletal structures.

Tree branches inspire improved aerospace joints
RMIT and Boeing are studying the biological design and adaptations of tree branch joints to increase the structural properties of composite joints in aircraft. Tree joints have many properties and features that are highly desirable in aerospace composite joints. These include increased failure stress, increased fracture toughness and damage resistance, suppression of brittle fracture and improved impact resistance.

The research has resulted in some of the highest ever property improvements achieved for bonded composite joints. These improvements have been achieved with no weight penalty and can be implemented using conventional manufacturing methods.
WORLD-CLASS PEOPLE AT RMIT

“The substance of research carried out at RMIT epitomises the productivity and innovation we find throughout Australia. We are keen to engage with the best and the brightest in the field for today and for tomorrow, and we consistently find world-class people at RMIT.”

Mr Ian Thomas
President, Boeing Australia and South Pacific

Optimising self-healing repair systems for aircraft

RMIT and Boeing are jointly researching the use of biomimetic microvascular self-healing composites to avoid down-time repairs for aircraft. Self-healing mimics the vascular (blood) system in humans by transporting repair resin to damage within composites. The research goal is to optimise the design of microvascular systems to maximise repair efficiency, thus avoiding down-time repairs. By developing analytical tools and data, this project will enable the Australian aerospace industry to take advantage of the benefits of self-healing systems.

Biofuels – a better option

RMIT has a team of microbial systems biologists and energy crop biotechnologists sharing expertise to develop processes using enzyme biotechnology techniques to produce liquid fuels from waste plant materials.

RMIT is also working to develop processes using biotechnology techniques that will make large-scale production and harvesting of algae for biofuels commercially viable.

Safer flying for children – optimising safety restraints

People travelling with infants will be aware that different airlines have different policies on restraining infants during take-off and landing. In Australia a supplementary lap belt is used that clips on to the seatbelt of the parent, however, this is not allowed in the United States.

Sponsored by the Civil Aviation Safety Authority, an RMIT project is investigating the safety aspects of child restraint options in aircraft. The study also considered the impact on other passengers, such as the rear passenger that is facing a back seat that does not break over, as it should in a crash situation, when impeded by a child seat placed in the seat.

Once completed, the study will be able to make informed recommendations on safety of child restraint systems in aircraft and how best to place and fix them in the seat.
Sir Lawrence Wackett Aerospace Centre

Established in 1991, the Sir Lawrence Wackett Aerospace Centre conducts fundamental and applied research in aerospace materials, multifunctional structures, aerodynamics and unmanned aerial vehicles, and aerospace system through-life support technologies.

Project areas include:
- the development of composite materials to improve damage tolerance
- low-cost composites for light-weight vehicle technologies
- multifunctional structures with embedded systems
- structural health prognostics
- future flight systems including shape morphing and micro air vehicles.

The Centre is a designated design organisation by the Civil Aviation Safety Authority of Australia under Civil Aviation Regulations 30.

Research Focus Areas:
Aerospace Materials and Structures
- Metallic and composite technologies
- Fatigue, fracture, and damage tolerance
- Modelling and simulation

Dynamic Aerospace Systems
- Unmanned air vehicles (UAVs)
- Aerodynamic loading
- Dynamics, modelling, control, and optimisation

Through-Life Support
- Multifunctional air vehicle technologies
- Embedded intelligent systems
- Health monitoring and prognostics
- Repair and joining technologies

Aerospace Design and Manufacturing Processes
- Virtual and knowledge-based engineering
- Advanced manufacturing processes
- System support engineering

Transforming the future through research
RMIT is spearheading multi-disciplinary research projects in close collaboration with industry, government, partner organisations and universities around the world. Current partner and industry projects include:

Defence Science and Technology Organisation
- Repair of high-strength steels for aircraft components
- Predicting intergranular corrosion impact on structural integrity
- Analysis and modelling of composite structure and repair
- Cavity resonant and buffet analysis
- Aircraft loads (Aerodynamic Loading Centre of Expertise)

Australian Aerospace
- Helicopter fleet health usage monitoring
- Optimum maintenance scheduling
- Performance-based contracting

USAF
- Micro air vehicles in turbulent environment

Defence Material Technology Centre
- Repair technologies for aircraft systems
- Next generation tooling development
- Aircraft prognostic tools to reduce corrosion impacts
- Multifunctional composite structures
- Advanced composite armour

Civil Aviation Safety Authority of Australia
- Fatigue of joints under the influence of corrosion inhibition compound
- The use of child automotive restraint in civil aircraft

Boeing
- Bio-inspired joints
- Self-healing composites

Cooperative Research Centre for Advanced Composite Structures
- Structural health monitoring
- Failure theory of composites
- Analysis of post-buckling structures
- Composites under fire

Platform Technologies Research Institute
RMIT’s Platform Technologies Research Institute brings together scientists and engineers to create innovative materials and smart systems needed by industry and government.

