composites CRC
Cooperative Research Centre for Advanced Composite Structures Ltd

June 2008
NEWSLETTER

Inside

Composites CRC wins CRC STAR Award for Innovation Project with Regina Glass Fibre

On 22 May 2008 during the Gala Dinner at the annual CRC Association conference held from 21 to 23 May, Senator the Hon. Kim Carr, Minister for Innovation, Industry Science and Research presented the CRC STAR Awards to the Composites CRC and the CRC for Greenhouse Gas Technologies for their outstanding efforts in developing new business opportunities with small to medium enterprise partners.

This was the first time two Cooperative Research Centres (CRCs) have received the prestigious CRC STAR Award. The Composites CRC won the STAR Award for high level achievement in successfully working with Regina Glass Fibre Pty Ltd to develop a unique fire retardant surfacing material, FireShield, for the composites industry.

The Composites CRC would not have achieved this award without the capabilities and enthusiasm of Regina.

Above: Senator the Hon. Kim Carr presenting the CRC STAR award to Prof. Murray Scott (CEO, Composites CRC).

The CRC STAR Award is designed to recognise CRCs for high level achievement in engaging with and helping to build success with small to medium enterprises (SMEs) through the transfer of CRC innovation. The Award forms an integral part of a wider initiative to promote engagement with SMEs as a key component of the CRC Program.

The Composites CRC presented its case by detailing how it has engaged with Regina, what the particular technology transfer / innovation / innovative practice was, and how this has benefited the Composites CRC and Regina. The case was supported by statements from Regina that described how it benefited from the Centre's research efforts.

The Regina Story

Regina is based in Ballarat, Victoria, and produces lightweight surface tissue materials for a range of applications including thermal and sound insulation as well as decorative finishes for composite parts. The surface tissues (veils) are produced in house by a continuous process fed by glass rods. The finished goods are in the form of rolls of lightweight fabric.

In May 2005, Regina attended the Composites CRC Annual Conference, which is conducted jointly with Composites Australia – the industry association. Attracted by what it heard about commercialisation opportunities, Regina asked to join the Centre as an Associate Member.

Early discussions and site visits rapidly led to a mutual recognition that Regina was well placed to commercialise the fire retardant veil technology that the Composites CRC had developed. Initial market assessments revealed opportunities not only in aerospace but also in the general composites market, especially in maritime, marine and ground transportation where fire standards continue to challenge the use of composite materials. MOUs and NDAs were signed in July 2005. By March 2006, Regina had acquired a manufacturing licence for the production of fire-retardant veil (FireShield). It is anticipated that FireShield will be commercially available in early 2009.

Above: The CRC STAR Award Team from left to right: Paul Andrews (Research Engineer, Composites CRC), Arthur Rendell (CEO, Regina Glass Fibre), Murray Scott (CEO, Composites CRC), Andrew Beehag (Commercialisation Manager, Composites CRC) and Frank Rosselli (Senior Research Engineer, Composites CRC).

Chairman's Report

I expected an interesting time when I agreed to become the independent Chairman of the Composites CRC but did not think it would be as interesting as this; much has happened in the last six months and we can look forward to much more developing in the near future.

Firstly, the Defence 'CRC-like entity' was won by the materials bid, which was largely put together and presented by Peter Preston and the CEOs of ours and the CRC for CAST Metals Manufacturing (CAST) and their teams, strongly backed by representatives of defence industry. I am fairly sure that this outcome was a surprise to many inside and outside the Defence Department. I think the bid was successful because firstly it related the proposed program to impacts on defence operations and secondly the presenters convinced the panel that they knew how to efficiently run a CRC. These two observations point, I think, to the fact that although this Defence Materials Technology Centre (DMTC) is a 'CRC-like entity', it will differ significantly from other CRCs in that it has a prime funding source (the Defence Department) that is the ultimate end-user and thus is vitally interested in applying the DMTC outcomes through industry to its materiel. As some readers would already know, we will be involved in providing R&D services through a Composites CRC spin-off company called 'Advanced Composite Structures Australia' (ACSA), which is (initially) owned by the Composites CRC and will have the same chairman and CEO. The new company will draw on the talent of the Composites CRC and will therefore be able to begin contributing to the DMTC as soon as it commences operations. The DMTC promises to be, in both number of participants and spread of interests, one of the biggest CRCs.

ACSA itself, while providing services to the DMTC, will also seek to build on the very successful program of overseas commercial R&D contracts that has been gained by the Composites CRC. This program has been led by our CEO Murray Scott, who is also the CEO of ACSA. ACSA will need very close management and direction in the initial stages, as it gets under way.

After a slow start it is now pleasing to see the supplementary program starting to hit its straps. The technology that will be developed in this program will be applicable to defence platforms and therefore will help us in our work with the DMTC.

Work on developing a new program continues, with the CRC management continuing to talk with a range of industries where composite materials could make an impact. While we continue to work with potential core members for a new bid, we have been given no indication when the Government will announce dates for the new CRC round.

The new government and Industry Minister Senator Kim Carr in particular, have been making very supportive statements about technical innovation in general and CRCs in particular, and of course members would be aware of the reviews relevant to our work currently being undertaken by the new government. I was however disappointed in the lack of emphasis on technical innovation and manufacturing that came out of the recent 2020 summit.

We live in interesting times and the next year to 18 months will be very interesting, revealing a number of things: how large and how quickly ACSA can grow; our prospects for achieving a new Composites CRC; the impact of the supplementary program; and the initial growth path of the DMTC. All these matters are closely linked, as are the people involved. We all therefore need to continue close cooperation to build Australia as an acknowledged leader in the science and application of composite materials. We are well on the way to this goal with a world reputation that is enviable: we can however achieve even more by pulling together at a new level.

Dr Bill Schofield, AM
Chairman

CEO's Comment

Australia has had a new Federal Government since 3 December last year, and consequently much change is upon us, particularly in the business of research and innovation.

There is a new department in Canberra concerned with all things important to our organisation – the Department of Innovation, Industry, Science & Research, and the new minister is Senator the Hon. Kim Carr. One of his first actions was to announce a review of the "National Innovation System", which incorporates the scheduled review of the Cooperative Research Centre Program. By the 30 April deadline for submissions, over 630 had been received – a very strong response. It is understood that this review process has introduced a delay of more than six months into the call for new CRC proposals and similarly the overall Round 11 implementation process. Nevertheless, the development of our "New Program" continues with excellent progress being made in various areas.

