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MIRA

CAD
Creative Automotive Design

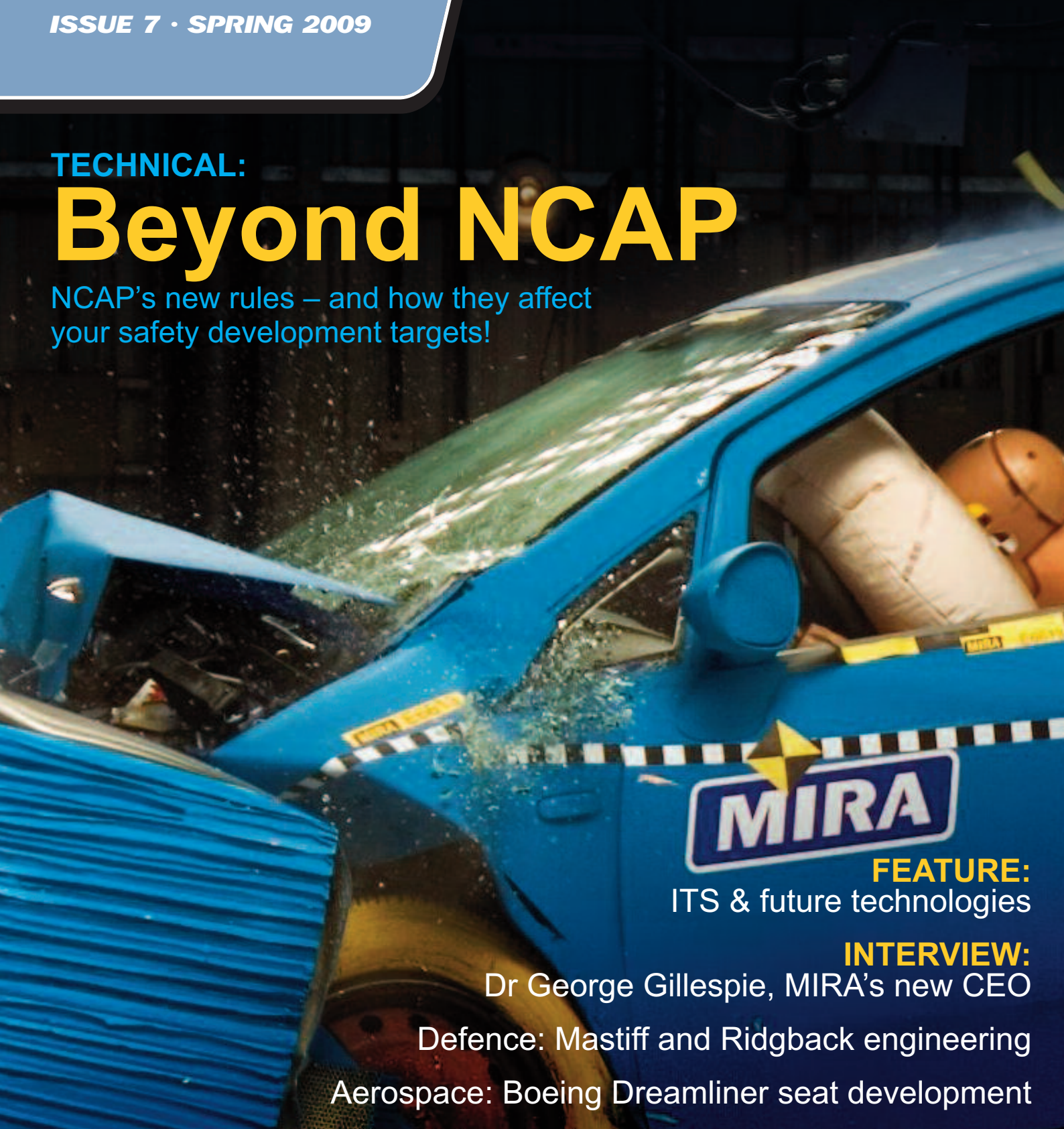
News from MIRA – Vehicle Engineering Specialists

ISSUE 7 • SPRING 2009

TECHNICAL:

Beyond NCAP

NCAP's new rules – and how they affect your safety development targets!



FEATURE:
ITS & future technologies

INTERVIEW:
Dr George Gillespie, MIRA's new CEO
Defence: Mastiff and Ridgback engineering
Aerospace: Boeing Dreamliner seat development

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Lord Mandelson visit to India

Business secretary Lord Mandelson headed a 100-strong trade delegation to India over the week 19-23 January, visiting New Delhi, Pune and Mumbai. Organised by the UK India Business Council (UKIBC) and UK Trade and Investment (UKTI), the high-level delegation included representation from a number of key British industries and set out with the intention of forging closer trade and business links with the UK. In Pune, Lord Mandelson and other senior ministers and car industry representatives visited Tata Motor's car plant and made their first acquaintance with the new Nano mini car. A series of meetings were held during the week with Ratan Tata, Tata Group's chairman, to discuss the financial restructuring of Tata-owned Jaguar Land Rover, though Mandelson made it clear that there would be no 'bailout' of the company. Also in Pune, Lord Mandelson addressed the Symposium on International Automotive Technology (SIAT) and later visited MIRA's exhibition stand at the event, showcasing some of the latest safety technology.



Engineering excellence vital to UK

Unveiled at the 2009 Geneva motor show, Bentley's fastest and most powerful production car ever – a two-seater supercar dubbed the 'Extreme' – makes concessions to increasing worries on climate change by being run on E85 fuel, containing 85% bioethanol. Much of current automotive research and development effort is now directed towards reducing fuel consumption and carbon emissions, and in many countries government bail-outs for the industry have been linked to environmental targets. Of late, the industry has made strenuous efforts to stress the importance of its engineering expertise. Only recently, in a speech attended by business secretary Lord Mandelson, Jaguar Land Rover chief executive David Smith emphasised his company's status as 'one of the country's biggest investors in R&D' and 'one of the top 10 R&D investors in the UK and top 150 globally'. The vast pool of engineering skills in the UK is one reason cited by Ford or concentrating its European powertrain development effort in the country and, for Bentley, has provided the engineering capability for its outstanding new creation.