The Institute uses an integrated systems approach to all its research which focuses on improvements to total system performance through coordinated design and fusion of materials and systems.

The capacity of smart systems to pre-process, correlate, compare and analyse data intelligently in different environments provides more information faster to industry, as well as solutions to issues and problems that are only emerging as technology advances.

The Institute works in close affiliation with the following RMIT research centres:
- Centre for Innovative Structures and Materials
- ARC Centre for Ultra high-bandwidth Devices for Optical Systems
- Satellite Positioning for Atmosphere, Climate and Environment Research Centre
- Rheology and Materials Processing Centre
- Centre for Advanced Materials and Industrial Chemistry
Two of the major challenges for aerospace design in the next 20 years are environmental issues and cost. Both the United States and Europe have completed studies that resulted in setting very ambitious targets for noise and emissions reductions for aircraft entering service in 2020.

Reductions come from efficiency improvement in airframe design, engine technology including alternative fuels, and aircraft operations / Air Traffic Management (ATM).

Regarding airframe design, improvements come from new and lighter materials, and alternative configurations, such as the Blended Wing Body and joined wing. For engine technology we may see a revisit of the open rotor or prop fan, a propeller engine for high-speed flight, and the application of alternative fuels including bio fuels and gaseous fuels. RMIT is internationally renowned for its expertise in each of these areas.

**Joined Wing**
First proposed in 1924, the joined wing showed that in theory it would provide a drag reduction. Unfortunately, other challenges – such as weight increase and stability and control – negate some of these advantages. Research into the joined wing concept, by RMIT and the German Aerospace Research Centre in Hamburg, aims to conduct an overall optimisation of the concept to determine the net benefits.

**GippsAero and the GA-18**
With a strong reputation for design and build of agricultural and utility aircraft, GippsAero in Gippsland recently obtained the design authority of the N-24 Nomad aircraft, which were originally designed and built by the Government Aircraft Factories in the 1970s. GippsAero’s aim is to re-design the aircraft with new engines, modern avionics and other improvements and offer the aircraft as the GA-18.

Working with RMIT a study is now underway to optimise the propeller of the GA-18 with a new engine, with particular respect to noise.
UNMANNED AERIAL VEHICLES – FROM SURVEILLANCE TO FIGHTING FIRES

With a core group of researchers engaged in pioneering work and cutting-edge facilities and equipment, RMIT offers leading expertise and knowledge in Unmanned Aerial Vehicles (UAVs).

The research will ultimately help to enhance public safety in a number of areas including:

» Enabling fire fighters to more effectively engage with and gain control of fires
» Providing communication nodes for mobile phones in the event of a major power outage
» Providing aerial coverage of disaster zones
» Increasing agricultural output through crop monitoring.

Areas of expertise
Key areas of UAV expertise at RMIT include:

» Signatures
» Military operations
» Flapping wing flight
» Lighter-than-air vehicles
» The Australian regulatory environment
» Biomimicry of natural flyers
» Determining operations costs of UAVs.

Advanced concepts
RMIT researchers are exploring many advanced concepts for UAVs, including corrugated wings which mimic the wings of a dragonfly, the ability of small aircraft to fly in turbulent environments, and cost-based comparisons of UAVs versus manned platforms.

Sharing controlled airspace – UAVs and manned aircraft
With UAV operations growing significantly, there is no doubt that UAVs will share the same airspace as manned aircraft in the future. This is a major challenge, in particular, for civil applications. The challenge is how to achieve this safely, with little or no impact to the existing Air Traffic Control systems and procedures.

An RMIT project considered optimal flight paths for the UAV based on known positions and trajectories of manned aircraft in the vicinity. This was selected as a collaborative project with Thales Australia, and will focus on voice communications with UAVs by air traffic controllers and the response of UAVs to standard voice commands. If the concept works well, a UAV will become a “manned aircraft” for the air traffic controller as it responds and behaves similarly.
Advanced Manufacturing supporting Australian industry

Recognising the importance of manufacturing to Australia’s economy, RMIT’s Advanced Manufacturing Precinct (AMP) was established to meet the challenges facing industry and to enhance Australia’s competitiveness in global markets.

