Connection

Issue 57 • December 2021

The official magazine of Composites Australia

Inside

allnex

aquaguard® X
Next Generation Pool Gelcoat

Aquaguard® X – an exciting new range of pool gelcoats, manufactured in Australia, to withstand harsh outdoor conditions

Aquaguard® pool gelcoats have long been the flagship product of our offering to the local and global composite pool markets with over 20 years of proven field history.

Aquaguard® X gelcoats are an exciting new range of pool gelcoats from allnex Composites, proudly manufactured in Australia, and designed to withstand our harsh outdoor conditions. They are high performance finishes for the manufacture of composite swimming pools exhibiting high durability, outstanding UV protection, weathering and chemical resistance properties.

Product Features	Benefits
High Performance Surface Coating	A striking and visually appealing cosmetic finish with exceptional durability
High Quality Gelcoat Pigments	Vibrant and long-lasting colours
Outstanding UV Protection	The Aquaguard® X technology protects the decorative finishes from harsh effects of the sun
Excellent Chemical Resistance	Products are tested extensively for chemical fade resistance to ensure a longer lifespan for the cosmetic finish

Performance Advantages:

- Improved chemical (chlorine) & water resistance
- Improved UV resistance, protecting the finish of your pool for many years
- Increased colour retention during outdoor exposure
- Superior aesthetics of laminate during service life which maintains the original cosmetic appearance for a longer period

Aquaguard® X gelcoats are available in a range of contemporary colours and striking finishes.

For more information, please contact allnex on 1800 789 607 or visit www.allnex.com

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Boeing's Melbourne facility recently commenced its fifth Boeing Airpower Teaming System aircraft, as the program continues its rigorous ground and flight testing. Source: Boeing Australia

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Composites Australia

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President's Letter

Welcome to this edition of the Composites Australia magazine which features a series of articles on Australian companies developing technology and supplying components and products into the Australian and offshore defence and aerospace sectors. These heartening articles validate the role of FRPs, GREs and CFRPs in land systems, military aircraft, naval vessels, UAVs and weapons all of which have high performance requirements with the safety and survivability of personnel and the assets paramount.

As the pandemic continued into 2021, Composites Australia shifted its focus on what it could do, rather than what it couldn't do. Our new website recently went live with greater functionality. The site features a new Suppliers Guide which is now the most comprehensive databank of Australian composites capabilities in the southern hemisphere. It is designed to generate leads for members as well as a source for equipment, materials and services across 350 categories.

Our scoping study on carbon fibre composites in Australia was recently released, a copy of which can be found on the Composites Australia website. Over a period of months we interviewed selected stakeholders, marshalled previous research and industry studies and studied over 600 websites to map the capabilities of Australian companies, enterprises and institutions and their specific capabilities with carbon fibre composites.

Which brings me to our forthcoming conference that will be held on 30 and 31 of March 2022 at Clifford Park in Toowoomba. The event's focus is 'Acting on Vision' and features stimulating presentations from composites practitioners and thought-leaders, including Denis Wagner, Director, Wagner Corporation, and Non-Executive Chairman, Wagners Holding Company. The Wagner Corporation is also opening its Composites Fibre technologies manufacturing facility for a tour for delegates. I urge you to visit www.compositesconference.com.au for updates on the program of impressive speakers, demonstrations and tours.

I have always benefitted from attending and am particularly looking forward to seeing you all again in person - so keep your eye on the conference website for the details and early bird pricing.

Leona Reif
President

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XTEK Ltd.
Advanced composite design & fabrication.

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

XTEK has a single purpose, which is to protect our frontline protectors. The company was founded – and is still managed today – by former Defence Force and Homeland Security personnel to develop and deliver the lightest, thinnest and highest performing protective and surveillance products to serve and sustain our service personnel and assets.

The company manufactures a wide range of specialised proprietary products for tactical and protective security and explosive ordnance disposal (EOD) as well as unmanned aerial systems (UAS) and geospatial visualisation solutions. Its protective personnel program portfolio includes personal light-weight armour vests and military and security light-weight protective helmets as well as military light-weight armour plating. XTEK designs and fabricates high performance composite components using carbon fibre, fibreglass, aramids and other specialty fibres in both thermosetting and thermoplastic resin systems.

The XTclave™ is a composite materials curing and consolidation technology that uses ultra-high isostatic pressure of up to 300bar at temperatures of up to 200°C to cure and/or consolidate thermoset and thermoplastic composites. The patented technology was developed in-house specifically to produce lighter, stronger and stiffer complex geometric shaped composites including precision ballistic and structural composites for armour, lightweight tactical and human load carriage equipment, robotic mechanical systems and unmanned craft.

"Closed moulding in a press for the RTM processes with expensive tooling can apply similar pressures as our hydroclave, but only in an axially direction. The RTM process has regions of high and low-pressure within the composite component that arise from part complex geometry. Our hydroclave technology makes it possible to manufacture composite articles by the isostatic pressure effect and high efficiency heat exchange using a heat transfer fluid. The resulting fibre volume content is typically 70 per cent, but up to 75 per cent has been achieved for structural components using thermosets without surface dryness and near zero void content through thickness," explained Rik Heslehurst, PhD, Aerospace and Composites Engineer, XTEK Ltd.

Simon Fielder and Ben De Boo of XTEK undertake final preparations for Hydroclave insertion.

