



AUTO+ MEDICAL

FIRE SIMULATION TRAINING

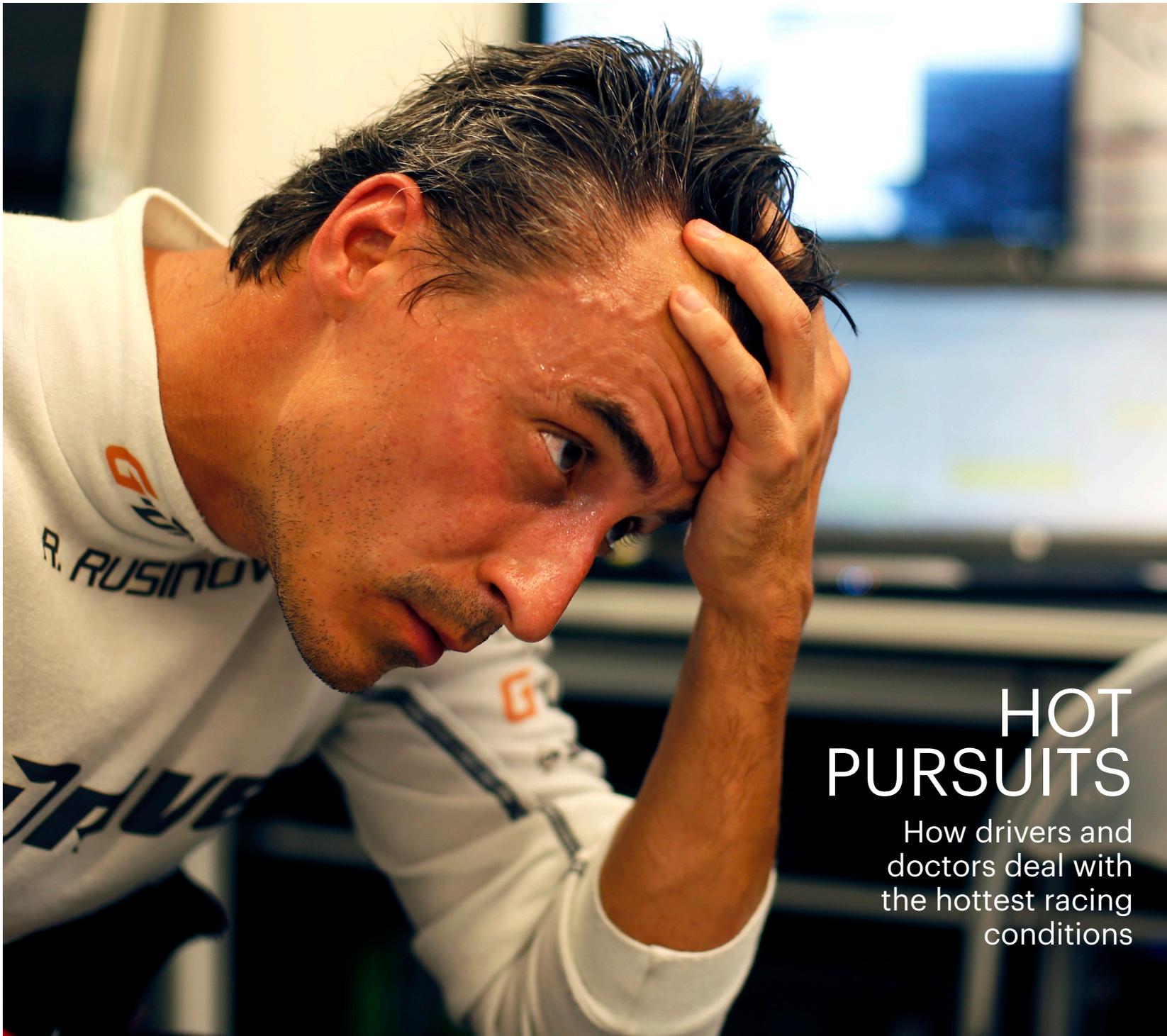
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HOT PURSUITS

How drivers and doctors deal with the hottest racing conditions

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We welcome your feedback: medical@fia.com



Welcome to the new issue of AUTO+ Medical. Since April, when the last issue was published, there have been a few major accidents that have hit our sport and really demonstrate the importance of the medical staff at our events.

This publication is for them - the Marshals, Rescue Teams, Paramedics, Nurses, Doctors and Surgeons involved in our drivers' care.

In our cover story, we take a look at the hot conditions at this year's 24 Hours of Le Mans, the demands on the drivers and the views of experts on heat stress.

We speak to Audi Sport's Dr Vincenzo Tota, about his role as a team doctor and the challenges that brings. We also look at modern fire training simulation techniques, and how immersive scenarios can result in more applicable knowledge when it comes to avoiding disaster.

In our regular Road Back feature, we speak to Formula E driver Lucas di Grassi, who took two podiums in Berlin on what was later discovered to be a broken leg.

Our scientific article looks at a systems-based approach to providing medical care for an extremely remote motor sport event.

I hope you enjoy the latest issue.

Dr Pedro Esteban, FIA Medical Delegate, FIA World Rallycross Championship

LETTERS

In this section, we print the best letters and emails received from readers around the world. We welcome comments on articles as well as suggestions for future content. If you wish to send in a letter or email, please direct it to: medical@fia.com

Dear Editor

I turned up to my first motor sport event in 1984 with little knowledge of the sport or the challenges the medical teams face. Over the years I have seen some terrible accidents and injuries, but with the work of the FIA both track and vehicle design and safety have improved beyond belief, with serious accidents and injuries the exception rather than the rule. However, this year I have seen one of the most awful accidents anyone can imagine with Billy Monger, the 17-year-old FIA British Formula 4 driver hitting a stationary car on the track at Donington race circuit on Easter Sunday. There can't be many who don't know about this accident, with the camera footage from Billy's car broadcast live on TV around the world and on the internet, just as the accident happened. The subsequent challenges faced by Billy with the loss of both legs have been an inspiration to everyone in motor sport.

When our medical team arrived on the scene we were faced with two drivers trapped in single seater cars, Billy with serious leg injuries and Patrik Pasma, the other driver involved, complaining of severe spinal and leg pain. Both were conscious and presented our medical team with one of the most challenging medical interventions I have ever been involved with. This accident has raised many questions that I hope will be addressed by AUTO+ Medical in future issues. We hope to talk to Billy about his recovery and the challenges he faces – his first question to me when he came to see me only five weeks after the accident was “how do I get my licence back?” Well he now has his licence

back having passed a stringent test set by the MSA and is looking to compete again. A few weeks later we were challenged again with a multi car accident in the British Touring Car Championship, arriving on scene to find three drivers injured, one unconscious with an obstructed airway and a minor leg injury, one trapped, unconscious with serious chest, leg and pelvic injuries, and one conscious trapped with serious chest and shoulder injuries. As well as this there were two other cars with drivers who had hit the barriers.

Our medical, extrication and disincarceration/ rescue teams worked incredibly well to deal with this; two drivers were airlifted to the major trauma centre, one went by road. The FIA, Global Institute and MSA have all been incredibly supportive and have produced some impressive work very quickly following these accidents. We should always learn from these events and improve where we can and there are a number of issues we hope to address in future editions of AUTO+ Medical:

- Having appropriate and experienced medical staff and the training we should have in place
- The type of rescue equipment we need and the training of the disincarceration / rescue teams
- The importance of the extrication teams and the training they need
- The availability of Air Ambulances and the communication before the event with the major trauma hospitals
- Communication with relatives and whether they should be allowed at the scene of prolonged and life threatening entrapments

- The level of equipment we carry in the medical cars and other units
- The emotional impact on all those involved and how we deal with it, particularly the marshals who are always the first on scene
- Support for injured competitors (and relatives) and their reintegration back in to the sport
- Recording what happens and keeping appropriate accurate records; use of body cameras or in-car cameras
- Debrief for all those involved after major accidents

We would love to hear from everyone what they think and if anyone would like to contribute to discussing these subjects in future issues please contact us.

Dr Paul Trafford
 Medical Director, TOCA / BTCC
 Chairman, AUTO+ Medical Editorial Board

Editor: Thank you for your comments on what must have been a traumatic experience. We encourage all readers to contribute to this important discussion.