The AMP offers access to research, skill development, product design and testing across the full scope of the manufacturing process. With a focus on additive technologies, high speed manufacturing and rapid prototyping, it enables industry to develop specialised products and processes of significant commercial gain.

It links research, education and industry across design, engineering and science, enabling customisation of innovative design solutions.

Specialist facilities

RMIT has specialised laboratories and research facilities across each of the following areas:

- Advanced Manufacturing
- Aerodynamics
- Automotive
- CAD / CFD / CAE Engineering
- Composite and Polymer
- Dynamics
- Material Testing / Fatigue Testing
- Measurements
- Mechatronics
- Rapid Prototyping
- Rheology and Materials
- Thermodynamics and Renewable Energy

RMIT Microscopy and Microanalysis Facility

The RMIT Microscopy and Microanalysis Facility provides advanced electron microscopy facilities, including high resolution and environmental scanning electron microscopes, transmission electron microscopes, scanning auger nanoprobe, X-ray photoelectron spectroscopy, and dynamic light-scattering spectroscopy systems. It is a Linked Lab of the Australian Microscopy and Microanalysis Research Facility.

Green Engines Lab

RMIT’s new Green Engines Laboratory was established to investigate liquid and gas fuelled engines. The facility can monitor air-mixing and combustion properties, as well as combustion stability, emissions and robustness. Capable of investigating the efficiency of all fuels used for internal combustion engines, the Lab has fuel delivery and flow measurement systems for H, CNG, LPG, gasoline, ethanol, diesel and biodiesel.

Dynamics Laboratories

RMIT’s Dynamics Laboratories provide researchers with access to test machines including: laser vibrometer, shock absorber dyno, high-speed camera and an acoustics chamber.

Microelectronic and Materials Technology Centre

The Microelectronic and Materials Technology Centre is one of Australia’s leading research centres specialising in micro- and nano-fabrication technologies. It has comprehensive facilities for the design and modelling, fabrication, packaging, and characterisation of micro- and nano-scale devices – enabling industry to transform ideas into accessible technology.

Focus areas include the fields of integrated optics, lab-on-a-chip devices, nanotechnology enabled devices, sensors, functional materials, microsystems, microelectronic devices, and RF/microwave technologies.

Other capabilities:

- Industrial Wind Tunnel
  RMIT’s Industrial Wind Tunnel has a maximum test speed of about 140 km/h and a test section of 3 metres wide, 2 metres high and 9 metres long.
- Accoustics and Vibration
  - Noise Vibration Harshness Centre of Expertise
  - Researchers with decades of experience in aerospace, automotive and industrial noise and vibration diagnostics and reduction.
  - State-of-the-art diagnostic equipment:
    - Acoustic camera
    - Phased microphone array
    - Laser vibrometer
    - High speed video camera
Fuelled by a shared vision to innovate, RMIT University and its aerospace and aviation partners are helping to transform the future of the industry.

Offering advanced research facilities, work-relevant education, global research connections and deep expertise in aerospace and aviation, the University is committed to working with its partners to lead and support major advancements within the sector.

Our partners

**Boeing – supporting tomorrow’s leaders**

RMIT University is proud to be part of Boeing’s university relations program as a focal university. RMIT and Boeing Australia work closely to enhance undergraduate curricula, recruit candidates for employment and collaborate on research that benefits the company’s long-term business development goals.

Boeing knows the future of innovation lies in the hands and minds of today’s forward-thinking graduates. Since 2006, Boeing has enabled RMIT to create inspiring opportunities by generously providing financial support for student projects, travel bursaries, scholarships, awards and community outreach programs.

**Giving Australia the edge in defence**

RMIT is a core partner in the Defence Materials Technology Centre (DMTC), which links industry, universities, government research agencies and federal and state governments. DTMC aims to give Australian industry a leading edge in winning national and international defence contracts.

RMIT is involved in a range of DMTC research projects including damage tolerance of aircraft structures, conformal antennas in composite structures, and composite structures for military aircraft.

**Australian Centre of Expertise in Noise Vibration Harshness**

RMIT University established an Australian Centre of Expertise in Noise Vibration Harshness (NVH centre) with LMS International, a Belgium-based technology partner for aerospace and automotive industries.

