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Editorial Board:

JEAN TODT, NORMAN HOWELL,
GERARD SAILLANT, RICHARD WOODS,
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Editors-in-chief:

NORMAN HOWELL, RICHARD WOODS

Executive Editor: MARC CUTLER

Editor: JUSTIN HYNES

Copy Editor: JOHN LILLEY

Art Direction and Design HELEN NILAND

Photo Editor: CAS

Design Consultant: JAMES GREENHOW

Contributors: MATT BEER, GEMMA BRIGGS,
ANNIE KELLY, ANTHONY PEACOCK,
MATT YOUSON

Logistics: KATE ROBSON

Repro Manager: ADAM CARBAJAL

Printing: MANOR CREATIVE

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Cover image: WILL THOM

BEHIND THE SCENES

In motor sport, the racing is just the tip of the iceberg, the culmination of months of technical work to ensure both car and driver have reached the highest standards.

This is never more the case than where safety is concerned. In this issue of *AUTO* we go behind the scenes of Formula One crash tests that take place throughout the off-season. Each car must pass 18 different crash and stress tests – that's 198 passes just so F1 cars can go racing. It's an essential element of the sport, and we reveal all.

Motor racing is also a great leveller. It is one of the few sports in the world where men and women, abled and disabled, young and old, compete on the same field of play. And this month we look at how a group of disabled soldiers conquered the Dakar. Alex Zanardi also tells us what it takes to make a champion – unsurprisingly, it has little to do with physical attributes and much to do with passion.

It isn't just on the track that such passions are to be found either. Russia's General Victor Kiryanov tells us about his mission to ensure that road safety is at the top of the political agenda in the world's leading countries. We also visit one of the most dangerous roads in the world, Bangladesh's N2, and hear from a group of experts determined to put things right.

Such passions are worth championing – as we do throughout this issue of *AUTO*.

THE FIA

The Fédération Internationale de l'Automobile is the governing body of world motor sport and the federation of the world's leading motoring organisations. Founded in 1904, it brings together 232 national motoring and sporting organisations from 134 countries, representing millions of motorists worldwide. In motor sport, it administers the rules and regulations for all international four-wheel sport, including the FIA Formula One World Championship and FIA World Rally Championship

THE FIA FOUNDATION

The FIA Foundation is an independent UK registered charity that supports an international programme of activities promoting road safety, the environment and sustainable mobility. It was established in 2001 with a donation of \$300 million from the FIA and is governed by a Board of Trustees. Among its activities, the Foundation participates in various UN road safety and environment related partnerships and is a member of the UN Global Road Safety Collaboration.

THE FIA INSTITUTE

The FIA Institute is an international not-for-profit organisation that develops and improves motor sport safety and sustainability. It leads projects that encourage the rapid development of new and improved safety technologies; that facilitate higher standards of education and training; and that raise awareness of safety and sustainability issues. The Institute was established in October 2004 and funds its activities through annual grants from the FIA Foundation.

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'OUR GOAL IS TO PREVENT TRAFFIC ACCIDENTS, FREE UP PEOPLE'S TIME AND REDUCE CO₂ EMISSIONS BY CHANGING CAR USE'

PROF SEBASTIAN THRUN – GOOGLE





The mix of ultra-light body weight and class-leading aerodynamic efficiency – with its blend of retro and futuristic styling cues – makes Volkswagen's XL1 as eye-catching as it is revolutionary. Hybrid electric/diesel power helps to extend its on-road range, but it is still capable of achieving a claimed 130-140mpg when running on diesel alone



PHOTOGRAPHY: TOYOTA MOTORSPORT

Sustainability

AERO DYNAMIC

Volkswagen has revealed details of a new production vehicle that it claims is the world's most fuel-efficient car. The XL1 delivers vanishingly low fuel consumption figures of just 0.9l/100km, the equivalent of 313mpg.

It was previously seen as a concept, but VW now says it has confirmed the fuel figures and that it will put the radical two-seater car into limited production at its plant in Osnabrück in Germany later this year.

The economy comes courtesy of the car's low kerb weight, slippery aerodynamics and frugal powertrain. The XL1 weighs in at just 795kg thanks to a body – made mostly of carbon-fibre-reinforced plastic and an ultra-thin glass windscreen – that on its own weighs just 230kg.

The 'retro-future'-styled XL1 is powered by a plug-in hybrid system consisting of an 800cc, two-cylinder turbodiesel engine generating 47bhp, and an E-motor that delivers 27bhp from a lithium-ion battery. Speed is limited to 160km/h, and the XL1 will reach 100km/h (62mph) in a respectable 12.7sec. In electric-only mode it will travel about 30 miles (48km) on a single charge. When driven in diesel-only mode at normal motorway speeds the car can still average around 130-140mpg, VW claims. That's about 250 miles (402km) on one 10-litre tankful.

The aerodynamics are also interesting. Its very low drag coefficient of 0.189 is made possible by innovations such as 'e-mirrors' mounted in the doors, which project road images onto screens in the cabin where the two passengers sit in a slightly offset position. □



'MY OWN STORY CAN HOPEFULLY TEACH OTHERS ABOUT THE LONG-TERM CONSEQUENCES OF SPEEDING'

SIR FRANK WILLIAMS

DOHA GOALS FORUM

Gathering Of All Leaders in Sport

by ASPIRE

Road safety

SAFE GUARDS

At the inaugural Doha GOALS sports business forum, the sobering facts and figures behind road accidents worldwide were discussed by the FIA president Jean Todt, the Make Roads Safe ambassador Michelle Yeoh, and Williams F1 founder Sir Frank Williams. They were speaking before an influential audience of government officials, federation heads and policy makers.

President Todt is responsible for the FIA's Action for Road Safety campaign, which is addressing the 1.3 million road deaths per year by urging drivers to follow 10 golden safety rules. Williams talked of his experience as a high-profile victim of the dangers of the road, and the ways in which Formula One can use its technology base to address the problem. The FIA is now playing a

key role in adapting F1 technology to road safety applications. Its Technology Centre in Qatar has developed advanced road safety simulators that are being used to train and certify ordinary road users and so reduce the death toll on Qatari roads.

"Road safety is an important issue for me and for Williams as an organisation," said Sir Frank. "I was delighted to be speaking alongside Jean and Michelle and to help raise awareness of this crucial issue. My own story can hopefully teach others the long-term consequences of speeding. It was also an opportunity to speak about the role Formula One can play with the advanced technology it has produced. Hopefully our road safety simulators can help reduce the number of deaths and serious injuries on Qatari roads in the future."

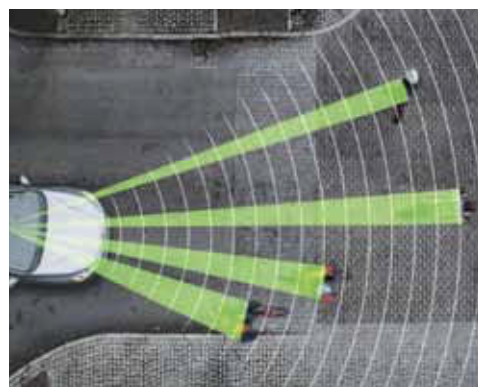


At the Doha GOALS forum, FIA president Jean Todt (second from left), Sir Frank Williams and Michelle Yeoh develop their thoughts on the contribution F1 can make to everyday road safety

PHOTOGRAPHY: DOHA GOALS / WWW.DOHA.GOALS.COM

Stories making the headlines from the world of the FIA family

News



Volvo unveils cycle-detection braking system

Swedish car manufacturer Volvo has launched new cyclist detection technology at the 2013 Geneva Motor Show. Cars equipped with the new feature – Volvo’s latest bid to avoid accidents before they happen – will detect, and automatically brake for, any cyclist who may swerve in front of the car.

The new software is an enhancement of the company’s present pedestrian detection and brake technology and will be fitted to a range of models from this May.

According to accident data, about 50 per cent of all cyclists killed in European traffic have collided with a car. This latest system includes more rapid vision processing to cover cyclists’ behaviour.

The advanced sensor scans the area ahead. If a cyclist heading in the same direction suddenly swerves in front of the car as it approaches from behind, and a collision is imminent, an instant warning is issued and full braking power is applied.

“Our solutions for avoiding collisions with unprotected road users are unique in the industry,” said Volvo’s vice president of marketing, Doug Speck. “By covering more and more objects and situations, we keep moving towards our long-term goal of designing cars that do not crash.”



Next European Formula 3 champion to get Ferrari Formula One test



By the end of the FIA’s 2013 Formula 3 European Championship season, one lucky driver will have won a potentially career-changing prize: an F1 test drive with Ferrari.

The series, which kicks off at Italy’s Monza circuit on March 22, has already attracted a highly competitive field, and the FIA is on course to establish the championship as a major rung on a proposed ladder leading from karting to top-level senior motor sport.

According to the FIA single-seater commission president, Gerhard Berger, the chance to spend a day with the Ferrari Driver Academy and drive a Formula One car confirms the value of the series both to



PHOTOGRAPHY: CHARNIAUX / XPB IMAGES / LAT; DPPI

up-and-coming racers and to the teams. “When we took the decision to get the Formula 3 European Championship up and running again, we had a single aim in mind: to give the best rising talents the opportunity to shine,” said Berger. “As Formula One is obviously the ultimate aim

for a young driver, it seemed to us to be very important to reward the champion with an F1 drive. We’re delighted to have reached this agreement with the Ferrari Driver Academy.

“A driver has very few chances to get behind the wheel of such a car,” he added. “It’s a great opportunity and one the 2013 winner will surely make the very most of. He’ll learn more, he’ll get himself noticed, and he’ll show that tomorrow’s F1 drivers are in Formula 3 today.”

Luca Baldisserrri, head of Ferrari’s Driver Academy added: “The Ferrari Driver Academy firmly believes that a Formula 3 car is an excellent preparatory car and that every driver’s career should include a spell in one, because of the special balance between grip and power, which is ideal for learning to drive a single-seater.

“This is why we choose to reward the winner with what is a dream for every racing driver, namely a day at the wheel of an F1 Ferrari.”

McLaren wins environmental recognition

Vodafone McLaren Mercedes is the first motor sport stakeholder in the world to receive the FIA Institute’s Environmental Award for the Achievement of Excellence.

The award is part of an initiative aimed at reducing the environmental impact of motor sport. It is the highest level attainable within the FIA Institute Sustainability Programme, which helps stakeholders to measure, improve and be recognised for their performance.

Underpinning the Sustainability Programme is an environmental accreditation scheme – the Environmental Certification Framework – the first to have been developed specifically for motor sport. It enables National Sporting Authorities, teams, circuits, manufacturers, and event organisers to achieve the highest standards in environmental management.

FIA president Jean Todt said: “McLaren’s award is an important step in the recognition by motor sport of the social responsibility our community must acknowledge.”

FIA Institute president Gerard Saillant said: “This is a fantastic achievement for a motor sport organisation, especially as the assessment is based on leading standards across all industries.”

The FIA Institute’s Environmental Certification Framework has been developed in partnership with leading environmental consultancy Det Norske Veritas (DNV), and the Institute’s Sustainability Advisory Panel, composed of environmental experts from across motor sport. The accreditation process itself is led by FIA Institute environmental consultant Even Wiger.

Achieving the excellence accreditation is no easy task. McLaren’s head of sustainability, Ian MacDonald, said: “We pride ourselves on our environmental credentials but the FIA Institute assessment really put those to the test. As a result, we have made major changes to further improve the team’s sustainability.”





Drivers will be able to compete for selection to the Academy in qualifying events in their own region

Academy spreads selection worldwide

The FIA Institute has expanded its selection process for its Young Driver Excellence Academy. Up to five qualifying events will be run in several countries later this year.

The new format will provide many more young drivers with the opportunity to apply for entry, which offers a fully-funded training programme to help develop their motor sport careers as well as improve safety skills and promote fairness and responsibility on and off the track.

Drivers will be able to compete for selection locally as qualifying events take place in widely varying geographical regions – the Americas, Europe, Asia/Pacific, the Middle East and Africa.

The Academy itself will run on similar lines to previous years, albeit with a smaller, more focused group of eight drivers taking on the training programme. Once again they will benefit from the expert tutelage of Alex Wurz, former Formula One driver and two-time Le Mans winner, and Robert Reid, former World Rally Champion.

“This is an exciting development for the Academy,” said Alex Wurz. “Now we have a truly global platform on which to welcome the most worthy drivers. Successful applicants won’t just be those with the most skill, but also the right approach and, most important, the right attitude towards safety.”

Robert Reid added: “We wanted to expand the learning from the Academy to far more

drivers regardless of where they’re from. With regional selection events also including valuable training we look forward to many more drivers having the opportunity to benefit from this important programme.”

With the provision of an event subsidy, qualifiers will be hosted by National Sporting Authorities (ASNs) worldwide. However, the first of these events, in Europe, will be run by Academy training partners ESP and TTI. This event will become the model for others to follow, and potential host ASNs will be invited to attend to gain important experience which will help them with the running of their own events.

Each qualifier event will produce one winner who’ll go forward to the 2013 Young Driver Excellence Academy. Further drivers will be selected using a wildcard system, bringing the total to eight participants in the final Academy group.

Those drivers not selected for the final will still benefit from the selection process, as each will receive driver training as part of a three-day workshop.

Every ASN in each region can nominate one driver for the selection event. ASNs will be provided with selection criteria to help them evaluate driver suitability and to ensure that all nominated drivers at least meet minimum criteria.

Gerard Saillant, FIA Institute president, said: “The Academy programme has been a



‘WE NOW HAVE A TRULY GLOBAL PLATFORM’

ALEX WURZ

great success in its first two years and now we want to increase its regional reach. To help with this we’ll be encouraging our ASNs worldwide to host qualifying events and we will in turn help them to develop training services for young drivers.”

Application details for the selection events will be announced shortly



Meeting of minds: Jim Yong Kim and Lord Robertson discuss extra funding resources

Commission discusses safety with World Bank

At a meeting in Washington in February to discuss road safety and the post-2015 agenda, Lord Robertson of Port Ellen, chairman of the Commission for Global Road Safety, and the president of the World Bank, Jim Yong Kim, emphasised the urgent need to find sources of additional catalytic funding to support country-led road injury prevention efforts.

Also attending were David Ward, director general of the FIA Foundation, and Kevin Watkins, a senior fellow at the Brookings Institution and member of the Commission for Global Road Safety.

They discussed progress on the UN Decade of Action for Road Safety and the efforts of multilateral development banks to integrate road safety performance indicators into road infrastructure loan programmes. The positive example here was Argentina, where a stand-alone World Bank loan is now supporting road safety interventions by the government as they drive down injuries.

Lord Robertson said: “We’re not afraid to criticise the Bank when we perceive shortcomings, but we recognise that it is one of the global policy leaders in sustainable transportation, climate change and health. So I’m delighted that the World Bank is taking the road injury problem very seriously and committing to play its full part. This will be crucial in the context of the post-2015 sustainable development agenda, where the key enabling role of transportation policy in delivering health, education, climate and other environmental targets must be recognised.”

PHOTOGRAPHY: MCLAREN

FIA orders road safety action study

The FIA has commissioned a study to determine how road safety can be kept at the top of political agendas worldwide. The report will provide governments and organisations with a road map of routes to ensuring safer road use in their countries.

The study will be undertaken by Holland’s SWOV Institute for Road Safety Research and, at a meeting in Paris to kickstart the initiative, FIA president Jean Todt said: “A lot of things have been done [to promote road safety] but we need to do more. Road [death and injury] is a major scourge. When I see the input given to tuberculosis, HIV and malaria by governments worldwide, I feel those issues are being dealt with in an appropriate manner. For me, road safety is not being addressed as it should be.”

During a two-day meeting, senior FIA Mobility personnel, SWOV representatives and a panel of road safety experts defined the parameters of a report to be delivered in the autumn. Commenting on the discussions FIA secretary general for Automobile Mobility and Tourism Susan Pikrallidas (below) said the study would aim to deliver in three areas.

“First, a background paper on road safety issues and strategies to get governments, especially those in developing countries, to fully grasp the importance of investing in road safety,” she said. “Also a short summary document to be used by the FIA president to communicate the road safety message to global leaders in government, the investment community, and international organisations. Finally, it will also develop a ‘toolbox’ of actions for our members.”

SWOV’s MD, and professor of traffic safety at Delft University of Technology, Fred Wegman, said that with the scope of the report now defined, the hard work could begin. “As an institute, we have received a lot of homework from the experts,” he said.



Todt holds road safety talks with Israeli PM

On a visit to Israel, FIA president Jean Todt held talks on road safety issues with the prime minister, Benjamin Netanyahu (above).

Todt was in Israel to speak at the annual conference of the Or Yarok Association, a road safety NGO founded in 1997 by Avi Naor, whose 20-year-old son was killed in a traffic accident. Since its inception the association has played a major role in raising public awareness of road safety. As the result the Israeli government has passed comprehensive legislation, putting it among the top 10 countries for road safety. In 2012 its road toll hit a historic low of 292 deaths.

Addressing the conference alongside Global Road Safety ambassador Michelle Yeoh, president Todt praised the association for helping to reduce road fatalities, and said the country was a good example of what can be achieved when there is “commitment and political will”. He also called for such political involvement on an international scale.

“While road safety is and will remain first and foremost a national responsibility, my conviction is that there is a growing role for the international community to play,” he said. “Until very recently, road safety was considered merely as a national issue, but road accidents are becoming such a massive scourge – especially in emerging and developing countries – that it is one of the greatest challenges the world is facing today, both in human and development terms.”

Todt later met with prime minister Netanyahu to discuss the importance of putting road safety firmly at the top of the international political agenda. They also talked about the possibility of using motor sport to develop mutual understanding and tolerance in the region.

Nissan to offer e-safety elements to small car sector

Nissan's new Note supermini (below) will offer a suite of e-safety technologies normally reserved for the premium sector.

The new small-sector car, which made its debut at the Geneva motor show and which will be available this autumn, features a pack Nissan is calling the Safety Shield, which not only features the company's Around View Monitor system – with camera angles viewable on a 5.8 touchscreen – but also a range of other technologies including Blind Spot Warning, Lane Departure Warning and Moving Object Detection systems which together have been designed to create a virtual 'safety net' around the vehicle.

With the systems working together, the car alerts drivers to objects moving behind the car, such as a child walking towards you when reversing. It also warns drivers when vehicles are in their blind spot, and it detects when another car is drifting out of its lane so avoiding action can be taken.

A neat convenience item is the self-cleaning rear camera. It scans itself for dirt and if it needs to be cleaned a small jet of water is fired onto the lens which is then dried with a puff of compressed air.

'A SAFETY NET IS PUT AROUND THE VEHICLE'



Hyundai fires up hydrogen fuel cell production line

Hyundai is the first car manufacturer to begin assembly-line production of zero-emissions hydrogen-powered vehicles for fleet use, with the launch of its ix35 Fuel Cell vehicle.

The new car rolled off Hyundai's Ulsan production line last month and will initially be shipped to Europe to fleets in Copenhagen, Denmark and Skåne, Sweden. The Municipality of Copenhagen, as part of its initiative to make itself carbon-free by 2025, will be supplied with 15 ix35 Fuel Cell cars for fleet use. Two will go to Skåne.

"With the ix35 Fuel Cell vehicle, Hyundai is leading the way to a zero-emissions future," said Hyundai Motors vice chairman, Eok-Jo Kim. "The ix35 Fuel Cell is the most eco-friendly vehicle in the auto industry and proves that hydrogen fuel cell technology in daily driving is no longer a dream."

Hyundai plans to build 1,000 ix35 Fuel Cell cars by 2015 for lease to public and private fleets, primarily in Europe, where the EU has established a hydrogen road map and started to build hydrogen fuelling stations.

Make Roads Safe presents evidence to UN



The UN's High Level Panel on the Post-2015 Development Agenda was given evidence by the Make Roads Safe campaign on the global road traffic injuries crisis at its key meeting in Liberia from 30 January to 2 February.

Presenting evidence on behalf of the Make Roads Safe campaign was Bright Oywaya of Kenya (above), who is also a representative of the Association of the Physically Disabled of Kenya.

Oywaya was nominated by other civil society representatives to present to the High Level Panel at the main consultative session on 30 January in the Liberian capital, Monrovia. The Panel of 27 has been tasked by UN secretary general Ban Ki-moon to advise on a global development framework to replace the Millennium Development Goals that expire in 2015.

It is co-chaired by president Susilo Bambang Yudhoyono of Indonesia, president Ellen Johnson Sirleaf of Liberia, and UK prime minister David Cameron. The meeting was one of only three opportunities for NGOs to engage with the panel before it produces its report in May.

Oywaya presented the case for road safety to be included as a target within the post-2015 framework for global development.

"In representing the Make Roads Safe campaign in Monrovia, this was a rare opportunity to bring attention to an issue which has huge implications for the development agenda," she said.

"As I have seen in my country, road traffic injury plunges families and communities further into poverty. And the human cost is unacceptable – how can we not address what is the number one killer of young people globally? The inclusion of road safety within the wider development agenda post-2015 would result in millions of lives saved and injuries prevented. This is a crisis which can no longer be ignored."



ASEAN NCAP releases first crash test scores

ASEAN NCAP, the new car assessment programme for South East Asia, has released the first-ever crash test results for cars in the region. They show encouraging progress by some manufacturers, but poor levels of safety at the bottom end of the scale.

Two models – the Ford Fiesta and Honda City – achieved five stars for adult occupant protection. But the results of the Hyundai i10 (two stars) and Proton Saga (one star) show there is still much more that can and should be done to improve vehicle safety.

The testing is the result of a collaboration between the Malaysian Institute of Road Safety Research (Miros) and Global NCAP.

Other models tested under the ASEAN NCAP off-set frontal collision protocol were the Toyota Vios (four stars), Perodua Myvi (three stars), and Nissan March (four stars).

All the cars were built in Malaysia, except the Ford Fiesta and Nissan March, which are produced in Thailand. To be eligible for a five-star rating, a vehicle must have at least two airbags, electronic stability control and a seatbelt reminder, or its limit is four stars.

David Ward, secretary general of Global

NCAP, said: "Consumers in the ASEAN region should expect the same levels of safety those with established crash testing programmes. These results show that it's perfectly possible to produce affordable cars with top level safety for emerging markets. However, the disparity [between them] and models at the lowest end is worrying."