XTEK provides several products for the Australian Defence and Security Forces. It exports to New Zealand, USA and Denmark and is forging markets into other European countries as well as Asia.

XTEK's integrated service portfolio also includes engineering and R&D consulting services as well as composites training. Its electronics workshop and composite repair facility that provide in-house through-life support for its equipment is housed at head offices in Canberra. XTEK's engineering facility is located in Adelaide which is home to its armour research hub and the XTclave technology and manufacturing centre for its lightweight composite production. The facility also houses its CNC machining, fabrication and injection moulding capabilities.

XTEK - an Australian Defence Force recognised supplier - is listed on the Australian Defence Force Register as an approved maintenance facility, and is a member of the Defence Industry Security Panel. XTEK Limited, listed on the Australian Securities Exchange (ASX:XTE) in 2005.

XTEK's accreditations include QMS ISO 9001-2021 DoD – DMO Registered Technical Support Agency Member of the Defence Industry Security Program Defence Recognised Supplier of Strategic Capabilities.

Hypersonix

Using high temperature composites for sustainable space travel

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

On the ground, sound waves travel at around 340 metres per second. An aircraft is Supersonic when it exceeds the speed of sound. Hypersonic speed is more than five times the speed of sound – or 'Mach 5' – which is just over 6,000 kilometres per hour. At Mach 5 and above, friction caused by molecules flowing over the hypersonic aircraft can generate temperatures in excess of 2000°Celsius. Suffice to say that Brisbane-based aerospace engineering start-up, Hypersonix Launch Systems, is choosing its materials to cope with these extremes.

Founded in 2019, Hypersonix Launch Systems aims to provide sustainable satellite launch services from Australia using hypersonic scramjet technology. In a short time, and in the shadow of the pandemic, the Hypersonix team of close to 20 aerospace engineers and material specialists has developed reusable scramjet engine technology for engines that are powered by sustainable green hydrogen fuel.

Dr. Michael Smart, Co-Founder, Chief Technology Officer and Head of Research & Development with Hypersonix is a recognised world leader in scramjet technology having worked as Research Scientist at the NASA Langley Research Center (Scramjet Branch) before returning home to Brisbane. His alma mater is the Centre of Hypersonics at the University of Queensland which is recognised globally as one of the leading university-based research groups in the field of Hypersonics.

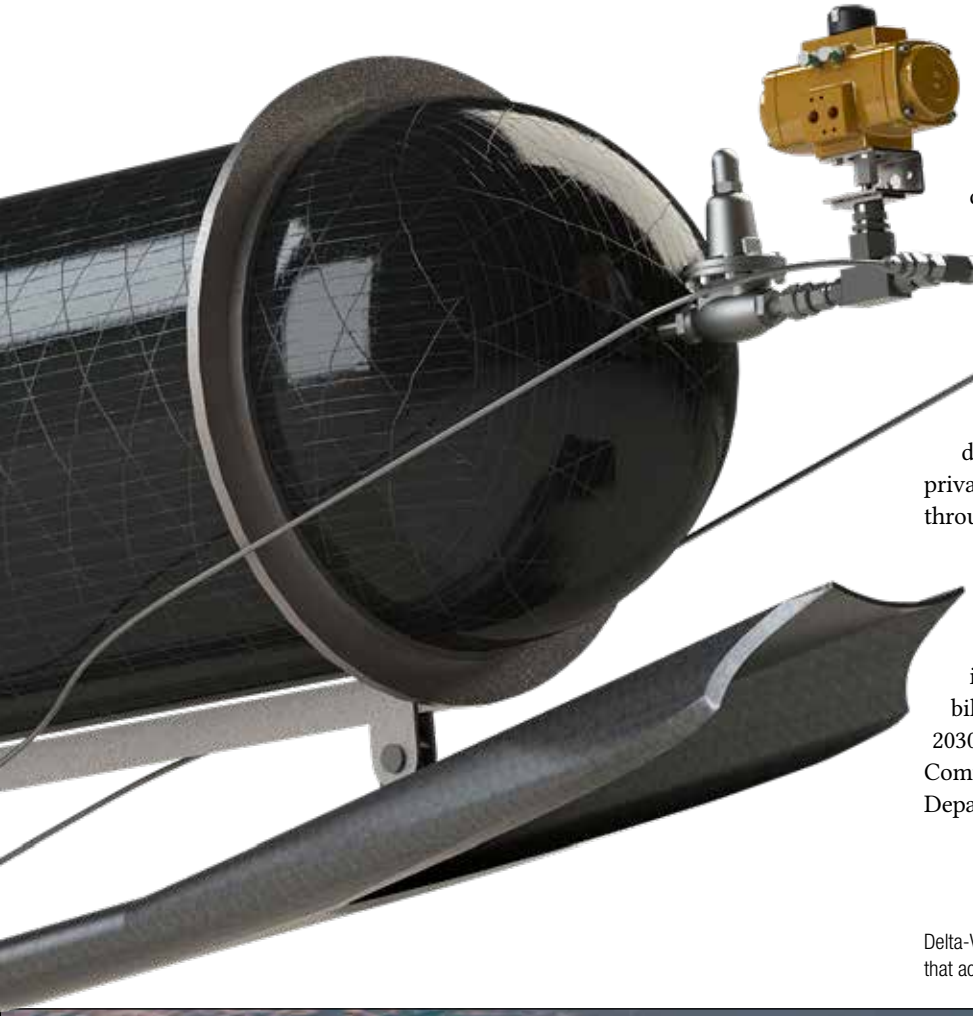
Dr Smart maintains that as access to space becomes cheaper and more frequent, space junk and rocket emissions from chemical propulsion are increasingly polluting the stratosphere. Developing multi-mission spacecraft powered by green hydrogen which is generated in an environmentally sustainable process using solar power to extract hydrogen from water is a prudent solution.