Dear Editor,
 We were very pleased to receive your Magazine. The news and features were good, relevant and important that we received. We are not yet at the level of the references and work that the issue expresses, but... we learnt a lot. As we are currently rehabilitating the Main Track of the Main Course in Mozambique, where we host Drag Racing races and we have a Karting Track, where we hold karting and drifting events. Do you have the magazine in Spanish? If yes if you wish to continue to send us the magazine Auto +Medical we would prefer it in Spanish. Best wishes and kindest regards,

António Marques
 President, Automobile and Touring Club of Mozambique

Editor: Thanks for your comments about the previous issue. It is good to know that the content is helpful to you and your team. Unfortunately it is not available in Spanish but we hope you will continue to read it in English!



A dozen drivers were involved in a serious pile-up during the British Touring Car Championship in June.

GLOBAL NEWS

Frédéric Sausset in action in his team's Morgan-Nissan in 2016



FRÉDÉRIC SAUSSET LAUNCHES DISABLED DRIVER ACADEMY FOR LE MANS

Quadruple-amputee Frédéric Sausset has launched an academy for disabled drivers, which will eventually culminate in a three-person team racing at the 24 Hours of Le Mans event in 2020.

Sausset, who lost all four limbs after an infection in 2012, raced at Le Mans in 2016 with a specially-adapted steering wheel under the Garage 56 entry, reserved for innovative and creative car entries.

Now, the Frenchman is looking to help other disabled drivers with Le Mans aspirations to fulfil their dream. 'Un Volant Pour Tous', which translates as 'A steering wheel

for all' will comprise of 20-25 racers, three of whom will be chosen to race at Le Mans in 2020.

"I want a sustainable academy of excellence that is not just a one-shot," he said. "I want to use my experience over the past couple of years to help people of all disabilities from around the world to race cars at all levels."

British teenager Billy Monger, who had both lower legs amputated after his Formula 4 crash in April, has also been invited by Sausset to join the initiative.

The academy will conduct tests on the Bugatti Circuit at Le Mans in November.

CLOSED CAR TRAINING IN ACTION AT NHS SCOTLAND EVENT

An FIA closed car training simulation device was used at a medical event in Scotland, with Wales Rally GB Chief Medical Officer Dr Ben Shippey there to oversee proceedings.

The NHS Scotland event, held at the Scottish Exhibition and Conference Centre in Glasgow in June, comprised of over 80 exhibitors throughout the medical sector.

The 'Extrication Challenge' was used as an engaging and interactive means of getting attendees involved in a live training exercise. The closed car device, made by medical education company MDT Global, provides an immersive training exercise for extracting trauma patients from vehicle incidents, with those taking part in the challenge aiming to do so in the quickest time possible.

These training simulations have clear links to motor sport. With training demonstrations focused on being a first responder to a road traffic accident, the idea was to give attendees an insight to the initial processes required after encountering such a situation.

Dr Shippey has in the past fulfilled the role of Chief Medical Officer of the Mull Rally, an event that is notoriously difficult to monitor due to the sparsity of marshals and the remoteness of the setting itself.



BMF HOSTS 2017 MEDICAL SEMINAR

The Bahraini Minister of Health was among the attendees at the ninth Bahrain Motor Federation medical seminar.

Held at the Bahrain International Circuit (BIC), Faeqa bint Saeed Al Saleh oversaw more than 120 participants conduct extensive extrication training under the guidance of Dr. Jean-Jacques Issermann, Special Delegate of the President of the FIA Medical Commission.

Training included Formula One, closed car and rapid extrication exercises, as well as hands-on airway management and advanced cardiac support training.

The Seminar was opened with a speech by Bahrain Motor Federation official Abdulaziz Al Thawwadin, BMF Motor Sports Marshals Club President, Fayeze Fayeze, and the Chief Medical Officer of Bahrain Formula One Dr. Amjad Obeid.

Further talks were held by Medical Director at Canadian Motorsports Response Team Rob Seal on the use of video laryngoscopes, as well as BIC Deputy CMO Dr Rami Al Ansari, who advised on the emergency medical skills required to demonstrate in the event of an on-track incident.



MONGER AIMING FOR QUICK RETURN

British Formula 4 driver Billy Monger, who sustained life-changing injuries after losing both his legs in a crash at Donington Park racetrack on April 2017, is determined to return to racing.

The 18-year old racer crashed, unsighted, into the back of Patrik Pasma's stationary car during the final race of a weekend that had already earned him a podium finish. Marshals led by event CMO Dr Paul Trafford carefully extracted Monger from his car in a process that took more than an hour and a half, before he was transferred to Queen's Medical Centre in Nottingham.

The injuries sustained were so severe that he had to have both of his lower legs amputated. However, huge public interest in a crowd-funding initiative has helped to raise over £800,000 for Monger's surgery and rehabilitation, and he has shown strong resilience and sheer determination to get back behind the wheel.

Already, he has performed tests at Brands Hatch for the Team BRIT Fun Cup outfit, a racing team charity dedicated to aiding the rehabilitation of injured racers and servicemen.

Monger will make his full racing return at Estoril, for the VdeV Series in November.



Three drivers were taken to hospital, with one placed in a medically-induced coma

THREE BRITISH TOURING CAR DRIVERS HOSPITALISED AFTER CRASH

A dozen British Touring Car Championship drivers were involved in a serious pile-up during qualifying for the Croft rounds of the championship in June.

An oil line on Motorbase driver Luke Davenport's car leaked and sent oil spilling all over the already-wet track, causing cars behind to slam into one another.

Jeff Smith ended up striking the side of Davenport's car, causing a large intrusion to the car and serious injuries to both drivers. They were taken to James Cook Hospital in Middlesbrough, along with Aaron Taylor-Smith, who sustained a broken leg.

Taylor-Smith was released the following day, but Smith, who sustained extensive chest and

shoulder injuries; and Davenport, who suffered a broken right leg, broken right arm, broken pelvis, and chest and lung damage remained at the hospital.

BTCC Series Director and Administrator Alan Gow says that the safety of modern touring cars saved lives in the incident. In an interview with Motorsport.tv, he said: "if we had been using the older generation of cars, we wouldn't be talking about injuries - we would be talking about something else."

Davenport has since been woken from his coma and has begun his recovery at the hospital in Middlesbrough. Smith will be replaced for the remainder of the season by his son Brett.

SEAN EDWARDS TEST IMPLEMENTED ACROSS MOTOR SPORT SERIES

Non-profit organisation The Sean Edwards Foundation (SEF) has developed a safety test for motor racing drivers across a number of national and international racing series.

The Sean Edwards Test (SET) is a multiple-choice quiz, developed in collaboration with the Stéphane Ratel Organisation (SRO), and can be taken on any mobile device.

It features a random selection of 20 questions, each testing the driver's safety knowledge. If they answer fewer than 15 questions correct, they must speak with the Clerk of the Course. Subjects include knowledge of flags, the Safety Car, weather, and several other topics.

The organisation's namesake, Sean Edwards, was a highly successful racer, who was on the cusp of winning the 2013 Porsche Supercup Championship, before a tragic accident claimed his life in October 2013.

Edwards was coaching a young driver in Australia, when the car left the track at high speed and hit a concrete wall. The SEF is now committed to raising awareness of safety in motor sport.

The SET was piloted in all SRO series in 2015, when 450 drivers took the test. After positive feedback from organisers, marshals, and race directors, it was more widely implemented for 2016.

It is currently used by the SRO's British GT, Blancpain, and Intercontinental GT Challenge series, as well as MSVR's LMP3 Cup and GT Cup, and BRDC Formula 3.



British GT drivers take the test at Spa-Francorchamps

NEW MEDICAL DELEGATES FOR FIA SERIES

Two new medical delegates have been appointed in two different flagship FIA World Championships.

Dr Alain Chantegret, appointed in February 2017, is the new Formula One Medical Delegate. Dr Chantegret has vast experience in the sport, previously occupying the role of head doctor at the Circuit de Nevers Magny-Cours in France, which held a Grand Prix from 1991 to 2008.

Dr Chantegret has in the past

also fulfilled the role of Medical Delegate for the FIA World Endurance Championship.