In the last issue of this newsletter, reference was made to our joint proposal to establish a new Defence Future Capability Technology Centre, to be known as the Defence Materials Technology Centre (DMTC). I am delighted to report that this bid won from a strong field of eleven proposals and the new organisation is currently being established with a total of AUD 82 m worth of cash and in-kind effort to be invested over a seven-year period commencing this month. The research work to be undertaken falls into four programs – Air Platforms, Maritime Platforms, Armour Applications and Propulsion Systems - and there will also be activities in the areas of education, training, commercialisation and technology transfer. The DMTC Participants are fortunate that the establishment phase has been led by the Composites CRC's immediate past Chairman, Dr Peter Preston, who was nominated by me last year to be provisional Chairman. Following the announcement of our success, Peter resigned his new position of Senior Advisor to devote his attention to the set-up of the DMTC.

Our involvement in DMTC will be conducted through our newly established spin-off company, Advanced Composite Structures Australia Pty Ltd (ACSA), which was incorporated on 1 April as a wholly-owned subsidiary of the Composites CRC. ACSA intends being involved in up to five sub-programs addressing challenges and opportunities in areas ranging from light-weight armour for personnel and ground vehicles to multi-functional composite structures for revolutionary performance in various applications. It is anticipated that ACSA will also work closely with the Composites CRC over the next two years to commercialise various technologies, as well as to develop additional new business.

A major highlight in the first part of each calendar year is the Composites Australia & the Composites CRC joint annual conference, which was held this year in Melbourne in March. As reported elsewhere in this newsletter, the event was once again highly successful with outstanding keynote presentations, quality technical papers, an extensive industry exhibition, and very interesting practical demonstrations of new technologies. Much business was conducted, including, for the Composites CRC, the execution of an important collaborative agreement with Vestas, the Danish wind turbine system manufacturer. With Vestas now also one of our newest Associate Members, it is anticipated that a range of important research projects will commence in the near future in cooperation with our new Vestas colleagues, many of whom are based in Singapore.

Another exciting initiative that commenced recently is in the area of natural fibre composites. Together with the Composites Innovation Centre Manitoba Inc. (CIC), which is based in Winnipeg, Canada, and supported by the governments of the Province of Manitoba, Canada, and the State of Victoria, Australia, the Composites CRC will be working on an initial project to identify the opportunities for supplying new composite products using reinforcements consisting of natural fibres, such as flax, hemp and kenaf. Strong interest is developing in sustainable materials technology, and the current project is just one area the Composites CRC is pursuing to develop this sector. Other Australian organisations involved to date in creating this and related opportunities include the CSIRO Textile and Fibre Technology Division, Queensland Government, Northern Territory Government, University of Queensland, University of Southern Queensland, University of Sydney and University of New South Wales.

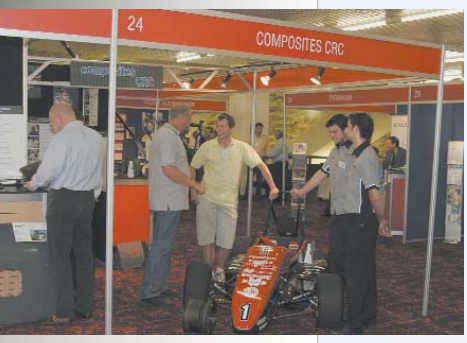
I have just returned from a whirlwind trip around North America that took in five cities in six days and a range of important meetings relevant to both current and future activities. Apart from some excellent business discussions at seven locations, I had the opportunity to witness first-hand the extent of investment in composites technologies and associated infrastructure being made by both government and industry in Canada and the USA for aerospace and general applications. This augers well for the future growth of our industry in general, but is also a reminder that investment in innovation does not come cheaply! During this week, I stopped off in Washington, DC, to attend a meeting of the Executive Committee of the International Council of the Aeronautical Sciences (ICAS), which had on its agenda a bid by the Royal Aeronautical Society, Australian Division, to host the 28th ICAS Congress in Brisbane in 2012. This proposal was supported by the Composites CRC and many other Australian organisations, and I am pleased to report that it was very well received, with a positive outcome boldly expected when the full Council meets in Anchorage, Alaska, in September this year!

Prof. Murray L. Scott
Chief Executive Officer

Fifth Composites Australia & Composites CRC Annual Conference

The fifth annual Composites Australia & Composites CRC Conference and Exhibition was held from 13 to 14 March 2008 at the Flemington Events Centre, Melbourne, Victoria.

The 416 conference attendees and exhibition visitors represented a slight decrease on the previous year of 438. This may be an indication of the size of the composites industry in Victoria compared to Queensland.
It is clear the event has support from industry and is serving a worthwhile purpose for those who attend.



Above: Discussions at the Composites CRC booth with the RMIT SAE racing car .

The event attracted delegates from ten countries and all states of Australia. Confirming the increasing popularity was attendance of Presidents of composite associations from four countries. Prof. Roberto Frassine, President of the Assocompositi, the Italian Composites Association, presented a paper on the Composite Industry and Research in Italy: Achievements and Perspectives. Niklaas Joost, from Fabristruct Solutions in South Africa and also the President of his country's association spoke on "Risk Based Inspection in Plastic Process Plant Equipment". Bobbie Cook, President of the Composites Association of New Zealand headed what is fast becoming regular attendance from a large New Zealand delegation.

Above: Live demo on Ultrasonic Welding of Fittings to Composite Panels hosted by Daniel Bitton of the Composites CRC.

Left to right: Murray Scott, (Composites CRC, CEO), Vistasp Karbhari (Professor of Structural Engineering, UCSD, USA), Matthew Low (VP & Managing Director, Singapore R&D, Vestas), Roberto Frassine (President of Assocompositi) and Norm Watt (Managing Director of Buchanan Advanced Composites).

Under the slogan "Formula for the Future", the conference program aimed to provide attendees with a broad-ranging view of the current and future state of the industry. As usual, the technical presentations were a highlight, with 45 presentations delivered in a range of areas including research, marine, renewable energy, materials, suppliers and general business.

There were also five live technology demonstrations running throughout the event, a "Pioneers Session" recognising trailblazing industry figures, a poster session for PhD students, and an exhibition open to the public involving 26 exhibitors from all sectors of the industry.

The conference dinner, populated by 190 composites practitioners and guests, was a highlight of the two-day event. Sponsored by Vestas, one of our newest Associate Members, the dinner was held in Flemington's "The Peak" with a breathtaking panoramic view of the Melbourne city skyline.

Above: Attendees at the annual dinner.