"Scramjet engines are a type of jet engine, and rely on the combustion of fuel and oxygen from the air to produce thrust. We've developed our green hydrogen-powered SPARTAN scramjet engine using Ceramic Matrix Composites (CMC) to withstand the high temperatures experienced by space vehicles during the journey through space and particularly during the controlled re-entry phase. The high-temperature load lasts only around 20 minutes per flight, and for reusability, at least 30 cycles would be sufficient. CMCs have a high strength-to-weight ratio even at high temperature, high thermal shock resistance and toughness. Carbon fibre reinforced Silicon Carbide(C/SiC) can be used up to 1500 °C.,' advised Dr Smart.

Hypersonix's SPARTAN is capable of accelerating from Mach 5 to Mach 12; or five to twelve times the speed of sound. The Delta-Velos vehicle that features the SPARTAN engine will fly over 2500 km without emitting CO2 or other noxious gases before landing like a conventional aircraft on a runway and in a condition to do it all again.

Dr. Smart maintains that Hypersonix has no ambition to become vertically integrated: 'Our core knowledge is scram jet engines and how to develop sustainable hypersonic aircraft. We are actively seeking research and development as well as

The SPARTAN scramjet engine is reusable, powered by hydrogen and fuel efficient. It is the World's most 'green' and sustainable scramjet.



production partnerships to investigate materials for durability and high temperature resistance for multi-use launch vehicles and engines and their components." The company has recently developed collaborative partnerships with the University of Southern Queensland, Boeing Australia, Siemans (for multiphysics computational fluid dynamics software) and the industrial gas company - BOC Ltd.

The Federal government recognises that the New Space Economy is being driven by private investment in start-ups and private technology interests. It is priming the sector through grant assistance and by setting a relevant legal and regulatory framework that meets international obligations and facilitates growth in industry while maintaining safe and secure operation in space and on earth. Its goal is to triple the sector's contribution to GDP to $12 billion and to create an additional 20,000 jobs by 2030. Last year, Hypersonix received an Accelerating Commercialisation Grant from the Australian Federal Department of Industry, Science, Energy & Resources.

Delta-Velos is a reusable hydrogen powered hypersonic launch vehicle that accelerates to Mach 12 and can land on a normal runway.

Acoustic properties of composite materials in defence

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

With the focus of future warfare planning, Australia, through the Royal Australian Navy (RAN) is procuring new submarines and anti-submarine warfare frigates. Both programmes require vessels to be able to operate with high levels of stealth, part of which relies on a low acoustic signature.

Noise and vibration are inevitable by-products of vessels' engines, propulsion and flow noise, and the sound waves from which propagate as an acoustic signature that travels for long distances in the ocean. These signatures are used by vessels, particularly submarines to see deep into the seas they protect to detect enemy targets and enable safe navigation.

Managing acoustic signatures of naval vessels is a critical function of the survivability and operational effectiveness of Australia's maritime force and also an area in which composites are a material solution.

Royal Australian Navy (RAN) Collins Class submarine exercising off the West Australian coast. Source – Navy Images

Left: HMAS Anzac is fitted with an advance package of air surveillance radars, hull mounted sonar and electronic support systems that interface with state-of-the-art Evolved Sea Sparrow Missiles and Ship Launched Torpedoes. Anzac was the third Anzac Class Frigate to complete the Anti-Ship Missile Defence upgrade program, which also provides an enhanced sensor and weapons systems capability. Photographer: ABIS Nicolas Gonzalez

Noise inevitably compromises a vessel's anonymity and so suppressing and masking an acoustic signature is an equally central protective measure.

The function of SONAR domes - on vessels above and below water - is to house, protect and optimise electronic equipment critical for detection, navigation and ranging. They are built to last more than 30 years in corrosive and challenging marine environments and to withstand enemy attack. A well-engineered composite laminate permits acoustic energy to pass through with minimal sound transmission interference optimising the acoustic performance of a vessel's SONAR system.

For submarines, an acoustic window enables acoustic energy signals or 'ping' - to pass unhindered with little reflection or attenuation. It is an acoustically transparent housing that surrounds the SONAR transducer array, the function of which is for detecting enemy targets and to enable safe navigation.

They are typically flooded compartments which means that when the submarine submerges it fills with water equalising on both sides of the window. Sonar domes are emptied for sonar dome maintenance or replacement and are always emptied when a vessel is in drydock.

RPC has been providing engineering services, sovereign manufacturing capability and providing Through Life Support for composite components for defence applications for over 30 years working continually with both Collins Class submarines, the second largest non-nuclear powered submarines in the world, and the ANZAC frigate fleet.