This role has now been taken over by Dr Christian Wahlen, who previously served as Chief Medical Officer at the Circuit de Spa-Francorchamps in Belgium for 25 years. Alongside his WEC position, Dr. Wahlen will be performing the same duties for the FIA World Touring Car Championship.



Dr Alain Chantegret is Formula One Medical Delegate

BRAZIL TO HOST REGIONAL MEDICAL SEMINAR

The Confederação Brasileira de Automobilismo will host the 2017 FIA Americas Medical Seminar on 14-15 October in Sao Paulo, where the focus will be on rallying and off-road events.

Medical professionals from both North and South America will meet to discuss the latest findings in motor sport medical provision, partaking in theoretical discussions and practical exercises.

Chief Medical Officers and their deputies from the region will discuss general topics such as their roles and responsibilities during motor sport events, anti-doping measures and administrative considerations, as well as more focused areas specific to rallying and off-road racing including altitude problems, survival kits needed in cross-country racing and the medical organization required at rally events.

In addition to theoretical discussions, practical exercises will see those in attendance cover a wide range of issues including extrication, anti-doping and dealing with on-track incidents, via simulated scenarios to be hosted at the Interlagos Curcuit in Sao Paulo, home of the Brazilian Grand Prix.

NEW CHIEF MEDICAL OFFICERS APPOINTED FOR FIA EVENTS



Dr Nick James is CMO for World Rallycross in UK

Four new Chief Medical Officers have been appointed for major FIA motor sport events in 2017 and beyond.

Dr Ben Shippey will step into the role of Chief Medical Officer for the Wales Rally GB in October, the penultimate round of the 2017 season. Dr Shippey's experience includes 15 years on the Grand Prix team at Silverstone Circuit, as well as Chief Medical Officer for the 2015 Race of Champions held in London.

Meanwhile, Dr Nick James has been drafted into the equivalent role for the World RX round of Great Britain, which from 2018 will relocate from Lydden Hill to Stowe Circuit at Silverstone. In the past, Dr James has facilitated the role of Clinical Lead for the Grand Prix team at Silverstone Circuit.

As well as the two appointments in Britain, Dr Dominique Vivier has also recently been appointed as CMO of the 24 Hours of Le Mans, and oversaw all medical proceedings at the 85th running of the event in June.

Finally, Dr Pankil Patel, a Gauteng-based General Practitioner, has been appointed CMO of the inaugural World RX of South Africa, which will form the final round of the 2017 season in November, based at Killarney Motor Racing Complex in Cape Town.



FEATURES

HOT PURSUITS

How drivers and doctors dealt with this year's Le Mans 24 Hours, one of the hottest races on record

Imagine you're a racing driver blasting along the Mulsanne Straight during the Le Mans 24 Hours, hitting speeds of 300kph as you overtake numerous cars in one go. Now imagine it is 40°C in the cockpit, you are wearing three layers of overalls, a helmet and gloves, and you are tightly strapped-in to your seat.

Sometimes racing is less enjoyable than it seems. It also requires high levels of fitness and preparation for all circumstances, particularly sweltering temperatures in the cockpit.

During this year's Le Mans, ambient temperature readings clocked above 30°C for the majority of the daylight driving hours, and were much higher than that inside the cockpit.

"It is obvious that the drivers all suffer in these hot conditions," says Dr Dominique Vivier, Chief Medical Officer at Le Mans. "They are wearing fire-proof overalls, helmets and gloves, and they are driving within

closed cockpits in which the temperature is high, even in normal conditions. Heatwave conditions are demanding – physiologically and psychologically – for the body, and drivers feel more tired as a result. This is why they must all be in excellent physical condition to race in endurance racing, and in the Le Mans 24 Hours in particular."

The risk of driving in the heat is not merely one of increased tiredness, it can be truly dangerous in extreme cases.

"Effects related to high temperatures include fatigue, dehydration (which can lead to coma in certain cases), and body convulsions, which could pose risks by overtaking the body temperature regulation mechanisms," says Vivier. "In medicine, malignant hyperthermia is characterised by body temperatures above 40°C and above. This situation can lead to hospitalisation in intensive care or resuscitation units."



José María López says the most gruelling time for a driver in the heat is during pit stops

CORE CONCERN

The human body is happiest at an optimal internal temperature of 37.5°C. The body is able to regulate its temperature in a number of ways – shivering when cold helps to raise the core temperature, and perspiring helps to send the temperature the other way, with the evaporating moisture cooling the body from the outside. But what if evaporation is hampered by numerous layers of clothing?

Professor Claude Meistelman, a lecturer at the University of Nancy, and expert in heat stress, says that developing a driver apparel solution that is both fireproof and sufficiently breathable is a fine balance.

"At a cockpit temperature of, say, 32°C, if the driver is wearing three layers of overalls with a lack of permeability, he will store heat very rapidly. More breathable overalls are more efficient in heat dissipation, and the rise in central core temperature is slower than with less well-vented overalls."

One man who can attest to the sizzling weather in Le Mans this year is José María López, one of three drivers of the #9 Toyota LMP1 car. "It was hot all weekend in Le Mans this year," he said. "In the cockpit, it's all closed. There's no air coming in, so when you are in the car for two or three hours, it gets difficult".

A full service stop in endurance racing takes roughly a minute and involves a change of all four tyres, as well as a brimmed fuel tank, and a swap of driver. Regular tyre/fuel stops take slightly less than this, but they are nonetheless

“ YOU BREATHE HOT AIR... IT FEELS KIND OF LIKE YOU ARE SUFFOCATING ”



Prof. Meistelman says breathable overalls are more important than air conditioning

one of the toughest parts of a race in hot climates.

"The worst time is when you stop, you don't want to be in there a long time," says Lopez. "There's no air coming in, and all the heat is coming into the car because the engine is stopped and you're not moving. The car is suffering, and you're suffering too."

López echoes Professor Meistelman's point about heat storage and build-up being the key factors when it comes to driving in the heat. "It gets uncomfortable in there," he says. "When you first start, it's okay, but the heat suddenly comes quite quickly. It's most noticeable with the breathing, because you breathe hot air and you sometimes have this sensation kind of like you're suffocating.

"That's why racing drivers – especially endurance drivers – have to be fit, because we spend a lot of time in the car in conditions like this. We have to be used to the conditions, but there are races sometimes like at Le Mans and the Circuit of the Americas where it can

be extremely hot in the car and difficult to manage.”

The Circuit of the Americas (COTA) – and more specifically the FIA World Endurance Championship (WEC) race there in 2016 – was one of the catalysts for a new heat-related rule in the championship which limits continuous driving time to 80 minutes if the ambient temperatures will reach 32°C. Race-winner Timo Bernhard described the conditions as “brutal”, with temperatures reaching 35°C during the race.

A heat stress study by Professor Meistelman documents that at the Acropolis Rally in Athens in 2001, the ambient temperature was 33°C, very similar to that seen in Le Mans this June. A by-product of this heat at the Greek rally was an internal cockpit temperature of 46.5°C in cars without air conditioning, and a core body temperature of 39.2°C for drivers of said cars, which can be a dangerous level at which to operate.

“Teams should understand that if the central core temperature of the driver is above 38°C, there is a risk that performance could be influenced” says the Professor. “I can’t say if this is equivalent to the driver losing a certain amount of time or driving a precise amount slower per lap, but he will be more prone to mistakes, such as going off, or spinning the car.”

PREPARATION AND PERSPIRATION

Despite rigorous training regimes it is near impossible for drivers to truly acclimatise to hot conditions in a cockpit.

“Some drivers expect an improvement in adapting to the conditions if they spend a few days in a hot environment before the race,” explains Professor Meistelman. “However, this is a hopeless endeavour, because adaptation to hot environments requires several weeks and is

“IF A DRIVER'S CENTRAL CORE TEMPERATURE IS ABOVE 38° C, HE WILL BE MORE PRONE TO MISTAKES, SUCH AS SPINNING OFF”

not guaranteed for anybody.”

Dr Vivier echoes this sentiment, saying it is “absolutely not possible” to acclimatise to driving in the heat. “One can’t train to overcome these high temperatures conditions. The human body is made to ensure an optimal, controlled temperature at 37.5°C.”

Since the body has no need to remain at a constantly high temperature, prolonged exposure to heat will do little for a racing driver other than to make them familiar with the sensation of warmth in the cockpit.