ASEAN NCAP is also supported by the membership of automobile associations from Malaysia (AAM), the Philippines (AAP) and Singapore (AA Singapore).

The Malaysian Government has applied the UN's regulation for frontal impact to all

new passenger cars. This is in line with the recommendations on vehicle safety included in the Global Plan of the Decade of Action for Road Safety.

Miros launched its crash test laboratory when it hosted the largest-ever gathering of NCAPs at the Global NCAP annual meeting in May 2012. ASEAN NCAP carried out frontal off-set crash tests at 64km/h as it assessed results for driver, passenger and child safety.

The second phase of ASEAN NCAP will feature side impact testing and is expected to begin in the second quarter of 2013.

PHASE ONE RESULTS

Ford Fiesta LX Ti-VCT (2012) – Adult ***** Child 66% Airbags 7
Honda City Grade S (2012) – Adult ***** Child 81% Airbags 2
Toyota Vios 1.5J MT (2012) – Adult **** Child 48% Airbags 2
Nissan March E MT (2012) – Adult **** Child 48% Airbags 1
Perodua Myvi SX (2012) – Adult *** Child 54% Airbags 2
Hyundai i10 1.1 Epsilon (2012) – Adult ** Child 48% Airbags 2
Proton Saga Standard (2012) – Adult * Child 49% Airbags 1





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Opinion

The making of a champion

Former FI and CART driver, and now double paralympic gold medallist **Alex Zanardi** pins down the difference between good athletes and the great – it's their passion

The first few races of a season are vital. You know then who your real competitors are and whether or not you have the car to challenge for the championship. But the single most important thing you need is passion. I remember listening to interviews with Ayrton Senna, and he spoke a lot about the commitment and training you need to succeed. But that made me laugh because I knew that, deep down, he absolutely loved what he was doing and considered himself extremely lucky to be doing it – as I did myself.

Look at Michael Schumacher. After everything that he's achieved he's planning to go back to karting: simply because he loves it. Ambition and talent alone won't make you a champion. First of all, you must really enjoy what you're doing. To have the mindset of a champion your car should be the first thing you think of when you wake up in the morning and the last thing you think of before you go to sleep: how much you love driving it, how you can make it better.

Then, when you're lined up on the grid and know that you have everything behind you to succeed, what feeling in the world could possibly be better? When I won my CART titles, there was a certain point in the championship when the maths were on my side and it was practically impossible for me to be beaten. But I honestly didn't

'IF YOU PASSIONATELY ENJOY WHAT YOU'RE DOING, SUCCESS WILL LOGICALLY FOLLOW'

enjoy that as much as the start of the season when everything was still uncertain. If you passionately enjoy what you're doing, success will logically follow. Winning at Brands Hatch to claim my Olympic gold medal in paracycling was a special moment, but if I hadn't as felt as much joy in every kilometre of training as I did in that single moment, then I don't think I'd have achieved anything.

What attracted me most to handcycling was the phenomenal degree of competition in the sport: opposition that is every bit as tough as what I'd faced in Formula One. I consider myself so lucky, in my 40s, to have discovered another sport for which I have the same passion as I had for motor racing. There were many other offers in between those two episodes of my life, but I turned them down because I wanted to be sure I'd chosen something I would look forward to every day. That's why ambition alone is not enough.

Look at it this way: I once asked Lewis Hamilton if he'd rather be at the start of a race, having qualified in, say, fifth position and with it all to do but the means to do it, or crossing the finish line with the podium to look forward to. "Are you kidding me?" he said. "The first one, obviously." And that's exactly the way I've always felt. I'm proud of my gold medal, but the pleasure of doing the job, not the souvenir, is what counts. When I'm training, just cycling in the Italian hills, it's really beautiful: you see everything and drink in your surroundings; you feel alive. I really enjoy it, and that's how I feel about driving.

Obviously winning any championship is a long-term exercise, but you can't afford to think too much like that at the beginning of the year. You just have to do your best in each race while remembering that to finish first, first you have to finish. The hardest thing about motor sport is that it isn't, for example, like tennis, where you can fight back from a mistake. Often it means you're out. So you need to get through those opening races to learn more about your car relative to everyone else and ways to improve it. Learn more about your rivals too: where they're strongest and weakest, and maybe how to pressure them into making a mistake. It's a very technical sport, of course, but still basically a psychological game as well.

Here was another similarity I found with handcycling: it was a sport that allowed me to indulge my interest in engineering and creativity. I'm always happy if I'm fiddling, hammering, filing, designing – all of which comes down to the same basic thing: real passion for every aspect of what you are doing.

When you line up on the grid for the first race of the season with No1 on your car and everyone calling you the favourite, there is a certain degree of pressure, for sure. But you're in that situation for a reason: it's a brand new year and you're ready to play. How could you not feel happy? That's what I think makes a champion. □



The London Paralympics at Brands Hatch, and Zanardi gives his all to take two gold medals – in the handcycling time trial and the road race

PHOTOGRAPHY: LAT/GETTY IMAGES

AUTO ASKS:

'How will road car use change over the next 20 years?'

The cultural commentator

Stephen Bayley

Design critic, author and car enthusiast

The ancient Greeks believed that history, like a car's wheels, went round in circles. The idea of 'progress', from a primitive present to a better and shinier future condition, is a modern one. The glorious automobile, mankind's defining device, was always a herald of such progress. But the idea of 'the car of the future' has a tragic sense. That future may not exist.

Detroit in the 1950s thought it could predict the future: indeed, the entire business-model of the US car industry was based on the prophetic visions of designers. On awaydays at Michigan country clubs they spoke of nuclear-powered cars. There were jet-engined concepts. In 1963 Graham Hill raced a gas-turbine powered BRM at Le Mans. Its exact contemporary was the Amphicar, an atrocious German design with a Triumph Herald engine, suggesting an amphibious future. Flying cars were debated. None of them worked properly.

Current predictions need to be tested against this patchy history. Although the heat engine retains huge development margins,



today's discussion is dominated by power sources. A battery with sufficient charge for a lengthy journey is still a dream. But this deficiency might be moderated if anyone can organise a global battery-swap infrastructure.

If the future is electric, it will change more than emissions: the proportions and shape of cars, for example. Past architecture was based on the presence of a large metal power lump, a clumsy drive-train and bulky fuel tank. Compact electric motors alter all these assumptions and may tempt designers into radical aesthetics. The most extreme prediction is the intelligent wheel: the motive power, brains and (indeed) value of a car might all be contained in a hub that's attached to a different light-weight body style according to weather, mood or need.

For years, the electronic content of cars has been increasing. It will soon get to the point where they can drive themselves (see feature, p68), although whether this will be welcome is another thing: airline customers are notably resistant to aircraft that fly themselves.

The motor industry is also very conservative, despite its fondness for futuristic speculation. More than 50 years after the Mini, the best small car, the Volkswagen Up!, is a four-seater, front-drive metal box with a heat engine, a direct descendant of that 1959 original. The big influences on the future of the car are not so much technological as social and cultural.

Then there's the whole idea of travel itself. The car liberated us only, paradoxically, to enslave us in traffic. When I was a child, we would go on a 'drive' for pleasure. To a new generation this seems inexplicable: a car is an occasional utilitarian necessity, not a source of pride or pleasure. This generation commutes internally by computer, not externally on roads.

To them, a Lamborghini seems a ludicrous embarrassment, a thing of the past. In a recent US survey of consumers under 30 none included a car-maker in a list of 'cool brands'. And none would forgo the internet to own a car. Meanwhile, French car sales, for example, are on a descending path that will soon lead to a Big Fat Zero. Is the automobile dying? Not in China. But in Europe? Only the future will tell.

The engineering expert

Bernard Niclot

FIA technical director

As the world grows increasingly urbanised, I believe that small city cars will be a defining characteristic of future mobility. And, as urban travel becomes more difficult and emissions in populated areas an ever more sensitive issue, the development of electric cars and very low or zero emission vehicles (ZEVs) will progress more rapidly. In fact, I think this type of vehicle could become mandatory in cities.

To me it isn't yet clear whether these vehicles will be purely electric or hybrids but, at the very least, they'll be hybrids able to run on electric power alone for part of the journey.

Such developments and concerns will, I think, lead to all of us driving smaller vehicles. In France something in the region of 16 million journeys are made every day by single-occupant vehicles. This is clearly an incentive for manufacturers to develop smaller vehicles which, obviously, would help to ease congestion and alleviate parking difficulties in our increasingly crowded cities.

The third main parameter, I think, will be a rise in car-pooling and single-use rental cars. This already exists with schemes such as Autolib' in Paris, but we'll probably see much more of this over the next couple of decades.

In technology terms, we can expect to see a rise in what I might call 'cool driving', where the driver travels completely relaxed because the car is doing most of the work. The 'connected' nature of future cars, where car-to-car and car-to-infrastructure communication is the norm, should mean that we'll see safer road use, changes to the way our streets look

(probably less street furniture and signage clutter) and a much more efficient traffic flow.

We've already seen driverless car initiatives from companies such as Google and Toyota, but for the moment these are what you might call lab exercises. So I don't think we'll see driver-free cars very soon. But it will happen.

For longer-range driving, I think hybrids with high enough levels of electrification, particularly plug-in hybrids, will come into their own. Such cars will also have a significant ability to run in a purely electric mode, for use in cities, which will be a big advantage. Added to which, forecasts suggest that over the next 10 years battery life will be increased by a factor of three. If so, electric autonomy in the range of 300km will be possible. Couple this with increasingly efficient fossil fuelled engines, then city-to-city travel over long distances by such efficient vehicles becomes very probable.

Let's hope that bio-fuels develop at the same pace. For example, interesting research is currently being done on algae that could help the rapid generation of bio-fuels.

The holy grail, of course, is the hydrogen fuel cell, a technology I find perplexing. It may be the ultimate solution, but the generation of sufficient quantities of hydrogen at a reasonable cost is difficult. Currently, platinum is required which is prohibitively expensive, so the target is to find a substitute, added to which is the infrastructural problem of having to rethink and renew the means of distribution.



'CONNECTED CARS OF THE FUTURE WILL MEAN SAFER AND MORE EFFICIENT TRAFFIC FLOW'

BERNARD NICLOT



The car designer

Chris Bangle

Former BMW design chief, now consultant to Samsung

much more than an incremental change.

For me, this is an interesting area. Right now, we either have cars or no cars. If we don't have cars, what do we have? A closed city centre in which you have to walk, or a city that bankrupts itself putting in a metro system. Why can't we just use automated electric cars in such localities? In short, urban planners should look at the technological possibilities and set out environments in which such cars can operate. Act bravely and the worst that could happen is that it might inspire people to make those cars.

Historically, it was always the establishment that set the agenda by incentivising innovation – rewarding those who wanted to transform the rickety horseless carriage into a reliable, safe mode of transport. Without a doubt we now need similar institutional infrastructural change to develop transport of the future.

Great play is also made for electric cars. Manufacturers have proven they can overcome the physics problems through improved battery technology etc, but what has not happened, I believe, is engagement with the public imagination. Electric cars should offer freedom from the gas station, but right now they come with a host of other issues, such as range anxiety and poor access to power. So there's a way to go before they become the car industry's bread and butter.

Can we do any of this within even three decades? It shouldn't be a problem to set up automated zones, or investigate infrastructure needs. And I certainly think there could be enough working models for it. I'd love to see it happening. We have a chance to reduce all the present problem areas of the car. We just have to be brave enough to take that chance.

The first thing to appreciate about car use two decades from now is that we're only talking about 2033. Given a seven-year cycle for car use, that means some of us will still be driving cars built in 2026 and designed much earlier.

Will those 2026 cars be built on a radically different platform? I'm not so sure. There's a five-year lead-time on design to market, so you're looking at one generation removed from cars in development right now. So it's hard to see a big change in that time frame. However, I'm sure there will be enough going on for people to say 'driving isn't like it was'.

These changes will, I think, be predicated on a major shift in how people view car use and ownership. And it's happening right now.

A car is a nice-to-use object but nowadays it's a given – a forgettable device that for new generations is little more than a taxi. People won't pay a lot for it and they don't care about any status it may confer. That may not yet be true in India or China, but in the USA, Japan and Europe it's all over. Youth today has a very different view of cars from the one we grew up with. Increased technology in other areas lets us to do different things in different ways so I imagine we'll see a strong change in the landscape – from self-driving vehicles to better public transport. Indeed, fully automated driving – do-able today – would certainly be

PHOTOGRAPHY: REX FEATURES

Safety science

SIZE MATTERS >

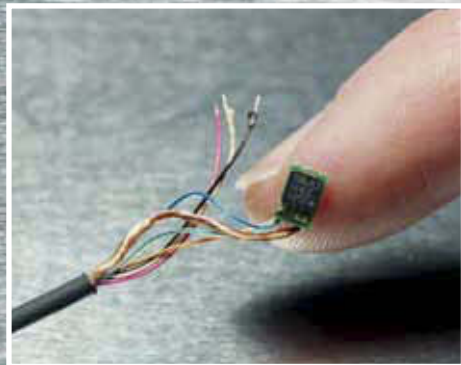
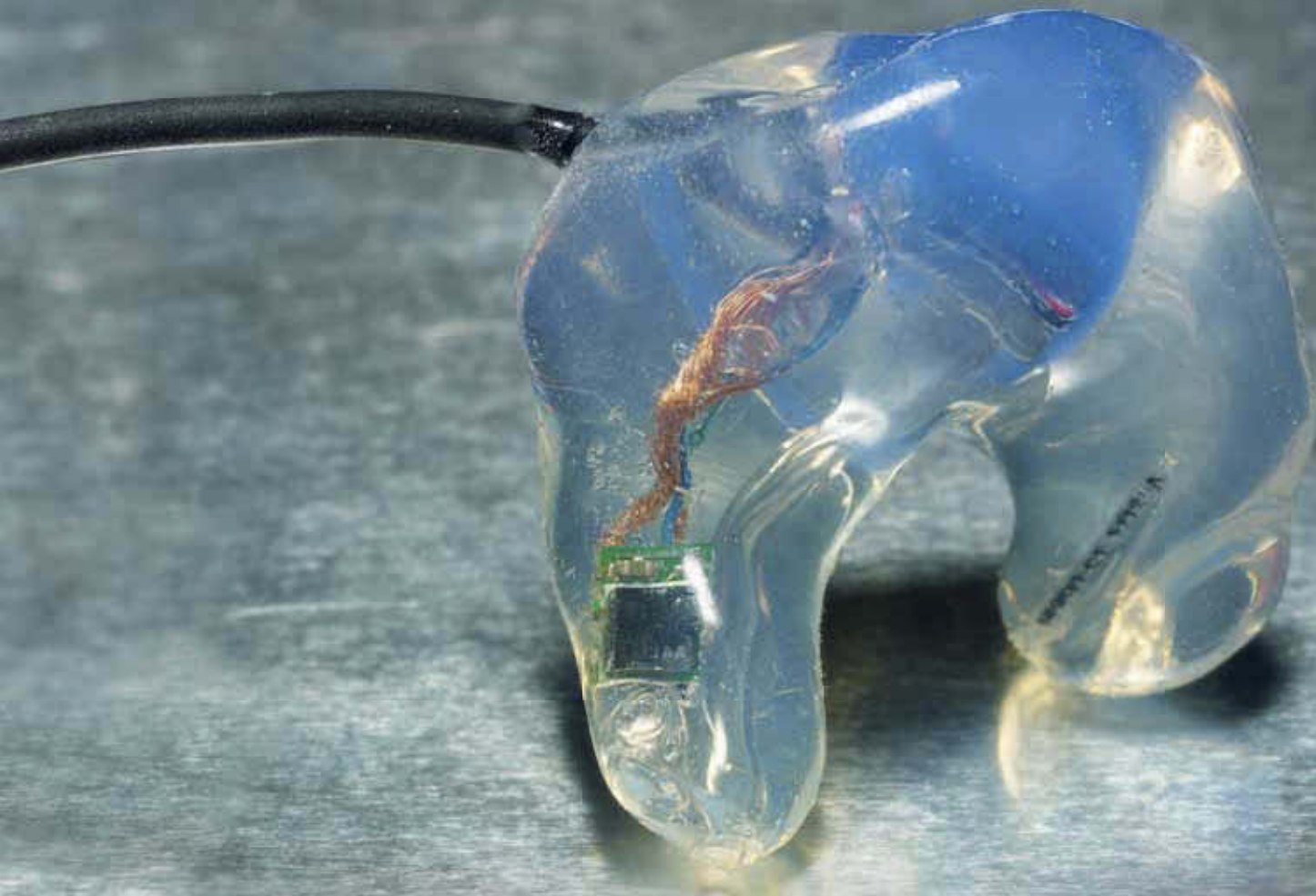
This tiny chip - the result of a collaboration between the FIA Institute and one of the world's biggest semiconductor companies - is set to revolutionise safety in Formula One



PHOTOGRAPHY: WILL THOM



This sensor - an accelerometer that's only a few millimetres across - will deliver vital instant impact information to help researchers understand driver injuries during a crash



The chip is housed in a silicon gell moulding tailored to the ear-canal shape of individual drivers. Such a snug fit will ensure highly accurate readouts of head acceleration and deceleration during an accident

A

tiny chip is about to make a huge impact on motor sport safety. Just 3mm wide, it may be smaller than a matchstick head but within that space sits some serious engineering that could ultimately save lives.

It's an accelerometer of the type you might find in any smartphone or other mobile device that senses movement or acceleration. But this one has been specifically designed for use in sport. Working in conjunction with STMicroelectronics – a \$9 billion turnover company that makes components for many consumer devices – the FIA Institute has adapted the sensor for use by racing drivers.

The sensor will be implanted in the driver's earpiece and inserted directly into his ear canal. It measures acceleration across three axes and continuously captures data about the forces acting on a driver's head, which is especially important in an accident. The data is delivered in real time and provides vital information for trackside doctors as well as safety researchers looking to make improvements.

FIA Institute research consultant Andy Mellor, who is leading this project, believes it could lead to a major breakthrough in safety research. "There is so much we can learn from a crash if we have the right information," he says. "For the last few years we've relied on Accident Data Recorders and these have given us hugely important information after a crash. However, they only tell you about the forces acting on the car. So the possibility of tracking the motion of the drivers themselves is a major breakthrough. The information from the accelerometer could give a precise kinematic of the head and the timing of the head movement during an accident."

Currently the only way for safety researchers to study the forces on a driver's head is to conduct a full-scale sled reconstruction in a test lab. The results are effective but take a long time and are extremely expensive. This tiny sensor will hugely speed up that process.

Mellor says: "In high-g impact accidents, such as the one suffered by Sergio Perez at the 2011 Monaco GP, you could have the information immediately. Doctors could use it to potentially assess what course of intervention they might need to take. Safety researchers could know straight away whether more work should be done on things like head rests or seat positions. It will all add to our knowledge base."

This new information could have a major influence at the top level of motor sport, from car design to equipment manufacture.

Mellor adds: "Just having that knowledge will take us into a world we haven't really been in before. Ultimately it will be helping us to design better cars; to make better safety equipment such as harnesses and helmets; to improve the positioning of the driver within the car with better seats, surrounds and side support."

The idea for the project was presented by Mellor almost 10 years ago. But only now has technology caught up with the theory.

Mellor first became involved in the project in 2004 when the Indy Racing League was using a larger accelerometer fitted on the outside of the driver's ear-piece. The FIA Institute did a detailed study back then and found that although the results could be useful, there was a significant decoupling between the head movement and data from the device. Mellor's endeavour was to find a device so small that it could go deeper into the ear canal to ensure more accurate results. After a couple of false starts, he was introduced to STMicroelectronics by a colleague two years ago and that's when the project gained pace.

'THIS KNOWLEDGE WILL TAKE US INTO A WORLD WE HAVEN'T BEEN IN'

ANDY MELLOR



The chip is so small that it will become an integral part of a driver's earpiece. So much so that Sebastian Vettel (left), won't even notice that he is carrying a potentially life-saving extra piece of equipment

Mellor says: "ST was right on the ball with the tech we needed, even though they didn't make the part we wanted at the time. From the moment we sat down with them it was obvious they had exactly the technology platform we needed." The resulting sensor is based on a platform part that ST mass-produces for smartphones. It is, in fact, this market that has driven the technology forward. Apart from its size, the major difference with this new sensor is how it measures loads.

Marco Ferraresi, business development manager for ST Motion MEMS in automotive and custom industrial applications, explains: "The FIA Institute's specification for the accelerometer was that it had to be very small to fit into the ear canal and we were able to produce that kind of miniaturisation. We started with an off-the-shelf sensor for preliminary try-outs. After a couple of years we managed to develop a sensor with the right specification, not only in terms of size but also in being a high-g accelerometer that will detect the impact a driver is subjected to during the race."

This was no easy task. Normally these sensors are used for low-g applications, such as measuring whether a mobile device is the right way up for apps and games. But for this usage the input is limited to less than 10g. For head impacts in Formula One the measurements peak at 400g across all three axes – inputs that are instead closer to the g-ranges that are measured during car crashes and trigger the deployment of the airbags

The new chip is specifically designed to deal with such forces. Mellor explains: "It's a micro-electro mechanical system, so if you look at it under an electron microscope you don't see wires; you see what look like little structures. If you imagine it to be like a children's playground, you've got three little spring-riders that respond to movement. If a child sits on the normal design, a slight push will start the child rocking. However, if we replaced the spring with a stiffer one, a much bigger push would be required. The three spring-riders are mounted at different orientations to respond to motion in three directions: forwards-backwards, left-right and up-down."

Mellor is now confident that the new sensor is ready for the next stage of testing, which is to begin trialling it with F1 drivers. The F1 ear-piece is already a platform for driver communication with the teams, and the chip would be embedded alongside the speaker tube so there will be no discernible difference to the elite driver. But the information it provides could be of profound importance.

Mellor says: "We want to engage with the teams through the F1 Technical Working Group and validate it for F1 this year. We'll also do a final validation of the system from a mechanical point of view. By summer we'll know how to integrate it and the value of the data.