The new CO₂ challenge

As part of an energy and climate change package, the European Parliament has recently passed one of the most significant pieces of legislation to affect the automotive industry in decades. Here are some of the key points of the new CO₂ legislation:

- ◆ CO₂ emissions from new cars will have to reduce to 130g/km from as soon as 2012, with an extra 10g reduction from 'complementary measures' including biofuels.
- ◆ 65% of new cars will have to comply with the emission requirements in 2012, 75% in 2013, 80% in 2014 and 100% in 2015 (with special provisions for niche manufacturers).
- ◆ Eco-innovations will count for up to 7g.
- ◆ Financial penalties imposed on a sliding scale: Exceeding the target by more than

3g incurs €95/g for each vehicle sold; Lesser transgressions will be between 5 and €25/g; From 2019 all penalties will be €95/g.

- ◆ An evaluation in 2014 of the average mass development of cars over the previous three years; with a possible adjustment of the CO₂ targets in 2016.
- ◆ A new objective of just 95g/km is set for 2020, conditional on an impact assessment.

European automakers are world leaders in clean and low-emission technologies, with Europe already having the lowest emission levels of the globe. To maintain this progress it is vital that investment continues into enabling technologies like advanced powertrains and ITS to develop the next generation of solutions for the vehicle makers.

Had that *déjà vu* feeling with VW's new Golf advertising campaign?



MIRA's regular clients may have noticed something strangely familiar with the new VW Golf advertising campaign. Can't quite put your finger on it?

Well... The new VW Golf Mark 6 hit dealer forecourts in January 2009, with the tag line "Sometimes the only one you have to beat is yourself" – a nod to the fact that as the class leader the new model had to create its own benchmark. Despite its teutonic lineage much of the promotional activity has relied on MIRA's development facilities. The current newspaper, magazine and billboard advertising campaign highlights four attributes where the new model has improved upon its predecessor. Each of the adverts serves as a case in point, using



MIRA's facilities as the setting. Then, in January, the first episode of the new series of 5th Gear revealed the Mark 6 and put VW's claims of increased refinement to the test in MIRA's Full Scale Wind Tunnel. And for good measure, VW have also announced a competition where a Mk6 purchaser will be given a MIRA experience. Let's see if the lucky winner figures it out during their 'behind the scenes tour'.

Call for engagement with new Def Stan 61-5 test standard

The MOD has renewed its focus on the electrical systems in frontline vehicles by updating Defence Standard 61-5 part 6 issue 6. The scope of the new Def Stan encompasses all new and existing vehicles destined for current operational theatres, so stakeholders throughout the defence community should take note.

The new Def Stan has been developed to ensure military vehicles possess a powerful yet robust electrical system that operates reliably in the arduous conditions faced by frontline troops. The previous issue was released back in 1990, since then supplementary equipment and new technologies have arisen that place additional pressures on the electrical architecture of the MOD fleet. This march of technology demanded a root and branch revision of the document. Stringent new requirements like the 'power critical design review' act as a lynchpin for the whole standard; and environmental testing is included for the first time. MIRA served as primary advisors to Dstl for the

latest issue. MIRA's subject matter expertise and recent experience upgrading and certifying a range of front line platforms is embedded in issue 6. MIRA's Andy Mead explains: "Clearly it was high time for change. The release of Issue 6 prescribes a robust set of guidelines that ensure all vehicle platforms destined for theatre are founded on an electrical architecture that delivers unshakeable reliability and the capability to readily accept upgrades; future-proofing the fleet from the kind of issues that have been raised by retro-fitting modern systems into legacy equipment lacking adequate latent capacity."

In creating the new standard, Dstl were keen to avoid burdening the supply chain with a reliance on highly specialist engineering knowledge. Andy Mead takes up the story: "The new Issue 6 goes much further than before. It's not just about prescribing limits; it's there to help meet our shared objectives of delivering better products, by acting as a design guide."

Limo Green points the way to eco-friendly luxury cars

Designing small eco-friendly city cars is one way to reduce the environmental impact of the transport sector, but sometimes a city car simply will not do. Larger vehicles present a whole new set of challenges... and MIRA likes a challenge! Is it possible to design a luxury limousine with impeccable green credentials? We think so and, with the backing of the DfT, a consortium has been drawn together to take project 'Limo Green' off the drawing board and onto the road by the end of next year.

Limo Green takes a Jaguar executive saloon as a basis for the development, proving out the concept of a large luxury hybrid limousine, utilising an advanced drive motor, small battery pack and a small Auxiliary Power Unit (APU) for sustained cruising. The collaboration between Jaguar

Cars Ltd, MIRA Ltd, Lotus Engineering and Caparo Vehicle Technologies, aims to demonstrate a large, prestigious executive saloon with less than 120 g/km CO₂ emissions, whilst maintaining premium quality characteristics. The combined average fuel consumption target is 57mpg. MIRA is responsible for the advanced drive motor & controller, battery pack and hybrid integration. The car is fitted with a powerful 170hp motor, which gives the car comparable performance to the standard diesel Jaguar XJ, but with maximum speed limited to 112 mph.

Limo Green is a *series hybrid*, which means that it is primarily an electric car with an on-board generator to keep the batteries topped up. The car will also take power from the mains, providing enough charge for 30 miles of zero emission motoring.

industry NEWS...