“The body sweats to cool itself, and produces the sensation of thirst when it starts to dehydrate,” explains Dr Vivier. “However, the body temperature cannot significantly rise in normal conditions.”

In a hot race, then, sweating really is a driver’s best friend. Air conditioning and other cooling techniques such as liquid-cooled underwear are ineffectual in the long run, making permeable overalls and sweating the first line of defence in body temperature regulation when driving in the heat. This, of course, means a lot of lost fluids.

“Hydration is important, but it’s not just a case of drinking a lot,” says López. “You need to be careful, because you might be told to drink three litres of water – but if it’s only water, you will wash all of the salts out of your body, and that will make things even worse.

“You need to take supplements, salts, and

things that help you to retain the water in your body, which can be found in sports drinks. These will help you keep water in the body for a long time. If you only drink water, you will be going to the toilet every 10 minutes.”

WELL-OILED MACHINE

Thankfully, the 2017 edition of the 24 Hours of Le Mans ran perfectly despite the extensive heat, according to Dr Vivier. This had much to do with preparation and messages of advice for teams, drivers, and spectators.

“Temperatures were at times above 35°C, and this was for several consecutive days with little to no cooling of the air overnight. I had fears in terms of the effects of these temperatures, not only for the competitors and their teams, but for staff around the circuit, and the general public who were present in large numbers.”

Close to 260,000 spectators were at the circuit over the week, more than doubling the town’s population of around 148,000. The volume of fans pouring into the venue means

that there are two separate medical facilities; one for drivers, and one for the public. Packed grandstands all week coupled with the weather could have presented a higher amount of visits to the stands for medical staff, but Dr Vivier says it was business as usual.

“Heatwave weather conditions can cause difficulties for the Medical Centre, but activity was similar to previous years, both for the track Centre and the spectators Centre.”

There were 54 causes for medical extraction of spectators, and seven such cases for drivers on-track.

“Expertise and anticipation made the event run smoothly, and the public followed the prevention and awareness messages regarding the heat effects. In this situation, the right thing to do is to seek shade as much as possible and rehydrate steadily and significantly. When the sensation of thirst occurs, it means that the dehydration mechanism is already engaged, so it is important to have this rehydration reflex constantly.”



Aston Martin driver Stuart Hall takes on board vital fluids after a stint in the car

DR VINCENZO TOTA

Official team doctor, Audi Sport MSc (Sport Psychology), Specialist in Sport Medicine Traumatology, Degrees in Medicine & Surgery and Osteopathy

Dr Vincenzo Tota is the team doctor for Audi Sport and Medical Director of TechMed. He talks to AUTO+ Medical about how his past career as a racer has equipped him for his role, and the challenges of preparing drivers for the demanding and technology-driven world of modern racing.

AUTO+Medical: What is your background in motor sport, medicine and training?

Vincenzo Tota: I was a racing driver myself, I raced for many years in off-road racing, and then in offshore racing. This gives me a very good perspective of what is going on with racing drivers.

I also have a good knowledge of engineering and ergonomics. When you're doing the off-road races, you are obliged to do the mechanics yourself – if you have a problem in the middle of the Sahara desert, you need to fix it yourself.

A+M: In your current role with Audi Sport, what kind of work do you do with teams and drivers?

VT: I'm the official team doctor, so I'm responsible for everything that Audi Sport does. Whatever they do, I'm involved, and I have a group of five doctors working with my company TechMed, so even if I have clashing events, there is always one of my team covering the medical side of these events. We take care of the team, we take care of the drivers, and we supervise the safety of the tracks where we go.

A+M: What are the biggest challenges you've faced when providing medical care trackside?

VT: Dealing with champions and other very good drivers is always challenging, because they always want to test if you are an expert, with a good updated knowledge. They keep questioning you on every single detail, and this pushes myself and my colleagues to keep updated on the latest technology or the latest discoveries in motor sport and in sport medicine. I'm also very much involved in safety, so I always push Audi to be careful, to not go testing where it is not safe, and if it is not enough, I will push the race crew to improve their level of safety.

A+M: Can you give an example of a track you've really pushed to try and improve?

VT: Wherever I go, I check with the medical questionnaire, I check with the local doctors, and if we go testing in a special location, I always like to have a very good standard, almost like an FIA event. When it's a race, it's

always an FIA-sanctioned event, but when we go testing it might be that it's only one car testing, so I'm always pushing to have the best performance and the best care.

A+M: How has your experience as a driver helped your role as a medical professional?

VT: I know exactly – from the physical and mental point of view – what are the stresses, and where you need to be extremely strong, so this helps me in giving them the best advice in terms of physical preparation, hydration, mental training, relaxation techniques, anger management, how to convert negative energy into positive energy, and so on. I know all about these things, just because I've done it myself.

“ I WAS A RACING DRIVER FOR MANY YEARS - THIS GIVES ME A GOOD PERSPECTIVE OF RACING DRIVERS TODAY ”

A+M: What do you think are some of the biggest changes in driver fitness and development that have happened in motor sport in recent years?

VT: We have had two big milestones in fitness and mental training: one is Ayrton Senna, and the other one is Michael Schumacher. These two raised the bar incredibly high, and they set the base for modern training. Before, there were good talents with basically very little training. Now you can really build up and

Dr Tota's experience as a racer gives him a unique insight into the mind of a driver



increase the level of professionalism, increase the level of preparation – increase every single detail. And we have to thank these two guys.

A+M: What do you think are the most important areas of training and nutrition for a driver who is becoming professional?

VT: The most important thing is that you start racing pretty early in your life, and you need to learn when you are 14-15 years old, to be professional, be disciplined, to respect rules, to respect your body, that is the biggest asset that you have. So basically, I teach the young drivers to be very careful with themselves and to respect themselves as much as they can, in order to perform better when they are racing.

A+M: Are there any particular things you would tell them to eat?

VT: I cannot give them a diet, because everyone has a different one, but I can give them advice on what to do, what not to do, and the main principles of how to be healthy, and how to enhance their performance with food. These are things like not eating junk food, not overloading the liver – the most important thing in your body – and not putting on too much weight.

Essentially, it's different depending on if you do sprint racing or endurance racing. In endurance racing you need to have slightly increased body fat, because in a 24 hour race, for example, you really need to have some reserves. If you are sprint racing, the leaner and thinner you are, the better it is for the performance.



Dr Tota briefs the rest of the medical team at a race meeting

A+M: Is there a difference between off-road racing & rallying, and closed-circuit racing?

VT: Rallying is a more demanding event. They have ten hours a day of driving, versus one

“ YOU NEED TO START RACING EARLY IN YOUR LIFE, SO THAT YOU ARE PROFESSIONAL AND DISCIPLINED ”



Dr Tota with nine-time Le Mans winner Tom Kristensen (right)

and a half for a sprint race, including tests, free practice and qualifying. So a rally driver is definitely closer to an endurance driver, in terms of food and body mass percentage.

A+M: What about Formula One, where the G-loads of a driver are particularly high?

VT: In Formula One, the most important thing is to have very strong muscles in the neck, because the neck is what is under strain in every corner, braking and acceleration. You cannot rely on the headrest, because if you are leaning on it, you are upsetting the vibrations, so you really need to have a very strong neck and very strong muscles.

Isometric contractions are where you keep in a fixed position, and are one of the most demanding things for a muscle to do. They are needed to keep the correct position, and require a lot of energy. For that reason, drivers need to be in really top conditions to face the isometric contraction, because of the really high G-forces.

A+M: Are there other activities that help with driver training and development?

VT: I do suggest to my drivers to do the training of a kick-boxer or a Muay Thai boxer – but without the fighting. That kind of training focuses on reaction time, speed, agility, flexibility, and powerful, explosive movements, and that's the best training that I always suggest to my drivers.



IN THE LINE OF FIRE

How the latest fire training simulations are helping to make motor sport a safer environment

Under normal circumstances, a human being cannot withstand the ferocious, 700 degrees Celsius heat of being engulfed in flames. Within a few seconds, they would be in agonising pain and would swiftly perish.

However, a racing driver wearing FIA-standard protective underwear, boots, gloves, helmet and overalls can remain unscathed for around 15 seconds, improving their chance of survival and giving marshals a chance to intervene.

