PRESS RELEASE - FEATURE ARTICLE

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Australia's first carbon fibre monocoque sports car cockpit chassis 'Out of Autoclave' moulded from GMS EP270 epoxy prepreg

The Australian designed and built FR-1 light weight structure has become a reality after nine years and over Aus$ 1 million invested to produce this unique, hand-built one-off high performance concept two-seater roadster sports car. The concept car has many innovative engineering and design features. These include a new light weight carbon fibre composite monocoque cockpit chassis, the first ever built in Australia, which was designed and moulded 'out of autoclave' at only 70 deg C from GMS EP270, an epoxy prepreg with a 200gsm 3k twill carbon fibre base fabric. This unique epoxy carbon cockpit chassis, with approximate dimensions of 2 meters by 1.5 meters, weighs only 80 kg but still provides the high torsional rigidity needed. This has been achieved by design optimization in the number and orientation of the carbon fibres plies used. The high mechanical performance of the fabricated chassis laminate has been independently tested, correlated and analysed using FEA analysis, by the Australia Future Fibres Research & Innovation Centre (AFFRIC) at the Deakin University of Melbourne.

Unusually, the entire FR-1 concept car project is run by a charitable foundation called 'Autohorizon' whose aims are to demonstrate the engineering, design and manufacturing expertise available in Australia today and to inspire Australian school and college students to become the engineers and designers of the future. The FR-1 project has over 90 sponsors including: the Victorian Centre for Advanced Materials (VCAMM); Holden; Boeing Aerostructures Australia, the Automotive Centre of Excellence (ACE) in Melbourne, where the concept car was built, and GMS Composites, who manufactured and supplied the GMS EP270 carbon fibre prepreg system for the FR-1 project. Sam Weller, managing director of GMS Composites stated: "*FR-1 has been a fantastic engineering project, bringing together leading automotive designers and material technologies in Australia. We are thrilled to have been involved and to demonstrate the application performance that can be achieved with our low temperature, out of autoclave advanced carbon prepreg system.*"

The VCAMM/Autohorizons/Boeing engineering team which has worked on the FR-1 project designed and built the FRP cockpit chassis and the fibreglass mould tooling. They looked at a number of different epoxy prepreg options; GMS EP270 was selected from the onset due to a combination of several critical factors. Firstly, as the vehicle is a one off, they were looking for a cost efficient low temperature tooling and production process, and in a material which they could obtain in small volumes. Secondly, they needed a material which, post cured, would provide the required dynamic strength and stiffness properties in the monocoque cockpit chassis needed for a sports car powered by a Holden 6.0 litre V8 with a Ferrari 355 transmission. GMS EP270 with a carbon fibre fabric fitted the bill perfectly, being a high performance 'out of autoclave' epoxy resin prepreg designed for low temperature moulding under a vacuum at as low as only 70 deg C, using fibreglass tooling. GMS Composites has the manufacturing flexibility to supply even small volumes of the GMS EP270 prepreg system in a choice of carbon fibre, aramid or glass fibre reinforcements. In addition to being used for moulded FRP parts, GMS EP270 can also be used in the construction of composite sandwich structures as well as for tooling applications.

Having completed the design and material specification phase and built the mould tooling, the FR-1 project then used the production expertise of Boeing Aerostructures in Port Melbourne to assist with lay

up, mould and fully cure the GMS EP270 carbon fibre prepreg and bond the chassis using an aerospace grade high performance Araldite® structural adhesive. Jason Bonar, who has worked at Boeing for over 18 years, worked with the Auto Horizon team on the moulding and lay up work, which included eight 16 hour cure phases and a final post cure, all done out of autoclave under vacuum at 70 deg C. During production, GMS EP270 prepreg offered the benefits of being very easy to work with, conforming accurately to the tight and detailed tool. The finish and integrity of the final product was outstanding. Mr Bonar commented: *"With respect to workability and surface finish, I found GMS EP270 prepreg to be on par, if not better, than any other prepregs I have used*." For some years now, in order to drive down capital and operating costs, as well as to gain greater production efficiency and flexibility, many leading OEM and tier 1 manufacturing companies in the aerospace industry have now approved and specified a number of primary and secondary structural composites parts manufactured from an 'out of autoclave' composite prepreg material; out of autoclave prepregs have the added benefit of simpler and significantly lower tooling costs. While exact figures are not given out by Boeing Aerostructures, 'out of autoclave' composite part manufacturing costs are estimated to be a factor of four times lower, with tooling costs typically reduced by over 50%.