Composites 2009

As announced at the end of the conference, next year's event will to be held on the Gold Coast in Queensland. Once again a high profile conference will be prepared by Composites Australia and the Composites CRC Events Committee. The dates have been set already, so reserve in your diary now 12-13 March 2009!

Above: Prof. Tony Kelly during one of his lectures.

Prof. Tony Kelly – Australian Lecture Tour

As one of the "fathers" of advanced composite materials, Prof. Anthony Kelly needs little introduction to most people working in our field.

He is an Emeritus Professor and a Distinguished Research Fellow at the University of Cambridge, a Fellow of the Royal Society and Royal Academy of Engineering, and a Foreign Associate of the US National Academy of Engineering. He is also a World Fellow of the International Committee on Composite Materials, and a Fellow of the Institute of Physics and Institution of Materials (and Past President), as well as being a founding Fellow of Churchill College Cambridge. He holds honorary degrees from universities in Europe, the USA and Korea.

From 5 February to 28 February 2008, Prof. Kelly toured Australia presenting a paper on "Fibre Composites: Very Stiff Fibres Woven into Australia's Engineering Future". He visited Perth, Brisbane, Sydney, Canberra, Adelaide and Melbourne, with a total of over 450 people benefiting from the opportunity of meeting him in person. The tour was supported by the Composites CRC and ACSS (Australian Composites Structures Society) and was jointly hosted by the Engineers Australia / Royal Aeronautical Society Joint Board of Aerospace Engineering.

The tour coincided with the February 2008 (Volume 41-1) issue of "Materials Australia", where the paper was published. Prof. Kelly describes how growth of high performance composite structures is linked to the growth of demand for carbon fibre. It is noted that the 2007 carbon fibre production was some 27 thousand tons, worth USD1.3 b, hence selling at USD50 / kg. The global sales of carbon fibre reinforced plastics are some USD10 b; Airbus, based in Europe, and Boeing, based in North America, absorb some 50% of the total small tow carbon fibre. The paper then proceeds to provide an overview of the history of composites and their applications, primarily with carbon fibre. Prof. Kelly focuses on the challenges associated with the construction, inspection, monitoring and performance of the Boeing 787. An electronic copy of the issue is available from the Materials Australia website.

Software Licence for the Composites CRC Ply Stack Technology

The outcomes of Composites CRC research and technology development are of benefit to the Australian composites industry in many ways.

The increase in capability of participant organisations through cooperative research programs; training of research students to build capability within Australian research institutes and commercial companies; and the building of profile across the composites industry, through local and international leadership in composites technology. Perhaps the most visible outcomes are the transfer of technology into member companies to give increased capability, employment and revenue to Australian composites industry participants.

The Composites CRC is proud to report the completion of another technology licence. GKN Aerospace Engineering Services has licensed automated ply stack technology. The software provides a ply stack optimisation system for complex components, providing minimum weight designs of multiple-zone composite stacks. The technology is an important time-saving tool for bringing forward the next generation of designed composite structures for aircraft, allowing higher levels of efficiency to be determined in complex lay-ups (including ply drop-offs) and multiple loading requirements. GKN has formally licensed the software, and will use the developed code as a part of its suite of software tools.

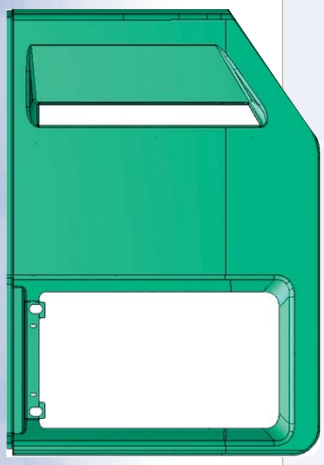
Development of the software was conducted in a cooperative program between GKN Aerospace Engineering Services and the University of New South Wales (UNSW). While legal ownership of this intellectual property remains with the Composites CRC, the beneficial ownership (and therefore licence revenue) is provided to the participants engaged in the project. Therefore, the partners in the program (in this case GKN and the UNSW) have received payment as a result of the licence agreement.

An advantage of commercialisation through the Composites CRC is the opportunity to move the technology to a range of end-users, subject to approval from the project participants. This mechanism allows the Composites CRC to move any part of its technology across non-competing market sectors, and greatly leverage the value of the developed technology. Enquiries on the licensing of any aspect of the Composites CRC's technology can be forwarded to the Commercialisation Manager, Dr Andrew Beehag, at a.beehag@crc-acs.com.au.

RTM Flow Simulation Conducted for the Composites Innovation Centre Manitoba

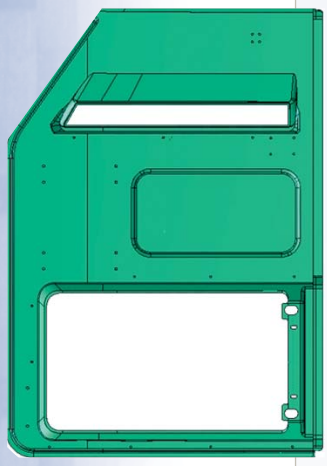
At the request of the Composites Innovation Centre Manitoba, Canada, a pilot study has been performed to demonstrate the potential benefits of flow simulation for the production of composite components using Resin Transfer Moulding (RTM).

The part used for this study was a vehicle radiator door, which uses several reinforcement types and has sections stiffened with foam core. The flow simulations provided key insights to the process filling pattern and demonstrated the use of flow simulation in process design for RTM.



Above:
Front face of door panel.

Below:
Inside face of door panel.

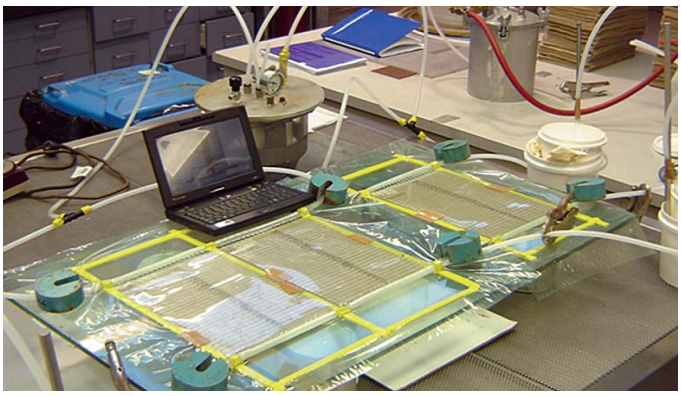


The Composites Innovation Centre Manitoba Inc. (CIC), Canada, is a not-for-profit corporation that is jointly sponsored by private industry and government. Its mandate is to support and stimulate economic growth through innovative research, development and application of composite materials and technologies for manufacturing industries.