The Collins Class submarine fleet was expected to be retired in about 2026, however the 2016 Defence White Paper extended this into the 2030s. The recent pivot from the Naval Group's Attack-class submarine under the AUKUS agreement will see the Collins Class life extended, possibly until 2050 with significant capability upgrades.

RPC continues to be contracted to upgrade, re-engineer and replace various composite components which often requires significant R&D on the materials and construction, and validation of new materials.

Novafast International

Robotics and GRE a solution for Naval piping

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

Based just south of the Osborne Naval Shipyards in Adelaide, Novafast International specialises in glass reinforce epoxy (GRE), glass reinforced vinyl ester epoxy (GRVE) and glass reinforced plastic (GRP) pipes and fittings, tanks and processing equipment for the energy, resources, water infrastructure and defence sectors.

David Figallo from Novafast in front of their Newly installed Robot.

The company was recently awarded close to $1.4million under the Sovereign Industrial Capability Priority Grants program which assists local businesses improve their manufacturing capabilities to enable the Australian Defence Force (ADF) to maintain its leading edge. The grant is to support the acquisition and installation of new robotics equipment for a GRE filament winding production line to supply piping for the naval ship building programs, particularly the Hunter Class Frigate Program.

Ship's piping systems are a complex labyrinth of piping networks that service and perform an array of crucial functions in corrosive and aggressive conditions. Bilge, ballast, potable water, sewer and scrubbing piping systems as well as firefighting piping systems, engine cooling systems and hydraulic and steam piping systems can all snake through a hull and are expected to operate at extremely high and low temperatures. These systems have conventionally been made from steel or CuNi (copper-nickel alloy) which contribute significantly to the total weight of a vessel. Both materials are also known to fail internally from abrasive or fluidic corrosion, fatigue and galvanic action as well as externally from atmospheric conditions.

Paul and David Figallo standing next to Conductive Novaflo 2000M GRE piping ready for Oil and Gas Applications in Western Australia.

Brothers Paul and David Figallo, Business Directors at Novafast International say; "Our Defence and Marine industries are becoming more open to non-conventional materials and innovative engineering technologies to achieve their aims for low maintenance, weight-savings and installation efficiency. There is a slow realisation that while the acquisition cost of GRE pipes is greater than their metallic counterpart, the properties such as corrosion resistance improves overall usage reliability and leads to reduce through-services expenses. We've developed our NovaFlo 2000M series as a lighter replacement option for conventional steel piping or CuNi seawater piping given its ease of installation."

Novafast GRE Pipes range from 50mm to 1 metre and consist of a synthetic or carbon tissue layer followed by an E glass structural layer and can also be finished with external coating for UV and fire protection. The design life of the pipes can range from 20 – 50 years based on long term test data with international standards.

The NovaFlo 2000M series has been developed for use across ballast and cooling water pipework, potable water and sewer services as well as on-ship gas scrubbing systems. "Scrubbers on marine vessels are exhaust gas cleaning systems designed as an environmental solution to reduce sulphur oxide emissions. Our pipes are a customized solution for this corrosive environment," advised David.

David maintains that, "Epoxy resins are much more suited to extremely strenuous tasks such as enduring vibrational loads, fire resistance and environmentally stable than either vinyl ester or polyester resins, whilst providing higher mechanical strength and thermal stability. They form a much more complex structure than the other resins, without the use of styrene making it more environmentally friendly and safer to manufacture."

Novafast has developed its own proprietary amine cured epoxy resin system specifically for their Novaflo 2000m product range. "We develop our own chemistry in-house which allows us to formulate in, or out, the required physical, thermal and mechanical properties of the materials," said David.

In parallel Novafast is also developing the filament winding robots in-house using Fanuc technology from Japan.

Novafast Holdings is an Australian-owned business that specialises in engineering, manufacturing and construction of industrial composites. The vertically integrated group includes the advanced engineering firm and long term Composites Australia member, Dennis Southam & Associates; the composites manufacturing firm, Novafast International; and Basetec Services, which provides project management and construction and installation services specialising in GRE/GRVE/GRP pipes and fittings, tanks and processing equipment for the energy, resources, water infrastructure and defence sectors.

Novafast International manufactures pipes to ISO 14692-1:2017 for the petroleum and natural gas industries; BSI - BS 7159 which is the code of practice for design and construction of glass reinforced plastics (GRP) piping systems for individual plants or sites; ASTM D2992 – 18 which is the Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fibreglass" (Glass-fibre-reinforced thermosetting-Resin) Pipe and Fittings; and AS 3571.1-2009, the standard for plastics piping systems - Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin.

Mincham

Light-weight solutions for the defence, aerospace and high-tech industries

Written by Kerryn Caulfield, Executive Director of Composites Australia Inc.

Mincham specialises in the design, prototyping, production, and through-life support of advanced light-weight structures for the defence, aerospace, and other high-tech industries. For over 25 years Mincham has serviced the Australian Defence Force along with key industry members and primes, such as: CEA, BAE, Raytheon, Thales, Boeing, and many others both within Australia and internationally.

The Mincham team in front of the Econoclave - one of the largest autoclaves in Australia. Business Development Manager, Brody Mincham, extreme left.

According to Mincham's business development manager, Brody Mincham, "The increased focus on regional security and building defence capability is opening up unprecedented technical opportunities. Our founding services in full MRO (maintenance and repair operations) and through-life support (TLS) have expanded to offering a broad range of composites capabilities and agile solutions for low/medium-rate production. We've recently moved into a 4,000 square metre facility within the defence hub in Edinburgh Parks - which is much larger than our previous site – and we've invested in new strategically important equipment."