This scenario was powerfully demonstrated in a simulation featuring safety companies DZ Engineering, Haagen, MDD, Geobruigg and Stand 21 at the FIA Sport Conference in Geneva in June. The collaborative effort simulated a fire in an open-wheel race car,

using a full-scale model supplied by Haagen for fire safety training.

The simulation started as an incident on track, indicated by a digital flag, manufactured by DZ Engineering. Marshalls were ready behind their post, manufactured by Geobrugg and designed to protect track workers around the circuit. The fire gained momentum and the driver was soon covered in flames. The fire team – a combination between Stand 21, Haagen and a local fire brigade – were on hand to put the fire out.

The driver was fully equipped with the mandatory FIA-approved clothing, supplied by Stand 21, and was protected against second-degree burns for around 15 seconds. The flames were extinguished and the driver (in this case a stunt man) emerged, sweaty but unscathed.

This kind of demonstration is typical of the situation that fire teams must be prepared to deal with at race tracks across the world. It is essential that marshals receive fire safety training specific to motor sport, according to Leon Timmermans, Managing Director of Haagen, which supplies training both in motor sport and in public situations.

“As we all know, there is a lot of risk of fire in motor sport. A lot of the marshals and firemen who work on specific circuits around the world have a sort of ‘double role’ – they are either a volunteer or a professional in their day-to-day life for the fire brigade, and then help the circuits during certain weekends in training.

“One of the areas where we help is in creating a curriculum for these volunteers. They have basic training of how to fight fires in a building or in a construction yard, but it is completely different to what they need to do

on a circuit, because there are people sitting inside the cars. As well as knowing how to put out the fire, they need to know how to extract that person from the car.”

SITUATIONAL AWARENESS

Fire training scenarios require balance. They must be sufficiently hands-on to properly equip those training with relevant skills and experience, but not so realistic that they present genuine danger. The scenario must also be relevant to the environment where a fire is likely to occur in that person’s line of work.

“The type of training we provide really depends on who we are training – whether it’s marshals, volunteer firefighters, or maybe team personnel,” explains Frank Hulshoff, Marketing Director at Haagen. “Depending on that, we set up what we call an escalating approach to training – they start training on digital screens that mimic fires with smoke and digital fires on screens, and the final part of any training is a real fire, where you have the heat and ‘scare factor’ of the flames.”

It is important that this training takes place in the area that a fire is most likely.

“The pit lane is definitely a high risk area,” says Hulshoff. “It has everything from a risk assessment point of view that you don’t want: people passing objects, cars, fuel, and it’s a crowded place, so we want to be able to do training there and raise the safety standard.

“If you look into the past, we all remember the pit fire at the 2012 Spanish Grand Prix in the Williams team garages. A lot of learning has been made from that on how to approach that situation. If you look at a situation that will never change, the first people on the scene are team members, crew



A fire marshal tackles the blaze on a model open-wheel race car at the FIA conference in Geneva



“WE BELIEVE THAT ELECTRIC VEHICLE FIRE TRAINING IS NOT THAT GOOD... WE WANT TO WORK WITH THE INDUSTRY ON THIS”

members, mechanics, and the like. They are the first at the scene so they should have proper training in how to handle such a fire.”

This is why the marshals at the Monaco Grand Prix receive their fire training from Haagen. Monaco’s marshals are regularly referred to as the very best in the world, due to the high incidence of collisions that require track clearances on the narrow racetrack, and the impressive speed at which they are sorted out. This, as Hulshoff explains, is down to training.

“Our most renowned customer is the Automobile Club de Monaco. They have a very strict training regime, and it’s not just a case of learning how to put out a fire when it occurs, you also have to be very fit. One of their requirements is that you’re not completely out of breath when you get to the

“ A SITUATION THAT WILL NEVER CHANGE IS THAT FIRST RESPONDERS ARE TEAM MEMBERS...THEY SHOULD HAVE PROPER TRAINING”

car if you have to sprint to it, because you may need strength to extract someone. That’s how proud they are of their standards.”

FUTURE-PROOFING

As motor sport moves from traditional internal combustion engines to hybrid and fully-electric powertrains, new challenges are arising for fire safety teams. But it doesn’t make the risk of fire any less real.

“The challenge of reacting to battery-powered cars is completely different,” according to Timmermans. “If you don’t understand how to control those fires, then you are facing enormous risk, and that’s where we see a lot more development possible. We want to work with the FIA to understand this better, and do the best job possible. Depending on the different levels of the professionals and the volunteers, we need to fight these issues together.”

It is therefore essential to train for all types of fires in motor sport and to continually update this training as technology develops.

As Timmermans says: “We are convinced there is still work to be done to improve training for dealing with fires in electric and



Haagen's laser fire extinguishers are used in realistic fire training drills

hybrid cars is not as advanced as it could be, specifically completely battery-powered cars like Teslas or those we see in Formula E. In these scenarios, what is very important is cooling down the car and battery, to make sure it’s not getting overheated. You might not see when there is a fire around the battery itself and what the impact of that is. So, what you normally do in a battery-powered car is cool down the area where the battery is located, and then control any fires, explosions or leakages.”

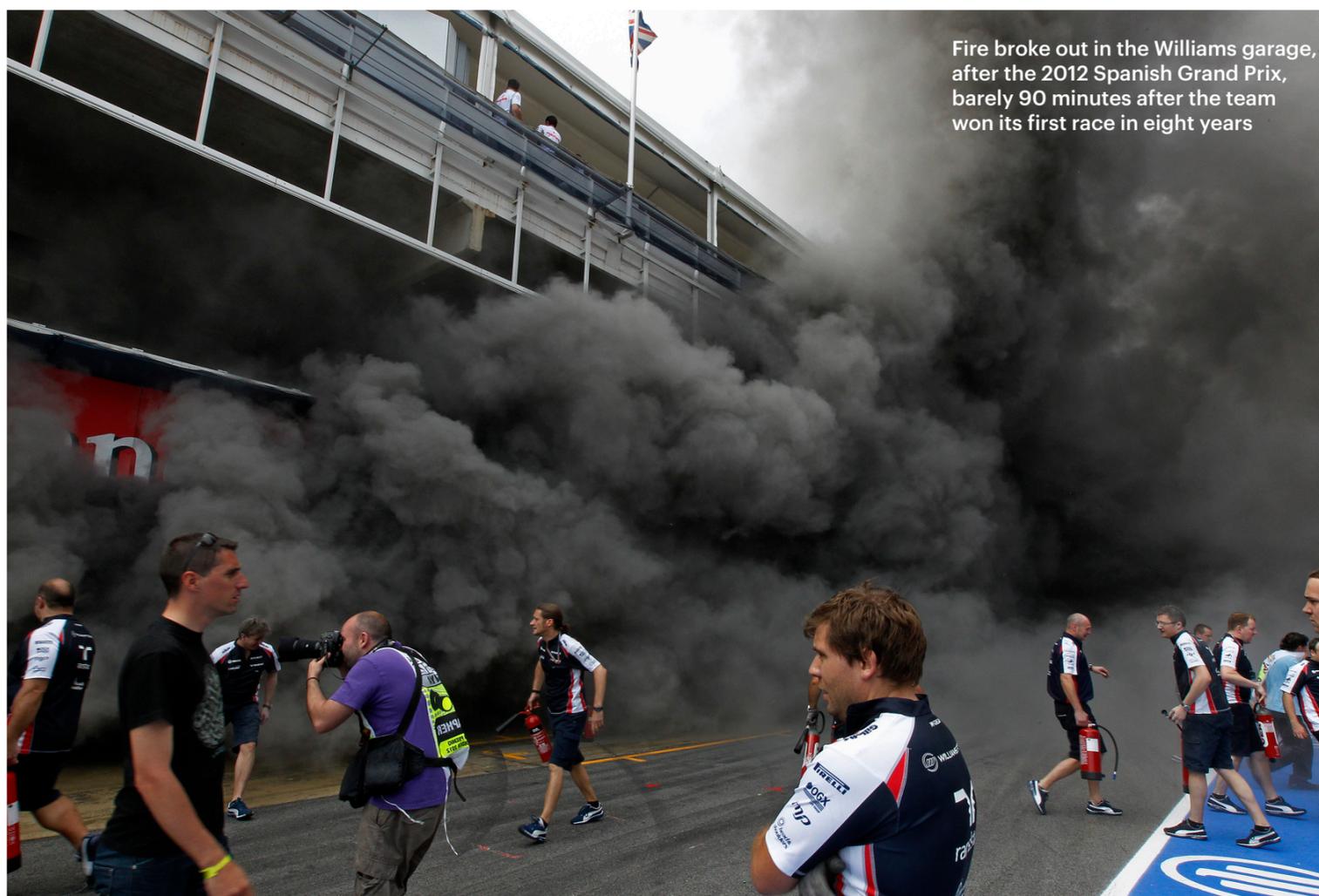
If an electric road vehicle catches fire, after extracting passengers and isolating the battery, the fire department will often let the car burn out in a controlled way. But a battery fire can last for hours so new techniques must be developed.