"We've got a brilliant partner in ST and it's something we're really confident about. We hope to be running this in F1 next season." □

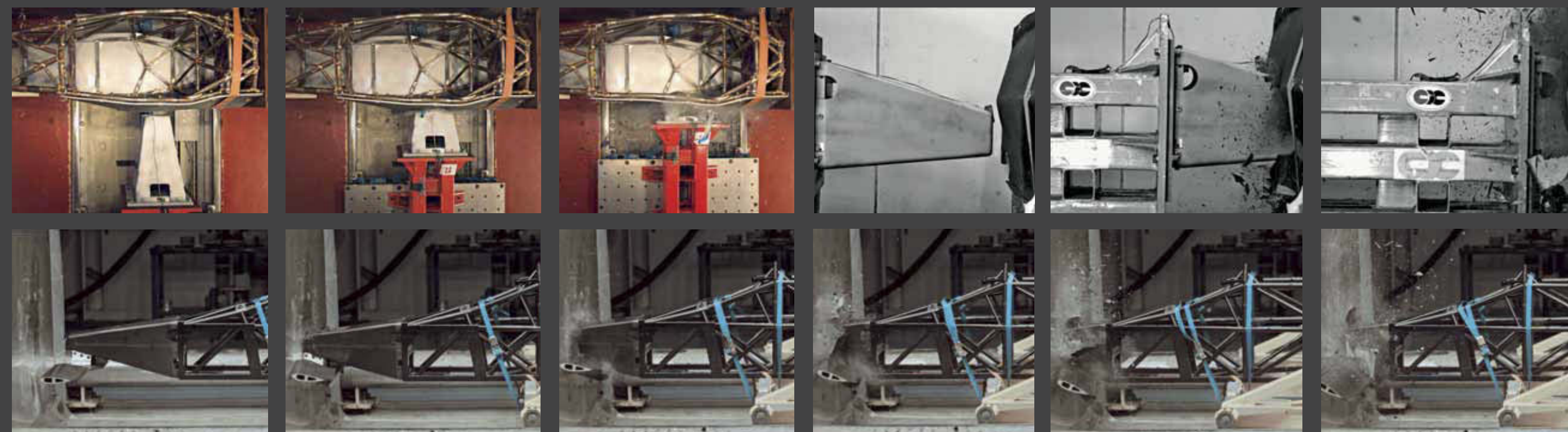
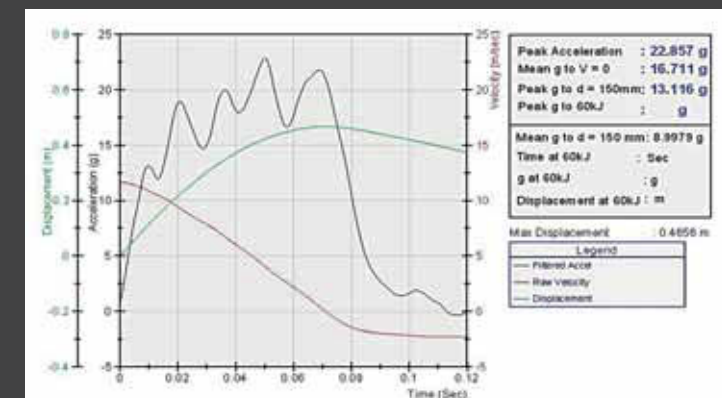
Safety racer

FORMULA FOR SAFETY

Ford has drawn on the FIA Institute's technical and safety expertise for its latest single-seater race car design. The result is a chassis that matches the safety levels of an F1 racer – for a fraction of the cost



Telemetry report from the nose impact test (right); average maximum deceleration during front-on tests did not exceed 25g



'ALL FUTURE FORMULA FORDS HAVE INCREDIBLE LEVELS OF SAFETY FOR A JUNIOR CATEGORY'

MICHAEL NORTON

implementation have ensured that all future Formula Fords have an incredible level of safety for a junior category series – equal to that of more expensive current carbon monocoque cars."

The car was subjected to a whole range of static and dynamic tests, many of which required unique solutions. For frontal protection, for example, a bespoke carbon crash structure was developed.

Mellor explains: "Although carbon crash boxes have been used for many years in leading championships such as F1 and F3, this car takes a slightly different approach whereby the energy absorbing carbon structure part is fitted inside the nosecone bodywork. Impact testing involved mounting a crash box to a rolling sled, then subjecting it to a controlled impact with both a rigid wall and side of the full chassis."

This worked so well that the resistance of the test structure was such that during the impact the trolley's average deceleration did not exceed 25g, and all structural damage was contained within the nosecone.

For side protection, as this is a tubular steel chassis, the development of the materials for the side intrusion panel itself and the way it was attached to the chassis were very important. To give additional protection to the driver in the event of a side impact, the car was fitted with FIA specification side (anti) intrusion panels. These panels extend fore-aft from the front roll structure up to the rearmost edge of the fuel cell. And vertically, from the floor chassis rail to the top of the cockpit opening.

Mellor says: "During the development phase of this project we tested many prototype panel configurations, especially to ensure compatibility with the nosecone during a T-bone impact. The panel strength is a crucial element of the car's ability to absorb a heavy side impact. It simulates the side of a carbon monocoque chassis and spreads the load throughout the steel frame ensuring the crash box does not penetrate."

The chassis also passed tests for rear protection and roll-over protection with flying colours. Mellor adds: "This Formula Ford shares many of the safety features and innovations found in the current Formula One car and provides a very high level of protection at a much more affordable cost."

The project has proved such a success that the FIA has adopted those safety regulations for use by National Sporting Associations running spaceframe chassis single-seaters around the world.

Norton says: "The knowledge we all gained from the project paved the way for the complete overhaul of the FIA Appendix J Article 277, which is now available to the entire motor sport world."



George Blundell tests the FFord 200; in side impact tests (top) the side intrusion panels overlaying the spaceframe passed with flying colours; the carbon nosecone absorbed the energy in frontal impact tests (centre)

This year will see the relaunch of the Formula Ford Championship with a new car that isn't just the fastest junior single-seater in the UK but which also meets the highest levels of safety.

Much of this is down to the work that Ford has been doing with the FIA Institute over the past few years to ensure that its EcoBoost chassis sets the standard for safety in the junior formulae.

The project started in 2008, when Ford asked the FIA Institute to help it develop a spaceframe chassis that would be as safe as more expensive carbon-fibre tubs.

Michael Norton, Ford Motor Sport manager, says: "Safety is paramount for Ford and we wanted an official and regulatory way of ensuring all Formula Ford cars were built to a specific standard. We wanted to fully evaluate all aspects of the safety elements of Formula Ford and update the safety, where necessary, to ensure it complied with the latest standards we knew existed for this type of car."

Every area of the car was evaluated from chassis strength and side intrusion protection to crash structures and wheel-retention devices.

This is where the FIA Institute's expertise proved to be a major help, says Norton. "It was really down to the technical expertise and experience of the FIA Institute's Andy Mellor who was invaluable to the project", he says. "Andy's knowledge of all elements of FIA crash-testing for single-seat cars cannot be overestimated. His leadership with the technical aspects of the design, construction and

Safety elements engineered into the Formula Ford EcoBoost 200

- 1 - FIA approved frontal impact structure
- 2 - FIA approved rear impact structure
- 3 - FIA chassis and roll-bar quasi-static load tests
- 4 - FIA specification side intrusion impact panels
- 5 - FIA head surround support system (the part you see F1 drivers remove before they exit the car)
- 6 - FHR (HANS) system compatible
- 7 - FIA specification collapsible steering column
- 8 - FIA specification wheel retention tethers
- 9 - FIA specification cockpit opening size
- 10 - FIA approved removable seat

S

port has a happy history of breaking down barriers and forcing change. However, motor sport has often taken time to make those breakthroughs and frequently finds itself playing catch-up as it modernises. One area in which motor sport can look to its record with something akin to pride, though, is its efforts in the field of physical disability.

It's a sad fact that motor sport's need to feel inclusive about the disabled has often been self-inflicted: the sight of young men using wheelchairs is more prevalent in motor racing paddocks than almost anywhere. Thankfully, rising safety standards now make this a less common phenomenon. On the other hand, the attraction of motor racing to disabled drivers has never been stronger. Why? Because, given the right modifications, motor sport is one of the few areas where disabled and able-bodied participants get to compete on something like a level playing field.

While the recent Paralympics in London was hailed a great success that locked the public gaze onto disabled participation in sport, it did so in a way that firmly placed disabled accomplishments in a separate category to those of able-bodied athletes. Motor sport, conversely, has the ability to integrate rather than segregate – and now is the time for it to be more inclusive than ever. This, too, has links with the Olympic movement.

"This is a timely debate," muses Graham Stoker, FIA deputy president for sport. "Although I think we've got a pretty good record, the FIA has now joined the International Olympic Committee (IOC) and under the Olympic charter one is required to recognise that access to sport is a human right. We have to make sure we are inclusive and do not discriminate, as this is one of the obligations placed on members of the Olympic movement. I think it's timely to look at these matters."

This isn't simply a question of customising car controls for a driver's individual needs. For race licences to be meaningful documents they need to enforce certain criteria, chief of which is the requirement for participants to be able to compete in a manner consistent with their own safety and that of others. In practical terms it means that disabled drivers must be able to exit a vehicle and retire to a safe distance within the same limits laid down for the able-bodied: there is no room for compromise.

If this sounds like a barrier to entry it shouldn't: there is perhaps a perception among the able-bodied that suggests disability means inability. Disabled drivers argue otherwise — and in the general scheme of things licensing authorities tend to agree.

"I think the licensing programme has to be continually refreshed in terms of current best practice," says Stoker. "Clearly, in order >

'WE HAVE TO MAKE SURE WE ARE INCLUSIVE AND DO NOT DISCRIMINATE'

GRAHAM STOKER



8,500km 2013 Dakar Rally started in Peru on 5 January and finished in Chile 15 days later; the Race2Recovery team suffered mechanical problems but came up beaming, and ready for next year's event

From race to rehabilitation

READY, WILLING AND ENABLED

A blistering desert challenge? No sweat. Motor racing is one of the few sports in which the disabled compete equally with the able-bodied. It's up to motor sport to make sure access becomes more inclusive

PHOTOGRAPHY: JAGUAR LAND ROVER



Race2Recovery Land Rovers kept the crew, including team leader Tony Harris (below), hard at work; a touch of fine-tuning on the one limb that navigator Tom Neathway can still call his own (opposite top); South American terrain varied enormously over 5200 miles



echelons of motor racing. Former Winter Olympian Albert Llovera turned to motor sport after a skiing accident left him paraplegic, and he has raced successfully in the PWRC and SWRC categories of the World Rally Championship.

Meanwhile, double CART champion – and ex-Formula One driver – Alex Zanardi, launched a second racing career with prosthetic legs following a horrific crash at the Lausitzring that saw him suffer a double amputation. The redoubtable Alex has since become a multiple race winner in the World Touring Car Championship, driving a modified BMW. And he has been equally successful in the sport of handcycling, picking up two gold medals at the 2012 London Paralympics (see p19).

But perhaps the greatest inspiration is not to be drawn simply from the elite in disabled motor sport. While the past 12 months have produced many amazing stories from the world of racing and rallying, the most remarkable is probably that of the Race2Recovery team which competed in — and completed — the Dakar Rally. While entering purely for a love of competition is an entirely noble



to get a licence one has to go through certain tests and medical requirements, which are there for absolutely the right reasons, to ensure the sport is safe.

“But I think it’s also right that it has to be inclusive and has to accommodate disabled drivers from all around the world,” he adds. “It does that today: there are disabled and able-bodied drivers racing together, and the disabled drivers are in a position where they can secure licences. But it’s an area that requires continual monitoring.”

Stoker says that the FIA’s recent affiliation with the Olympic movement is a step in the right direction.

“Going forward, with our new IOC membership, I’d love to see a comprehensive audit across all our championships to make sure that we’re doing our best to include people and encourage access for everyone. To my mind, motor sport has a lot to offer in that sense.”

And its disabled standard-bearers are operating in the very highest

‘I’D LOVE TO ENCOURAGE ACCESS FOR EVERYONE. MOTOR SPORT HAS A LOT TO OFFER IN THAT SENSE’

GRAHAM STOKER

motive, Race2Recovery came to the Dakar for other reasons as well. With a team consisting primarily of service personnel injured in war zones, Race2Recovery set out to prove a point about disability not being the barrier to entry it is often assumed to be. Various team members admit that they took part as a means to redefining themselves as they went through the process of adapting to life as a) a civilian and b) a disabled civilian. The team’s founders, however, while acknowledging the value of Race2Recovery as a method of rebuilding self-esteem, say that their goal was to make a point to the outside world.

“I really hope it’s going to inspire others with disabilities or difficult situations to think very carefully about what’s stopping them. Is it someone saying ‘no, this is too hard, you can’t do it?’” says driver and spokesman Captain Tony Harris. “It wasn’t just about doing something we wanted to do, it was about getting more people involved: guys and girls who’ve been injured as well.

“Obviously I understand that some people are so severely disabled that they won’t be able to do stuff, but there are a lot out there trying to make things happen. Of course, there are limitations but you shouldn’t just take ‘no’ for an answer purely on the basis of disability. We’re going rallying but it doesn’t have to be motor sport. It can be anything: the mindset is what we’re trying to impart.”

Coming into motor sport as novices, Race2Recovery embarked on two years of preparation for their big test, competing in the British Cross Country Championships, rallying in Saharan Africa and various other competitions. Inexperience, they argue, was a bigger initial handicap than physical disability — and the problems that did exist were issues the motor sports community could solve.

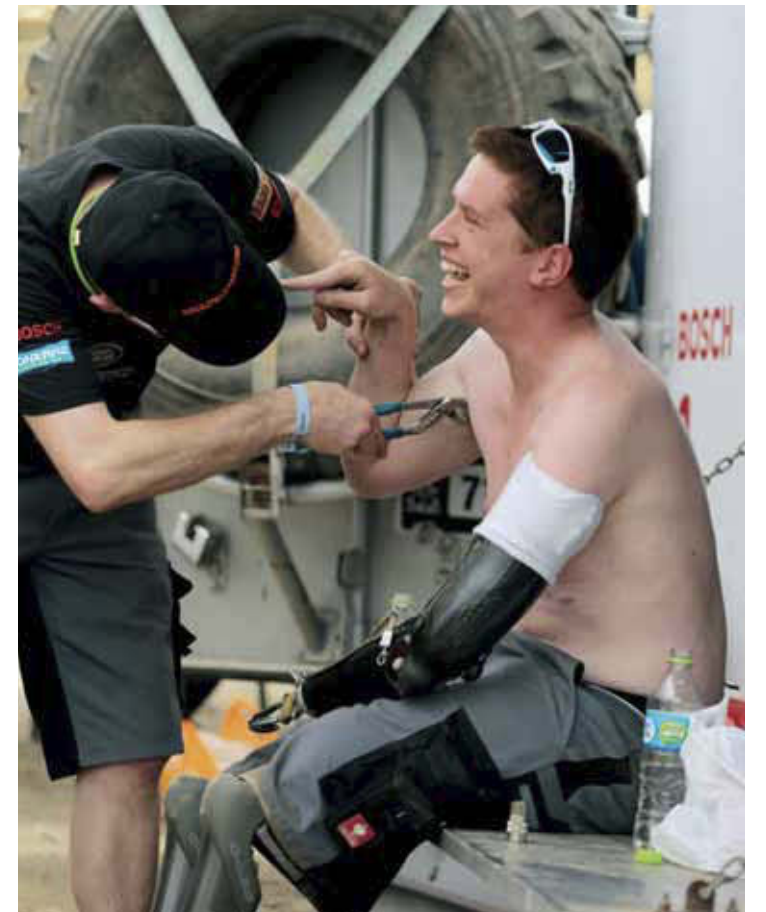
“The majority of people we’ve encountered have been amazing,” says Harris. “They’ve been prepared to work around problems and build cars around us rather than the other way around: things like an infrared clutch or a remote terratrip for our navigator Tom Neathway [a triple amputee] who has only one arm. Rather than encountering people saying ‘no, you can’t do that’ we’ve found technologies that are incredible. And more often than not there’s a way to make something happen.”

Captain – soon to be Mr – Harris, is a British Army soldier who was injured in Afghanistan by a roadside bomb. Having been propelled a distance he describes as ‘impressive’, he shattered both feet and suffered a severely fractured arm. Ten months later, he had his left leg amputated below the knee, and describes the decision to have it removed as one driven by a desire to enhance his mobility, remove a burden from his family, “and start cracking-on with my life”.

He says this sitting in the garden of a typical English house with a mug of tea – but he very definitely never uses the word ‘ordinary’ to describe his future or that of his team-mates. In fact, he spells out very clearly his philosophy of what Race2Recovery hoped to achieve.

“I think it’s vital that the last great thing you do in your life, the last amazing story you have, should not be that day you got blown up, or shot, or had an accident.

“That’s where this got born. There are so many aspects of motor sport that the guys can do. You have classic examples like Alex Zanardi, Lord [Paul] Drayson [blind in one eye], real inspirational >



PHOTOGRAPHY: JAGUAR LAND ROVER



'WHEN YOU GET
IN THAT CAR
THE DISABILITY
DOESN'T MATTER'

TONY HARRIS



The cycle of pit and rest (and navigation) stops for both the team and the cars made the adventure a memorable one, even for injured ex-Army types well used to making the best of tough conditions in exotic parts of the world

characters who've raced at high level with disabilities – or let's say what could be classed as disabilities – and have shown absolutely that they can still achieve success.

"For me, it's something that's exciting and challenging and allows me to be competitive. Bizarrely motor sport is one of the few sports where the disabled and able-bodied are on a completely level playing field. As soon as you get in that car, it doesn't matter. No one cares."

Having achieved their goals in South America and raised the profile of their project enormously, Race2Recovery are in the process of finding more sponsorship for new ventures. Given the endorsements they've received from an eclectic group of supporters – taking in both the Duke of Cambridge and the BBC TV show *Top*

PHOTOGRAPHY: JAGUAR LAND ROVER

Gear – it's reasonable to assume they'll be successful in finding sponsorship and technology partners to take them to even greater feats in the future.

But what about the grassroots drivers who simply want to compete at club level? Converting cars or even karts is expensive. Researching better, perhaps cheaper, ways of doing it is something in which the governing body and its ASNs are now taking a greater interest.

"From a research point of view, it may be that there are particular matters we can take a look at, in terms of the physical modification of the vehicle," says Graham Stoker. "I think it's something we need to look at sensibly and sensitively. There are options for research and assistance through the modification of vehicles, and perhaps that is

something for the FIA Institute and the motor sports industry to have a look at. I don't believe it needs to be a fundamental hurdle."

Having the technology is, of course, only part of the solution. The rest will come from the inspiring profile of people like Zanardi, Llovera and the Race2Recovery team. The feats of Harris and co are perhaps the most significant, though, and something to be valued by the motor sport community at large. Faced with a desire to change perceptions of disability, the team looked for a project that would allow them to do so in a public arena that would simultaneously challenge their commitment and abilities while providing them with the tools to succeed. To meet those criteria they decided that motor sport was the ideal stage on which to perform. □



Road safety

LIFE AND DEATH ON THE WORLD'S MOST DANGEROUS ROAD

Seven years ago, the World Bank paid for a road in Bangladesh to be upgraded, but without demanding basic safety features. Now people are dying on it by the score. International development expert Annie Kelly reports on the daily struggles along a killer highway

PHOTOGRAPHY: RICHARD WIX / ANNIE KELLY / SIMON YUSUF - GUARDIAN / OBSERVER

'BASICALLY, THIS ROAD IS LIKE DRIVING A 10-TONNE TRUCK ALONG A PEDESTRIAN MALL'

GREG SMITH

We saw the bus before we saw the rickshaw. Abandoned on the side of the road, its engine was still running. A dent on the paint-scratched bumper was the only evidence of the head-on collision that had happened just 15 minutes earlier.

We had left the gridlocked city streets of the Bangladesh capital, Dhaka, that morning, inching through the blaring horns to the start of the highway. Ten minutes down the road, as the city's urban sprawl was giving way to green and the speedometer on our white minivan was inching upwards, we had come upon the crash.

Rickshaw drivers were gathered around the mangled remains of a motorised three-wheeler, gesturing angrily at the blood in the wreckage, a shoe lying discarded in the middle of the road.

"Another one dead?" a driver shouted at a highway police officer, filling out a road



ON THE ROAD

Annie Kelly is a writer on international development issues in Asia, Africa and the Middle East. She also reports on human rights, social affairs and the environment for various publications including the UK's *Guardian* and *Observer*.

accident report. "How many more?"

The police officer shrugged when I asked him what happened to the driver of the bus – who had killed the rickshaw driver and put another three in hospital. "He has run away," he said.

"But there must be records of who was driving the bus; the company must be able to trace him," I suggested. "He ran away," the policeman repeated, waving us away and walking back to his motorbike. "He's gone. It's just another accident."

At first glance, the Dhaka-Sylhet highway, the N2, doesn't look like a death-trap, or one of the world's deadliest roads. It doesn't teeter along the side of a mountain or plunge through a ravine with nothing but tumbling rocks and open space below. Instead, the N2 is a fat belt of grey tarmac connecting Dhaka to the booming city of Sylhet 123 miles away. Seven years ago more than



£169 million was spent turning it into one of Bangladesh's newest and fastest transport routes. Most of the money came from the World Bank.

It cuts through towns and busy intersections, slashes through Bangladesh's green fields and boggy marshland, past garment factories and countless small thatched-roof villages. It looks like a perfectly normal strip of single- and dual-carriageway, yet once we leave the crash site I'm in a state of terror, gripping the sides of my seat and pumping up and down on an imaginary brake as vehicles swerve and screech in front of us.

Passenger buses loaded with luggage overtake each other at high speed on blind corners, missing oncoming traffic by inches. The rusting skeletons of smashed-up vehicles litter the side of the road. Open-backed trucks filled with people – tonnes of thundering metal – career down the road at 90km/h, shaking our windows as they scream past. Amid this, streams of garment workers in bright saris, children walking home from school and men on wobbling bicycles share the road with these machines. More than 60 per cent of those who die on this road are pedestrians – mostly the poor who cannot afford to travel by car or bus.