Servicing both civil and military markets – whether the task is manufacturing, upgrading, rebuilding, or modifying, all require a broad range of advanced composite fabricating and engineering capabilities. Given the expanding growth in the sector, Mincham's facilities have evolved accordingly and now include most disciplines, such as pre-preg, wet lay-up, vacuum bagging, pressure moulding, resin transfer and infusion. The company also has plans to augment filament winding capability soon. Its composite's area now includes a series of separate climate-controlled rooms with large down draft preparation bays for debagging, carbon fibre trimming, priming and custom paint spraying in an automotive grade spray booth. Mincham also recently upgraded their CNC capabilities with new 4-axis and 5-axis machines located in a newly built machine shop.

To add to the existing autoclave capability, the new production site is fitted with an aerospace grade composite curing autoclave. One of the largest

autoclaves in Australia, the Econoclave® is an energy efficient composites bonding autoclave designed for medium to large sized production parts. It has a useable diameter of 3m (118″) and a working length of 8m (314″) as well as maximum operating temperatures of 250C and a maximum operating pressure of 10 bar.

Mincham's broad experience in material/technology capabilities extend to all high-performance fibres including Carbon Fibre, Kevlar™ (Aramid) and E, S and Quartz Glass as well as core materials and prepregs.

The company's engineering design service offering is equally broad and includes process engineering and automation, simulation testing, tooling design, material development, prototyping and testing enabled by a multi-platform suite of software.

Mincham is an active member of the South Australian industrial community and involved in several industry alliances including the Australian Aerospace Alliance and the Australian Technology Innovation Alliance. Company founder Darryl Mincham has served as a director for the Defence Teaming Centre which was constituted to develop Australia's capabilities for domestic and international defence markets across air, land, sea, space and cyber.

Having spent his early career as a Structural Aircraft Maintenance Engineer in the RAAF, Darryl realized the employability of veterans. Today, over 20 per cent of the Mincham workforce is veteran. "Employing veterans is a core company value and something we hold close to our hearts. Veterans spent their careers as end-users of the products that we manufacture, overhaul and service. Post service, they can come to a job outside the force with a clear comprehension of performance expectations and a respect for systems that come with complex certifications and standards." advises Brody.

The Department of Veterans' Affairs (DVA) assists veterans move into the commercial world through a number of programs including an Employer Incentive Scheme and a 'work trial' program that provides an opportunity for both the veteran and the company get to know each other. DVA moderates many of the new employee issues as well as the specific ones that come with veterans.

Strategically, the company has been working towards a portfolio of 50 per cent in contract work and services to Primes and industry, balanced with 50 per cent of proprietary products for which it invests in its own research and development, certification, and tooling.

"UAVs continue to be a key focus of our research and development program. Our Tube Launched Aerial Delivery Systems are our current focus and we're incredibly proud of the direction it's headed". Mincham's UAV project is contracted through Defence, with industry partner "Acacia Systems" complementing the vehicle with its renowned mission system. Due to the nature of the project, information is held close, what we do know is that the UAV is a high-speed, portable air-vehicle – with minimal set-up time and extremely low running cost. Its capabilities range from sensor deployment, training, decoy and what else Defence sees fit.

According to Brody, medical is also a fertile area for innovative product design for rapid response services for aeromedical patients and combatants; with composites aiding the technical revolution. The company has a range of products and services dedicated to the aeromedical and ADF deployment support, including lifting systems, specialised stretchers, restraint systems and cabinet systems designed and developed for customers such as the Royal Flying Doctor Service. Following the pattern of passion for Innovation and research, Mincham also supplies composite assemblies to a South Australian company manufacturing portable medical X-ray machines for the global market, as well as other defence niche technology products.

To complement the company's aerospace pedigree, the organisation is further expanding its space offerings on the back of a decade of R&D and low-rate production in the field. With complementing experience in advanced composites, light weight alloys/steels and MIL-SPEC coatings, Mincham is able to offer its clients a broad range of expertise that cross multiple specialities of advance light structures. This coupled with many years' experience in highly regulated complex certifications and standards such as AS9100, ISO9001 and CASA accreditations, places Mincham in a position to offer a unique capability.

Mincham's broad experience in light-weight solutions results in far more than composite components, often being able to deliver a start to finish solution from Design, to machining/sheet metal, assemblies and finishing/painting.

Innovaero

Design, manufacturing and integration for aircraft and aerospace systems

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

Innovaero is an Australian owned and operated aeronautical technology company that designs, certifies, maintains and manufactures equipment essential to aviation, aerospace operations and aircraft manufacturing from its facility just south of Perth, WA, and office in all major capitals. Founded by Mike von Bertouch in the mid-90s, Innovaero has generated significant local and export sales of sophisticated high resolution aerial imagery systems, and is an established world leader in this field.

Innovaero Group CEO, Simon Grosser, a past Composites Australia Board member, joined the company in 2018. "Our focus on product development in the highly regulated Aerospace industry, requires a multi-disciplinary approach to Design and Manufacture. We hold a very broad range of approvals from the Civil Aviation Safety Authority (CASA) that enables us to develop leading edge products within the strict constraints of a highly regulated industry, including the necessary aircraft modifications.