CIC was contacted by a customer interested in determining the potential benefits that simulation of the infusion process could bring to their business. The company makes a large number of composite parts and panels primarily for the bus industry and is currently in the process of converting to RTM from other processes. The RTM process being used involves laying-up the reinforcement on a rigid tool, with a semi-rigid tool used to close the mould, vacuum drawn on the part and resin injected under pressure. Flow simulation has the potential to assist in optimisation of the fill strategy leading to improve process robustness and part quality control.

The part selected for demonstration was a vehicle radiator door panel made from a variety of reinforcement materials and with sections stiffened using a core material.

Composites Innovation Centre

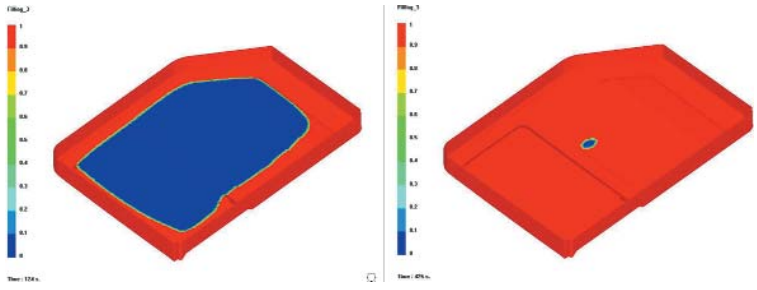


Above: Permeability test set-up.

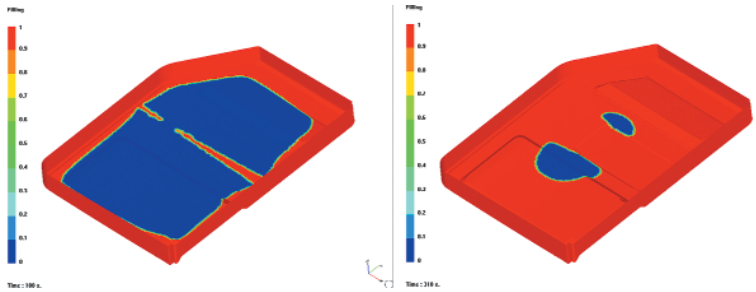
The permeabilities of the reinforcements were determined experimentally using a standard Composites CRC test procedure. This data was used as input parameters for the flow simulation.

The accuracy of the simulations was critically assessed by identifying possible sources of error and uncertainty, and strategies to improve confidence suggested. Flow simulations were conducted using the PAM-RTM software to investigate different fill strategies and the effect of race-tracking on the fill pattern.

These simulations provided key insights to the process and filling pattern and demonstrated the capability of PAM-RTM for use in process design for the specific RTM technique to be used. It was demonstrated that the simulation environment is ideal for exploring novel strategies that have the potential to increase productivity, yet bear minimal risk if they prove to be unsuccessful. Additionally, simulation enables deep insight into the characteristics of the resin flow in a part to be rapidly gained. The use of flow simulation to perform “what-if” studies can be invaluable for the development of a new product.



Above: Fill strategy 1. Red: resin, Blue: dry fibre.



Above: Fill strategy 2. Red: resin, Blue: dry fibre.

Associate Member News

The Composites CRC Associate Membership program is a mechanism to facilitate engagement with Small and Medium Enterprises (SMEs). This program was established in 2003 with the aim to transition research accomplishments to local industry. Since then, The Composites CRC has collaborated with materials suppliers, software developers, training organisations and end users in the aerospace, maritime and general composites industries.

Our Associate Members

This issue presents our newest members since October 2007.

New members include AMOG (VIC), Brenco Aerospace (VIC), Linatex Australia (VIC), Vestas – Australia Wind Technology (VIC) and PLASMATE JSC (Vietnam). This is another great example of the broad range of members that are part of the Centres Associate Membership program.

With an increase in interest from various conferences and relationships within the industry, membership has grown to a total of 20.

Members Conference 2008

Due to the success and feedback from the last two annual members' conferences, the Centre will be hosting the third conference on 3 October 2008 in Melbourne, with the annual dinner to be hosted the night before.

All Core, Supporting and Associate Members will be invited to this exclusive annual event. This gives all members a great opportunity to present new technologies, ideas and recommendations on sustaining the composites industry.

Plans for this years conference will incorporate the following activities:

- "Speed Networking" session, since it was a very popular activity last year.
- Open forum discussion on a topic selected by members before the conference
- New members since our last conference to provide a brief overview of their company
- Members currently working on a project with the Composites CRC may give a brief summary on any aspect of the project.

VESTAS Signs Long Term Partnership with the Composites CRC

On 13 March 2008, the Composites CRC signed a collaboration agreement with Vestas Wind Systems A/S.

Left to Right: Bill Schofield (Chairman, Composites CRC), Murray Scott (CEO, Composites CRC), Matthew Low (VP & Managing Director, Singapore R&D, Vestas) and Jørn Hammer (Asia-Pacific Senior Vice President, Vestas).

Vestas is the world's leading supplier of wind power solutions. Wind energy is today the most cost competitive offering technology that can help Governments reduce their energy dependency on fossil fuels and energy imports while reducing their CO_2 emissions.

The outlook for wind energy is positive with international wind markets predicted to continue their spectacular growth. Vestas already has the largest research and development unit in the wind industry, however, they are further expanding their R&D to keep ahead of the market. As part of this they are initiating collaborative research with partners who are experts in their given area.

The agreement between Vestas and the Composites CRC marks the start of a long term partnership between the two organisations and will enable the realisation of projects to the different areas involving composite materials. The Composites CRC is one of the world's leading composites research institutes which brings together research providers and composites businesses to provide competitive technology for the Australian industry. The unique position of bridging research, development and implementation of composites technology means that the Composites CRC can respond to the requirements of composites businesses on many levels, and become an integral partner in the generation and adoption of new technology.

Above: Vestas and the Composites CRC official signing ceremony.

AMOG Consulting

Member Since
January 2008

AMOG Consulting is an Australian engineering consultancy offering specialist skills and solutions in a range of technology disciplines. Its markets include international offshore oil and gas, Australian defence, construction and infrastructure, government, mining and process, legal and civil maritime. AMOG's focus is in the provision of leading engineering solutions to its clients, which include government and defence agencies, as well as private sector companies ranging in size from small operations to large multinational corporations.