The World Health Organisation believes that more than 20,000 people are killed on Bangladesh's roads every year. Government figures put the N2 death rate at 180 a year –



85 per cent of patients in the Narsingdi Hospital (left) are road accident victims; workers inspect two lorries (above) after another head-on crash on the N2 highway; 1.3 million people are killed on the world's highways every year, the majority of them on inadequate roads like the N2, in emerging and developing countries

around 10 times the total for the UK's worst road – yet road safety experts claim the real death toll is probably at least four times greater. If they're right that means at least two people die each day, and tens of thousands more are injured.

On the road with me is Greg Smith, an affable Australian who works as the regional director for the International Road Assessment Programme (iRAP), an organisation that critiques and star-rates roads around the world mile by mile. Bangladesh's road accident record is bad, but by no means uniquely so. Around 1.3 million people now die on the road every year and 50 million are injured, the vast majority in poor countries such as Bangladesh.

"Basically this road is like driving a 10-tonne truck along a pedestrian mall," says Smith. "And nobody is doing enough to stop it."

He points to road verges without crash barriers. Nor is there much of a central reservation on the dual-lane parts, and none on the single carriageways, to stop dangerous overtaking and the majority of head-on collisions. There are no footpaths, no footbridges, no traffic lights, no speed controls.

"They built this road with absolutely no basic safety features," he says. "As an engineer I look at this road and all I see is a systematic failure. And this is a World Bank road. You would never ever build a road like this in a developed country. Why is it OK for it to be built with millions of pounds of

international money here in Bangladesh? Because these people are poor and it doesn't matter?"

He gestures to the edge of the highway, where the tarmac ends just a few metres from a steep bank going down into a floodplain. On the N2 many drivers don't die from a crash impact. They drown in their cars. And as we travel the road I can't stop thinking about the crumpled rickshaw we saw and the driver who has died. Did he have children? What would their lives be like now?

According to one road survey the ripple effects of road accidents in a poor country like Bangladesh are devastating – more than seven out of 10 bereaved families reported that their income and food consumption had suffered after the crash. More than half had been forced to take out loans.

Mohamed Al-Amin's story is as typical as it is appalling. This slight, meticulously neat 25-year-old lives in one of the villages along the N2. When he was a boy, he says, the highway was cracked and pot-holed. Trucks and buses rumbled past at 30 or 40mph. It was a bad road, but nobody really died. It just took hours to get anywhere.

Six months ago, eight of Al-Amin's family were in a rickshaw heading to market along the N2 when a bus overtook another vehicle on a bend, swerved across the road and smashed into them. The rickshaw crumpled like a tin can. Three were killed instantly. Al-Amin's sister, Amama, and sister-in-law Roni suffered horrendous injuries and

'THE BUS COMPANY LEFT £190 FOR US AT THE LOCAL POLICE STATION [AFTER THREE OF MY FAMILY WERE KILLED]'

MOHAMED AL-AMIN



Two people were badly injured when a bus collided with this three-wheel rickshaw on the N2. Some estimates put the death rate at two a day on this arterial highway. A big problem is that the high-speed N2 doesn't separate major vehicles from farm carts, bikes and tuk-tuks

were taken to a private hospital in Dhaka, where they amputated Roni's leg at the hip. Amama never woke up. The hospital said they could do nothing else for her and told the family to take her home or keep paying for her treatment. Now this once vibrant woman is a skeletal shadow of her former self, fed through a drip in the family home while her children wait for her to die. After years of hard work to pull themselves out of the poverty that blighted their previous generations, this family have had to sell their house and land to pay the hospital bills.

"I worked for years, every day, to establish my business," says Al-Amin, sitting next to his sister in their small house. Outside, children play in the fields while men with oxen slowly plough strips of grain as the boom and screech of high-speed traffic echoes around them. "The bus company left 25,000 taka (£190) for us at the local police station, but this isn't enough. They built this road



and told us it would make us richer, but what's the point of getting somewhere quicker if you risk death just trying to get there? They didn't even bother to build us a footbridge."

Such stories are frequently swapped by the side of the N2. There's the garment factory that has lost 23 workers to the road in three years. And the grief-stricken single mother of two young boys whose husband was killed by a truck on his way to work and who is now working overtime at a factory to try to keep her sons in school.

In a crowded ward at Narsingdi District Hospital we meet Mohammed Abdul Hannan, a 38-year-old ex-soldier who has been unable to walk or work for the past seven years following a bus crash. He stares at the pins in his twisted leg while he tells us how he begs his wife to leave him so she can improve her life.

The doctor treating Hannan says that 85 per cent of patients in the hospital are road-crash victims. "Ten years ago we were dealing mainly with diarrhoea or children with respiratory infections," says Dr Abudul Zaed. "Now it's multiple traumas from high-speed collisions. We're not equipped to deal with the kind of injuries we see, and the numbers keep going up."

I return from our day on the road shaken and furious. Afterwards I encounter nothing more than woeful shakes of the head from the Bangladeshis I talk to about it. Greg Smith has had the same experience. "I spend my life assessing dangerous roads, but the N2 really scares me," he says. "The



Size is no guarantee of safety protection on the 123-mile Dhaka-Sylhet highway. This bus was severely damaged in a collision with a truck on the N2. The road offers few central reservations and other safety features to discourage dangerous overtaking. But it's pedestrians and cyclists who are still the most at risk



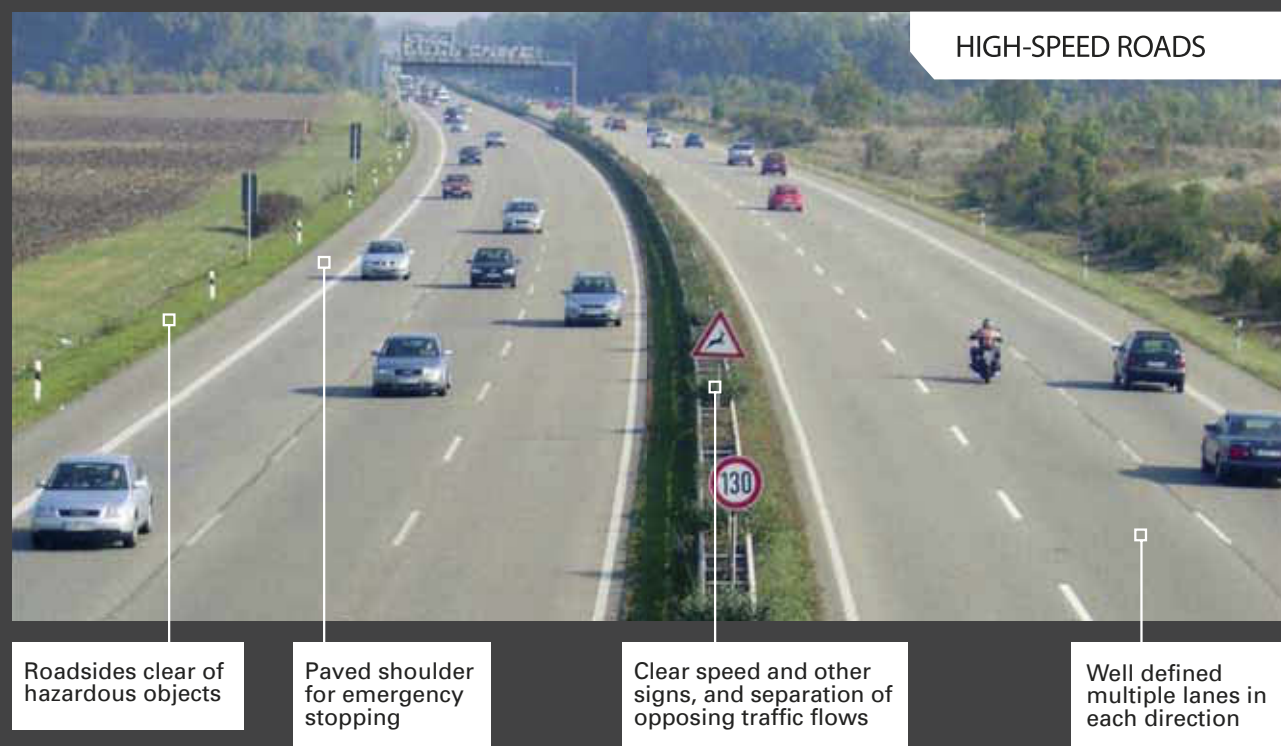
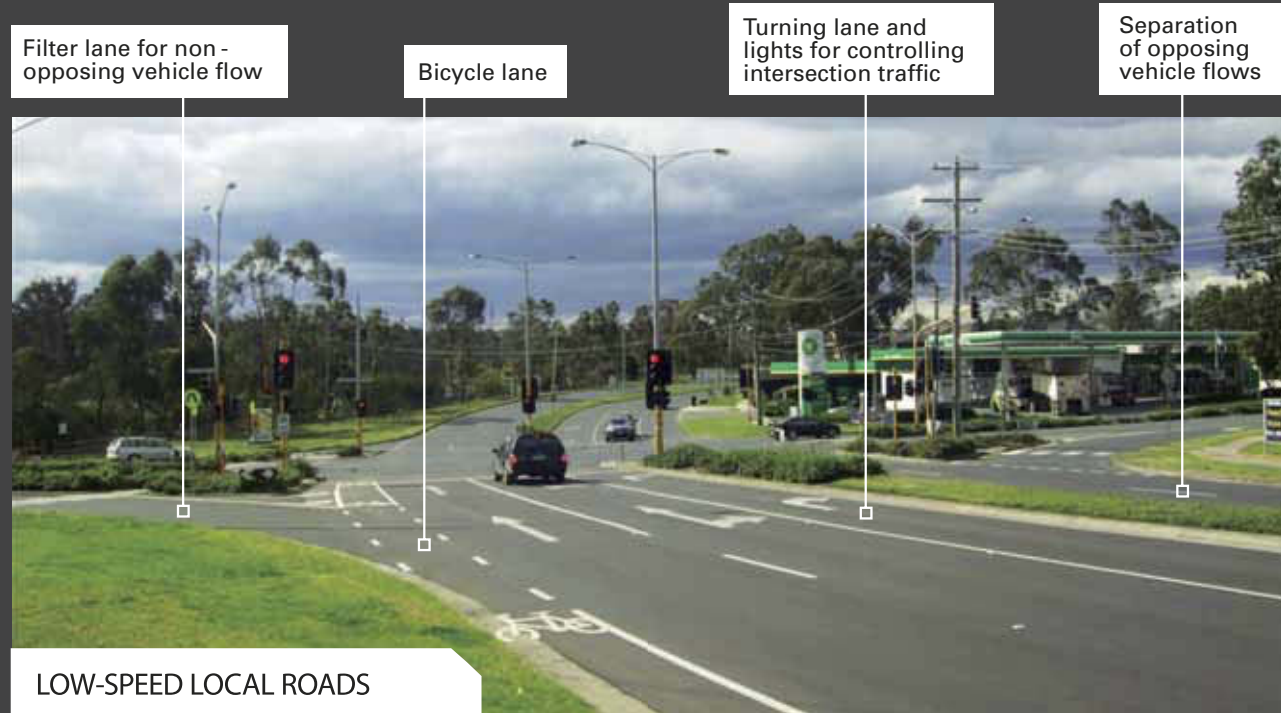
Greg Smith, from the International Road Assessment Programme, is appalled by the N2 highway – and the prevailing attitude of the locals: "It's just seen as part of the cut and thrust of economic development"

night after my first trip on it I sent pictures of the crashes I had seen to my Bangladeshi colleagues, telling them I'd had the most horrendous day – and everyone just shrugged. It's just seen as part of the cut and thrust of economic development."

At the World Bank no one wants to be linked to the N2. When I ask how they can account for an almost 50 per cent rise in accidents since the 2005 renovation I'm told the N2 is an "old project", that they have suspended all road building in Bangladesh because of corruption, and that a rise in accidents post-renovation is "to be expected" when there is more traffic on the roads. They say road safety is one of the Bank's highest priorities. And, ultimately, all the Bank did was give the loan. It was up to the government to do the rest. It's "their" road.

"We want to see economic growth and greater access to markets associated with renovating a road," says Ellen Goldstein, country director for the World Bank in Bangladesh. "We clearly don't want to see hospital beds filling up. But there is definitely a financial trade-off to be made by every developing country, not just over road safety but other development issues. The ability to get to Sylhet in five or six hours is unbelievable compared to what it once was. So when you look at the huge economic benefit this brings then, of course, you will have a cost, which is the potential for fatalities and injury."

It's true that you can't just blame the roads themselves. Dangerous driving is the main cause



How it should be done

In the developed world we take our carefully engineered roads for granted. But all those signs, street markings, lane separations and traffic signals are the result of many years of research and development. They are the first level of safety for anyone on the road.

For instance, most crashes happen

at intersections, and the best way to stop such conflicting movements when over/underpasses and grade separation are too impractical or expensive, is to use traffic signal lights or stop signs.

On high-speed multi-lane roads, safety barriers are used to prevent 'out of control' vehicles from leaving the

Signage and road markings make an inexpensive start

road and hitting hazards or rolling down slopes. And central reservations are used to stop vehicles from crossing into the path of on-coming traffic.

It may seem straightforward and obvious but even these most basic safety elements are missing from most roads in developing countries.

'IF YOU BUILD A FAST HIGHWAY MORE SUITED TO AMERICA THAN A DEVELOPING COUNTRY - AND DON'T INCLUDE ANY SAFETY FEATURES - THEN LOADS OF PEOPLE WILL DIE'

GREG SMITH

of the majority of accidents. After all, only 30 per cent of people here have licences, road-accident prosecutions are almost non-existent, and the buses are shipped-in wrecks from China and Japan given a lick of paint and put out to work. And amid this mess 200 new cars are hitting the roads every day.

Despite the rhetoric, road safety is still considered too expensive by the government. When the N2 renovation was complete, the Ministry of Communication in Bangladesh said publicly that "western-style road safety engineering features are too expensive for most developing countries to install on a large scale".

Greg Smith, however, does not agree that road deaths are the inevitable cost of effective transport infrastructure. "I just think that is a weak answer. We're not trying to find the vaccine for some killer disease. We are building these roads, we are causing these deaths," he says. "The idea that putting in road safety features is too expensive is sickening when you consider that, unlike curing malaria, we actually know how to prevent people from dying."

And although the Bank wants to distance itself from the N2, the fact is that road safety wasn't factored into the economic calculations of its loan package to upgrade the road. It was simply named as an "additional road-user benefit" alongside "improved riding comfort".

"If you build a fast highway more suited to the American Midwest than a developing country, but don't bother to include any safety features, then loads of people are going to die," says Smith. "You can't expect anything less. The tragedy in all of this is that not just the N2 but dangerous roads across the world can be fixed easily. It's pocket change to the multilateral development banks and other big donors, but it could help stop this pointless carnage." □

Road to recovery

One international body is addressing the crucial link between poor roads and high death tolls, with help from the FIA Foundation

Deaths and injuries on the road are a major and growing public health epidemic, and more than 85 per cent of them occur in developing countries. While road deaths are expected to fall in high-income countries, they are likely to increase by more than 80 per cent in the rest of the world.

Much of this trend can be addressed by the better roads and infrastructure that are taken for granted in the rest of the world. And the International Road Assessment Programme (iRAP) is targeting such improvements.

Rob McInerney, iRAP chief executive, says: "There has never been a more opportune moment to tackle this rapidly worsening public health crisis by fundamentally changing the safety of road systems. And the UN Decade of Action for Road Safety 2011-2020 is bringing unprecedented international leadership and political will to the cause. We must make this happen."

Working in partnership with governments and NGOs, iRAP inspects high-risk roads and develops star ratings and safer road investment plans. It provides training, technology and support to help build and sustain national, regional and local capability. And it tracks road safety performance.

The initiative started with EuroRAP in 2001, a partnership between automobile associations and road authorities. It created objective measures of road safety risk and highlighted the vital role that road infrastructure can play in preventing crashes. The approach spread rapidly throughout Europe, then to Australia,

the US and New Zealand, as local experts added their own improvements.

The focus then shifted to low- and middle-income countries, where the crisis is most urgent. IRAP is now a global programme set in more than 70 countries. Some 500 million kilometres of roads have been assessed. Around half the roads in middle- to low-income countries are rated in the highest risk bands: one- or two-star. The reasons are simple but deadly. For instance, 84 per cent of the roads where pedestrians are present have no footpaths.

The good news is that iRAP is also providing solutions. Construction of just 65km of footpaths on high-risk roads in Costa Rica, for example, is set to prevent almost 3,000 deaths and serious injuries over 20 years and save \$215 million in crash costs.

McInerney adds: "Such plans are helping to reduce the social and economic burden on families, communities and hospitals. Ambitious policy targets such as the elimination of one-star and two-star roads by 2020 or a requirement that all new roads achieve four-stars, help countries to create a legacy of safe roads."

As a registered charity, iRAP benefits from the financial support of the FIA Foundation, the Road Safety Fund (jointly managed by the FIA Foundation and WHO), and the Global Road Safety Facility. This support helps it to provide safety tools and software to low- and middle-income countries free-of-charge and to ensure that assessments are completed to the same, high-quality consistency around the world.



High-risk roads around the world are the focus of iRAP attention, as it works with governments and NGOs in support of local initiatives

Safety science

CRUNCH TIME: INSIDE THE F1 CRASH TEST

Nowhere else in the automotive world do conditions get tougher than this. The FIA sets the agenda and Formula One teams must offer up their latest machinery to a crash testing regime that would crush any normal road car like a beetle >



PHOTOGRAPHY: WILL THOM

As usual at the start of a Formula One season, early February is car launch time, a period thick with bright-eyed optimism, vaulting ambition and a determined effort by teams to have the outside world believe the upcoming campaign will be a massive improvement on the one just left behind. Drivers are presented as magically improved, über-fit examples of superhumanity. Design personnel are presented as clairvoyant boffins who have uniquely unravelled the sport's regulations to deliver a world-beating entrant. And, finally, the cars themselves are offered as glossy, perfectly sculpted winning machines, engineering paragons in which grand design meets super-science.

For the Williams team personnel manoeuvring the chassis and nose cone of the team's 2013 challenger, the FW35, through the bitter cold of a February morning at Cranfield University in middle England, the ambition and optimism of a Formula One car launch still seems a fair distance away. Today they have nuts and bolts work to get through; work that can mean the difference between life and death. For this is not only the season of F1 car launches but also of FIA crash-testing.

Williams has come to the Cranfield Impact Centre to put its chassis and nose cone through frontal impact tests, two of 18 FIA tests every Formula One car must go through before it can take to the track.

One of just three FIA-approved test centres (the others are the Transport Research Laboratory in the UK and Italy's CSI laboratory in Milan), Cranfield is at this time of year a revolving door for F1 teams as they contemplate a shrinking off-season and the looming deadline of the first pre-season test. Red Bull Racing's nose cone was smashed into a million pieces here a week before Williams's visit, and the F1 champions will be back again shortly. Marussia, too, is due soon.

The Williams test sees the chassis and nose fixed to a trolley, after which a crash test dummy is lowered into the cockpit and strapped in place using the standard seat belts fitted to an F1 car. Once the prep has been done, the trolley is released, at a speed of 15m/s and smashed into a wall at the end of the sled's track. At the time of impact the sled is travelling at roughly 54km/h and while that may seem tame, a race accident will, by and large, see a car collide with barrier which absorbs much of the impact energy. At Cranfield the nose cone is being thrown at a metal wall offering no reciprocal deformation.

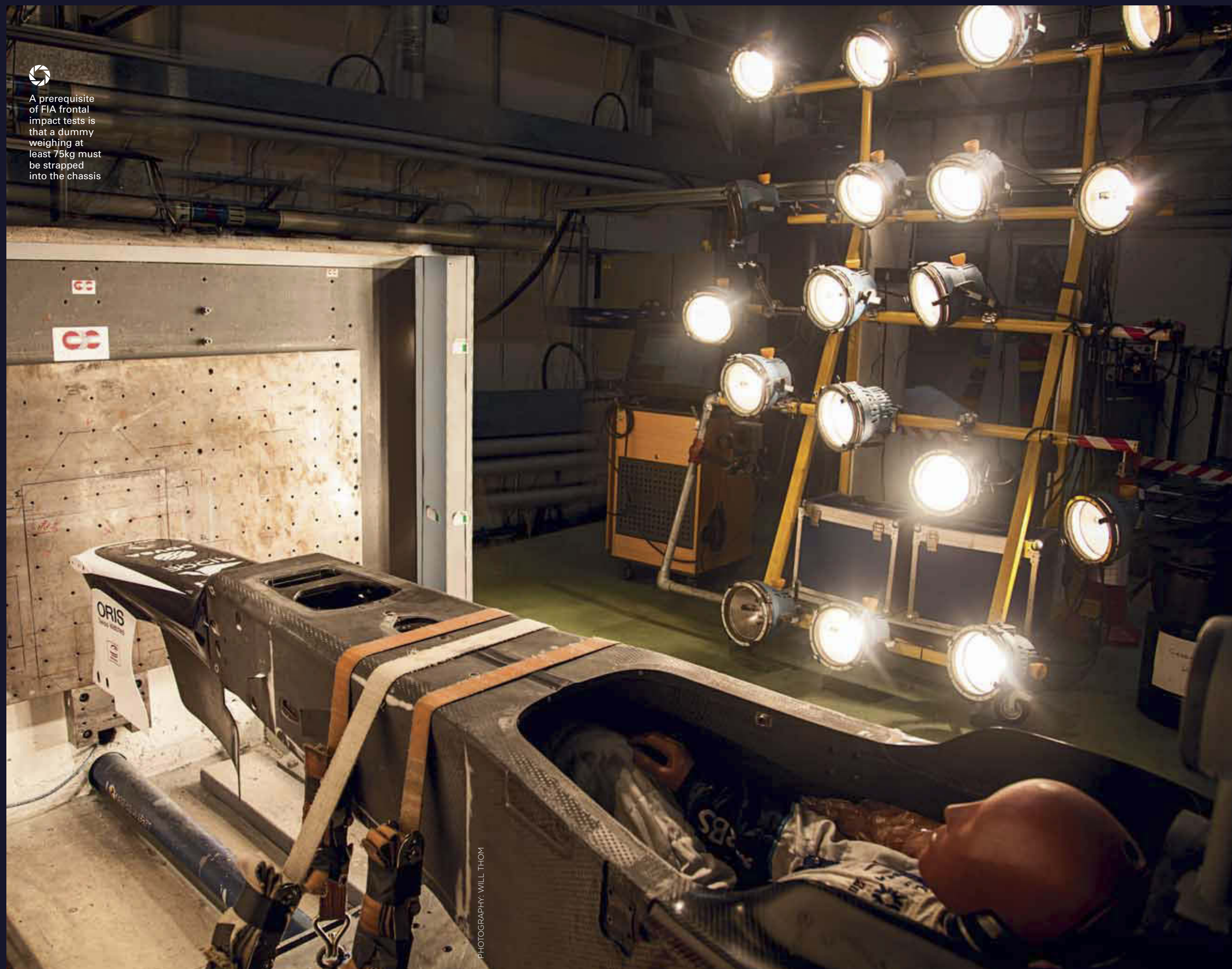
The results are spectacular. On impact the front of the nose cone explodes in a cloud of carbon-fibre, the first few hundred millimetres reduced to a scattering of razor sharp shards on the floor. However, the rear section has retained its integrity and all the energy has been dissipated by the collapse of the tip of the nose.