Regarding materials selection, whether it's metal, composite or plastics, it is critical to identify the most appropriate technology that matches the requirements for minimum weight, strength, stiffness, fatigue and, of course, cost. Composite manufacture introduces the additional consideration of processing, which ultimately affects the part's properties, so it's not just resin + fibre," advised Grosser

"Quality and repeatability of process are critical factors to producing reliable parts. "We take advantage of advanced processing technology, including vacuum-forming, wet layup, prepreg, automated fibre placement,

CNC carbon fibre placement in a controlled environment for precision control.

and precision machining of engineering plastics and metals to ensure design criteria and performance are translated into the completed component," said Grosser.

From a design perspective, Innovaero is a multi-CAD organisation with PTC Creo (mechanical design), Altium (electronic design) and VeSys (harness design), supported by ANSYS, LabView, MathCad and various other simulation and modelling tools.

INNOVAERO'S AERIAL GEOSPATIAL IMAGERY SYSTEMS

Innovaero has designed and developed bespoke optic and sensor packages to enable wide coverage from a practical form factor, alongside a complex control system to integrate the levels of stability required for image clarity.

Carbon fibre structures provide the backbone for sophisticated scanning array camera systems. The PLC controlled structures move precisely and incrementally in rapid succession. Design and operational tolerances are extremely tight, in order to capture high resolution imagery without distortion.

High modulus/strength carbon fibre was identified as the material of choice, to achieve optimized structural performance in terms of stiffness, strength and vibration damping and ultimate lightweight.

Due to the extreme tolerances in design criteria, an automated process was developed in-house for CNC precision fibre placement, resulting in carbon parts with consistent high quality and zero defects and repeatable properties in a low-medium rate production environment.

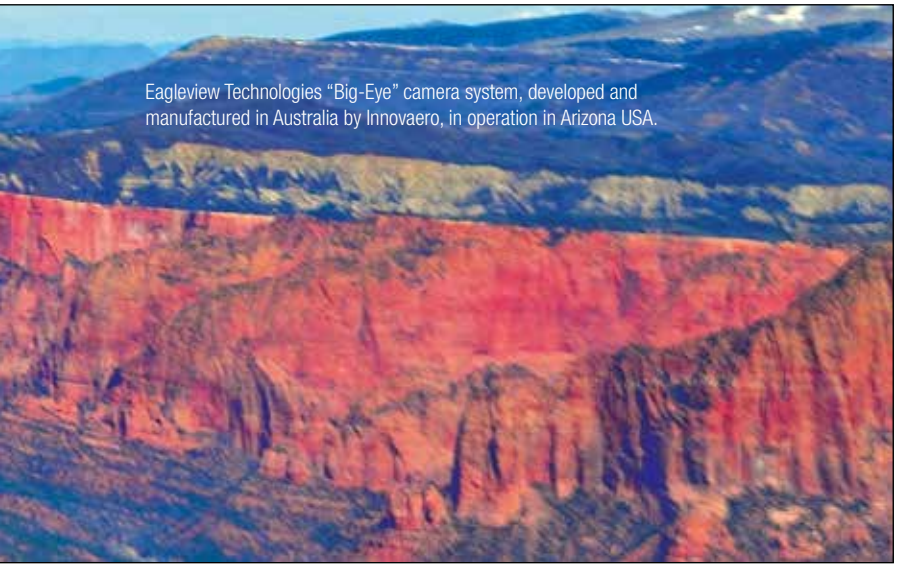
Innovaero also produces the monocoque composite (prepreg/carbon) camera pods, designed to be robust yet lightweight and with virtually no aerodynamic restrictions to the aircraft using them.

The final design allows the system to function reliably throughout the operation envelope, protected from the elements, and stable at all altitudes.

These two composite components demonstrate the versatility of Innovaero's composite capabilities, as part of the overall system design, certification, manufacture, assembly, and installation.

Innovaero recently secured AS9100 International Quality Management Systems standard certification to complete its end-to-end service capability, issued by the International Aerospace Quality Group (IAQG). AS9100 covers design, certification, manufacture, maintenance and overhaul of mechanical, electrical, and electronic systems, products and components for the aviation industry. It will enable the company to extend into space and defence industries.

The Australian Defence sector is also transforming, strongly supported by the Commonwealth government. Policies have generated confidence for our local defence sectors to invest in their capabilities and capitalise on the opportunities this brings in helping to meet the needs of Defence and, ultimately, Australia's national security.



Eagleview Technologies "Big-Eye" camera system, developed and manufactured in Australia by Innovaero, in operation in Arizona USA.

"Advanced composite materials and processes have been fundamental in enabling weight and cost-savings in the aviation sector and are critical in Defence. While the early focus of our business was mainly land-based defence projects and general aviation, the research, design and testing effort around materials and manufacturing processes required facilities and skills directly applicable to Defence applications. Innovaero actively addresses these opportunities in Australia and internationally and expands operations to meet market demand," Grosser said.

Earlier this year, Innovaero Technologies announced it had acquired Aviation Composites, with which it had had a lengthy working relationship. Based at Bibra Lake in WA, Aviation Composites is a fully CASA approved organisation under CASR 145 for airline and all GA aircraft and component repairs and parts manufacture of composites. Aviation Composites will continue to operate as an independent business of Innovaero Technologies.