Jaguar drives to be green

Jaguar Land Rover is working hard to improve its green credentials, spurred on by the government's strategy of linking loans to 'low-carbon' projects – JLR is understood to be seeking a GBP500m loan guarantee to help tide it over the worst of the current economic crisis. The Sunday Times reviews four projects being undertaken at JLR's engineering centre in Gaydon, Warwickshire, all part-funded by the Technology Strategy Board and involving collaboration with other British car firms. Key amongst these is 'Limo Green' – a performance 'series hybrid' (essentially an electric car with an on-board generator to keep the batteries charged) with a 170bhp electric motor, being developed in collaboration with MIRA, Lotus Engineering and the aluminium construction specialist Caparo. A separate project, REHEV (Range Extended Hybrid Electric Vehicle), seeks to develop a rugged electric-diesel plug-in hybrid powertrain suitable for large 4X4's such as the Range Rover – project partners include engineering consultants Ricardo, battery manufacturer Amberjac, and energy supplier E.ON. Other projects include the development of a flywheel hybrid, utilising KERS (Kinetic Energy Recovery Systems) technology to recover and store energy produced during braking and then using it to reduce fuel consumption, and REAL (REcycled ALuminium), which seeks to demonstrate the increased use of recycled aluminium in the production of lightweight, more economical, low-emission cars.

Chinese hybrid carmaker

BYD Auto winning global eco-race

Founded as recently as 2003, the Chinese automaker BYD Auto (short for 'Build Your Dreams') has achieved a global coup by producing the world's first mass-produced plug-in, petrol-electric hybrid, the BYD F3DM. Charged from a regular household supply, the car is now on sale in China and has beaten comparable models to the market from the US and Japan by at least 12 months. While China lags many years behind the West in conventional automotive technology, the development of green vehicles represents a more level playing field, and it senses an ideal opportunity to attain global leadership.

These industry news articles have been taken from MIRA's Automotive Abstracts Database which is available on subscription.

For further details please contact MIRA's Library & Information Services on:

Tel: +44 (0)24 7635 5394 or

Email: aic.enquiries@mira.co.uk

industry EVENTS...

1 – 4 April

Fatigue Analysis Course (by Safe Technology)

MIRA, UK

www.safetechnology.com/training.html

21 – 23 April

Traffex

Birmingham, UK

www.traffex.com

27 – 30 April

ADDITIVES 2009

Fuels and Lubricants for Energy Efficient and Sustainable Transport (RSC)

York, UK

[www.rsc.org/ConferencesAndEvents/
RSCConferences/Additives2009](http://www.rsc.org/ConferencesAndEvents/RSCConferences/Additives2009)

20 May

EIS Seminar on Multiplexed Digital Information for Test & Development

MIRA, UK

www.mira.co.uk/News/documents/EISseminar2008.pdf

20 – 21 May

Low Carbon Vehicles

London, UK

<http://events.imeche.org/EventView.aspx?code=c678>

20 – 22 May

JSAE Automotive Engineering Exposition

Yokohama, Japan

www.jsae.or.jp/expo/index_e.php

16 – 18 June

Automotive Testing Expo

Stuttgart, Germany

www.testing-expo.com

24 – 26 June

Defence Vehicle Dynamics

Millbrook, UK

www.theevent.co.uk

8 – 11 September

Defence Systems & Equipment International Exhibition

London, UK

13 – 14 October

EMC UK Exhibition & Conference

Newbury, UK

www.emcuk.co.uk

This list is not inclusive of all events taking place. It is an edited version of a more-comprehensive Diary of Events available in MIRA's AA & ABN publications.

K&C rig reaches 1000th test

If test rigs had counters like cars have odometers, MIRA's K&C rig would have clicked past the millennium marker recently. Rather fittingly the 1000th test was for Jaguar on their flagship XF model, a car acclaimed for its excellent road holding. Understanding Kinematics and Compliance (K&C) is pivotal to vehicle dynamics development. That's why MIRA opened the UK's first K&C rig back in April 1996. Since then supercars, city cars, F1 and touring cars – in fact virtually all makes and models have undergone close scrutiny on the rig.

The rig accurately measures all the kinematic parameters that relate to suspension & steering system geometries, and the compliances due to springs, anti-roll bars, elastomeric bushes and component deformations; a task that would otherwise take a couple of months to obtain through track testing. Since opening the facility 13 years ago, the progress of software modelling techniques has changed the way that MIRA uses K&C testing in new vehicle programmes. Often multi-body simulation codes are used to develop an initial dy-



Dave Hind (left), MIRA's K&C facility supervisor, marks the landmark 1000th test with Garry Aldous from Jaguar Land Rover.

namics package, prior to correlation on the K&C rig, alleviating the requirement to build prototypes in great quantity. Benchmarking exercises are notably different, as customers frequently lack the necessary CAD data, bush rates and other detailed information necessary to generate a complex software model. In these circumstances, a K&C test programme using forecourt models quickly identifies the defining characteristics of the market segment, providing crucial guidance to the subsequent objective setting process. Whatever the project scenario, the K&C rig is always required to generate the hard data necessary to verify the final design is achieving its objectives.

Torino Design & MIRA join forces

Italian design house Torino Design and MIRA have signed a collaboration agreement that delivers a turnkey design, development and certification service. At a time when development budgets are under pressure, the collaboration provides the quality of design and engineering required but at the right costs for market conditions. Torino Design provides design services to leading brands throughout the world. Its team is adept at all the critical aspects of styling and design but, in a departure from convention, the models and prototypes are made by the best of Turin's firms under coordination of Torino Design's chief modellers. This offers superior quality at a more reasonable price by reducing overheads.

Announcing the deal, MIRA's CEO Dr George Gillespie enthused: "Italian styling & British engineering – it's a powerful combination. We're sure this collaboration will be welcomed by automakers who have

come to rely on and trust our individual services. Together we combine the best attributes of the international consultancy market in one lean and integrated package, offering the assurance that single sourcing provides. Our turnkey service now extends from that first blank sheet, right through to homologation papers."

Roberto Piatti, Torino Design's Founder, and CEO observed: "Our structure is carefully sized to develop the high know-how activities in-house ensuring high quality and control over projects – and by teaming with MIRA we extend our capability from styling research and prototyping right through to Job 1. Our customers demand the very best people and technology, supported by full accountability, so that's what we've set out to give them – I am confident that between us we can set up a very professional team combining the best of our companies and I look forward to a long cooperation."