In providing solutions for its clients, AMOG brings to bear leading consultants, supported by a select group of highly qualified and experienced engineers, together with state-of-the-art analytical software and powerful computational hardware. Research and development is an important strategic part of the business, and AMOG devotes substantial resources to its own internal R&D programme that includes the following technology areas: risers and subsea pipelines; offshore platforms and structures; large mining industry equipment; steel wire and fibre rope and chains; and advanced testing facilities.

Linatex Australia

Member since March 2008

Established in Malaysia during the 1920s, Linatex revolutionised the concept of industrial wear design and solutions with its natural rubber formulation. Since then, Linatex has grown and developed into an unrivalled expert in this field. Linatex has grown to encompass a complementary range of products and services that include process equipment, material handling products, a range of mining hose products and technical expertise in hose and piping systems.

Linatex rubber sheet and lining has phenomenal resilience, exceptional tear resistance and toughness. Linatex is the only rubber to combine these properties making it unique in abrasion trouble spots. The rubber has been shown to outlast steel, manganese steel and even nickel-hard iron, resulting in significant cost benefits to the user.

Above: Picture of the Pará rubber tree (Hevea brasiliensis), often simply called rubber tree, used to collect its unique sap which is the primary source of natural rubber.

VESTAS - Australian Wind Technology

Member since March 2008

Vestas is the world leader in wind technology and a driving force in the development of the wind power industry employing over 15,000 employees globally. Vestas' core business comprises the development, manufacture, sale, marketing and maintenance of wind power systems that use wind energy to generate electricity.

Vestas' operation based from Melbourne is responsible for the sale, construction and maintenance of Wind Farms throughout Australia, New Zealand and emerging markets in Asia. Vestas – Australian Wind Technology currently supports over 900 MW of wind turbines in Australia.

Vestas already has the largest R&D unit in the wind industry, however, they are further expanding their R&D to keep ahead of the market. They are currently cooperating with several universities and are highly interested in working

closely with leading researchers worldwide in order to maintain their position as the leading supplier of wind energy solutions. As part of this, Vestas has recently become an Associate Member of the Composites CRC. It is anticipated this collaboration will facilitate development of new manufacturing techniques to meet the industry growth challenges.

Above: Vestas wind turbines.

PLASMATE Advanced Plastic Materials and Technology Joint Stock Company

Member since June 2008

Established on 4 October 2007, The PLASMATE Advanced Plastic Materials and Technology JSC is one of the very young companies in Vietnam's plastics industry and shows great potential, specialising in plastic materials and advanced composites. Based on three vital components - human resource, technology and business strategy - PLASMATE has found its own direction of development, and has gradually affirmed its position in national and international markets. The Company has been creating its competitive advantages as Vietnam integrates into the world's markets.

PLASMATE has a strong relationship with the School of Materials Science and Engineering at the University of New South Wales, Australia, and is the distributor for the UV curable prepreg system manufactured by Australian Composites (The Specialty Group).

PLASMATE plans to cooperate with the Composites CRC in developing and using materials sources available in Vietnam, such as natural fibres (jute, bamboo, coconut, etc.) and to become a strong base to help the Composites CRC penetrate the Vietnamese markets.

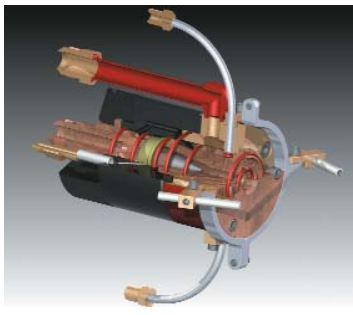
PLASMATE has been recognised as one of the top ten competitive brand names in the plastic and rubber sectors in Vietnam by receiving the "2008 Intelligent Award".

Above: Revelly is a fashionable protective helmet manufactured by PLASMATE JSC for motorcycle and moped riders. The construction consists of three substrates: EPS foam, ABS plastic and fabric (cloth).

The Brenco Group

Member since February 2008

The Brenco Group are an engineering based group providing advanced thermal and inorganic coatings for aviation, mining / mineral processing, oil and gas processing and power generation. The Brenco Group has joined the Composites CRC to pursue its interests in developing nano-based coating technology for the aviation industry. Current and future trends in energy provision, mineral processing and aircraft structures mandate the cooperation of material manufacturers, upstream applicators, research centres and market end users to achieve desired outcomes.



Above: Cross-section of the dispensing head used to distribute nanoparticles.

VESTAS Case Study

From wet lay-up to resin infusion

Vestas have manufactured over 8,000 blades using a wood epoxy composite.
In 2001 it adapted the wet laminated wood epoxy technology by introducing carbon fibre into its larger blades and converting the process from a wet lay-up process to a dry lay-up, resin infusion process. Blades of up to 59 m have been manufactured using the technology described in this case study.

Wet laminating process

Vestas 26 and 31 m blades were manufactured using the wet laminating process. Fibre glass and large birch ply sheets were hand laminated into a female blade shell mould.
This process, while effective for obtaining the adequate structural properties, involved a lot of contact with the resin. Hence, in an effort to improve health and safety standards and improve blade quality, resin infusion was investigated. The resin infusion process also offered a number of other advantages including improved production times, reduced resin wastage, superior fibre volume fractions and a lower void content. Although at the time there was a lot of experience with infusing composite yachts, building an infused blade was still a big challenge because there was little or no experience of infusing wood structures.

Above: Wet lay-up of wind turbine blades.

Development of the resin infusion process

The blade manufactured using resin infusion technology maintains the use of the same unidirectional birch plywood and epoxy resin. However, to enable the resin to impregnate the blade materials, the large birch sheets were exchanged for strip planking.

Initial infusion trials were performed using conventional veneer stacks and although successful at the laboratory scale, the trials highlighted problems with resin coverage of large sheets together with the concern that the main joints were hidden within the blade. Hence, an alternative method of construction using strip planking instead of the large ply wood sheets was introduced.

This technique enabled better inspection of the blade structure and faster infusion since the resin has less surface area to cover. At the same time, the new construction facilitated the addition of carbon fibre. Carbon was added between the birch planks, significantly increasing the blade stiffness.

Above: Dry materials layed in the mould ready to be bagged.

Building the blade skins

Blades are manufactured in two halves – windward and leeward blade skins. Dry structural materials (core, glass and carbon) are laid into the blade moulds and a vacuum bag is placed over each mould-half and vacuum is applied. This consolidates the lay-up and makes it conform to the shape of the mould. Resin is introduced and the vacuum infiltrates through all the air spaces, thus wetting out all the blade skin materials. The vacuum is maintained while the blade skins are cured. Once cured, the vacuum bags are removed from the blade skin halves and the two blade halves are joined together using a structural adhesive.