“We want to work on training people in how to work on such a car and the techniques behind it,” says Timmermans. “But we also want to work with the industry that builds those cars, and help fire departments become more informed in what they need to do in their procedure to get control of such a fire.”

No doubt fire safety has improved hugely in motor sport in recent years. In the 1960s and 70s, fires were a common occurrence, and the training in how to deal with them was clearly not advanced enough.

Despite the enormous advancements in fire safety, though, there is always room to improve. Hulshoff feels that the world of motor sport would benefit from some sort of log book of fires throughout motor sport history, to better prepare for similar fires in the future.

“When it comes to statistics for how many fires there are in certain championships, finding an exact number is relatively hard to pin point,” says Hulshoff. “This is something that we’d really like to work on with the FIA, and see if we can create a database for it, and be given more information. Realistically, large series like Formula One, the World Endurance Championship, and some of the American series are quite well monitored, so it’s not hard to see things that have happened in the past and take learning out of that.”



Fire broke out in the Williams garage, after the 2012 Spanish Grand Prix, barely 90 minutes after the team won its first race in eight years

INSIDE THE 24 HOURS OF LE MANS MEDICAL CENTRE

AUTO+Medical takes a look at the medical equipment, facilities and operations used at the 24 Hours of Le Mans in 2017



When you have 180 drivers to look after, and more than 1,000 times that number in spectators, it's worth doubling up on medical facilities. That's exactly how they do things in Le Mans, with dedicated medical facilities for fans and drivers alike.

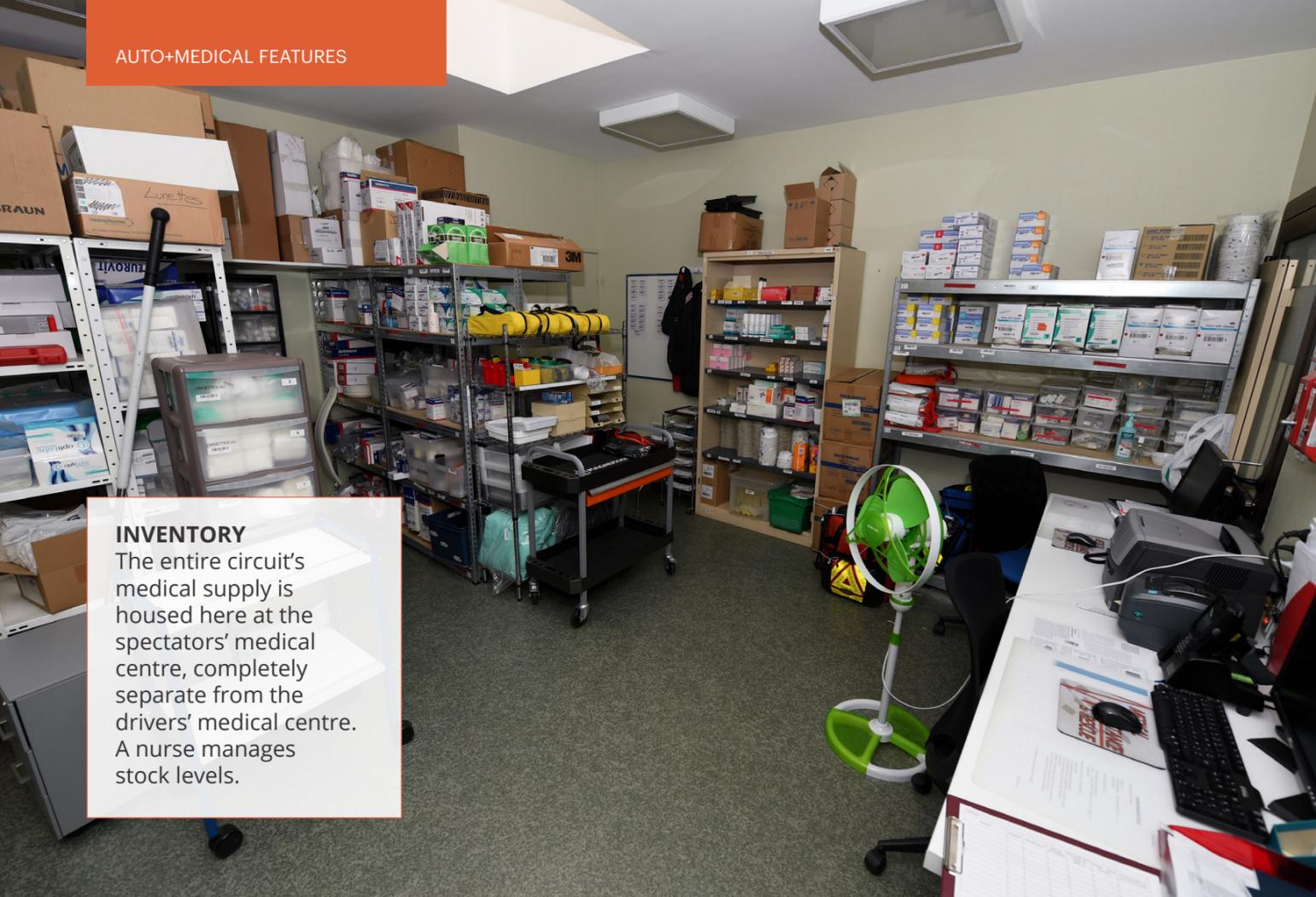
There are 50 doctors, 40 nurses and 48 extractors on call to take care of any racers who may require assistance in the event of an accident, with a fleet of 25 ambulances, five medical cars, and four extraction teams ready to transport them.

Another fleet of medical professionals are on hand to look after spectators and ensure there are no maladies amongst the thousands of fans watching.