To pass, the FW35 must meet a number of criteria: the deceleration of the trolley must not exceed 40g and the maximum deceleration measured on the dummy's chest must not exceed 60g over a three millisecond period. It's a tough standard but one that F1 teams accept as the FIA works to keep serious injury at bay. This time Williams is successful. Measurements taken by Cranfield staff and witnessed by FIA observer Gordon Forbes show the FW35 has passed with ease.

It isn't always the case, however. In the two decades since Formula One's approach to safety was dramatically overhauled in the wake of the 1994 death of Ayrton Senna, the FIA's crash tests for F1 cars have become more and more stringent. And with designers constantly working at the margins of legality in order to find a weight or aerodynamic advantage, failures are common.

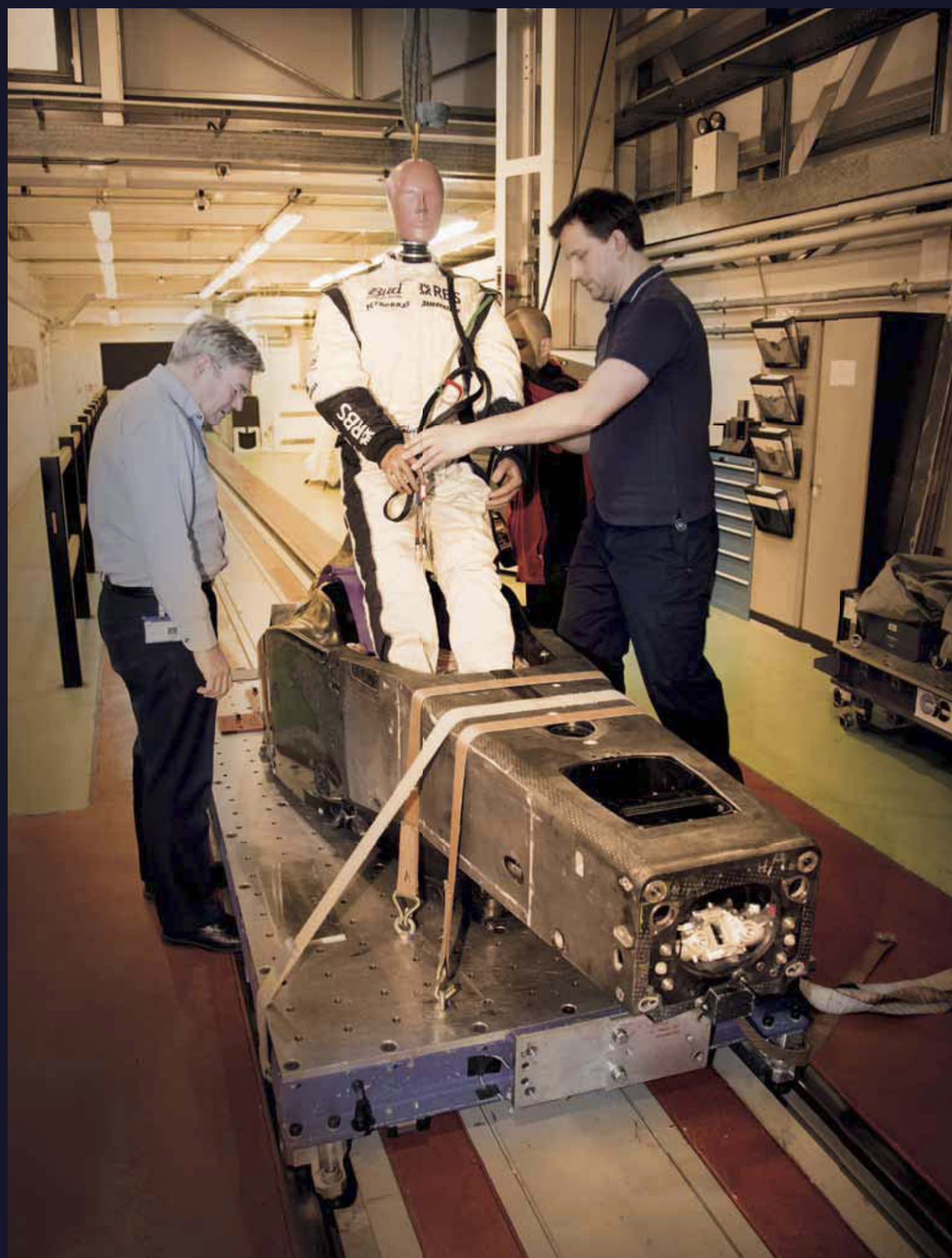
'ONE TEAM TOOK ABOUT 15 ATTEMPTS TO PASS THE REAR IMPACT TEST'

CHARLIE WHITING



A prerequisite of FIA frontal impact tests is that a dummy weighing at least 75kg must be strapped into the chassis

PHOTOGRAPHY: WILL THOM



“Any Formula One team can get their cars to pass the test without a problem, but obviously what they want to do is build the lightest most aerodynamic car they can. That requires specific shapes and specific packaging and very often that goes right up against the tolerances set by the tests,” says Formula One race director Charlie Whiting, who drafts the regulations the teams must adhere to. “The rear impact structure, which we also crash test, is a good example. Currently the teams want that to be swept upwards whereas, in terms of the tests, it would be far better for the structure to be straight.”

“We had one team this year pursuing a particular solution for the rear of its car and they had, I think, in the region of 15 attempts at passing the rear impact structure test before they got it right.”

“However, they’re not catastrophic failures; we’re talking about tiny amounts by which they miss the standard. In the rear impact test, the maximum deceleration can’t exceed 20g for more than 15 milliseconds and what they find is that it is exceeding that standard by one millisecond. So that’s the sort of fine-tuning teams are involved in.”

Jo Bauer, the FIA’s technical delegate at races and, along with Forbes, an observer at crash tests, agrees saying that while failures are frequent, solutions are normally straightforward.

“This year we had a team that destroyed its survival cells during the side impact tests and one team where the seat bulkhead failed during a [frontal] impact test, which is rare,” he says. “However, the solution to that was simply to add another ply of carbon-fibre, 200g at most, and the test was then no problem for them to pass. The margins the teams work at are very small, so there are never any real fundamental



A crash test dummy (left and opposite), laden with electronic measuring equipment, is readied for its stand-in role as an F1 driver as staff at the Cranfield University test centre set up another test; Takuma Sato’s massive ‘T-bone’ collision with Nick Heidfeld’s car in Austria in 2002 (below left), prompted the development of yet another (side intrusion) test



failures and by and large it’s just small adjustments that are required.

Testing on car components tends to be funnelled into the weeks just before the start of pre-season testing, but according to Bauer the labs responsible for the tests begin sampling new chassis almost as soon as a season finishes since there are 18 separate tests to go through.

“Currently we have eight static tests on the chassis and three push-off tests on the impact structure, front, side and rear,” he says. “We also have two front impact tests, one side and one rear, and a steering column impact test. There are also side penetration tests, so the teams supply a test panel and the chassis must be built with this construction.”

“The first team started in the middle of November and the last in the third week of January. It depends on what their development schedule has been like and how confident they are of passing the tests.”

Confidence sometimes isn’t enough, however, and though no team has yet been refused permission to race, testing is another matter. In 2012, the FIA introduced a new ruling stipulating that all teams must pass the full battery of tests before the start of pre-season testing. Marussia fell foul of the ruling when its MR01 failed its final test and was forced to sit out the first test of 2012. Whiting insists, though, that the requirement to homologate before testing was long overdue.

“It was common for cars to do thousands of kilometres of testing without any crash testing, which was madness,” he says. “Certainly it was unsustainable and we had to step in.”

Indeed, the tests are now so rigorous that Bauer admits that teams sometimes miss the pre-season deadline.

“It can take some time for teams to get it right,” he adds. “At the first of this year’s two pre-season tests in Barcelona we still had one team that hadn’t passed the full set of tests, so they were forced to run with a compromise solution. They just had to complete a rear impact test which they hadn’t passed, so in Barcelona they used their old rear impact structure.”

The need to meet the FIA’s benchmarks before running the cars in testing is just the latest in a long line of ever more stringent regulations stretching back to the 1980s when basic crash tests were introduced.

“The first was introduced in 1985, a pretty simple frontal impact test,” says Whiting. “In those days you just had to provide a nose and a little bit of the chassis and then around 1998 it progressed to using a complete chassis. And at the same time we introduced the first static load tests, what are colloquially called ‘squeeze tests’. Then later on we brought in the roll-hoop tests and side and rear impact structure tests.”

Bauer joined the FIA in 1997 just as the rear impact tests were coming into force and says that in the years since, the regulations have become much tighter, often as a direct result of on-track incidents.

“The tests have become much tougher over the past 15 years,” he says. “After the rear impact tests the next step was the introduction of the side intrusion panel, which came about following a bad accident involving Mario Haberfeld in an F3000 race in Barcelona in 2000.”

PHOTOGRAPHY: WILL THOM; LAT

'KUBICA'S CRASH SHOWED IT IS WORTH DOING ALL THIS TESTING'

JO BAUER

Whiting adds that a second accident, two years later at Austria's A1 Ring, was revealing. "At the Austrian Grand Prix in 2002, Takuma Sato was involved in a quite spectacular accident in which the rear impact structure of Nick Heidfeld's Sauber hit the side of Sato's Jordan," he recalls. "As a result we did a lot of research into penetration resistance. So-called 'T-bone' accidents are a very real possibility, so you have to make sure that the side of the chassis is compatible with the thing that's likely to hit it. We did a lot of testing on that and came up with different tests to cover that and different chassis constructions to make sure they were compatible with that."

Further changes were made following other on-track incidents. Cockpit rim heights were raised and load tests applied after a 2007 accident in which David Coulthard's Red Bull became airborne and skittered across the front of Alex Wurz's cockpit in Melbourne, narrowly missing the Austrian. In 2009 Timo Glock had a massive impact in qualifying for the Japanese Grand Prix. The crash resulted in the front wing being pushed back through the chassis and injuring the German's driver's leg badly enough for him to miss the final two races of the season.

"We introduced another floor deflection test after that – not just under the fuel tank but also the driver," says Bauer.

Any test introduced is a result of a process of evaluation and consultation with F1 teams, via the sport's Technical Working Group.

"The TWG has a representative from every team," says Whiting. "I chair those meetings and have to say the teams are incredibly competent. They know exactly what can and can't be done. It's a very consultative process and there's seldom any knee-jerk reaction. I don't think we've rushed headlong into anything. Typically it's about a year from identifying a problem to getting the solution onto the cars."

The FIA's crash tests are in a constant state of evolution and research into new safety measures is ongoing. The latest to be investigated are accidents in which cars are impacted at oblique angles, beyond the 90 degrees the tests currently inflict.

"Our own research is conducted for us by the FIA Institute and currently they're looking at some oblique side impact scenarios," says Whiting. "The reference for that was Robert Kubica's huge accident in 2007 in Canada.

"In Montreal, Robert hit the wall at something approaching a



30-degree angle and while there isn't much evidence that there was any great compromise, if we can make everything function that little bit better then it will be a step forward. Sometimes all it takes is being aware that a particular outcome is possible, which was the case there, and that provokes a response. That test will be introduced for 2014.

"Most of the other research being conducted at the moment centres on driver head protection – closed canopies in one instance, but also structures in front of the driver to deflect debris," he adds. "That's a major area of research for the FIA and FIA Institute at the moment. We are coming up with some interesting stuff in that regard."

For both Whiting and Bauer, Kubica's explosive accident after losing control on the run down to the hairpin at Montreal's Circuit Gilles Villeneuve remains the benchmark for why the FIA's crash-testing continues to be a worthwhile endeavour.

"Kubica's crash really showed that it is absolutely worth going through this whole process, doing all this testing," says Bauer. "It was a massive accident and for sure I believe the changes to crash testing over the past two decades absolutely saved his life that day."

Whiting agrees and adds that while the tests grow tougher with each passing year it is the FIA's role to pursue driver safety rigorously.

"The developments we've seen over the last 15 years have without doubt prevented quite a lot of injury," he insists. "Certainly when you look at the roll-hoop tests, in Robert Kubica's accident that element was subject to a huge impact and yet retained its integrity."

"Yes, the tests are quite stringent and I'm sure quite a lot of engineers at teams have sleepless nights. But the bottom line is that these tests are not done to frustrate them. If we didn't do them we'd undoubtedly see more injuries and more compromised racing cars."

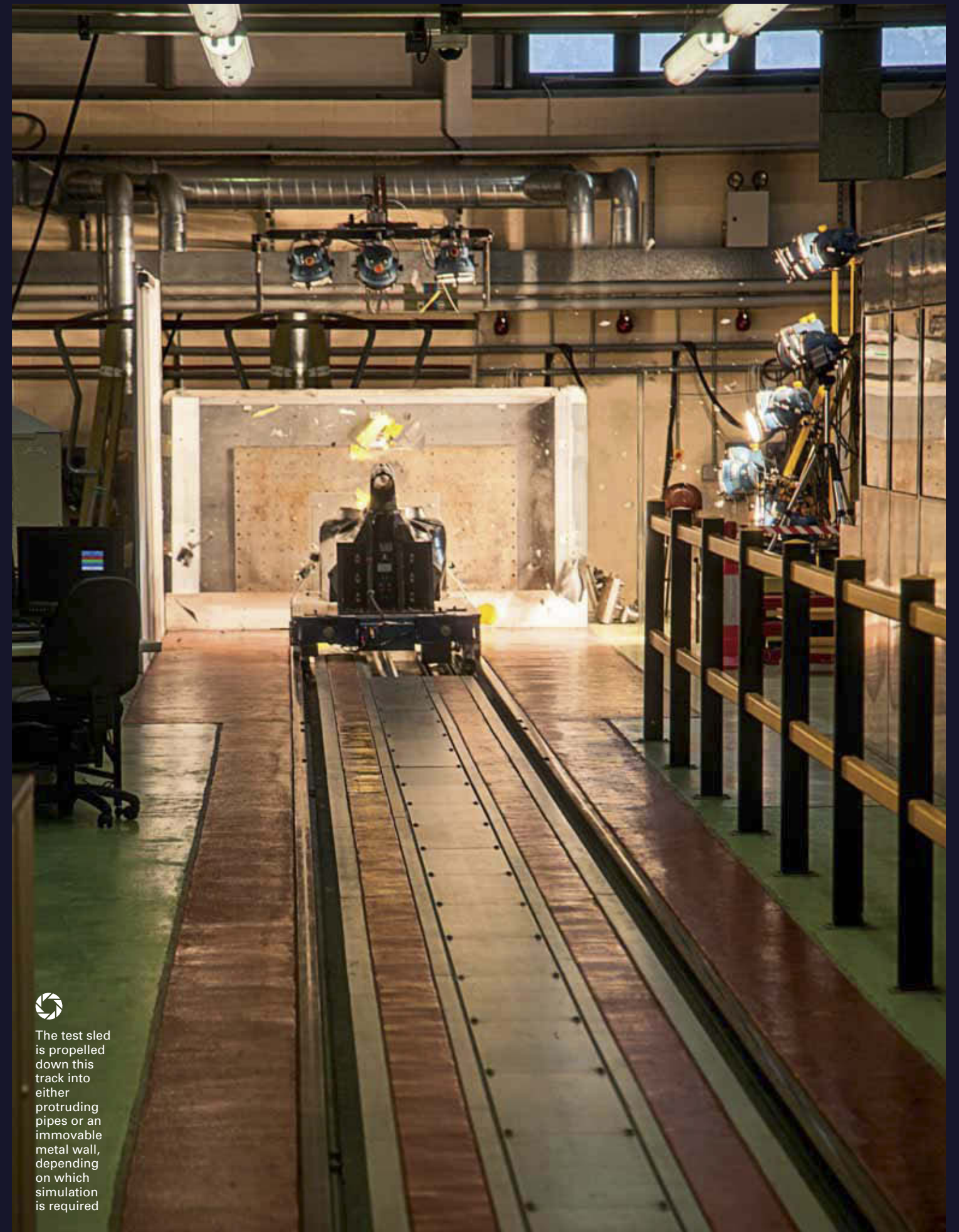
"It is the job of Formula One teams to make their cars go as fast as possible, and it is our job to make sure that at the speeds they go the cars and the drivers are as safe as we can possibly make them."

Back at the Cranfield Impact Centre, the Williams team's test is at an end and the team's personnel are now free to remove the chassis from the trolley and manhandle it back out into the frozen February air. It's been a productive day. In a week's time the team will roll the FW35 out at the second pre-season test in Barcelona, and drivers Pastor Maldonado and Valtteri Bottas will tell a waiting world that the car is a major step forward, straight out of the box. Optimism, ambition and hunger for success are delivered as expected and, more important, delivered safely. □



Robert Kubica's 2007 Canadian Grand Prix crash (above) was enormous. The accident took some 13sec from start to finish, smashed most surfaces of his car and yet the BMW driver survived in his carbon tub

Didn't he do well? In the wake of a crash test, a high-tech dummy (left) is about to have all his impact secrets downloaded



The test sled is propelled down this track into either protruding pipes or an immovable metal wall, depending on which simulation is required

PHOTOGRAPHY: WILL THOM, LAT

'WE NOW
HAVE AN
INTEGRATED
SOLUTION
FOR THE
PROBLEMS
OF ROAD
SAFETY'

VICTOR KIRYANOV



SPECIAL REPORT RUSSIA

In Russia, things aren't done by halves. Not content with hosting the Winter Olympics for the first time, the country is also preparing for its first grand prix in 100 years and its biggest car manufacturer's return to motor sport's world stage. But it isn't just on the race track that this nation is leading the way. General Victor Kiryanov is single-handedly ensuring that Russia takes a lead on global road safety and will be putting the issue firmly in front of the G20 group of countries at their meeting in St Petersburg later on this year

**ИНТЕРВЬЮ:
ВИКТОР КИРЯДИНОВ
CIRCUIT CITIES: SOCHI
МОСКВА, ВЛАДИВОСТОК
Lada's return to world motor sport**

ROAD SAFETY TSAR

The broad shoulders of Victor Kiryanov bear the weight of Russia's new road safety mission. As the boss of the country's traffic police, he fully appreciates the scale of the task he has taken on. The pain and the satisfactions are as vast and uniquely Russian as the nation itself

Shortly after his appointment in 2004 as the head of Russia's State Vehicle Safety Inspectorate, the country's traffic police, Victor Kiryanov visited the United Nations in New York and attended a special gathering on road safety. The trip proved to be a catalyst for his campaign to build political and bureaucratic support to help reduce the annual carnage on Russia's roads.

In 2003 more than 35,000 people were killed in accidents, a figure not seen since the collapse of the Soviet Union in the early 1990s when private car ownership began to shoot upwards.

"We understood that people were judging us [the traffic police] by the numbers of road deaths and accidents," says Kiryanov.

"A lot depends on us – but not everything... it's not only the Ministry of the Interior's work to keep order on the roads. It is an integrated set of measures that will allow the situation to improve, including working with the regions, work with ministries like the Ministry of Transport, the Ministry of Education and the Emergency Situations Ministry."

After he returned from New York, Kiryanov initiated a process that resulted in the creation of a federal programme for road safety that was backed by a state commission chaired by the president, Vladimir Putin.

"There was money from the federal and regional governments and our job was to bring this money to the ground," says Kiryanov.

The process was aided by a political drive to try to reverse some of Russia's acute demographic problems, and a wish to preserve the lives of Russians who were already suffering from reduced life expectancy and the spectre of a decline in the country's total population.

Now, almost 10 years later, Russia has succeeded in arresting, significantly, the number of deaths on its roads. Although the quantity of vehicles has risen steadily, between 2004 and 2011 the number of people killed in accidents fell by 19 per cent, from 34,506 to 27,953. And the crash total overall has fallen by four per cent, dipping below 200,000 in 2011. Child deaths have fallen over 30 per cent.

"Every year we have tracked the situation on our roads and the situation has only changed for the better," says Kiryanov. "Fewer people drink and drive and gradually people are beginning to use their seat belts."

And the importance of road safety now enjoys a higher profile within Russia's bureaucratic structures. The country even has a Road Safety Commission chaired by deputy prime minister Igor Shuvalov.

In 2011 president Dmitry Medvedev appointed Kiryanov as a

'FEWER PEOPLE DRINK AND DRIVE, AND THEY'RE NOW BEGINNING TO USE THEIR SEAT BELTS'

VICTOR KIRYANOV



Things are improving, says Kiryanov: in 2003, 35,000 people died on the roads but by 2011 that figure had been cut by 7,000. Last year road crashes also dipped under the 200,000 mark

PHOTOGRAPHY: MAX AVDEEV



deputy interior minister. The Interior Ministry is one of the most important bureaucracies in the country.

Now 60 years old, Kiryanov himself has come a long way. After service in the Soviet army he began his career as a simple traffic police officer. He started work in 1974 in his native town of Tikhvin in the Leningrad region, better known for its famous monastery. He worked his way up the ranks of the traffic police in St Petersburg before moving to Moscow in 2001. Today, as a deputy interior minister, he is responsible for more than 100,000 traffic police officers across all of Russia.

“The most important thing to say is that we now have an integrated solution for the problems of road safety,” says Kiryanov.