Creating the Dreamliner seat

MIRA selected to help develop Boeing 787 Dreamliner aircraft crew seats

The Boeing 787 Dreamliner promises to deliver unparalleled performance, efficiency, safety and comfort. To achieve this Boeing has selected leading aerospace companies around the world including awarding the contract to provide the aircraft's crew seats to the Ipeco Group of Southend-on-Sea. In turn, Ipeco have selected MIRA as its test partner to ensure the seats meet both Boeing's and their own demanding requirements.

Ipeco's crew seats differ considerably from the passenger seats most of us may be used to. For a start, to ensure optimum comfort, the captain and first officer seats must be highly adjustable and comply with stringent test standards. Seat adjustments including, recline, vertical and horizontal lumbar support, knee support, seat pan tilt and variable arm rests all contribute to

providing unique comfort for the occupant. Ipeco's captain and first officer seats have electrically controlled adjustment in the vertical and horizontal directions, providing infinite adjustment in the working range. The seats also incorporate a five-point restraint system with twin inertia reels and manual lock.

With some classes of 787 designed to have a range of up to 8,500 nautical miles the importance of the seats meeting their criteria for safety, strength, comfort, reliability and durability has never been greater. With a focus on issues of crew fatigue and consequent reduced alertness they are designed and developed using anthropometric data, ergonomic principles, medical recommendations and materials research. Ipeco pride themselves on their uncompromisingly high quality standards and the rigorous test

programmes their seats are subjected to. These requirements and the benefits of independence were key factors in Ipeco selecting MIRA as test and development partner.

In addition to the already stringent requirements of legislation for airborne equipment, aircraft seats are required to pass their own demanding test procedures. The safety requirements are, understandably, particularly high with the seats having to withstand 16g dynamic loadings. Other tests include pneumatic actuators applying repeated loads to assess them for durability whilst vibration and extreme climatic environments put the seats' materials, mechanical and electrical systems through their paces. Typically the adjustment systems are subjected to 50,000 cycles of operation utilising bespoke test systems that incorporate pneumatic cylinders or drive motors being sequenced by programmable logic controllers. Environmental testing is also a requisite of qualification test specifications with the seats being subjected to temperatures ranging from -55 °C up to +85 °C, humidity of up to 95% RH and some test durations of over 100 hours. From the replication of in-service conditions including vibration and temperature through to atmospheric tests (altitude, decompression & overpressure), the seats need to exceed the legislative requirements to meet Boeing and Ipeco's even more demanding corporate qualification specifications.

MIRA's capabilities for the development of aircraft seats combine the expertise and experience gained through many successful automotive and rail seat programmes. Between its operations at Quatro Park in Basildon and headquarters in Nuneaton MIRA has one of the world's most comprehensive suites of vehicle seat development facilities.

For further details contact:
Eamonn Martin on 01268 290115
or Email: eamonn.martin@mira.co.uk



The Boeing 787 Dreamliner's crew seat undergoing vibration testing at MIRA.

BEYOND

NCAP

What's in store from 2009...

The EuroNCAP safety protocol has now been with us for more than 10 years; today, all new cars have acceptable safety levels and regularly achieve 4 or 5 star EuroNCAP rating. EuroNCAP's goal has always been to reduce the overall numbers of 'Killed or Seriously Injured' (KSI). Over the last 10 years they have been carefully monitoring the real world effects of their protocols and the response of the public and vehicle manufacturers. They have concluded that it's now time to raise the standard yet at the same time simplify it for the public. The new protocol seeks to strengthen the pre-2009 focus on adult safety (with supporting information for child and pedestrian protection) whilst introducing a fourth aspect, that of active safety.

Beyond EuroNCAP will encourage OEMs to put greater effort into certain passive safety areas and to support measures to help prevent the accident happening in the first place. This new assessment was launched in 2008 and February 2009 saw the first vehicles to be formally assessed against it.

Effect on Passive Safety

Data published by EuroNCAP shows that OEMs have focused their efforts on passive safety which directly benefit the purchaser of the vehicle. The data published by EuroNCAP during 1997 to 2000 revealed very unstable body structures. The test images were adversely received by the buying public and created pressure on the vehicle OEMs to improve and so overcome the negative press. Subsequently, designs have improved and strength of the steel used in the body and closures has in-

creased through each model year change. This increase in material specification, and consequently in mass, has had a direct impact on the cost of the vehicle. It has also hindered the drive for reduced emissions as extra mass raises fuel consumption and emissions. Inside the vehicle, passive restraint systems have improved with increased use of multistage frontal airbags, seatbelt pretensioners, load limiters, inflatable knee bolsters, and head, thorax and curtain side airbags.

The published data shows how adult star ratings improved from a low starting point of 1 or 2 stars, to 4 to 5 stars a few years later. This trend continues with most recently assessed vehicles meeting 4 or 5 stars. Usually, the child protection rating has also been 3 or 4 stars. The disappointment is that vehicles which started at 2 stars adult rating – and now have a strong 5 stars rating – have stayed at only 2 to 3 stars for pedestrian protection.

Beyond EuroNCAP

EuroNCAP's challenge has been to create a new rating system that builds on the success of the existing protocols, taking into account the disappointing response to pedestrian protection, moving the rating to include whiplash and an aspect of active safety, whilst removing some of the apparent public confusion over the range of star ratings. To achieve this, EuroNCAP have devised a new single-star-rating scheme for each vehicle which draws from four distinct categories:

- ◆ Adult rating
- ◆ Child rating
- ◆ Pedestrian rating
- ◆ Safety Assist rating

These will comprise a number of assessments, each resulting in identifiable points scores with their own 'box rating'. The interesting aspects of the single overall rating are the relative number of points that each category will receive, how the boxes will be linked together and the minimum threshold that will be needed in each to achieve an overall star rating. Frontal impact and pedestrian impacts have not been affected.