Awards

Grants Send RMIT Researchers Overseas

Two RMIT Research Fellows have been awarded travel grants from the CASS (Contributing to Australian Scholarship & Science) Foundation Scholarships.

Dr Stefanie Feih and Dr Adrian Orifici from the RMIT School of Aerospace, Mechanical and Manufacturing Engineering have received the scholarships, for AUD4,000 and AUD4,824 respectively, from the CASS Foundation's Post-Doctoral Travel Grants for Early Career Researchers Scheme.

Both contribute to the Composites CRC research as RMIT Research Fellows, and the scholarships will fund their participation in international conferences in Europe and the United States. The CASS Foundation is a private organisation that supports research in education, science and medicine.

Dr Stefanie Feih

Award for UNSW Researchers

A team of researchers at the University of New South Wales (UNSW) has received a prestigious award from the Editorial Board of the Composite Structures journal

The "Composite Structures Award" is given annually to the paper published in Composite Structures that is voted by the Journal Board to have made the most significant contribution to the field in each year.

The 2006 Composite Structures award was won by the paper "Improvement of Bearing Strength of Laminated Composites" from a team led by Prof. Alan Crosky of the UNSW School of Materials Science and Engineering, with co-authors from the UNSW School of Mechanical and Manufacturing Engineering and the Ecole Nationale des Arts et Industrie Textiles in France.

The paper reports on a range of techniques applied by the team to improve the bearing strength for bolt holes in carbon-fibre reinforced laminates, and covers fibre steering, matrix stiffening using nanocomposites and z-pinning.

Dr Adrian Orifici

Prof. Alan Crosky

DMTC – Technical Aspects of the New Defence Program

Following a successful bid for funding late in 2007, the Composites CRC is preparing its participation in the new Defence Materials Technology Centre (DMTC), with operations due to begin on 1 July this year.
The Composites CRC will be participating in the centre through its newly formed spin-off company, Advanced Composite Structures Australia Pty Ltd (ACSA).

The technical program for the DMTC has been under development since the beginning of 2008. Technology development will focus on metals, composites and ceramic materials, for a range of technologies relevant to military platforms and personnel. Composites CRC participants DSTO, GKN Aerospace, RMIT University, Pacific ESI and University of Queensland are also contributing to the DMTC, along with Associate Member Nanotechnology Victoria. New partnerships are also being formed in defence composites research, with Thales Australia, Swinburne University of Technology, Fabrics and Composites Science and Technologies, the Australian Nuclear Science and Technology Organisation (ANSTO), SEAL Solutions, the University of Melbourne and the University of Wollongong to participate with ACSA in DMTC projects. Significant funding support is being provided by the Victorian and Queensland Governments, with additional funding support being finalised from the New South Wales Government.

The research program for composites will assist in pushing the knowledge envelope for the application of composite materials. Projects to be addressed within DMTC include:

- rapid and reliable detection and analysis of composite defects – technology for the automatic detection and handling of composite defects, reducing subjective operator assessments during NDI of composites;
- multi-functional composite materials – composites incorporating a diverse array of potential enhancements from embedded antennas, sensors and wires through to frequency selective surfaces and electromagnetic interference surfaces;
- advanced personnel armour – personnel protective systems capable of providing protection as well as signature management and power harvesting functions;
- alternative construction and protection systems for land platforms – applications from transportable blast shielding through to embedded sensors and actuators;
- high temperature materials for hyper and supersonic flight – supporting the use of composites in the development of next-generation propulsion systems.

Formation of the Composites CRC Spin-Off Company

On 1 April 2008, Advanced Composite Structures Australia Pty Ltd (ACSA) was registered with the Australian Securities and Investments Commission. The company is a proprietary company limited by shares which are wholly owned by the Cooperative Research Centre for Advanced Composite Structures Ltd.

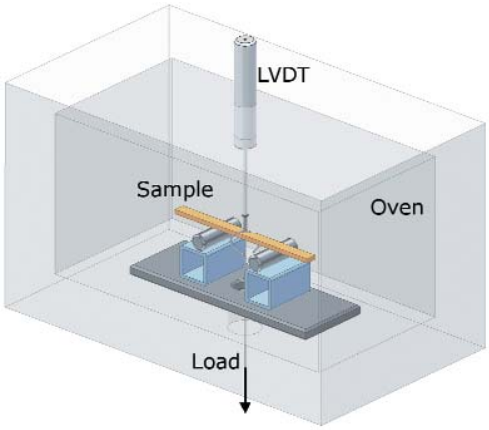
The objects of this new company are to be Australia's leading provider of world–class research and innovation in the field of composite materials, structures and related technologies, and to drive the increased utilisation of engineered composite structures globally.

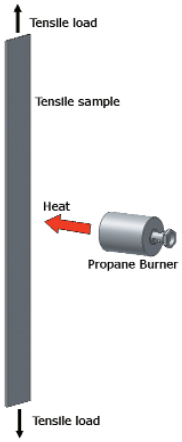
The initial appointments are as follows:

- Dr Bill Schofield – Chairman of the Board
- Prof. Murray Scott – Managing Director
- Mr John Heathcote – Company Secretary

A business plan for ACSA was endorsed by the Board of the Composites CRC at a meeting on 9 May 2008. The creation of the spin off company (ACSA) is an indication of the valuable contribution that the Composites CRC has made within the Commonwealth CRC Program. It is anticipated that ACSA will develop into a very successful organisation given the strong support from the Composites CRC.

RMIT Team Wins Paper Prize





Above: Temperature controlled rig for measurement of flexural modulus while the specimen is subjected to elevated temperatures.

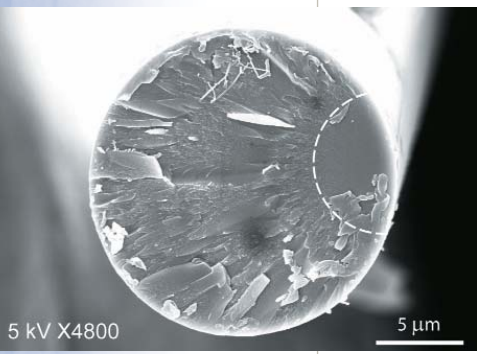
Right: Test specimen under tensile load subject to one sided heat flux using a propane burner. (Rear face insulation of specimen is not shown.)