Russia is currently coming to the end of its first road safety programme, which has seen deaths fall steadily. And in April the government is expected to confirm the second such programme, which will run until 2020 and which expects to further reduce the number of road accident deaths one and half times over.

“It’s an ambitious aim, like those of the first programme, and we have to strive to realise these aims,” says Kiryanov.

But is such a reduction really possible? It will require cutting road deaths to below 20,000 a year, a figure that has not been achieved once in the past 30 years.

Kiryanov looks nonplussed when asked if the target is realistic. “Of course it’s possible. If it wasn’t possible we wouldn’t be striving towards it,” he says.

Russia, the biggest country on earth and obliged to cope with some of the most extreme climates on the planet, has difficulties peculiar to itself when the implementation of national road safety campaigns is undertaken.

 From local town traffic officer 40 years ago to deputy interior minister in charge of 100,000 officers right across Russia, Kiryanov is proud of his record, not only in reducing road deaths, but in inspiring a more responsible attitude to road safety among ordinary Russian drivers

To start with, the country’s poor road infrastructure is one of the traffic problems most commonly complained of by ordinary Russians. While this infrastructure isn’t one of Kiryanov’s responsibilities, he admits that the situation needs attention.

“Our road infrastructure of course seriously lags behind the quantity of vehicles,” he says. “Roads are becoming better but they are a long way from being perfect.”

He emphasises one problem in particular – the scarcity of motorway service stations and other places where tired drivers can take a break.

Education – of pedestrians as well as the instruction of drivers – is another handicap. It will be a central tenet of country’s second road safety programme.

Driving and roads are such an integral part of a modern society that children should be taught about them as soon as possible, Kiryanov says. “The process of education isn’t just about coming to a driving school and learning. People must be taught at an early age... even from nursery schools.”

And if you can inculcate a respect for road safety and the rules of the road, this not only helps to reduce death and injury, but also helps to create well-rounded and responsible citizens, he believes.

“If a person is law-abiding on the roads, he will probably be law-abiding in general,” says Kiryanov.

It’s a process that is already underway. “The statistics show that people are breaking the law less often,”

he adds. “People are becoming more disciplined.”

Another age-old blight that any road safety programme in Russia must address is the acute problem of drink-driving.

There has been some success in bringing down the number of fatalities that are the direct result of alcohol. Between 2004 and 2011 the number of road deaths linked to alcohol dropped by 42 per cent, and now only one in 13 accidents is alcohol-related, compared with one in eight in the early 2000s.

But Kiryanov immediately identifies drink-driving as one of the most serious Russian-specific aspects of the road safety battle.

He says he was going to respond to a small recent spike in drink-driving incidents by organising a series of large “raids” – where teams of traffic police, along with doctors, journalists and public organisations, are dispatched to problem areas across the country to mount patrols and catch and punish offenders.

“When we began stopping people less frequently it turned out that drivers started to drink again more often,” says Kiryanov.

As well as his campaign inside Russia, Kiryanov’s period at the top of Russia’s traffic department has been marked by Russia’s higher profile on the international road traffic safety stage.

Kiryanov has worked with the United Nations and the FIA Foundation, and is one of the high-profile members of Lord George Robertson’s Commission for Global Road Safety.

In 2009 Russia hosted the first Global Ministerial Conference on Road Safety in Moscow, ‘Time to Act’, which Kiryanov recalls with much fondness.

“When the conference finished, the hall was full, and people did not leave – it was like they wanted it to continue,” he says. “The topics were interesting and something people were worried about.”

He also expresses his concern that he isn’t yet aware of any move to organise a second conference that would continue the work of the first. Participants at the first conference had hoped to hold such an event every five years, he says.

“A lot of questions have accumulated... I would like it if someone, a country, took the initiative on this because we have to reach the highest levels... When we’re working on saving human lives, the higher the political level, the better it will be for every country,” Kiryanov emphasises. “We have to constantly speak about this, and constantly be doing something, and constantly holding events.”

Another area where Kiryanov is seeking to encourage movement in the international arena is over the need for reliable and unified statistics, an essential basis for effective analysis of road deaths, road injuries and their causes.

“We have to look for good examples from across the whole world... we should collect all this information, share it, analyse it and then recommend it to the FIA and for the signature of [FIA president] Jean Todt. So good experience can be spread to those countries where it is not yet present.”

Different ways of measuring statistics – for example, the time after an accident at which a death occurs that has been attributed to the accident – contribute to confusion and obstruct a common and unified approach, says Kiryanov.

“It’s essential to collect a complete analysis of the reasons for

‘A PERSON WHO’S
LAW-ABIDING ON THE
ROAD WILL BE LAW-
ABIDING IN GENERAL’

VICTOR KIRYANOV

accidents from the FIA and it is very important that this is analytical work – and not just a collection of statistics. In Russia we do that sort of analysis in a special centre that was created as part of a federal programme and we are ready to share our experience.”

And many countries do not have a body, or a person, who is responsible for road safety, and that also obstructs co-operation, he says. The international bodies that do work on road safety need to define their roles in relation to one another more closely.

As well as playing a more active part in road safety diplomacy globally, Russia was also thrust into the world of motor sport after the then prime minister, Vladimir Putin, and Formula One chief Bernie Ecclestone announced in October 2010 the return of a World Championship Russian Grand Prix.

The host city will be Sochi on the country’s Black Sea coast – and the race is scheduled for 2014. It will be a busy time for Sochi because the resort is also hosting the 2014 Winter Olympics, and building work on the infrastructure for both events is currently proceeding at breakneck speed.

Kiryanov has been closely involved with the ongoing preparations and speaks warmly of the support that has been forthcoming from other countries.

“We have of course never held an event at that sort of level,” he



 As a Commission for Global Road Safety member, Kiryanov spells out road safety priorities at the UN (above). He’s just as heavily involved on his own patch (below), managing metropolitan traffic in Moscow, and persuading drivers to follow the rules of the road



PHOTOGRAPHY: MAX AVDEEV



says. "To host a stage of the Formula One Championship is a grandiose event for any country and it shows the country's standards and its attitude towards motor sports... I am very grateful to the FIA which does not stand to one side, but actively helps us."


The process of building a world-class facility at Sochi, however, is perhaps less of a challenge, in fact, than raising the profile of the sport of Formula One in Russia, which hasn't traditionally been a home of motor sport.

The shortage of proper motor racing circuits is linked to what has so far been a low level of investment, which in turn has led to an unwillingness by major television channels to show major events – which in turn has discouraged sponsors.

But Russia is now working hard to break this vicious circle. "We have to work in all directions: raise the level and quantity of competitions, build new circuits, attract young people to

'WE HAVE TO BUILD NEW CIRCUITS AND ATTRACT YOUNG PEOPLE. THERE ARE NO PANACEAS'

VICTOR KIRYANOV

 Kiryanov leads Commission for Global Road Safety in the Russian Parliament

motor sports, and find a way of financing motor sport. There are no panaceas," Kiryanov concedes.

"I think it's particularly important to create a viewing system for national motor sport events on the main television channels, on the internet and in the press. This will enable us to attract the support of sponsors."

Kiryanov stresses the crucial importance of attracting sponsorship from car manufacturers and fuel producers.

Russia does have some history of motor sports. The Russian Grand Prix was staged twice a century ago, before the first world war – in St Petersburg in 1913 and 1914.

"I'm sure that the 2014 grand prix will not only give a jolt to the development and popularisation of motor sports in Russia, but it will reveal Russia to be one of the major powers of international motor sports," says Kiryanov.

Until only a few years ago there wasn't a single modern circuit in the country. Now there are many, and more are under construction, as you can read over the next few pages.

The departure of F1 driver Vitally Petrov, however, means there is currently no Russian driver competing in the World Championship. Kiryanov admits that this may be a barrier to attracting new fans to the sport, but he believes that the development of new infrastructures should help to cultivate a new generation of drivers.

"We might even see Schumachers appear in Russia soon," he says. "What Russian does not love to drive fast?"

PHOTOGRAPHY: MAX AVDEEV, MIKAEL SIMONOV

CIRCUIT CITIES

New circuits and healthy ambition are springing up in motor sport's oldest and newest market

With seven permanent race circuits and another four under construction, including a major development in the Black Sea Resort of Sochi – host to the country's first Formula One grand prix, in 2014 – motor sport is enjoying a resurgence in Russia.

The country is certainly big enough to cope with the proliferation of tracks. After all, there's around a 9,000km stretch between Sochi in the west and Vladivostok's new PrimRing circuit in the far east, so overcrowding won't be an issue. In fact, Sochi is closer to the UK's Silverstone than to its eastern compatriot. But will this growing motor sport infrastructure translate into demand from a new generation of spectators with little experience of motor racing?

When F1 lands in Russia next year, it will be exactly 100 years since it last hosted a grand prix. Then it was staged in the cultural capital of St Petersburg, but now it will be set in a less than populous coastal city near the border with Georgia.

Yet the circuit organisers are confident that the Russian public are ready. Alexander Bogdanov, the CEO of Formula Sochi, says: "Russia is a nation with an increasing interest in sports in general, and in technology, and a passion for areas where the two combine. And now the process of introducing motor sport is well under way – with the construction of tracks in various Russian cities, the hosting of European and world-class motor sport events, and the success of Russian drivers on the international stage."

While there is already concrete interest in motor sport in Russia, Bogdanov believes the new grand prix will further cement that interest: "One of the catalysts is preparation for 2014. F1 is popular right now, as evidenced by live race broadcasts and high traffic on F1 websites. And I'm sure that will increase significantly from 2014."

Apart from F1, Bogdanov expects the circuit to host different racing series such as the FIA World Endurance Championship, World Touring Cars, FIA Formula 3, and Russian national championships. "With Sochi's unique location, warm weather, large tourist traffic, and the infrastructure being built for the 2014 Winter Olympics, we expect high commercial attractiveness and grandstand occupancy not only for F1 but almost all major international car racing series."

But Sochi is just one of many Russian circuits vying for public attention. The new Moscow Raceway, opened in July 2012, is also



laying claim to being the home of Russian motor sport – and spectator numbers are impressive. The circuit attracted 80,000 for rounds of the World Series by Renault and FIA GT1 World Championship in 2012, and is set to welcome DTM to Russia for the first time this year.

Ekaterina Beltsevich, who heads the Moscow Raceway project, believes that interest from external investors has really helped to create a strong foundation for motor sport in a short space of time.

"There is a real interest in investing in motor sport and motor sport facilities," she says. "In its first season Moscow Raceway signed long-term contracts with industry leaders such as Mercedes-Benz and Yokohama. Yet 5-10 years ago who could really think that a world-class circuit would be built near Moscow? Or that it would attract 80,000 spectators? Now sponsors, partners and racing series can see that Russia can host international top-class motor sport events."


Indeed, Beltsevich believes that circuits in Russia can succeed without F1: "Moscow Raceway is fully scheduled for other races. This year we'll host WTCC, World Series by Renault, FIM Superbikes and DTM. Not to mention rounds of national championships.

"We want to see an international series weekend once a month, and also to host track days and corporate events. Our audience needs to get used to the fact that a high-quality circuit has appeared." But F1 is also on Beltsevich's mind: "F1 is an investment in a country or region. We hope that some day F1 will come to our circuit."

Certainly, no corners were cut in the design of the Moscow Raceway and it does have the potential to host the sport's crown jewel. The Hermann Tilke-designed facility cost 45 billion rubles (£112 million) and offers every up-to-date feature of a modern circuit.

Beltsevich says that sustainability was of major importance during the build. "During designing and construction, measures to protect the environment – storm water drains to remove surface water from



 Sochi will host the 2014 Winter Olympics (left) as well as a round of the FIA F1 World Championship, and work on the circuit (right) and facilities is already well advanced; the Moscow Raceway will welcome DTM racing (above) later in 2013





the track and parking lots, and treatment plants with a high level of cleaning – were brought to life. We also built a 12-metre high embankment to limit the impact of noise from the cars.”

A similar approach has been taken by the new PrimRing circuit in Vladivostok. Its slogan – Natural Power – is testament to the environmental focus. And a grant from the Motor Sport Safety Development Fund has helped to ensure that its construction is both sustainable (environmentally and economically) and incorporates road safety elements of further benefit to the region.

Circuit president Vitaly Verkeenko says: “Following the environmental module of the FIA Institute’s facility development programme we applied best practice and technology in this area. We are, for example, using locally sourced materials where possible; a heating system for all buildings using natural gas, recycled from old coal mining shafts. And we’ll establish a racing class for hybrid cars.”

The facility has been conceived as a racing and leisure destination and is recognised by the regional Primorsky government as a ‘priority project’ for developing the area, and is set to help increase local interest in motor sport. The circuit will be used to establish a foundation for developing motor sport talent – not just for drivers but for engineers, technicians, officials and volunteers. Another key objective is to establish a regional road safety training centre.

The project is backed by the Sumotori Machinery Group, one of the biggest companies in eastern Russia, which has major ambitions for the track and to help with the development of motor sport in Russia.

Verkeenko says: “While it might sound a little ambitious, we believe Vladivostok can be the capital of motor sport in Russia. Car ownership is double that of anywhere else in our country, there are more race licence holders in Primorsky than any other territory and, with our close alliance with Japanese motor sport, there are more competition vehicles in Primorsky than any other region in Russia.”

With its potential for various track configurations, the PrimRing circuit is planning local, national and international events. Verkeenko says: “We will focus initially on Asian championships which are a perfect logistical fit. We’re also planning winter sports such as rally and 4x4. We’re in discussions with series organisers; in the short term we intend to bring the Japanese D1 drift competition to PrimRing in 2013, to host national events on our Motocross and kart facilities in 2013, to host an international (possibly World Championship) kart event in 2014 and, once the main circuit is built, to host FIA GT, World Superbike, Japanese GT and the Asian Festival of Speed.”

The first phase of construction will be finished by this June (the site’s main roads infrastructure is already complete). Also set for completion during this initial phase are two commercial buildings for vehicle supply and servicing, the motocross track, the kart circuit and the main paddock (for road safety training and drift competitions). The circuit is on target for full completion by 2015.

Verkeenko says: “As the focus of the Russian economy has shifted towards Asia, Vladivostok is a logical motor sport hub for Russia. The mature motor sport market in Japan and our close proximity to the emerging motor sport markets in Korea and China only add to this. Historically, geographically and in terms of available infrastructure, this is the best location and timing for the PrimRing project.”

Sochi, Moscow and PrimRing – three circuits with three different approaches all vying to become Russian motor sport’s spiritual home. The evidence so far is that there is room for all of them to succeed.

‘VLADIVOSTOK IS A LOGICAL MOTOR SPORT HUB FOR RUSSIA’

VITALY VERKEENKO



Russia’s Rings

Permanent circuits

- Autodrom Moscow
- Autodrom Saint-Petersburg, St Petersburg
- Domodemovo Autodrom, Moscow (under construction)
- Kazan Ring, Kazan
- Moscow Raceway, Moscow
- NRing, Nizhny Novgorod
- PrimRing, Vladivostok (under construction)
- Red Ring, Krasnoyarsk
- Simbirskiy Sport Park, Ulyanovsk (under construction)
- Smolensk Ring, Smolensk
- Sochi Olympic Park Circuit, Sochi (under construction)

Street circuits

- Kurskaya Curve (Kurskaya Duga), Kursk
- Lipetskiy Climb (Lipetsky Podjom), Lipetsk
- Neva Ring (Nevskoe Ring), St Petersburg



Moscow Raceway (above) opened last July; Russian talent Daniil Kvyat (right) has been racing in Formula Renault, Formula BMW and Toyota Racing series since 2010 and has had nine wins; Moscow Raceway (below); the Olympic Park from the air (opp top); a model of the PrimRing (opp centre and bottom) and Sochi’s Bolshoi Ice Palace (opp centre, far right)



PHOTOGRAPHY: ANTON JIDANOV



RUSSIA'S GRANTA TOURER

Russia's most recognisable motoring brand is back on the international motor sport stage, determined to deliver when a round of the WTCC comes to Moscow for the first time

Russia and international motor sport have often been uneasy bed-fellows, and any fleeting dalliances have usually been in the realm of rally raid, where Lada's Niva was a frequent sight on Dakar rallies throughout the 1980s. It's a competition where blocky Kamaz HGVs still boss the truck category, and where Russian driver Eduard Nikolaev won the class this year for the first time. The country was also put back on the map recently with rounds of the GT1 championship and World Series by Renault series at the newly opened Moscow Raceway, but while European car and motorcycle series are seeing Russia as a territory ripe for plucking, domestic motor sport remains a closed shop. That's not to say that motor sport inside Russia isn't in good health. According to a 2012 national calendar approved by the Ministry for Sports, 20 championships, 29 cups and 15 trophies were

organised in the country last year. It is, however, racing that's far removed from international eyes, a curiously self-contained world in which the recently launched Formula Russia, organised by the Russian Automobile Federation, is the main single-seater class, using Italian-made Tatuus chassis and a 1.4-litre FPT engine.

That situation is about to change because Lada, the most widely recognised Russian motoring marque on the planet, is once again about to try its hand at international motor sport in the shape of a full entry into this year's World Touring Car Championship.

Lazy jibes surrounding Lada's plans are inevitable. This is, after all, a company most famously known for the joke about a man who asks a car parts department salesman for a fuel filler cap for a Lada and receives the reply that it sounds like a fair swap. However, the company is deadly serious, as Artyom Fedosov, vice-president of sales and marketing at Lada and parent company, Avtovaz, explains.

"When we talk about sport, the main goal is victory," he says. "Surely we will try our best to fight for podiums. We understand that it will be not so easy, because when you enter a championship it's always hard to be the leader in the first year. But we will accumulate the experience, improve our cars and learn much."

"Being a team in the WTCC is a key part of Lada's marketing strategy," he adds. "Successful performance on the race tracks gives an excellent image effect and increases brand loyalty. In 2013 one of the championship rounds will take place in Russia at Moscow Raceway. It is a historic moment, because Russia will host the WTCC for the first time. Russian fans will support a Russian team, and this fact will enhance the image effect for Lada."

Lada last contested the series in 2009 with a racing version of

'BEING IN THE WTCC IS A KEY PART OF LADA'S MARKETING STRATEGY'

ARTYOM FEDOSOV

its Priora model, prepared by the Russian Bears racing team of driver Victor Shapovalov. The team competed in every round of the season taking a best result of a double sixth-place finish at the round in Italy. At the end of the season, however, the company was gone from the series, the plug suddenly pulled on a proposed multi-year involvement.

"It was rather unexpected, especially after our first success in Imola, where James [Thompson] finished in sixth place in both races," says Shapovalov, who has returned to head up Lada Sport's latest entry. "We had every chance of starting to fight for podiums. But this decision was made in the tough economic conditions Avtovaz faced at the end of 2009."

"So we just had to accept the situation the way it was. But we didn't give up. We used all our experience and knowledge in other racing projects in Russian motor sport. We organised a new Lada Granta Cup and we developed new technical solutions for a new model Lada Granta."

Fedosov is even more blunt. "The priority was to save the company, keep the production process underway, pay wages, meet obligations to banks and suppliers," he says simply.

The crisis, however, is over. After 2009 saw domestic sales of all cars fall by 60 per cent, production has been ramped up again. And while the heady days of early 2008 – when the Russian market briefly overtook Germany's as Europe's largest – have yet to return, sales are healthy once more, a development that has prompted Renault-Nissan to up its stake in Avtovaz. The original 25 per cent it took on in 2008 will become a controlling 67 per cent by 2015, and it is against this background of new investment that Lada is returning to the WTCC.

"Thanks to the competent crisis management policy and co-operation with Renault-Nissan Alliance, Avtovaz was able to overcome the crisis and stabilise its financial position," says Fedosov. "Today we are implementing a long-term development programme, renewing the company's model line-up and modernising production processes. Participation in the World Touring Car Championship is an effective marketing tool and an efficient way to increase brand recognition. Rounds of the championship take place in Europe, North Africa, South America and Asia. These markets are interesting for Avtovaz in terms of the perspective export strategy."

It certainly will be if the new Granta WTCC car can pick up where



After his stint as a Lada works driver in 2009, James Thompson was impressed by the new Granta in early testing and has signed up for 2013; leading in 2012 at the Hungaroring (above)

the Priora left off. Shapovalov is convinced this will be the case. "We took part in two rounds in Hungary and Portugal," he says. "It was a kind of test – to see where we were, what position we could take among other participants. The car showed really impressive times and now we feel strong enough to participate in all races of the 2013 season."

"The car has been developed significantly in many areas: aerodynamics, engine, speed, driveability," he adds. "Compared to 2009, we have a much more competitive race car. The preliminary tests demonstrated good results."

Those preliminary tests took place at Magny-Cours in February, with experienced WTCC pilot Thompson at the wheel. The Briton raced the Priora in 2009 and has signed up for the 2013 campaign.

"I'm very satisfied with the speed and performance of the car and the steps forward that have been taken," Thompson said after the test. "I think we have worked very hard to maximise [the Granta's] strengths and minimise any weak points."

"This updated variant of the car gives hopes for better overall performance, especially in the race. Now we should focus on further improvements and I am eager to test new evolutions of the Granta."

Following further testing at the end of February, when second driver Aleksei Dudukalo also drove the Granta, the next step is to race the new car in anger at the opening race of the season at the end of March, at Monza, and both Shapovalov and Fedosov are hopeful that Lada can compete on the big stage.

"The results of our test races in 2012 make us optimistic," says Shapovalov. "James fought for ninth position in race one of the Portugal round and finished 11th in the race two – where he started from the last position on the grid. The gap between James and the leader was only 19 seconds. Now we have an improved car, which gives us more chances."

Fedosov agrees, again emphasising that Lada is not entering the series simply to make up the numbers.

"We have two high-class drivers and a competitive racing car. So, at least we will take the fight to our competitors. That's the 'basic programme' for us."

"But the main goal, of course, is fighting for podiums."