Points awarded for side impact will now be split between the two tests so, instead of the current 16 points for the side barrier test and 2 for the side pole, it will now be 8 points for each test. This is no surprise as many cars achieved 15 or 16 points for side barrier so could then decide whether to add head protection for an extra 2 points. The higher points value for the side pole test will encourage the inclusion of head protection devices as standard, improving overall protection in side impacts. Points for including up to three seat belt reminders (SBR), one for each front seat and collectively for the rear seats, have been moved to the 'safety assist' box. This heightens the challenge for OEMs as these were considered easy points to acquire. Whiplash has been introduced to the adult rating with an apparently small number of points, however the adult rating is considered the most important aspect of the overall rating, therefore the real value of these points will be significant. The different boxes will be weighted to emphasise the importance of particular areas. As expected the star ratings will be based on overall points with each box requiring a minimum score to achieve a certain star rating (see Table 1).

There is, however, a 'soft landing' to allow OEMs time to develop the technology to achieve their desired star ratings. As an example of this 'soft landing', the minimum overall percentage score to achieve a 4 star rating is 70%, but for 2010 would only be 60% and for 2009 only 55%.

Active Safety

All of EuroNCAP's measured work to date has focused on passive safety. The assumption is that a crash has occurred and the technology is helping to reduce the effect of the impact. Active (or primary) safety is all about avoiding the impact in the first place. An early example of active technology is ABS (antilock braking systems), which stops the brakes from locking up, therefore stopping the wheels from locking and inducing skidding. It enables a driver to maintain control of the vehicle's direction, whilst also slowing the vehicle effectively. Table 2 shows examples of such technologies. The challenge within active safety is that test

methodologies are at various stages of development with many not yet mature enough to have gone through Government or Industry Working Party review. This is a problem for organisations such as EuroNCAP; their goal is to get all such technology into vehicles, provided it can be proven to work and contribute to reducing casualties.

Next steps for EuroNCAP

EuroNCAP's ultimate goal is to reduce the number of casualties, of all types, caused by passenger vehicles. The *Beyond EuroNCAP* scheme shows that they favour a steady move to maintain the momentum established with the media and buying public, and draw industry along with them. The aim is not to introduce a radical change which could confuse the public and frustrate the vehicle OEMs. The new system builds on the foundations of the existing protocol and has cleverly focused effort on areas that were not receiving the attention considered necessary. Importantly, none of the existing requirements have been dropped but those that are now established as vehicle OEMs target requirements, namely the current front and side impact barrier tests, have been slightly diluted.

As implied earlier, the growth area in technology is aimed at either reducing the severity of the impact or avoiding it all together. The new rating protocol will introduce the fourth 'box' of 'safety assist' and so encourage the public to ask for these systems. However, the rating system itself only offers 2.5% of the overall points for such technologies. The likely next steps are for an evolution of the protocol that builds upon what is being done well and gradually increases the contribution of safety assistance to the overall score.

	Box 1 Adult		Box 2 Child		Box 3 Pedestrian		Box 4 Safety Assist		Total Points Needed
	%	Points	%	Points	%	Points	%	Points	%
5 Star	80	28.8	75	36.75	65	23.4	60	4.2	80
4 Star	70	25.2	60	29.4	50	18	45	3.15	70
3 Star	40	14.4	30	14.7	25	9	25	1.75	60
2 Star	30	10.8	25	12.25	15	5.4	15	1.05	55
1 Star	20	7.2	15	7.35	10	3.6	5	0.35	45

Table 1: Minimum % of weighted points needed in each section and overall 2012.

Active Safety			Passive Safety
Driver Warning & Info Systems	Collision Avoidance Systems	Vehicle Stability Systems	Occupant Protection Systems
Tyre Pressure Monitoring	Adaptive Cruise Control Systems	Anti-lock Braking	Front / Side / Curtain / Knee Airbags
Lane Departure Warning	Lane Change assistance system	Electronic Stability Control	Anti-submarining Seatpans
Traffic Sign Recognition	Lane Keeping System	Active Steering	Seatbelts / Loadlimiters / Pretensioners
Driver Drowsiness	Emergency Braking Assistance		Whiplash Protection

Table 2: Examples of Active & Passive Safety Technologies



carbonshift
Moving carbon out of the city...
for a cleaner future!

Cut journey times
Save 20% on fuel!
Use High Speed Platooning.

Traffic
signal
cameras

Get it
now!
Smoothflow

it'll cost less your stock

ITS the future!

It's not often a technology arrives that lets you have your cake and eat it, however Intelligent Transport Systems (ITS) promise it all: superior road safety, reduced traffic congestion, lower emissions and remarkable fuel savings; but is this really the panacea it first appears? It's clear that no other single technology promises such a compelling mix of benefits – little wonder then that auto makers, legislators and technology providers are all excited. But how can these systems deliver such impressive rewards and what is needed to bring them to fruition?

Vehicle to vehicle and vehicle to infrastructure communications are key to many active safety technologies such as Advanced Driver Assist Systems (ADAS) and Active Traffic Management (ATM). The same tools would facilitate more efficient utilisation of the road network, with techniques such as platooning resulting in smoother traffic

flows. The consequently calmer, less stop-start driving conditions require less energy, reducing net fuel consumption and lowering CO₂ emissions. Many of the technologies required already exist, but barriers to their implementation such as a lack of common standards and system interoperability issues have led to inertia in integrating them into the vehicle and the road infrastructure. One solution may be to use ad-hoc networks which are less dependent upon fixed infrastructure and permit a more gradual introduction of the technology.

So where are we today? We have hybrid cars that can run on various fuels and deliver very impressive fuel economies, but still operate on a legacy road network, the majority of which were built in the previous centuries. As more and more of us elect to drive, and travel further, our current level of congestion and inconvenience will increase. We need to raise the bar, so let's look at what ITS can offer.