There are 10 doctors, 20 nurses and 140 rescuers on hand to provide medical

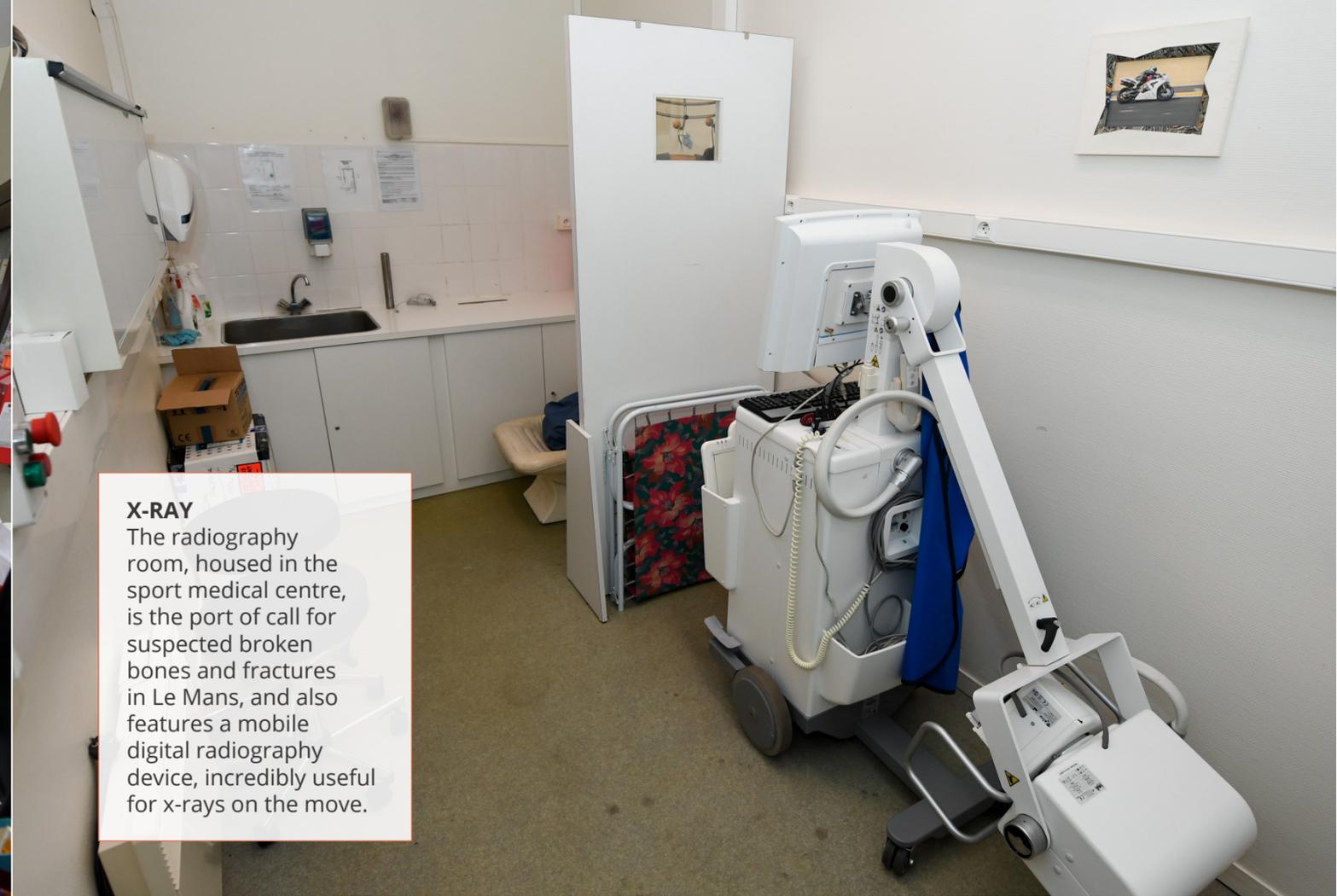
assistance, with 10 ambulances also set aside for them.

AUTO+Medical takes a look at the facilities and equipment that the Le Mans medical team works with over the week-long event.



INVENTORY

The entire circuit's medical supply is housed here at the spectators' medical centre, completely separate from the drivers' medical centre. A nurse manages stock levels.



X-RAY

The radiography room, housed in the sport medical centre, is the port of call for suspected broken bones and fractures in Le Mans, and also features a mobile digital radiography device, incredibly useful for x-rays on the move.



MEDICAL INTERVENTION

In total, the medical teams at Le Mans ran a smooth operation for 2017, despite scorching temperatures. There were 601 interventions for spectators, 54 of which resulted in an evacuation. On track, there were 51 interventions, and seven of these required driver evacuation.



SERIOUS INJURIES

This is the room where serious injuries to racers are taken care of, should a serious accident occur on-track.

THE ROAD BACK:

LUCAS DI GRASSI

The Formula E and World Endurance Championship racer takes a look back at a seemingly innocuous football injury, a surprise broken leg and a remarkable recovery to win the 2016/17 FIA Formula E Championship

During a charity football match at Chelsea FC's Stamford Bridge, Lucas di Grassi sustained an injury to his ankle. Initially he thought it was not too serious and he went on to take two podiums at the double-header Berlin ePrix a few days later. However, the pain didn't subside and after x-rays he was found to have a double fracture in his leg, ruling him out of the Le Mans 24 Hours. He spoke to AUTO+Medical about the injury, and his recovery from it.

AUTO+Medical: Could you explain how the injury came about?

Lucas di Grassi: I was playing a charity football match at Chelsea's stadium in London on the Tuesday before the Berlin race. I got a tackle from another player, and I had a lot of pain at the time, but I could move around so I didn't think it was serious and I just went straight to the Berlin ePrix. I went straight from Berlin to Le Mans, and I was in a lot of pain after the race weekend. I did an X-ray at the hospital, and found out that the fibula was fractured in two places!

A+M: Was that at the Le Mans hospital?

LDG: Yes it was, and the feedback from the doctors was actually not very good. The orthopaedist had a look at my foot and thought that I was right-foot braking, and that it was dangerous for me to compete, but this was not the case. I could not convince him that in modern motor sport we brake with the left foot and only use the right foot for the throttle. I had a long discussion with him, and he thought I was just saying it so I could race, but that was not the case – I was just telling the truth, that we use the right foot for the throttle nowadays. There was no safety concern, because in the worst case of a lot of pain, I would just not accelerate any more.

In any case, I consulted three or four orthopaedists, including one from Brazil who is a very close friend of mine, Dr Caniedo – he's a big motor sport fan. He races go-karts and he's one of the top orthopaedists in the world. He told me that I needed surgery as soon as possible because it was a diagonal fracture, so we decided together with the Chief Medical Officer from Le Mans that the priority is Formula E, it's not Le Mans itself, so

Despite having a fractured fibula - in two places - di Grassi went on to take pole and two podiums at the Berlin ePrix



it was better to not do Le Mans, not be in pain, not compromise any of the other ligaments or anything on my foot. It was the wisest decision to not do Le Mans and fly straight to Brazil and do the surgery, so I did that.

We followed the FIA's advice, we followed the Audi doctor, Dr Vincenzo Tota's advice, and my doctor in Brazil. We did the surgery the day after I arrived, they put in a titanium plate, and I did four weeks of recovery, physiotherapy, a lot of work in the swimming pool, and now I'm almost 100 per cent, less than a month after.

A+M: So how did you recover so quickly?

LDG: Like I said, I 100 per cent trust this doctor from Brazil, Dr Caniedo – he did a fantastic surgery, I managed to focus myself on the recovery, eating the right things, doing the

right exercise, trying to rest for the most amount of time I could, putting a lot of ice... doing all the medical procedures recommended. I'm feeling very good, feeling almost no pain, and I've been off medication for nearly two weeks. Everything works really well.

A+M: What would your advice be to drivers who have similar injuries?

LDG: First, you cannot stop your life because of racing. Riding bicycles is dangerous, and I broke my collar bone once training. It happens, so don't stop your life because you're afraid of getting an injury. But as soon as you have one, go and see your doctor straight away. If it's an injury that is not critical, you can do a race and you feel safe to do it,



Di Grassi in action in Monaco, where he finished in second place



Di Grassi made a speedy recovery to win the 2016/17 FIA Formula E Championship

picture. But like we've seen many times in MotoGP and other races, athletes can deal with a lot of pain. We are not like common people, in the sense that when we are doing our sport, we are so focused on what we are doing that we forget about the pain, so we can take a lot more than most normal people can and still perform our job at a certain level, so they should take this into consideration when making their call. I'm already established, so missing Le Mans this year won't hurt my career, but for young drivers, missing one specific race might be the loss of a massive opportunity, so they have to balance it. They have to make a safe decision and put safety first, but they have to consider that drivers can take a lot of pain, even with a major injury.

A+M: Are you still doing physiotherapy?

LDG: Yes, for the next two-three months. My foot already has 80-90 per cent of the full range of movement of my other foot, so I'm doing quite well. Bones take another three to four months to recover to 100 per cent, so I will do very little impact work – more cycling, swimming, kayaking because I live by the sea... so I should be back to full fitness by season four of Formula E.

then do it, but think about the long-term consequences and whether it will cause long-term problems in the future. Racing is only part of life, and first you have to think about safety, and making sure your body is 100 per cent working perfectly so you can take the performance out there on the race track.

A+M: You mentioned that a doctor did not understand your situation with the pedals – What advice would you give to motor sport doctors who are dealing with drivers?

LDG: I think for the doctors, they are right to be very conservative and evaluate the whole

“ THE ORTHOPAEDIST WOULD NOT BELIEVE ME THAT WE DO LEFT-FOOT BRAKING... HE THOUGHT IT WAS DANGEROUS TO COMPETE ”

SCIENCE

A SYSTEMS-BASED APPROACH TO STAGE RALLY SAFETY AND MEDICAL RESPONSE

Held annually on a remote Scottish island, the Isle of Mull Rally is one of the most unique motor sport events in the world. But with such limited facilities, how do the event organisers ensure that those in need of medical care get it? This article takes a look at the systems in place to ensure a safe event for all.