GMS Composites is located in Melbourne, Victoria, Australia, where they have their main offices, the production plant, R & D and their warehousing and distribution operations. They have been manufacturing epoxy prepregs for over 12 years and now have an established range of over 10 different prepregs resins systems covering a wide range of industries including: aerospace, motorsport, marine, sporting and leisure goods, ballistics and tooling. GMS Composites is part of GMS Industrial Pty. Ltd., whose origins in insulation materials date back more than 70 years, but who today is a modern epoxy prepreg composites producer focused on supplying the rapidly expanding high performance fibre reinforced composites markets in Australia and Asia Pacific. GMS Composites also offers customers CNC machining services, plus distributes a number of insulation products and composites related consumables, reinforcement materials, resins, cores and mould releases from leading global suppliers.

Technical data sheets and further details about GMS EP270 and the full range of GMS epoxy prepreg materials available can be found on line at www.gmsindustrial.com.au. Alternatively, e-mail info@gmsindustrial.com.au or call the GMS Composites technical sales team on +61 3 9768 2225.

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NB : More photos and captions on page 2

Websites featured in this article: www.gmsindustrial.com.au http://www.conceptfr1.com

Photos & Captions:

Photo 1: Infusion moulding of GMS EP270 carbon fibre pregreg.

Caption for photo 1: The carbon fibre epoxy composite monocoque cockpit chassis was 'out of autoclave' moulded under vacuum from GMS EP270 epoxy pregreg at only 70 Deg C.

Photo 2: Demoulding the epoxy carbon composite monocoque cockpit chassis.

Caption for photo 2: For this one-off concept car, GMS EP270 epoxy pregreg provided the FR-1 design team with light weight and high mechanical performance, combined with being able to use cost efficient fibreglass tooling and a low temperature, low cost production process.

Photo 3: FR-1 sports car finished cockpit - carbon fibre composite monocoque chassis

Caption for photo 3: This unique epoxy carbon fibre composite monocoque cockpit chassis, the first ever built in Australia is approximately 2 meters by 1.5 meters. It has all the torsional rigidity needed for this 6.0 litre V8 powered roadster sports car, yet weighs only 80 kg.

Photo 4. Race track testing the Finished FR-1 roadster sport car

Caption for photo 4: Race track testing the finished FR-1 roadster sports car, a project run by the charitable foundation 'Autohorizon' to demonstrate the engineering, design and manufacturing expertise in Australia today and to inspire students to become future engineers and designers.

About GMS Composites.

GMS is a leading specialist manufacturer of prepreg products for a range of industries. Their flexible and lean production facilities means that the company is very well positioned to supply tailored prepregs solutions not only in resin selection but also in volume and speed to market. This is ideal for customers who are looking for quality prepregs solutions in low, or JIT volumes, with out long lead times. Beyond prepregs, GMS also distribute a full range of technical fabrics, resin systems, cores, vacuum consumables and mould releases which enables them to fully service the highly specific yet diversified composite market.

GMS Composites, 42 Redgum Drive, Dandenong South, Vic. 3175, Australia, Tel: +61 3 9768 2225
www.gmsindustrial.com.au

GENERAL INFORMATION FOR MEDIA CONTACTS	
SUPPLIER:	GMS Industrial Pty. Ltd.
READER RESPONSE INQUIRIES TO:	info@gmsindustrial.com.au
PRESS PUBLISHING INQUIRIES TO: Nigel O'Dea , Director	Outsourcing B2B Marketing Tel: +44 1536 210133 Mobile: +44745 695984 e-mail: nigelodea@outsourcingb2bmarketing.com
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