PHOTOGRAPHY: FIA, WTCC



Shapovalov (left) will relish a return to the fray, especially at the Moscow Raceway, an event that marketing boss Fedosov (right) also savours; Thompson's Granta (opp) leads the way in Hungary



Rally revival

A NEW BEGINNING FOR THE EUROPEAN RALLY CHAMPIONSHIP

Don't be fooled by the familiar name. Out of the ashes of the old ERC, a new championship has arisen, and the differences are spectacular. The revived series has a proper focus – it enjoys Europe-wide Eurosport TV coverage, it can lead drivers directly into the WRC, and it is attracting talents like Robert Kubica >

PHOTOGRAPHY: LAT; DPPI



In 2013, ERC is a 13-event series from which the strongest talents can expect to graduate to the WRC; privateer entrants are welcome as well



The first 2013 ERC event, the Janner Rally in Austria, (right), and Robert Kubica (below) with his DS3 Citroën



The FIA European Rally Championship is undergoing a renaissance so spectacular that it's worthy of anything Leonardo da Vinci could have come up with. From being an unloved series bogged down by 'coefficient' scoring requiring a maths degree to understand, and set in locations unlikely to be troubled by even the most intrepid tourist, it has re-emerged as a slickly televised package showcasing some of the most famous rallies in Europe. In short, it has been dragged into the 21st century, while still paying homage to an illustrious past.

In fact, the European Rally Championship (ERC), founded in 1953, is the oldest rally series in the world. The World Rally Championship (for manufacturers) didn't come along until 1973, and in many ways, that's when the trouble started for the European contest.

As more manufacturers and drivers were attracted to the premier series, which included such emblematic events as the Monte-Carlo and Safari, the ERC increasingly became a backwater: forgotten, obscure and untended. With a huge number of events – around 40 at its height – and some more complicated (and therefore earning more points) than others, a labyrinthine scoring system made it even harder for the public to follow, which discouraged manufacturers from joining in. The rot had set in, and once the full WRC for drivers turned up as well, in 1979, the European series began to wither.

The midwife now attending the rebirth of the ERC is Eurosport Events, a wholly owned subsidiary of the pan-European TV channel Eurosport, which reaches 130 million homes across 54 countries. And that means the traditionally thorny question of television rights and distribution – probably the biggest obstacle to the continued growth of rallying as a sport – has suddenly faded away. From each ERC round Eurosport televises daily half-hour highlights shows, a magazine show – *Inside ERC* – also 30 minutes, plus a rally review of 52 minutes that's available to other broadcasters around the world.

At least two rounds will be produced for live television coverage this year, with four hours of live broadcasting per event, which is also on offer to other TV channels. Additional programming includes a mid-season and season review plus a half-hour round-up programme, *ERC All Emotions*, for Eurosport.

In short, it's a true revolution, which has never been seen before, in the rallying world. But it is a formula that Eurosport successfully adopted with the World Touring Car Championship (which it has promoted since 2005) and more recently the Intercontinental



Rally Challenge, out of which the revitalised ERC was born.

Those liking snappy acronyms will note that only one letter has changed from IRC to ERC. And indeed many of the personnel are the same, meaning that the television product has been honed over six seasons. It's led to innovations such as Simulcam: an overlaying of images that shows two rally cars on the same piece of road effectively 'racing' each other and full live coverage of a rally, which was also pioneered by Eurosport four years ago.

But principally, it's the philosophy that has changed. The ERC is now an integral part of a global masterplan, which will take the WRC further afield while the ERC concentrates on its domestic continent.

There will be a clear distinction and graduation from one to the other, giving the European series an obvious identity and mission for the first time in more than 40 years. However, encouraging privateers to take part will remain pivotal to the ERC's success.

We're barely into it and the formula is already working. Former grand prix driver Robert Kubica is set to announce his commitment to the championship, attracted by a series that guarantees enough TV exposure to generate sponsorship, while allowing him to structure >

Stars of the ERC

The ERC is overflowing with highly capable and influential talents. Meet six of the key players



Jean-Pierre Nicolas

International rally-winning driver turned boss of the factory Peugeot team in the WRC, Nicolas is the ERC's general co-ordinator and the on-the-ground contact for teams and event organisers. Fittingly, the ERC's visit to Corsica in May will mark the 40th anniversary of his victory on the famous island rally.



Gilbert Roy

A former motorcycle racer, Roy is at the heart of Eurosport Events' television coverage of the ERC in his role as director of editorial and programme development. Whether it's determining the path taken by the camera helicopter on rallies or overseeing the edit of the daily review programmes, Roy is the organiser who brings it all together.

Craig Breen

A graduate of the FIA Institute Academy, Breen, 23, is destined for a glittering career in rallying. Peugeot has signed him to its factory squad to help develop the new R5-specification 208 T16, and he's one of the favourites to take the ERC crown in 2013.

François Ribeiro

Vastly experienced, Ribeiro is Eurosport Events' motor sport development director. As the ERC's 'fixer', he uses his considerable contact base, negotiating prowess and tireless work ethic to forge agreements with event promoters, partners and other stakeholders designed, first, to strengthen but, above all, to grow the ERC in the future.



Michèle Mouton

Mouton's achievements behind the wheel are the stuff of legend. Since retiring from full-time competition she has played a prominent role in event organisation and championship management. As president of the FIA's Women and Motorsport Commission, Mouton is a keen supporter of the ERC's new-for-2013 Ladies' Trophy.



Marco Tempestini

Veteran competitor Tempestini is one of several privateers embarking on an expanded programme of events. At the same time, his Napoca Rally Academy operation has registered for the new ERC Teams' Championship, and is fielding a second car for his son Simone – an emerging star – while also promoting various initiatives such as road safety and engineering in Romania.

his career progression before possibly embarking on the world series.

Kubica, who turned his back on DTM and GT racing to compete in the ERC, will be one of the stars this year. (His performance on the French Rally Championship's Rallye du Var last November – where he dominated before going off owing to a pace note error – suggests he could even challenge for the title in his debut season.)

In a rally car, Kubica is not particularly hindered by the injuries he sustained following his accident two years ago. He still has limited movement in his right forearm, but in the relatively spacious environment of a rally car he can use his shoulder and upper arm to generate the movement needed to turn a steering wheel, which is impossible in the cramped confines of a single-seater. The aspect of his recovery that the Pole said struck him most was not so much the speed of it, but the way his body learned to compensate for its limitations by working in a different way. As Kubica puts it himself, he invented a brand new driving style and sees the ERC as the means to express it: a sign that the series has well and truly arrived. A few years ago, nobody of his stature would have considered it.

He'll need every trick he knows. Established rallying legends such as Frenchman François Delecour – a four-time WRC event winner – have committed to a full season as well, thanks to backing from the Romanian tourist board, which benefits from consistent television coverage, as well as a revamped website and social media offering throughout the season and specifically on its home event in July.

With financial pressures weighing so heavily on everyone involved in motor sport, one of the cornerstones of the ERC is that competitors are not obliged to compete in every round, just counting their best eight scores towards their final points tally (the best four from the first eight events and the best four from the last seven).

With more and more privateers signing up for year-long campaigns and young drivers such as Germain Bonnefis and Craig Breen coming to the fore with manufacturers like Renault and Peugeot respectively, the future of the sport is in safe hands, helped by the ERC. It's all things to all men – which was the exact guiding principle of the Renaissance itself. □

A FEW YEARS AGO NO ONE OF KUBICA'S STATURE WOULD HAVE CONSIDERED THE ERC



Czech team of Vaclav Pech and Petr Uhel barrel through a stage of the Janner Rally

Rally goes green

Organisers of ERC events along with drivers, team crew and even the public, help with tree-planting schemes as rallying does its bit to develop carbon-neutral strategies



Reminders of the forests that motor sport is fighting to help preserve surround competitors on the ERC Rally Liepaja-Ventspils in February

Reducing motor sport's impact on the environment won't be an easy task, but it's something the organisers of rounds of the European Rally Championship are preparing to tackle head-on.

Rally Islas Canarias El Corte Inglés, venue of Round 3 in March, is one such example. The event is being run for a 37th time this season. Anxious for the rally to remain a long-term fixture on the international calendar, officials have instigated a tree-planting programme in partnership with the authorities on the island of Gran Canaria where the event is run.

On the Sunday prior to the rally (March 17) the organisers are inviting competitors, team representatives – even members of the public – to plant a tree to help compensate for any ecological damage the rally might cause. Such plantings will also help to replenish forests containing different species of Laurisilva, a tree that has been largely decimated on Gran Canaria over the centuries.

Because trees remove carbon dioxide from the air as they grow

and so help to restore the natural balance of the atmosphere, research indicates that every tree will remove about 300kg of CO₂ from the air we breathe in their first 40 years.

"It will be a great opportunity to prove that motor sports and an environmental conscience do go together," says Germán Morales, president of the event organising committee. "This tree planting will remind the public attending this event of how important is to preserve the environment. Not only can we minimise the impact of our actions on the environment, but we can also collaborate to preserve it."

A similar tree-planting programme was carried out on SATA Rally Açores – the venue of Round 4 of the ERC – last season, while other ERC events are planning environmental initiatives and other activities to promote sustainability during the course of 2013.

The European Rally Championship and its 13 events also support the FIA's Action for Road Safety campaign.

RALLYING LEGENDS LIKE FRANÇOIS DELECOUR HAVE COMMITTED TO A SEASON AS WELL



Another star from the past, competing in the ERC in 2013, is François Delecour, here on route to third place in his Peugeot in the Rally Liepaja-Ventspils

Safety technology

SWITCHING TO AUTO PILOT

The day when your 'drive time' commute becomes relaxing 'me time' – when you can travel safely while watching a movie or reading the news – is fast becoming less science fiction fantasy and much more a reality >

PHOTOGRAPHY: JON FEINGERSH/GETTY IMAGES ILLUSTRATION: SEAN RODWELL





Audi's TTS conquered the fabled Pike's Peak hillclimb on its own by mixing today's technology (eg, GPS navigation) with added computer aids to keep it on track



The car that drives itself is a staple of science fiction. Whether your tastes run to Hollywood blockbusters or pulp fiction paperbacks, the driverless car is right up there with personal jet-packs and space vacations – although the reality

of the driverless car is now a little closer than a weekend break on Venus. In fact, the sci-fi premise is actually quite realistic. Generally the driverless car is controlled by artificial intelligence within the vehicle; it's frequently portrayed as an aid to passenger comfort and safety as well as the alleviation of traffic congestion. And autonomous car projects being developed today wouldn't find these ideas fantastical. The technological case seems inevitable: many of the enabling systems already exist and are almost commonplace on the road. Satellite navigation, with a reasonable

degree of fidelity, will plot a route; cruise control will maintain a speed, and adaptive cruise control (ACC) will use radar and other sensors to vary speeds to suit the conditions. Lane departure warning (LDW) systems will use cameras to identify road markings and the replacement of mechanical linkages with electrical actuation has opened the automotive world to the possibility of collision avoidance systems in which the vehicle takes control in a critical situation.

The principle behind such a development is that, given enough information, the car is better able to avoid a collision than the average driver. Take this argument to its logical conclusion and the driver would be removed from the loop altogether. The technologies to create such a fully autonomous car already exist – it's just a question of stitching them together.

There's more than three decades of solid research in the field, carried out for the most part by car makers and/or state-sponsored academia. But, as companies such as Audi and Toyota still pursue the technology, they have been joined in the search by an engine-designer of a very different type: Google.

Why Google would want to enter the automotive market has been much debated. Business commentators speak of a possible wish to join a market with more stability than the notoriously fickle internet, while internet analysts point to the driverless car as yet another way to monetise Google maps. Whatever the reason, Google is certainly now a player. The State of Nevada has granted it a licence to conduct trials on open roads (and Florida and California have followed suit). Much of the technology being used by the search engine giant is the same as that tested by the established automotive sector – although Google is rather better at blogging about it.

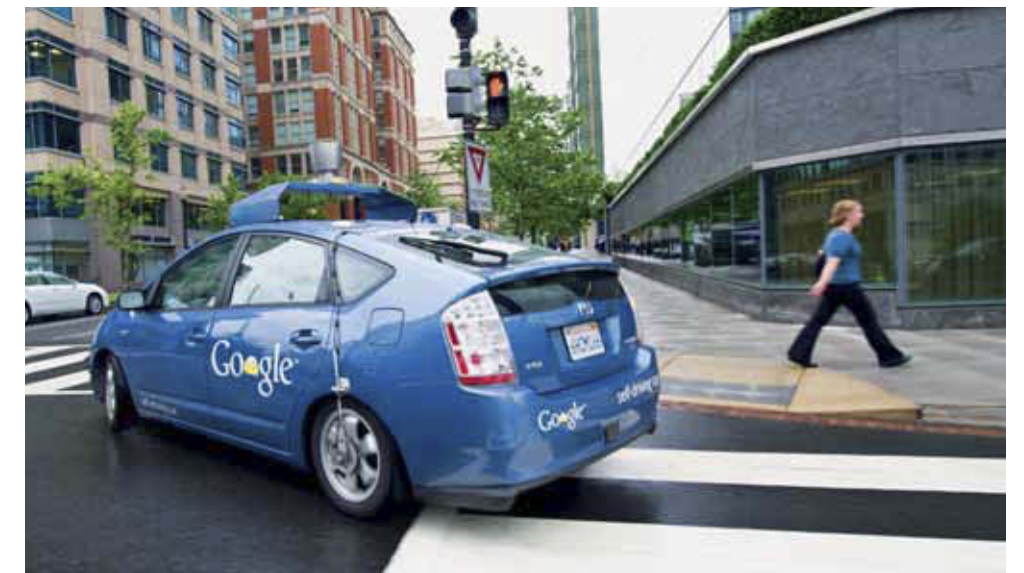
Professor Sebastian Thrun is the public face of Google's driverless car. With a distinguished background in robotics and computer science on both sides of the Atlantic, he is a former director of Stanford University's Artificial Intelligence Laboratory (SAIL), and now a Google VP and fellow.

"One of the big problems we're working on is car safety and efficiency," he says. "Our goal is to help prevent traffic accidents, free up people's time and reduce carbon emissions by fundamentally changing car use. According to the World Health Organisation more than 1.2 million lives are lost every year in road traffic accidents. We believe our technology has the potential to cut that, perhaps by as much as half."

Google's fleet consists of production cars fitted with various cameras, radars and range finders, The centrepiece of the system is a spinning LIDAR (light detection and ranging) array, composed of 64 laser range->



Google VP Thrun (right), is helping to make the driverless car (below and bottom) a reality by combining Google Street View technology with artificial intelligence aids



finders. Mounted on the roof it accumulates 1.3 million map points per second, building a real-time 3D map of its surroundings. It's also commercially available.

Radar is mounted in the front and rear bumpers of Google's cars, and operates in a similar way to ACC. The cars also have windscreen-mounted cameras (to detect traffic signals, lane markings etc), GPS, inertial measurement and an encoder embedded in a wheel to fill in gaps during GPS blackouts (for example, in a tunnel). Google's test cars follow routes previously driven by data-gathering (human-driven) vehicles which help them to differentiate between, for example, pedestrians and post boxes. Prior to a journey the test car loads route information from one of Google's data centres – the dozen or so massive complexes dotted around the world where Google crunches petabytes of data. In this area it is Google, not the car industry, that has the experience and technological advantages.

Google has completed more than 300,000 miles of testing but says there's a great deal of work ahead. Perhaps a good example of the contextual challenge involved in creating a truly autonomous car can be illustrated by the way a car deals with four-way junctions. Google cars obey US traffic laws and give way to the right – but if other drivers at the junction don't take their turn, the Google car will edge forward, wait for a response and, if none is forthcoming, grab the initiative and manoeuvre. This sort of interaction, familiar to any driver, is awkward to replicate in algorithmic form: there's no eye contact or hand gestures available to a car that's driving itself.

It's one of countless everyday situations that the driverless car would need to cope with. "We're encouraged by this progress, but there's still a long road ahead," writes Google engineering lead Chris Urmson. "To provide the best experience we can, we'll need to master snow-covered roadways, interpret temporary construction signals and handle other tricky situations that many drivers encounter. As a next step, members of the self-driving car team will soon start using the cars solo (rather than in pairs), for things like commuting to work. This is an important milestone as it brings the technology one step closer to every commuter. One day we hope this capability will enable people to be more productive in their cars. For now, our team members will remain in the drivers' seats and take back control if needed."

Google cars are currently cruising Nevada's streets and highways, wearing red number plates to denote their status. But they're not alone, as Continental and Audi have also been granted permission to test. Audi is expected to begin running cars in

the near future, building on the autonomous technology the Volkswagen Group has been testing over the past few years, predominantly in the western United States around the hub of VW's Electronics Research Laboratory (ERL) in Silicon Valley.

After providing VWs for various projects at Stanford, ERL in turn enlisted the help of the university in adapting a production Audi TTS into an autonomous hill-climber that completed the notorious 12.42-mile Pikes Peak course in 27 minutes. The TTS was selected for its by-wire throttle, ACC and semi-automatic gearbox – all useful tools for an autonomous vehicle. In addition, two computer systems housed in the boot did the thinking: one running safety-critical algorithms, the other vehicle dynamics algorithms. The car navigated the various Pikes Peak terrains using 'Differential GPS' (conventional satellite GPS combined with fixed, ground-based reference stations for much greater accuracy) with the ability to keep the vehicle within a couple of centimetres of the ideal driving line.



EU-funded Safe Road Trains for the Environment (SARTRE) project would 'platoon' groups of 'slaved' cars heading to a common destination

"Our aim from the start has been to show how the future of driver assistance technologies will lead to dramatic improvements in traffic safety and saving lives," said Dr Burkhard Huhnke, executive director at ERL. "With this project we are working on electronics that will help drivers steer their way out of dangerous situations. But first we need to create programs that will replicate the quick decisions and rapid manoeuvres of the best rally racers under the most difficult road conditions."

Past-masters at transferring motor sport technology to the road, Audi's follow-on autonomous projects, less grand in scope but closer to production, made their debut at the 2013 Consumer Electronics Show. The first demonstrator was a self-parking car. Unlike other such systems Audi's operates without anyone in the vehicle, which helps it to get into (and out of) very tight spaces.

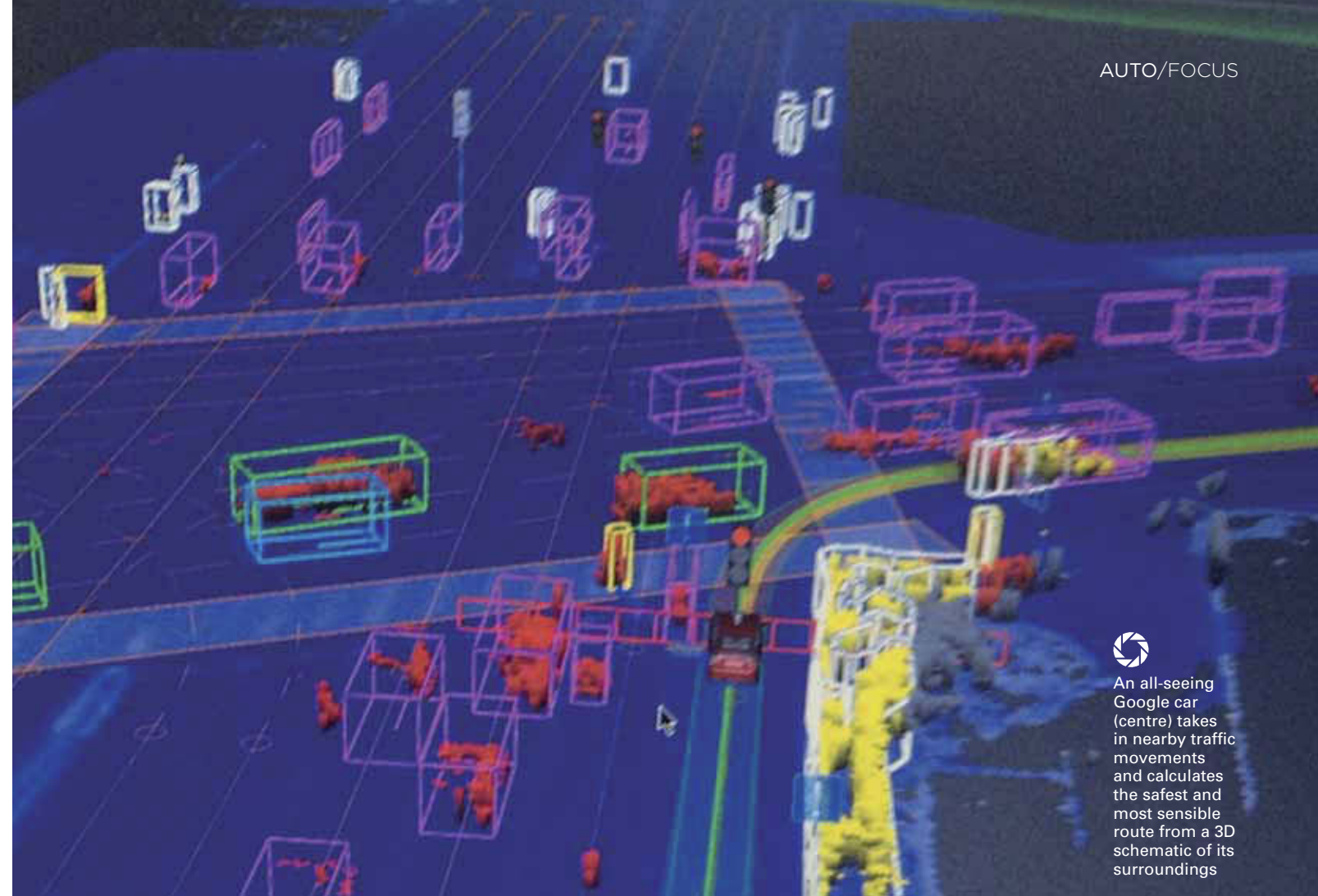
More significant was an autonomous traffic-jam assistant, perhaps the first step toward a fully autonomous car. At speeds of up to 37mph the system self-drives through congestion, steering the vehicles, operating the accelerator and brakes. Again, much of the technology used is standard, in this case ACC and Stop-Go. The system adds lateral guidance: two radar sensors monitor everything within 250m, at a scan angle of around 35 degrees. A wide-angle video camera monitors the lane markings, and can also detect objects such as pedestrians, other vehicles and safety guard-rails, while also interpreting temporary lanes in road works. Eight ultrasonic sensors monitor the zones directly in front of the car and at its corners.