The Centre’s laboratories will be set up in Melbourne with LMS equipment and software for modal analysis, spectral testing and sound intensity measurements, including an advanced multi-channel acoustic camera, providing unique capabilities for both internal and external acoustic field mapping.

**First COMAC Centre outside China**

In collaboration with Commercial Aircraft Corporation of China Ltd (COMAC) Beijing Research Centre, RMIT has established a postdoctoral research centre in Melbourne – the first one outside China.

RMIT will collaborate with researchers at COMAC’s Beijing Aeronautical Science and Technology Research Institute on structural optimisation of large commercial aircraft. COMAC is the leading Chinese aircraft manufacturer and functions as the main body in that country for implementing large passenger aircraft programs.
RMIT and Japan unite on global nav satellite systems

RMIT has signed an agreement with the Japan Aerospace Exploration Agency (JAXA) to collaborate on global navigation satellite systems (GNSS).

The agreement between JAXA and the SPACE Research Centre at RMIT will strongly position RMIT as a key player within the international GNSS community. It will also demonstrate the benefits and impacts of having more satellite signals and more accurate satellite positioning, navigation and timing services in the Asia Oceania region.

RIIERP – developing global leaders

The RMIT International Industry Experience and Research Program (RIIERP) is the only one of its kind in Australia. It provides opportunities for students and research fellows across all RMIT disciplines to undertake international work experience and research with leading organisations in Europe, North America and Asia.

The opportunities usually involve placements of three, six or 12 months duration. Currently, there are 165 international companies involved in RIIERP, including such globally respected names as Airbus, European Aeronautic Defence and Space Company (EADS), Boeing, Pratt & Whitney and the Rolls-Royce Group in Europe and North America.

Through the RIIERP program organisations enter into a unique partnership with RMIT. The program not only supports the development of some of the most talented students, but also opens up a wide range of opportunities for on-going research and collaboration for each of the companies taking part.

RMIT Engineering Graduate Jason Seris, who worked at Rolls-Royce in Indianapolis
COME FLY WITH US
RMIT offers tailored training programs for clients both locally and internationally.

RMIT Flight Training for pilots
Based at Point Cook Airfield, RMIT’s flight training facilities and operations are some of the largest and most successful in Australia. RMIT Flight Training instructional staff have the qualifications and experience to conduct theory training and flight training at all levels to Air Transport Pilot Licence.

RMIT successfully trains pilots for both the military as well as commercial airlines.

Clients include:
- Xiamen Airlines
- Air China
- Oman Air
- China Eastern Airlines
- Hainan Airlines
- Civil Aviation Flight University of China.
- China Northern Airlines
- QANTAS
- Royal Australian Air Force

The aircraft
RMIT operates a fleet of Cessna C172S aircraft for ab-initio training, and Cessna 182T aircraft for CPL training phases. Aerobatic training is conducted in Decathlon aircraft. The Piper PA44 Seminole is used for multi-engine and instrument rating training, while the Beechcraft C90 is available for high performance training.

The Associate Degree in Aviation
The Associate Degree in Aviation (Professional Pilots) is designed for those with little or no flying experience. In addition to obtaining the Associate Degree, participants are provided with the flight training necessary to obtain a CASA Commercial Pilot Licence for fixed wing aircraft. Multi-engine Instrument Rating and Air Transport Pilot Licence. Alternatively, the participant can select the Instructor Rating elective.

Aviation Management
Recognising the worldwide trends in aviation and the need for aviation managers with higher-level qualifications, RMIT offers the Master of Aviation Industry Management.

The program offers:
- training for those with managerial potential
- an opportunity to enter the civil air transport business
- an industry-driven program linking current practice with theoretical models for an integrated practitioner approach
- skills and knowledge for career advancement.

Aviation English skills and training
RMIT English Worldwide (REW) provides Aviation English testing and training solutions, enabling pilots and air traffic controllers to comply with the International Civil Aviation Organisation’s (ICAO) Language Proficiency Requirements. QANTAS Airways and Air Services Australia contribute to these courses.

Aviation English Test for Aviation
RMIT English Language Test for Aviation (RELTA) is one of only four tests to have received official endorsement, and is the only test outside of Europe and Russia to be endorsed by the International Civil Aviation Organization. The test uses aviation scenarios to reliably and effectively measure English language skills in both face-to-face and radiotelephony communication. Almost 25,000 pilots and air traffic controllers have been assessed by RELTA, more than any other language proficiency test on the market.