The proliferation of basic travel information is becoming mature. Weather and congestion data is commonly delivered over telecommunication networks and linked to a GPS navigation system. However, at present only the driver assimilates this knowledge. In future the car could use this information directly. Radar and vision recognition systems can also be used to enable the car to “see” its surroundings and take appropriate action. This could be to override the driver’s specific instructions, such as when a car has been sensed beside the car during an overtaking manoeuvre.

In future the car may use GPS information to decide its own control strategies; increasing the level of hybrid battery charge in anticipation of a traffic jam, or when a ‘Zero Emission Zone’ is declared in the destination city due to smog forming weather. Other zoned control features are active speed limits – set to slow traffic down as it approaches an accident, schools only in term time – or even changes to the vehicle’s acceleration characteristics when inside a 20mph traffic calmed zone, doing away with the need for speed bumps. Cars will become broadcasters of information not just receivers, sharing: position, heading, speed, throttle position and brake force with other local vehicles. This creates an ad hoc network in which vehicles carry information upstream to other vehicles approaching a point of congestion, informing the driver (or car) of the problem ahead. It could also create the novel event of the car being able to “see” a car approaching a junction, at night and in the fog and being able to prevent an accident from occurring by taking avoiding action.

Great, so when can I buy it?

Well this type of sustainable transport requires communication means that simply do not exist today. Most of the building blocks required for a good communication system are already available, but so far they have not been systemised and standardised. Thankfully we have seen a substantial effort in the design of new standards in this area recently. ISO TC204 WG16 has provided a series of draft standards under the acronym CALM (Continuous Air interface for Long and Medium range). This work is a truly global effort, since our transport challenges are global in nature.

Cooperative systems need to interact in real-time and organise behaviour at decentralised levels. They should allow communication at every location, at any time and also to everybody. Today, many different communication bearers exist, each one optimised for a specific set of applications.

Some only work at low speeds, others work well at high speed but only at low bandwidths, some cannot be used for mobile applications, some can only be broadcast, etc. In addition to the existing bearers, the industry is working on adapting existing communication technologies to provide support in a mobile environment. Among the most important are the M5 (radio communication at 5GHz frequency), IR (Infra Red light) and MM (radio communication at >40GHz frequency) technologies. M5 will support omni-directional communication between moving objects with a minimum data rate of 6 Mbps up to 300m radius. It’s useful for vehicle-to-vehicle and low-directive vehicle-roadside communication. IR complements this by providing highly directive beams with a typical performance of 2 Mbps up to 100m range. MM allows for much higher data rates in the range of several hundred metres. Directional communication is useful since the communication range can be confined to a specific object or set of mobile objects.

One thing is apparent, one perfect communication technology does not exist. The CALM community is working on its specifications; currently the most important development for integrated communication solutions, with draft standards available for the majority of the core functions. Similarly, the internet standardisation community are providing the missing parts to allow a truly open end-to-end connectivity over the Internet. So in this wild frontier things are gradually coming together, so there is hope out there.

What’s MIRA doing to add its weight to these strategic efforts?

Later this year MIRA is planning to be the home of the world’s first dedicated single site ITS development centre – a serious attempt to bottom out some of these big issues. The centre, called “innovITS ADVANCE” is a five phase, €30 million project. The first phase, destined for completion by the fourth quarter of 2009, is a 120,000 m² city circuit. A network of roads, traffic islands, traffic circles and complex intersections is being created to replicate the challenges of almost any European urban environment. Comprehensive and complex instrumentation is integral to the project. As well as established systems including GPRS, roadside beacons and inductive loops, position monitoring technologies such as differential GPS will be installed, with Galileo systems expected to have roles as the project expands. The aim is to achieve cohesion between the automotive, telecommunications and the highways sectors. Watch this space...

INTERVIEW:

Dr George Gillespie joined MIRA on 1st January 2009 as the new CEO. Here, in his first interview, he discusses his early thoughts on both MIRA and the future of the industry...

You've enjoyed a great deal of success with well known companies like Ricardo, Schenck and latterly Horiba. What initially drew you to MIRA?

I think it was a combination of my personal interests and also an opportunity to work for a company with the pedigree and reputation of MIRA. On business level, what excited me about MIRA was the opportunity to take a company that already had a long established strong brand image and with the support of the Board, develop and lead the strategy for the future development and success of MIRA for the next 10 to 15 years. It's not often you get that opportunity to review the overall strategy for a company like MIRA – and then lead it through that. For me personally, I have always been interested in the automotive industry and the closer I am to the complete vehicle, the more I have enjoyed it. MIRA is an extremely interesting place for me to work on a personal level – and having been here for 3 months now I am finding it both a fascinating and challenging role. So for me as an engineer and as a manager it's a great opportunity.

What are your ambitions for the company?

MIRA is a wonderful brand that says quality and integrity. Building on that brand is my ambition, so that in 10 to 15 years time, MIRA is a globally respected brand for vehicle engineering services in the leading technologies in the automotive sector in addition to selected other sectors. I want MIRA to grow to be valued and recognised in other sectors such as Defence and Aerospace, in the same way that it is in the automotive sector today.

What are you finding are the biggest challenges in running an organisation like MIRA?

Probably the biggest challenge within MIRA is the diversity of the services and products we offer. There are many different areas, all of which require attention and investment. The challenges lie in understanding and deciding what are the priorities, in terms of both management effort and future investments going forward. There are many deserving areas within an organisation as broad as MIRA.

I hear that in your first month in charge you have been busy meeting MIRA's customers, to get a feel for their outlook and the way that MIRA is perceived. What have you learnt so far?

What I'm hearing is that MIRA is a company that delivers high quality work to our cus-

tomers and we have the recognised world class engineering talent within the company that our customers want to tap into. MIRA is a company that has a reputation for customer service and the commitment of our staff to satisfying the customer comes through again and again. There is a large amount of good will towards MIRA and many of our customers are long term customers who value MIRA. These customers wish to see a strong MIRA that has a successful long term strategy that allows the company to grow and to be sufficiently profitable that we can invest to create the products and services required to meet their needs.