RMIT researchers Dr Stefanie Feih and Prof. Adrian Mouritz have received the 2008 Composite Award from the Institute of Materials, Minerals & Mining (IOM3) for publication of a paper with co-authors from the University of Newcastle, UK.

The prize is awarded by IOM3 for "published work of particular merit in the field of composites", and relates to their paper: "A Failure Model for Phenolic and Polyester Pultrusions Under Load in Fire" by R.C. Easby, S. Feih, C. Konstantis, G. La Delfa, V. Urso Miano, A. Elmughrabi, A.P. Mouritz and A.G. Gibson – Plastics, Rubber & Composites, November 2007, 36(9), 379-402. The award will be presented at a special ceremony in London on 22 October 2008. This is the second time Prof. Mouritz has been awarded the honour, having also received the same award as co-author of another paper in 2004.

The work featured the failure of polyester and phenolic pultrusions under tensile and compressive load while subjected to a heat flux of 50 kW m^2 on one side. A thermal / mechanical model, based on the Henderson equation and laminate theory, was used to model their behaviour. In tension, significant load bearing capacity was retained over a period of 800 seconds, due to the residual strength of the glass fibres. However, pultruded composites are susceptible to compressive failure in fire due to the loss of properties when the resin Tg is reached. The fire reaction properties reported showed that the phenolic pultrusions perform better than polyesters in all fire reaction properties (time to ignition, heat release, smoke and toxic product generation). The measurements under load in fire also showed that the phenolic system decayed at a slower rate than the polyester, due mainly to the very shallow glass transition of the phenolic and its char forming characteristics.

RMIT & the Composites CRC Win ONR Grant



Above: Fracture surface with surface flaw fracture mirror.

RMIT University and the Composites CRC have secured another substantial research grant from the US Office of Naval Research (ONR) to study fracture of carbon and glass fibres under elevated temperatures.

The grant is entitled "Mechanistic Fracture Study of Engineering Fiber Strength" and is a two-part project over two years, for which the first year funding of USD100 k has been awarded. RMIT and the Composites CRC will contribute to the international project that will also involve the University of Newcastle-upon-Tyne, UK. The project builds on the success of RMIT and the Composites CRC in several preceding ONR-funded projects investigating composite properties in fire, and recognises the international reputation of these organisations in the field.

Chair of Monash University Aerospace Engineering

Professor Brian G. Falzon has recently been appointed to the Chair of Aerospace Engineering at Monash University in Melbourne.

He was awarded a PhD from the University of Sydney in 1996 and was one of the first PhD students to work on a Composites CRC funded project investigating the postbuckling behaviour of stiffened composite aerostructures. This research formed the cornerstone to a significant body of work which has received considerable international interest and recognition.

Brian is still very active in this field. He moved to the United Kingdom in that same year to take up the post of Research Associate in the Department of Aeronautics at Imperial College London. He was appointed Lecturer in Advanced Aerostructures in 2000, Senior Lecturer in 2005 and Reader in 2007. Brian was also Director of Undergraduate Studies between 2005 and 2007 and is currently Visiting Professor at Imperial College London.

MONASH University

During his time in the UK, Brian initiated and managed a number of large research programmes funded by industry and government, including research for the Ministry of Defence (DSTL), Airbus UK, Shorts/Bombardier, BAE Systems and QinetiQ. Brian was elected Chairman of a GARTEUR (Group for Aeronautical Research and Technology in Europe) Action Group to address the challenges facing the European aerospace industry in developing reliable methodologies for the design of advanced composite aerostructures. This group was represented by industries and leading academic institutions from the UK, Italy, France, Germany, Sweden, The Netherlands and Spain. He maintains regular contact with these and a number of international research groups in Delft, NASA Langley, Haifa and Milan among others.

Brian's research interests include the development of robust finite-element algorithms for predicting the response of geometrically non-linear structures, fracture mechanics and damage in composites, structural optimisation, the dynamic response of composite structures to impact loading, structural testing, the development of virtual testing environments and the design of medical implants and modelling biomechanical systems. He is the author of two books, has contributed chapters in others and has published numerous journal and international conference papers. He is a Chartered Engineer and a member of a number of professional organisations and scientific committees. Brian is co-founder of Veryan Medical Limited, which is developing a number of implantable devices including a new endovascular stent for which he holds two patents. He is on the editorial board of the Applied Composites Material Journal and World Scientific Press, a consultant to industry and has received numerous awards and lecture invitations.

Composites CRC CEO in Helmholtz Review

HELMHOLTZ ASSOCIATION

DLR

Prof. Murray Scott has taken part in a formal review of the Aeronautics program of Germany's Helmholtz Association, held at the German Aerospace Center (DLR) in Cologne from 18 to 20 February 2008.

The Association has an annual budget of EUR2.4 b, and uses an international review panel to allocate annual funding to projects of up to five years on a competitive basis.

The Helmholtz Association was founded in 1995 as an umbrella organisation of 15 national research centres, which includes the DLR, and is the largest of four German research organisations. The Association operates in 34 locations and 250 institutes around Germany, and its 26,500 staff includes 8,000 scientists and engineers and 3,800 doctoral students.

The Aeronautics Review Panel consisted of 15 experts and leading figures from industry, academia and research organisations. Each proposal was presented and discussed, and the panel was asked to make assessments on the basis of scientific quality, strategic significance and cost effectiveness. The panel recommendations were passed onto the Senate Committee, which then acts to allocate the EUR67 m budget of the Aeronautics research program.

The current DLR program is focussing on making the fast-growing air transport sector efficient, environmentally friendly and sustainable, and is geared towards the objectives stated in the European strategy paper 'Vision 2020':

- Reduce the cost of air transport by 30%
- Reduce accident rates by 80%
- Increase the volume of European air traffic to 16 million flights per year
- Reduce carbon dioxide and nitrogen oxide emissions by 50% and 80%, respectively
- Reduce perceived noise levels by 50%

Lilienthal Medal

The Federation Aeronautique International (FAI) gave their highest gliding award for 2006 to Alan Patching AM, FRAeS.

The Gliding Federation of Australia (GFA) recommended Alan in recognition of his extensive and substantial contribution to glider airworthiness and sailplane fatigue life. For over 60 years he has maintained an intensive study of, and interest in, glider airworthiness. His accomplishments include lecturing and directing the National Gliding School for 16 years, early recognition of the potential for fatigue failure in Blanik gliders, development of fatigue design requirements as part of the OSTIV airworthiness standards and making a major contribution to the fatigue of fibreglass glider structures.