AS9100 is the international Quality Management System standard for the Aviation, Space and Defense (AS&D) industry, created by the IAQG (the International Aerospace Quality Group), and AS9100 Rev D (2016) is the most recent version. The standard provides suppliers with requirements for creating and maintaining a comprehensive quality system for providing safe and reliable products to the ASD industry, as well as civil & military aviation requirements.

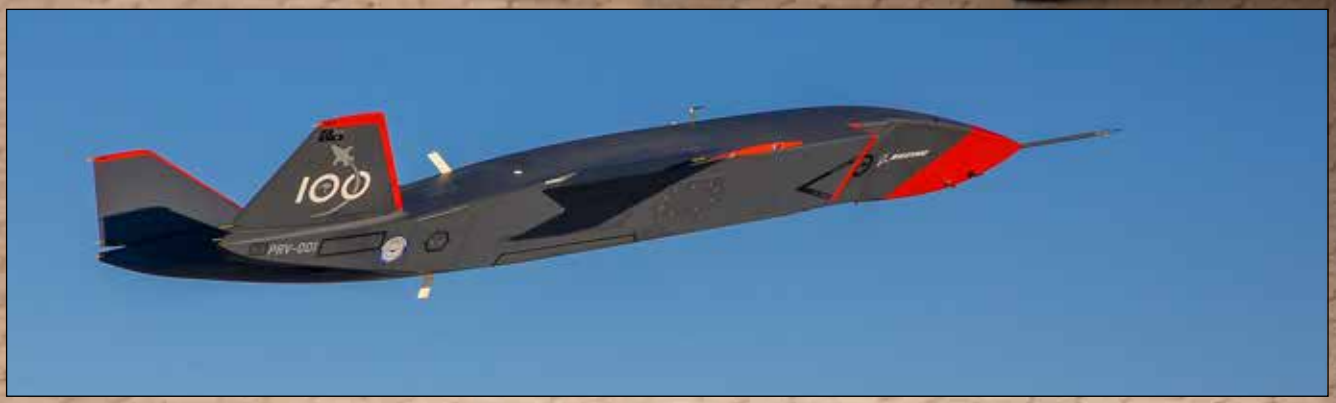
Boeing's Melbourne Team

Key to Airpower Teaming System prototype design and manufacture

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

Boeing's Melbourne facility recently commenced its fifth Boeing Airpower Teaming System aircraft, as the program continues its rigorous ground and flight testing. In late September, Boeing Australia also revealed the final assembly of the uncrewed aircraft will be at Wellcamp Airport in Toowoomba, Queensland.

Also known as Loyal Wingman, the Airpower Teaming System is an uncrewed fighter-like aircraft designed to act in a team to protect and project force alongside other crewed and uncrewed aircraft. The aircraft is designed for fighter-like flight performance with a range of more than 2000 nautical miles.



The 'Loyal Wingman' in flight.

The 38 feet long (11.7m) aircraft is Australia's first sovereign-designed and produced military combat aircraft in over 50 years. It is the Boeing's first uncrewed system to be designed and developed in Australia and the company's largest investment in a new uncrewed aircraft program outside the United States.

The first aircraft rolled out of the Melbourne factory in May 2020, which is also home to Boeing Aerostructures Australia and Boeing Australia's R&D facilities. The site called on its roots from heritage companies Government Aircraft Factory and Commonwealth Aircraft Corporation as well as its commercial airplane experience to design the air vehicle and production system.

"We approached the design of the air vehicle and production system together with a "design for cost" philosophy," said Andrew Glynn, director of Airpower Teaming System Vehicle Design and Production. "While we've developed a clean sheet design featuring many new technologies, we've also made smart decisions by incorporating off-the-shelf components and leveraging digital engineering to optimise both speed-to-market and design producibility."

Article adapted from Boeing Media release - December 03, 2021

More than 35 Australian companies, including BAE Systems Australia, RUAG Australia, AME Systems and Ferra Engineering, are involved in the production of the aircraft. "By collaborating with our Australian industry team, throughout the design process we've been able to incorporate 'design for manufacture' features across all air vehicle components and sub-systems," he said.

"The team adopted three key manufacturing innovations for the Airpower Teaming System, in the areas of robotic drill and fill, shimless assembly and full-size determinant assembly to significantly reduce assembly costs, compared with traditional methods," said Glynn. "We've completely removed manual drilling from our production system, improving safety, quality and efficiency across our manufacturing operations.

"To achieve this, we have designed all components to have pre-drilled holes by our suppliers at the sub-component level, allowing the final assembly to snap together without the need for any manual drilling in the factory.

The Airpower Teaming System team also took advantage of Melbourne's commercial manufacturing aircraft experience on Boeing 787 wings' trailing edge. The unique carbon fiber technology, the legacy research for which was undertaken in Melbourne with the Cooperative Research Centre for Advanced Composites Structures, enables the components to be cured without a traditional autoclave significantly reducing the capital facilitation costs.

"Our team has produced Boeing's largest resin-infused single composite components for the Loyal Wingman leveraging proven technology," said Adnan Raghdo, director and Chief Engineer of Boeing Commercial Airplanes Fabrication, Composite Capability. "Extensive computational modelling was used up front to simulate and optimise the manufacturing process which enabled 'virtual learning' ahead of the first part."