Is MIRA in good shape to respond to the current climate?

We have just finished in December 2008 our busiest quarter in the last 4 years and we have started 2009 with a reasonable order book. Previous experience has shown that engineering service providers, such as MIRA, may well actually have a counter cyclical business to the OEMs. As the OEM's business struggles, they have to reduce their internal staff, but they still need to keep their development programmes on schedule. This creates a short term demand for outsourced testing and engineering services; both services MIRA is well placed to provide. However we should never underestimate the challenges we face at the moment as the automotive sector is facing an unprecedented global downturn in sales, projected to last perhaps until 2011

It is also helpful that more than 25% of our business comes from non automotive customers. This diversification, particularly into the defence sector that is less affected by the current recession, is certainly softening the impact on us of the downturn in the automotive sector. Our defence business is doing very well at the moment due to particular short term needs and requirements that are driving a growth in the defence sector. Having said all that, it will require us to be innovative, flexible and manage our costs carefully to ensure we emerge from this difficult period stronger and better placed to meet the changing requirements of our customers.

Is the reduction in the value of Sterling having an effect on the business?

It primarily creates an opportunity for us to be more aggressive in export markets where our prices have reduced by 20 to 25% compared



Biography...

Dr George Gillespie gained his PhD from Queen's University Belfast for his research into GDI applied to two-stroke cycle engines. To his new role as MIRA's CEO he brings 20 years of international experience in the automotive and marine engine sectors, drawn from his role as Vice President of Strategic Business Development at HORIBA Europe GmbH and previous senior roles with Ricardo plc and Schenck AG, having worked extensively in Germany, USA, Japan and China. He is 45 and married with two children.

to a year ago, or where we are competing in the UK with European competitors. However we must remember that the best way to be successful in the long term is to ensure we provide a highly valued service for our customers regardless of the short term vagaries of currency fluctuations.

Has anything about the business surprised you so far?

What has pleasantly surprised me as I have got to know the company and reviewed the activities in many areas, is the many examples of engineering and technical competence that are truly world class. To pick one or two examples, one would be the large scale flow visualisation in the wind tunnel, where we are tracking tiny helium bubbles to reveal a transient digital model of the airflow. This is leading edge engineering providing a real step forward in the correlation of wind tunnel developments with CFD simulation. Another example would be the H4V hybrid demonstrator vehicle I drove – that is a very well integrated, well engineered demonstrator showing that we have excellent vehicle systems and hybrid engineering skills in the company. I have also been struck by the very strong sense of pride in MIRA among the staff who love working here, enjoy the diverse and interesting work we do and the strong com-

mitment to satisfying our customers that makes them proud to work for MIRA.

There are enormous pressures on the finances of the automotive sector right now, but without the right products coming through, the industry will find it difficult to recover. So how is MIRA reducing the cost of this development for your customers?

I think one of the best ways we can help the automotive sector, is to work with our customers to deliver the development programmes that they still need, but to do that more efficiently. We are very good at looking at the most efficient and pragmatic way through a development programme to achieve the end result. We can have the clarity of vision that allows you to understand what you need to measure and then how to turn that test data into information that allows you to take engineering decisions quickly. I think the leaner nature of our organisation allows us to deliver such programmes at the best possible cost. We obviously feel that we can deliver right-first-time solutions, at high speed. I would use the "Limo Green" project as an example, where within 9 months we will deliver hybrid prototypes, fully engineered, installed and running on the new XJ platform. That is an example of delivering a programme up to demonstrator stage very cost effectively and very quickly.

And finally knowing that travel budgets are among the first to be cut in difficult times, we have just launched an enhanced web based meeting service that for no additional cost to the customer provides high quality video, audio, document and interactive presentation communications.

What is MIRA doing to support the automotive industry through this critical period?

We're being very flexible about how we work with our customers. Our Quatro Park operation in Basildon is one business model in particular that appeals to our customers. The OEMs and Tier 1 suppliers often have dedicated high cost, high maintenance facilities that are only used in-house activities. It is not possible for them to really manage them in a commercial way and bring in third party work. But if those facilities are run by an independent company like MIRA – and Quatro Park is a very good example – then we have two things. First, we have the independence and second we have the internal processes and commercial understanding to run it as a business. As we win additional third party business for that facility, it reduces the costs to the OEM who is our partner in the project.

What do you see as the big issues facing the transport sector in the medium term and how will MIRA respond to these challenges?

The biggest medium term challenge is the

need to reduce dependence on oil for transportation; what is termed the low carbon agenda. With drivers such as global warming focusing attention on CO₂ emissions the need for energy security and the finite known reserves of oil and the inevitable future increases in the oil price, reducing short term fuel consumption and diversifying away from oil are the primary automotive sector challenges. Once we have emerged from the current global downturn in automotive sales, this will remain the key issue within the automotive market.

How will MIRA respond? Well, we will continue to invest in our own internal R&D and in the development of our facilities and people: in both the core technologies that are required to meet these challenges and the facilities that allow us to evaluate these new technologies.

Another challenge within the automotive sector is how to efficiently and safely manage the growing amount of real time data and information available within the vehicle. This is a customer driven demand as much as anything. There is the potential for a lot of information based technology within a vehicle that needs to be integrated in a cost efficient and effective manner, where at the moment it's done in a standalone piecemeal fashion. You have an in car entertainment system which is entirely separate from the satellite navigation system, which is separate from any roadside transport systems and so on. Developing a coherent approach for intelligent transport systems is a real opportunity for MIRA, particularly with our plans for the proposed new telematics development centre that we announced together with InnovITS recently. This facility will place MIRA at the forefront of this technology and we will be very well placed to deliver engineering solutions around the Telematics and ITS area.