The one thing the Google and Audi projects have in common is a wish to put artificial intelligence at the centre of the driverless car – but this in an enabling technology rather than an end in itself.

Closer to production is the concept of the road train, which relies on humans, albeit fewer than usual. The SARTRE Project (Safe Road Trains for the Environment) was a multi-partner, EU-funded project to develop road-train technology. Recently completed, it investigated 'platoon' driving technologies for use on motorways. The lead vehicle in a platoon would normally be operated by a professional driver, while the following vehicles would be slaved to it.

"When the project started three years ago, we were looking for benefits in fuel consumption, safety and congestion," says Eric Chan, SARTRE chief engineer from engineering consultancy Ricardo, "but we soon realised that the 'minor' benefit of convenience was a lot more significant than we had considered. We really think drivers will like it because for long, dull journeys they can get on with other tasks."

Compared with the fully autonomous car,



An all-seeing Google car (centre) takes in nearby traffic movements and calculates the safest and most sensible route from a 3D schematic of its surroundings

SARTRE is limited – but also more realistic commercially in the short term. "The thing you notice about other autonomous vehicle projects is the scanning laser on the roof," says Chan. "By itself that probably costs more than the vehicle to which it's fitted – so it isn't something that's really feasible for production in the near future."

"We want to reuse the technology already on the car. Our forward-looking radar is already used for ACC, which is already able to control a car's acceleration and braking, so we not only reuse the existing hardware but also a lot of the software. We use a camera that's in production for LDW, and don't need a fully steer-by-wire system. Instead we're able to use conventional electric power-assisted steering with some modifications to put extra steering torque overlay on top of the normal assistance. On top of that we developed the V-to-V [traffic information] systems which allow the vehicles in the platoon to share real-time data and co-ordinate control."

The road-train concept needs much less information than the fully autonomous car because the highway is a simplified environment and there's an experienced human making the decisions – albeit one person for a whole chain of vehicles. SARTRE engineers envision futures in which platoon driving is either a formal system or a looser ad hoc set-up in which drivers pick-up and drop-off the road train at will.

"We foresee both modes of operation," says Chan. "I might be driving from London to Edinburgh tomorrow, I know I want to leave at 9am. I go to a website, I see what platoons are travelling that route at the time I want, and I book a place. I might join different platoons for several stretches of that journey and drive manually in between. The second scenario is ad hoc: I'm on the motorway. I tell my SARTRE system where I'm going, it looks for platoons running that way, spots one a few miles in front and has me catch-up. When I get close the SARTRE system guides me into the platoon. Later, I tell it when I want to leave, it creates space, and I simply pull out of the queue."

As a fuel consumption measure, SARTRE makes gains simply by having vehicles drive closer together in a more aerodynamic

'I MIGHT JOIN DIFFERENT PLATOONS FOR SEVERAL STRETCHES OF A JOURNEY'

ERIC CHAN

formation. With five-metre separation SARTRE trucks recorded an average fuel saving of 16 per cent, with an eight per cent saving for the lead vehicle. For cars with an eight metre separation the saving was about 15 per cent. In terms of congestion, SARTRE diminishes the 'concertina effect', seen when drivers over-react to speed changes, and it improves safety in an arena where 90 per cent of accidents are caused by driver error, simply by reducing the number of drivers.

Safety, though, is an interesting topic for all driverless vehicles. Beyond the technical there are wider questions of social and legal arguments. The science says driverless vehicles will be safer: they will be able to react to situations with greater clarity and precision, but what happens when accidents do happen? When drivers simply become occupants, are they still responsible for the actions of their vehicle or is the manufacturer? For this reason developers are more confident in answering 'how' questions than 'when' questions.

Clearly a system that enhances road safety is desirable and in the public interest, so should car makers be given legislative protection? The issue then becomes creating an operational zone large enough to permit driverless vehicles to be a practical proposition. It requires legislatures in different states to collaborate for the greater good. But, remember, that utopian ideal is yet another mainstay of science fiction. □

PHOTOGRAPHY: DUMMY, LAT; PICKETT RACING

THE FUEL PRESSURE IS NOW ON

Latest analysis from an FIA Foundation partnership shows that countries must step up their fuel economy policies if they are to meet key targets



The time for countries to hit crucial fuel targets is running out, says the GFEI, as it presses a sense of urgency on both car makers and politicians

A

s fuel economy improves, so it helps to save money for consumers, combat the rate of climate change, and aids in reducing local pollution through the implementation of a few simple measures. So why don't countries invest more in setting and meeting better efficiency targets? A new report released by the FIA Foundation and International Energy Agency (IEA) shows that the global effort to improve fuel economy is making strides, but more needs to be done. "Fuel economy is improving, but not fast enough," says François Cuenot, an analyst at the International Energy Agency (IEA), who has carried out an international comparison of light-duty vehicle fuel economy. Using data on new vehicle registrations during 2010 and 2011, Cuenot was able to analyse the sales of different models of car and, using their fuel economy ratings, to estimate the percentage by which average fuel economy had increased in individual nations. >



The Global Fuel Economy Initiative (GFEI) works in partnership with concerned international agencies to emphasise the need for improved fuel economy. Its 50by50 campaign is working towards a 50 per cent reduction in unitary CO₂ emissions by 2050

'FUEL ECONOMY AROUND THE WORLD IS IMPROVING, BUT NOT FAST ENOUGH'

FRANÇOIS CUENOT

PHOTOGRAPHY: AKIRA SUEMORI / FIA

The results showed that pressure is rapidly increasing to meet targets set by the Global Fuel Economy Initiative (GFEI), a partnership of the IEA, FIA Foundation, United Nations Environment Programme (UNEP), International Transport Forum (ITF), International Council for Clean Transportation (ICCT) and ITS Davis.

The GFEI's 50by50 campaign is targeting a 50 per cent reduction in per vehicle.km CO₂ emissions from light duty vehicles by 2050 – by which time the global car fleet will have tripled in size – by reducing the average fuel economy figure of new cars from 8.0Lge/100km (in 2005) to 4.0Lge/100km in 2030. The latest report concludes that this is attainable using existing cost-effective technologies if average fuel economy improvements of three per cent are now made every year until 2030. Each year in which a target isn't met means that the following year's goal will be steeper. And Cuenot's data analysis shows that the global average annual improvement rate is just 1.9 per cent right now – well below target.

Sheila Watson, director of environment for the FIA Foundation and executive secretary of the GFEI, explains: "We have made the task harder for ourselves because the progress made in the last two years, when we had a little more time until 2050, was only 1.8%. The target gets harder because we're not doing enough each year. This report shows that although there has been some improvement, sadly we're still saying more needs to be done. Obviously it's great to see progress, but the pressure doesn't lessen."

While many countries are heading in the right direction (but must still accelerate their efforts), Cuenot discovered that countries which do not belong to the OECD have not been making sufficient progress. The non-OECD average annual improvement rate has been just 0.3 per cent (compared to an average OECD rate of 2.5 per cent) yet these are the countries that are experiencing huge increases in car sales – while the more carefully fuel-frugal OECD markets are falling.

"If you look at Denmark and Sweden, the Nordic countries are improving at 4-5 per cent a year, well above the target," says Cuenot.



François Cuenot: his research shows that car markets in the most fuel efficient countries are getting smaller, while those in the least fuel efficient countries are increasing. Sheila Watson (below): "There are options – and no fixed blueprint"



A fresh challenge for Damon Hill as he helps to raise the profile of fuel efficiency by joining the GFEI-sponsored Brighton to London Future Car Challenge for the Global Fuel Economy Initiative, and drives the 62 miles using as little energy as possible

Missing the target

Fuel economy improved by an average of 1.8 per cent per year between 2005 and 2008, much less than the required 2.7 per cent per year improvement rate to reach the GFEI target

New car fuel economy evolution compared to GFEI target					
		2005	2008	2011	2030
OECD	Average fuel economy (Lge/100km)	8.1	7.6	7.0	
	Annual improvement rate (% per year)	-2.3%		-2.6%	
NON - OECD	Average fuel economy (Lge/100km)	7.5	7.5	7.3	
	Annual improvement rate (% per year)	0.4%		-0.9%	
GLOBAL	Average fuel economy (Lge/100km)	8.0	7.6	7.1	
	Annual improvement rate (% per year)	-1.8%		-1.9%	
GFEI TARGET	Average fuel economy (Lge/100km)	8.0			4.0
	Required annual improvement rate (% per year)	-2.7%			-3.0%



Most countries covered by this analysis have shown good signs of continuous improvement, and the global trend is towards the improvement of the average new vehicle fuel economy. However, there is still a need the improvement rate to accelerate if the 2030 GFEI target of 4Lge/100km is to be met.

"Looking overall at the OECD countries, 2.5-2.7 per cent is quite close. But really the places that are not improving are the non-OECD ones. Even if countries like India, China and Brazil are showing limited progress, they're working on fuel economy policies that will improve average fuel economy in the coming years. These markets are growing fastest in the number of new cars being registered.

"Our target is to engage with countries and their fuel economy policies and say they'll get a lot of benefits from labelling and fiscal levers – all these kinds of policies. Such moves would be beneficial for everybody; it's a win-win situation and they need to understand that. We're working a lot with the UN Environment Programme to improve fuel economy in countries like Montenegro and Georgia, which are interested in such policies to create regional champions and engage neighbouring countries. Over the next five years they're going to sell more vehicles – so they're the big players of tomorrow."

The work of the GFEI is vital in reaching out to these nations. "When countries show an interest in hearing more about fuel economy we have developed a tool kit with various options which we share with them," says Watson. "But we do not have a fixed blueprint – it's what is right for each individual country."

'OBVIOUSLY, IT'S GREAT TO SEE PROGRESS, BUT THE PRESSURE DOESN'T LESSEN'

SHEILA WATSON

"They are suggestions only in so far as they are good ideas that people have taken on, and we have drawn them together in one place. It's very much for each country to pick a policy that suits them – because all countries are at different stages. Some are importers of cars, some are exporters. They need to take a holistic view."

Chile is one country that has sought the help of the GFEI. It experienced a 22 per cent increase in car sales over 2010-11, and is responding with the Chilean Fuel Economy/CO₂ Mandatory Labelling initiative, which started for LDVs in Chile earlier this year.

"In lots of countries the data available is very poor – some do not

have any effective [car] registration," adds Watson. "Data collection is expensive and bureaucratic and some countries have different priorities. So we help establish a baseline, then we set up stakeholder discussions and encourage the public authorities to join in."

Indeed, Watson is keen to point out that it is not only governments with whom the GFEI works, but car manufacturers, tyre companies, fuel providers and clubs.

"Clubs care about consumers and one of the benefits of improving fuel economy is that you spend less money," she adds.

This latest report has been a great measure of progress – or, in some quarters, a lack of it – and the GFEI will continue to track information. The authors of the report have called for data consistency and transparency to be improved in order to create a clearer picture of the worldwide average vehicle fuel economy and how it evolves over the coming years.

Meanwhile, the GFEI will continue its efforts to help non-OECD countries develop fuel economy policies. But, as Watson points out, mobility brings benefits, but with car growth comes great challenges: "When it comes to climate change, it doesn't matter where in the world you drive. So all cars should be as fuel efficient as possible." □



Renault COO Carlos Tavares guides his Alpine down the D122 at Bourlatier on stage one of this year's Monte-Carlo Historique

Freeze frame

ALPINE CROSSING

AUTO presses pause on the Monte-Carlo Historique to zoom in on one of the event's most beautiful entrants, the Renault Alpine A110 of Jean-Pascal Dauce, driven by Renault COO Carlos Tavares

Last year Renault revealed that it will revive the Alpine brand 18 years after the last Alpine, an A610, rolled off the production line in Dieppe.

To highlight the relaunch of the marque and to celebrate the 40th anniversary of the A110's victory in the Monte-Carlo Rally, Renault Classic this year entered five A110 Berlinettes in the Monte-Carlo Historique. In a field of 300, all five finished in the top 100.

First to cross the line for the Renault Classic team, in 24th place, was the A110 1600S of Jean-Claude Andruet and female co-driver 'Biche', the pairing that headed the one-two-three finish Alpine scored in the Monte back in 1973. Curiously, the second-placed Alpine in 1973 rally was driven by the late Ove Andersson (later

boss of Toyota's F1 programme) and co-driven by the man who is now president of the FIA, Jean Todt.

"The Alpine is the most enjoyable car ever," said Andruet afterwards. "No other car is this much fun. It's a sheer delight. I hadn't driven an Alpine since the days when I won the Rallye Monte-Carlo, but it felt like an extraordinary toy in the mountains this week. Its efficiency was truly astonishing."

The car in this picture, however, is not Andruet's but the 1300 model belonging to Alpine-Caterham project director Jean-Pascal Dauce. With Renault chief operating officer and confirmed motor sport enthusiast Carlos Tavares at the wheel and Dauce co-driving, the pair finished the Historique in a creditable 76th place. □

The driver – Carlos Tavares Chief operating officer, Renault

A former French Touring Car Championship racer and regular EuroBOSS series driver, Renault's COO Carlos Tavares is a dyed-in-the-wool motor sports enthusiast. He drove Renault's Alpine A110-50 concept car at last year's Monaco Grand Prix and says the chance to drive the 1971 A110 in the Monte-Carlo Historique was the perfect opportunity to sample the Alpine brand's DNA. He was not disappointed.

The co-driver – Jean-Pascal Dauce Project director, Alpine-Caterham

"This picture is on the first stage, the Burzet to Burzet leg on Monday 28 January. We were quite tired having done 1000km in a raw concentration leg just before this – that is 18 hours of driving before we even started this stage. We were very focused on the job in hand, and I believe we did this stage at an average speed of 49.7km/h. There was plenty of snow and it was great fun."

The car – Renault Alpine A110 1300 model, built in 1971

"The car was made at the Alpine plant in Dieppe and was a customer car, not a competition version," says Dauce. "I bought it 25 years ago and it was my first car. I was 21 and crazy about the Alpine A110. It took nine years to restore and every nut and bolt has been removed, checked, changed or rebuilt. It was displayed at the 2012 Paris motor show and at the Alpine-Caterham launch."



PHOTOGRAPHY: DPP

\$470bn

\$433.53bn

\$216.21bn

\$221.9bn

- Ferrari
- McLaren
- Toro Rosso
- Red Bull
- Caterham
- Mercedes
- F1 Global
- Lotus
- Sauber
- Williams
- Force India
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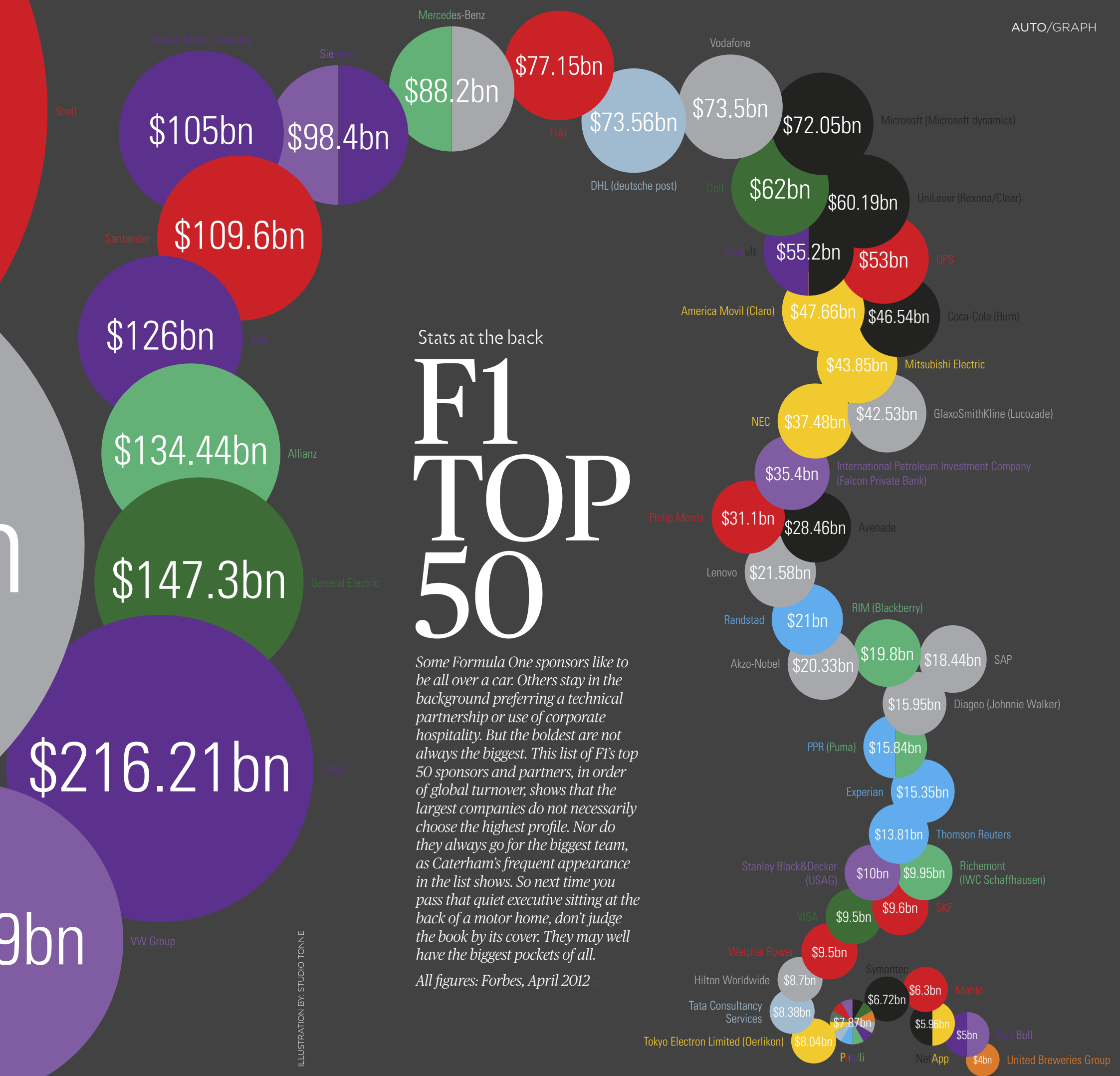
ILLUSTRATION BY: STUDIO TONNE

F1 TOP 50

Stats at the back

Some Formula One sponsors like to be all over a car. Others stay in the background preferring a technical partnership or use of corporate hospitality. But the boldest are not always the biggest. This list of F1's top 50 sponsors and partners, in order of global turnover, shows that the largest companies do not necessarily choose the highest profile. Nor do they always go for the biggest team, as Caterham's frequent appearance in the list shows. So next time you pass that quiet executive sitting at the back of a motor home, don't judge the book by its cover. They may well have the biggest pockets of all.

All figures: Forbes, April 2012



Back to the future

ON A FAST TRACK TO SAFETY

Formula One's new medical rescue co-ordinator, Dr Ian Roberts, discusses the challenges he's facing and why advanced specialist training is the key to ensuring safety on the world's race tracks



Roberts, a consultant anaesthetist, will be at the sharp end of trauma care whenever there's an F1 injury

The Medical Rescue Co-ordinator is at the heart of safety practice in Formula One. Paired with the driver of the medical car, he is first on the scene and the primary point of contact at any racing incident. The job has changed dramatically in recent decades but, as he settles into the hot seat, Dr Ian Roberts also ponders the future with AUTO.

Q First, explain a little of your background?

A My medical background is that I'm a consultant in anaesthesia and intensive care at a hospital in north Warwickshire. In motor sport terms, I've been chief medical officer at Silverstone for a number of years and also of the British Grand Prix. Before that I was deputy chief. The role of deputy is quite important because while the CMO sits in race control most of the time, the deputy is free to move around the services, and I felt it was part of my duty to make sure the people were not only in the right place doing the right job but also that their welfare was being looked after. It's very similar to what I'll now be doing.

Q How much of a challenge is Formula One?

A The new role is going to be extremely challenging. Certainly, my predecessor, Gary Hartstein, had a very good apprenticeship with the great Sid Watkins, whereas

I'm going in fairly fresh, so it will be a challenge. But it's extremely exciting.

Q How will you familiarise yourself with the systems the FIA currently has in place?

A It's all down to team effort. I'll be on a steep learning curve, I'm fully aware of that, but with the help of the guys within the current FIA team that curve will be sharp but short. Obviously, working with [medical car driver] Alan van der Merwe is something I see as a key partnership. His support is crucial. To me it's actually a bit unsafe, in the event of an accident, to think 'Well, I'm the doctor, I'll just get in there and do it.' You need to be supported by other people and you must also work closely with the host country's medical team. These guys know their stuff, they know the environment, they've been specially selected and the FIA specifies the level of equipment they need. It's all about bringing that together, helping them work as a team.

Q The last three decades have seen great

'UNFORTUNATELY, THERE ARE PARALLELS BETWEEN MILITARY AND MOTOR SPORT TRAUMAS'

IAN ROBERTS

advances in track safety and motor sports medicine. How do you see it evolving?

A One of my biggest bugbears is that a lot of people think safety is purely down to the doctor, but that's just not true. The doctor sees the end product; we're there to pick up the pieces. The truth is that safety starts with the designers, the engineers and the regulators. It has to be a consultative process. Doctors need to be involved with the design and engineering process, interfacing with the teams and saying, 'Look, if you don't do this, this is the type of injury that's going to happen.' Again, it's about teamwork. It's working with other professionals and sharing your abilities to provide a better outcome. Training is also a key issue for me. The FIA Institute, with its motor sport medicine course, has the right idea. We need to attract doctors into the sport and we also need to progress those doctors. We need to give them a basic grounding and then develop them, add value to them, so that they can specialise. Teach them administration; bring them into trauma teams; educate them about every aspect of the role.

Q What about new medical technology?

A Are techniques being developed that you think will be applicable to motor sport?

A There have been an enormous number of advances in trauma treatment over the years. A lot of those advances, for good or ill, have come from military situations, but there are absolute parallels, unfortunately, with the type of trauma you might see in motor sport. You have to remember that the traumas potentially suffered by racing drivers now are probably extreme. The car is so cleverly protected by good engineering that drivers are surviving both mild and moderate traumas. So if they do get hurt, then that injury is going to be quite severe. And certainly, there are medical advances going on in trauma care and we have to thank the military for that at least. □

PHOTOGRAPHY: ALICIA CANTER

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