This project arose because the certified service life of glass reinforced plastic (GRP) gliders was only 3,000 hours and since Australian gliders were being flown at the rate of 1,000 hours per year, this was clearly unacceptable. The service life of all composite gliders has been extended, some to 12,000 hours, which is considered adequate by operators these days. A joint project between the GFA, CASA (formerly the Department of Civil Aviation) and RMIT involved measurement of flight loads and full scale structural testing of both a new and repaired Janus glider wing.

The significance of this work was summarised in a supporting letter from Gerhard Waibel, a noted German glider designer. Alan Patching was the first of the fatigue experts who distributed the news that fibre reinforced plastics are less prone to fatigue than metals at the stress levels used in sailplane design and even more importantly, that fatigue problems may be recognised early enough by appropriate inspection intervals so that catastrophic failure can be avoided. Because of his engagement in considerably extending the service life of sailplanes, it was recommended that FAI should consider an appropriate recognition.

At the age of 83 years Alan has made over 9,000 flights in gliders and continues to be an active glider instructor, authorised to train and endorse tug plane pilots.

Left to Right: Alan Patching accepting the 2006 Lilienthal medal from FAI President Pierre Portman.

Development of a New Program for the Next Decade

The Composites CRC is looking to the next decade of development in composite materials technology and the opening of Round 11 of the Cooperative Research Centre Program.

CRC funding has formed the core of the Composites CRC operation since its beginning as the CRC for Aerospace Structures in 1991. Development of the New Program is based on modern drivers and on an industry that has matured significantly and moved into an array of applications.

A review of the National Innovation System was announced by Senator the Hon. Kim Carr on 22 January 2008. This wide-ranging review includes funding to Cooperative Research Centres, with a panel formed to study CRCs being led by Prof. Mary O'Kane. Some significant changes are expected in the next round of funding, notably that Senator Carr announced that the "Rudd Government is absolutely determined to restore public benefit as one of the primary objectives of the CRC Program". Alongside a strong drive to research into climate change and sustainability in the Rudd Governments recent actions, there is strong expectation of a "triple bottom line" approach to assessing CRCs: commercial viability, public good and environmental responsibility.

The Composites CRC has been developing its New Program plans around this triple bottom line approach. While commercial success of the Composites CRC has been outstanding and widely recognised within Government, the public good outcomes of the Composites CRC to date have also been impressive - in particular, the strong emphasis on supporting defence and building defence technology, along with commitment to SMEs (many in regional employment centres) through technology diffusion and collaborative engagement. There has also been a recent strong commitment to developing sustainable composites technology and to securing participation in both local and international collaborative networks to provide Australian businesses with environmentally responsible technology into the next decade.

The timing of the Round 11 call for submissions is unclear; however, Senator Carr has stated that "our aim is to have the next selection process completed by the middle of 2009". A "green paper" from the innovation review is expected at the end of July.

Six potential sectors have been identified for the New Program, covering major existing and emerging composite technology markets:

- Aerospace – covering fixed and rotary wing aircraft in the civil and military sectors;
- Marine and Maritime – engaging civil and defence technology development;
- Ground Transportation – trains, trams, buses, road tankers and the passenger automotive sector;
- Resources and Energy – incorporating the oil & gas and mining industries, as well as renewable energy generation;
- Civil Infrastructure – from bridges and building construction to water and power infrastructure;
- Special Applications – an emphasis on innovative and public good applications, including sports and medical composites.

Within these six programs, an array of fresh, exciting technologies are expected:

- multifunctional material for addressing multiple structure requirements;
- enhanced multi-physics modelling capabilities integrated into the design and simulation process;
- extension of low cost manufacture and assembly into virtual manufacture and test capability;
- biomaterials for enhanced sustainability, reduced cost and improved end-of-life handling;
- maturity of health usage and monitoring systems for greatly improved operation and repairability.

Research in these and other areas under the new program will be industry driven and relevant, ensuring maximum utilisation and benefit for Australia.

Further enquiries on the new program development can be directed to the New Program Development Coordinator, a.beehag@crc-acs.com.au.

Composites CRC Patent Update

Compared to other CRCs, the suite of twelve patents and provisional patents that is held by the Composites CRC is somewhat small. In many instances, research by the Composites CRC results in the building of capability both for participant staff and the Composites CRC staff.

In other research programs, new technologies are developed that can be packaged for use. A number of these can be protected by commercial confidentiality arrangements and do not require the high level of expense associated with patent protection. Over the operating life of the Composites CRC, some technologies have been developed with high commercial value and have warranted additional protection of a patent. Within the last twelve months, the first patent grants have been received by the Composites CRC, following approximately six years of application process.

The first technology patented by the Composites CRC was the impregnation and manufacture of distance fabrics, including foam-filled distance fabrics. A patent has now been granted in the USA and will soon follow in Australia. The technology is particularly suited to the manufacture of glass phenolic composites, where two glass phenolic skins sandwich a phenolic foam core. This has applications to the transportation industry, where fire resistance and structural performance need to be combined.

The majority of patent applications have been submitted for the suite of technologies known as Thermoset Thermoplastic Integration (TTI), with ten of the twelve Composite CRC patents and applications belonging to this suite. The first patent, for protection of the underlying Thermoset Composite Welding (TCW) technology, has now been granted in Australia, Taiwan, Malaysia, China, UK, France, Spain, Germany and Italy. This patent covers the selection of a thermoplastic for integration onto the surface of a thermoset composite, and the subsequent welding of thermoset structures together having a thermoplastic surface. TCW has been the subject of significant Composites CRC investment, as well as continuing to be demonstrated in externally-funded projects.

Enquiries about the Composites CRC technology portfolio can be addressed to the Commercialisation Manager, Dr Andrew Beehag, at a.beehag@crc-acs.com.au.

From top: TCW patent from China, Taiwan, Malaysia and Australia.

RESEARCH LEADERS IN ADVANCED COMPOSITE MANUFACTURING AND DESIGN

Core Participants

australian aerospace
Eurocopter - an EADS Company

Australian Government
Department of Defence
Defence Science and
Technology Organisation

Composites Australia

CSIRO

GKN AEROSPACE

Hawker de Havilland

UNSW

MONASH University

The University of Sydney

RMIT University

Supporting Participants

Aviation AUSTRALIA

BAC
BUCHANAN ADVANCED COMPOSITES

MSC Software

Pacific ESI

QMI SOLUTIONS

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

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