From 2012 onwards the CO₂ legislation in Europe will have a real bearing on the viability of certain models. Is it realistic, for instance, to expect that large luxury cars can meet the new emissions targets?

I would point to our current work on project 'Limo Green' where MIRA is working in a collaborative manner with our partners to show that we are able to deliver a luxury vehicle – not a city car – which is capable of 120g/km, within a relatively short timeframe. With the pragmatic application of known technologies such as hybrid drivelines we can help our customers meet this tough challenge while still delivering cars that customers want to drive.

MIRA has just announced a collaboration agreement with Italian Design house "Torino Design". What will this mean for vehicle makers?

Outsourcing a vehicle programme is a critical decision, and our customers need to know

they are getting the best service available; so that's what we are giving them – Italian styling and British engineering. It's a combination that resonates throughout the automotive world. There is clearly something fundamentally right about our collaboration with Torino Design as we are already working together successfully on major vehicle projects in both China and India. Our combined turnkey service extends from that first design sketch right through the full vehicle engineering process to the final vehicle homologation. Together we can handle the whole programme with clear accountability. I look forward to building our business with Torino Design and working to see how we can further develop the relationship.

The new EuroNCAP scoring system was announced in mid-February and with a stiffening of EU legislation covering pedestrian protection in the wings, safety remains a hot topic. Despite this it's clear we are not going to achieve the stated EU ambition to halve the number of road deaths by 2010. What is MIRA doing in this field to improve the situation?

I think MIRA has a great reputation for innovative safety engineering and testing built on years of experience. MIRA started research into pedestrian protection a decade before there was any such legislation and we continue to invest in this area with recent enhancements in our Crash Rig area. Similarly, Automotive Testing Technology magazine awarded our safety engineers *International Crash Test Team of the Year 2007*, in recognition of their enduring service to the industry.

Moving to this year, we have plans to host a new telematics development centre at our HQ; that development should provide the setting for many new active safety driver aids that have the potential to significantly reduce automotive accident and injury levels.

Some people infer a great deal from the car someone drives. So as the CEO of a landmark automotive engineering and development consultancy, what are your wheels and why?

My company car is a Jaguar XF diesel. Having looked at all of the medium sized vehicles I found that the XF driving dynamics were an excellent balance of performance and comfort, and the interior design was a refreshingly modern change from all of the main competitors. Being a pragmatic engineer, I selected the diesel engine for the balance of fuel economy, taxation level and performance.

My other car is a Caterham race car which is a complete contrast but something I like to do in my spare time.

Dr Gillespie, thank you for your time.

Engineering Mastiff and Ridgback for NP Aerospace

With the UK's forces embroiled in two military campaigns there has been considerable criticism in the press over the vehicles our troops are equipped with and the time and costs involved in developing new defence vehicles. Less reported are the remarkable achievements of Coventry based NP Aerospace, who have successfully introduced a range of highly capable vehicles already credited with saving lives in Iraq and Afghanistan.

In response to MOD Urgent Operational Requirements, UORs, NP Aerospace have delivered hundreds of vehicles based on their Mastiff and Ridgback platforms. To achieve the rapid vehicle development times demanded by the MOD they took existing products produced by Force Protection Inc. of the USA and heavily modified them. NP Aerospace employed MIRA to help them with the integration of the various additional systems and to meet the resultant engineering challenges. MIRA also had to ensure the new vehicles would comply with UK and European legislation.

Mastiff is a heavily armoured 6x6 wheel drive patrol vehicle which carries six people plus two crew. Derived from the US Marine's Cougar, Mastiff incorporates features designed to provide the highest levels of survivability such as a V-shaped hull, run flat tyres and shock mounted seating and internal spall liners. The increased protection offered by the Mastiff enables them to be used to carry infantry troops around danger zones and makes them particularly suitable for the Royal Engineers and Bomb Disposal teams.

The smaller Ridgback is a 4x4 more manoeuvrable variant, offering the same high degree of protection but better suited for accessing urban environments.

Both Mastiff and Ridgback incorporate high levels of ballistic protection. The upgrade also included replacement of their communications systems and other advanced electronic systems.



NP Aerospace specialises in vehicle armour and was given the task of incorporating their CAMAC® product into the already well protected vehicles. NP Aerospace's CAMAC® armour is a high performance material that offers high levels of ballistic protection but is up to 20% lighter than the equivalent steel armour. This significant weight saving goes some way to compensating for the mass of the other additional equipment required by the MOD.

MIRA's first task was to specify and fit an up-rated braking system that could handle the increased vehicle weight and comply with European braking legislation notably the requirement for dual independent braking systems. For similar reasons the vehicles were subjected to a range of mobility trials and evaluation of their dynamic handling to ensure the Mastiff and Ridgback's performance wasn't compromised. Other practical and legislative requirements meant that MIRA had to re-engineer the lighting systems for instance adding orange indicators in place of the blinking red rear lights used in the US. Though not a covert vehicle, MIRA's NVH engineers made interior and exterior noise measurements with a view to keeping vehicle generated noise to a minimum.

Perhaps the most challenging task faced by the vehicle development team came as a result of integrating the electronic systems; that of ensuring the vehicles pass the MOD's demanding requirements for electromagnetic compatibility, EMC. MIRA's specialist EMC engineers achieved this by working closely with the vehicle team to optimise the location of components and wiring harnesses and incorporating a range of bespoke EMC screens and filters.

With such a major series of upgrades and modifications it was important that they were appraised for durability and their ability to perform in extreme environmental conditions. MIRA's proving ground with its array of specialist tracks and surfaces proved ideal for putting the vehicles through their paces. Likewise MIRA's large vehicle climatic wind tunnel, CWTtwo, provided the extremes of temperature, humidity and solar load required to ensure the powertrain cooling system functioned reliably and that cabin conditions remained comfortable.

For NP Aerospace being able to conduct this complete package of design, development and test work on one site proved a major benefit saving them time, reducing costs and maintaining confidentiality.