Beyond Level 4 for Pilots
Beyond Level 4 is RMIT’s latest training product – an innovative online e-learning package that develops high-level language skills for aviation professionals, ensuring that language proficiency is maintained between ICAO English Language Proficiency tests. Designed to minimise the impact on work/training schedules, the course allows participants to study independently in their own time or in groups, via the internet.

REW partners with KIST Aviation Academy
RMIT English Worldwide (REW) has signed a contract with KIST Aviation Academy in Kuala Lumpur, Malaysia for the provision of Aviation English training and testing products. About 300 aviation personnel including pilots and air traffic controllers have been tested to date in Malaysia by REW.
Lift your output and productivity with RMIT

Research shows that investment in training contributes to lifting business output and productivity by increasing market share, and enhancing service delivery and product development.

Benefits to your business

» Increased quality and productivity, by generating greater reliability and efficiency.
» Increased customer satisfaction through improved customer services, leading to greater customer retention.
» Implementation of new technologies, work practices and business strategies.
» Enhanced staff satisfaction and team morale, thereby reducing absenteeism and staff turnover.
» Better communication and leadership skills.

Inventive training for the Australian Defence Force

As part of an innovative strategy of blending on-the-job and academic learning, Australian Defence Force personnel have undertaken training in aeroskills at RMIT University. Senior non-commissioned officer (SNCO) aviation and avionics technicians from the Army and Royal Australian Navy (RAN) have been training with RMIT for seven and 12 years, respectively. The SNCOs undertake the National Aeroskills Training Package, completing the Diploma of Aviation Maintenance Management and Advanced Diploma of Aviation Maintenance Management. This phase of training addresses the academic requirements of the respective service training, as a prerequisite for promotion to Chief Petty Officer (RAN) and Warrant Officer Class 2 Aviation Artificer (Army).

Training the Tiger

RMIT has developed a customised training program for Tiger Airways staff as part of the airline’s quality improvement program. The staff training mainly involves senior pilots, cabin trainers, and safety and quality-related senior ground crew. The training and checking captains are being trained in nationally recognised, industry standard training qualifications designed for aviation-related instructors. The Australian standard for workplace training, Certificate IV in Training and Assessment, has also been integrated into the program.

Heavy maintenance training on-site at Avalon

RMIT University has developed a Diploma of Management customised for the heavy maintenance sector of the aviation industry. The diploma was recently delivered to a group of Forstaff Aviation engineers engaged with the maintenance of Qantas aircraft at Avalon. The highly specialised Forstaff personnel found the on-site delivery and one-to-one coaching suited their way of working and they benefitted hugely from the training.

Customised short courses

RMIT’s Wackett Aerospace Centre provides continuing education and training for Australia’s aerospace industry and government agencies. Courses are available in the Centre’s areas of expertise and advanced technologies including:

» Design and airworthiness approval regulations
» Aircraft weight and balance
» Conceptual design and airworthiness of helicopters
» Conceptual design and airworthiness of unmanned aerial vehicles
» Aircraft damage tolerance design
» Advanced composite materials

RMIT develops and delivers short training courses focussed on design and airworthiness for fixed wing, rotary wing and unmanned aircraft systems. This training provides participants with an understanding of the regulatory system within Australia and its application to aircraft design, manufacture, modification, safety, repair and continuing airworthiness. The course is intended for professional engineers who hold an Instrument of Appointment under Civil Aviation Regulations Part 35 and Part 36, or to provide competency training for those individuals intending to apply for one. It has been developed in consultation with the Civil Aviation Safety Authority and is often tailored on request, for delivery to specific customers.

Executive education

With extensive experience in the design and delivery of customised professional development programs, RMIT’s training integrates management theory with practical skills, and includes the latest technology, research and education concepts. RMIT also offers a full range of postgraduate business programs that address the challenges of today’s fast-paced and complex global business environment. The programs are designed to foster leadership and strategic thinking and to help participants maximise their personal and professional capabilities.
ENGAGE WITH RMIT

RMIT University offers multiple benefits to business, including industry-relevant training and education, easy access to research, technical solutions to industry issues and the provision of work ready graduates.

The Industry Development team will involve the relevant staff and provide the necessary professional services to support your connection with RMIT.

Contact us
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Our Industry Engagement team will connect you to the relevant academic staff and professional services you require.

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