The team also realised the benefits of additive manufacturing, printing a large number of flyaway parts on-site to help support rapid insertion of the prototype aircraft and adoption of digital engineering. Boeing Melbourne will continue to support the design, composite component manufacture and development of the program, with the final assembly of the Airpower Teaming System to commence at the Wellcamp Defence and Aerospace Precinct by the middle of the decade – pending orders.

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Matrix Composites & Engineering
Leaders in subsea buoyancy technology and systems

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

Matrix Composites & Engineering (Matrix) is strategically located within the Australian Marine Complex (AMC) at Henderson in Western Australia. The AMC is located around 23 kilometres south of Perth and is an internationally recognised industrial key sustainment precinct for Australia's surface and submarine fleets, and one of only two sites identified for shipbuilding under the National Naval Shipbuilding Plan. Within and around the AMC is a cluster of companies that play a vital role in providing support to defence, commercial shipbuilding and repair, the resource sector, and offshore oil and gas.

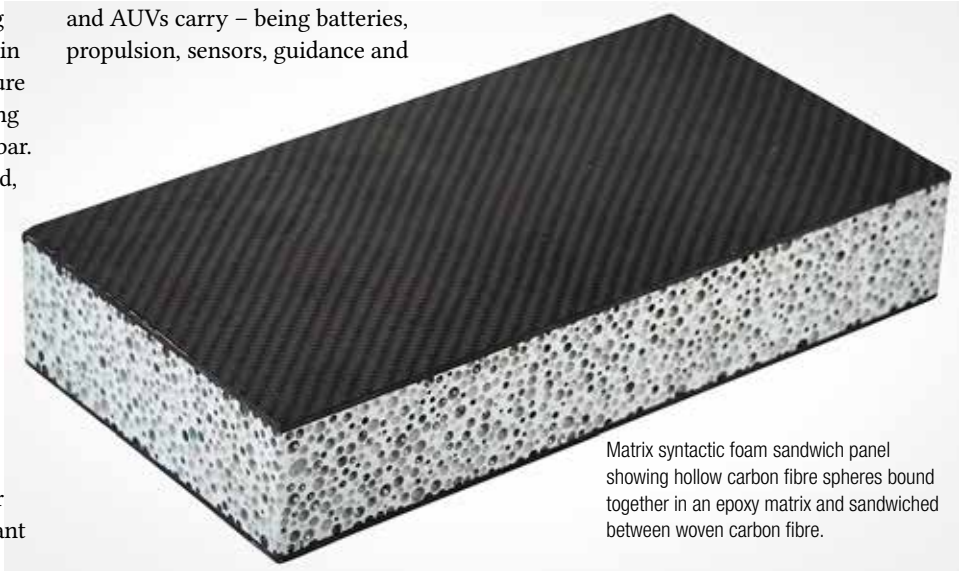
Matrix produces engineered products, functional additives and advanced materials for marine, defence, offshore and mining, civil and infrastructure, and transportation applications. It has niche industrial expertise across a number of proprietary polymer composite and chemical technologies, notably for buoyancy systems for subsea applications.

Matrix is a global leader in the design and manufacture of syntactic foam solutions and is the largest syntactic foam manufacturing facility in the world. It has the only plant in the southern hemisphere (indeed within the Asia Pacific) and is also the home to the largest deep water simulation facility in the Southern Hemisphere. The hyperbaric chambers are used to validate the design and manufacturing of products that are intended to work in subsea conditions or other high pressure environments and are capable of testing to sea water depths of 6,750 m or 662 bar.

Aaron Begley, Matrix CEO, explained, "The subsea environment is complex, harsh and corrosive. We developed our syntactic foams to have high strength at low density, resistance to hydrostatic pressure and long-term exposure for use in drilling risers, though these materials can also be used in deepwater pipe insulation, and are equally efficient in on-land and space applications. Our buoyancy systems are API17L compliant to 4,000 metres and API16F compliant to 6,100 metres and are in operation around the world." Matrix undertakes all its material science and engineering in-house and can tailor the physical and mechanical properties of its products.

While the debate rages over Australia's submarine capability, transformative technology in the form of more nimble and cost-effective autonomous undersea defence platforms is maturing. Unmanned underwater vehicles (UUVs) or autonomous underwater vehicles (AUVs) travel underwater without requiring submariners. They can be teamed and networked with larger crewed vessels, air platforms or land based capability, and are used for intelligence, surveillance, and reconnaissance and mine countermeasures. "The systems UUVs and AUVs carry – being batteries, propulsion, sensors, guidance and communications – are invariably heavier than water and therefore need buoyancy to return to the surface. Our syntactic foams can be moulded to suit the most complex of geometries and can provide stable buoyancy to 4,000 metres and beyond. Our integrated fibre reinforcements also maintain overall structural integrity, substituting for heavier metallic chassis,' advised Aaron.

Matrix's manufacturing capability include vacuum infusion, resin transfer moulding, hand lay-up and manual, semi-automated and fully automated trimming and finishing. Its 22,000 m² facility is ISO 9001 certified and boasts a large research and development office run by scientists and material engineers from a broad spectrum of industry disciplines.



Matrix syntactic foam sandwich panel showing hollow carbon fibre spheres bound together in an epoxy matrix and sandwiched between woven carbon fibre.

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