Author: Dr. Ben Shippey, Consultant Anaesthetist, NHS Tayside

INTRODUCTION

Since 1969, there has been a motor sport event held in early October on the Isle of Mull, in Argyll and Bute, Scotland. The Isle of Mull is a large island in the Inner Hebrides, separated from the mainland by the Sound of Mull, which is served by several ferries. The island is approximately 340 square miles (880km²), being 28 miles (45 km) from furthest north to furthest south, and 30 miles (49 km) from furthest east to furthest west. The population varies seasonally, but is approximately 2,800 people.

The event has been through several iterations, but perhaps the biggest change in the competitive nature of the event was the passing of an Act of Parliament in 1989, which permitted the temporary suspension of the



Road Traffic Act for short periods. This allowed the 2300 Club, based in Blackburn, Lancashire, to effectively close a series of roads around the island to the public and run rally special stages at unrestricted maximum speeds. Largely as a result of its road rallying history (road rallies – on public roads – were usually run late at night to avoid conflict with other traffic) the rally continues to run approximately two thirds of its 150 special stage miles during the hours of darkness. Now run by the Mull Car Club, the event continues to attract between 100 and 150 competitors every year.



Fig. 1: The single-track roads of Mull are a unique challenge

ACCIDENTS AND SAFETY MEASURES

Every year, approximately ten of those cars leave the road at speed, and approximately half of those roll the car. This being special stage rallying, there are two competitors in each car, so approximately twenty competitors each year are at risk of serious injury. Sadly, there have been fatalities during the Mull Rally, in 2003 and 2015, and there have been other significant injuries. In addition, the rally is well attended by spectators, who are also at risk, as was demonstrated in two separate fatal incidents in 2013 and 2014 in other special stage rallies in Scotland.

Minimum standards for medical and rescue support for special stage rallies are determined by the UK Motorsport Association (MSA). Put simply, each stage (or every nine miles of stage, if the stage is over nine miles long) must have as a minimum a doctor, or registered paramedic, and an MSA licensed rescue unit. The rescue unit is crewed by volunteers, usually marshals with significant experience of motor sport, who have received first aid training, and are skilled at fire fighting and casualty extrication. Each rescue unit is

capable of transporting a casualty, and is equipped with extrication equipment, resuscitation equipment, and audio-visual warning systems (see appendix). In addition, each medical and rescue group is supported by a recovery vehicle with heavy winching and additional fire fighting capability.

The Mull Rally deliberately exceeds the medical and rescue requirements of the MSA regulations. This is owing to the nature of the roads on Mull (Figure 1) causing long transit times, and the timing of the rally leading to the need to extricate casualties in darkness, and poor weather conditions. The rally runs its own radio safety network, allowing the coordination of safety activity.

This uses the MSA Safety and Medical frequency, which is unencrypted, and therefore identifiable patient details cannot be passed by radio. Mobile phone signals on Mull are variable, and cannot be relied upon.

The island has a community hospital with three acute beds, the Mull and Iona Community Hospital, which moved in 2012 from its previous location in Salen to a new,

purpose built facility in Craignure, vastly increasing the physical space available and allowing the development of telemedicine facilities connected to tertiary care facilities throughout the country. The hospital is staffed by nurses, including two extended role emergency nurse practitioners, supported by a radiographer, and local GPs.

There is no facility on the island for critical care, so patients requiring services that cannot be offered locally are transferred to the mainland. This is done either by the Scottish Ambulance Service (SAS), on the ferry to Oban, or if more serious, by the Emergency Medical Retrieval Service (EMRS), a specialist service developed to deploy a consultant-led critical care service to the remote communities of Scotland. The EMRS uses a helicopter based in Glasgow, or military aircraft if SAS aircraft are engaged on other missions. The nearest major trauma centre is 130 miles (4 1/2 hours) by road, or 80 miles (30 minutes flight time) by air, in the centre of Glasgow. Weather conditions and darkness (there is no instrument approach into the

“EVERY YEAR, APPROXIMATELY TEN CARS LEAVE THE ROAD AT SPEED, AND HALF OF THOSE ROLL OVER”

landing strip on the island) can preclude civilian helicopter landings on Mull.

The rally poses significant challenges, therefore, to the provision of a seamless trauma service. A systematic analysis of these barriers was undertaken by rally organisers, summarised in Figure 2 below.

Spectators are not all conversant with rallying, and will stand in locations where they are exposed to significant risk. Marshals are few in number, and are variably trained in first aid, as are competitors. Cars may have accidents unseen, and only be discovered when they are overdue at a subsequent point along the rally route. Neither the skills, nor the equipment needed to provide advanced

Fig. 2 Opportunities and Barriers discovered as a result of system analysis



“SPECTATORS ARE NOT ALL CONVERSANT WITH RALLYING AND MAY STAND IN AREAS WHERE THEY ARE EXPOSED TO SIGNIFICANT RISK”

resuscitation are permanently present on the island, and visiting medical staff with the necessary skills are prevented by indemnity arrangements from practising within local healthcare facilities. Weather, and the remote location, can make evacuation difficult, and uncertainty about the responsibility for referral and on-going care can create confusion. Several handovers (rally to ambulance to local hospital to retrieval service to receiving hospital) are necessary, and information may be lost as a result. Opportunities for improvement were also identified as a result of the analysis of the system. The stage routes could potentially be modified to allow better spectator control, or to reduce the risk of collision. Social media could be used to warn spectators of the potential danger posed by their behaviour in the proximity of the special stages. Marshals and competitors could be trained to provide basic skills at the scene of an accident, and further marshals could be recruited using the popularity of the rally as an incentive. Local engagement with the rally from the healthcare services on the island could possibly provide the opening for a dialogue regarding closer collaboration, and previously negotiated arrangements with the SAS could possibly be expanded to allow reciprocal sharing of assets and clearer communication pathways. The availability of aircraft



Fig. 3: The additional equipment required to create a critical care bed in the community hospital

controlled by both the military and the SAS / EMRS is an obvious opportunity, but a clearer understanding of the availability of these assets, and their operational capabilities over the rally weekend could be useful in planning evacuation of casualties.

Several changes were made as the result of this analysis. The rally route changes every year, and this year chose to avoid an area that regularly creates one particular spectator hotspot. A video was produced, and was published on the Vimeo video streaming site, where it was watched by 5,000 viewers. A series of posts on Facebook and Twitter signposted the video, and also offered reminders and encouragement regarding safe behaviours. The Facebook audience over the rally weekend was roughly 150,000 enthusiasts.

SPECIALIST TRAINING AND EQUIPMENT

A “First on Scene” training evening was held on the evening before the rally, and was attended by 78 marshals, spectators and competitors. This training was provided by experienced rescue marshals and rally paramedics, and consisted of didactic and practical instruction on scene safety, approach to the scene, fire, patient assessment, airway and cervical spine basics, cardiopulmonary resuscitation, haemorrhage and clear communication.

Negotiations were undertaken with NHS Highland. This resulted in temporary honorary contracts being awarded to three of the rally doctors (two anaesthetists and an emergency physician), and an intensive care nurse, creating the opportunity for them to

use their specialist skills in the local hospital, making them able to care for a casualty from scene until retrieval by the EMRS, reducing the need for sequential handover. The equipment and disposable supplies needed to create a temporary level three critical care bed in the Mull and Iona Community Hospital were obtained from a variety of sources. Monitoring was loaned by Dräger Medical UK, and a portable blood analyser by Abbott Point of Care. A portable ventilator (Oxylog 3000+) was loaned by the Scottish Centre for Simulation and Clinical Human Factors. Disposables and drugs were supplied by NHS Highland according to protocols provided by the EMRS, supplemented by a few disposable items purchased by the Mull Rally. Surprisingly little additional equipment was



John MacCrone (pictured) won the Mull Rally in 2016

needed – as can be seen in Figure 3. The resulting single bed resuscitation bed is shown in Figure 4. In addition, supplies of tranexamic acid were purchased and distributed to rally medical staff to allow early administration to casualties with significant haemorrhage, as described in the (then recently published) CRASH-2 trial.

Negotiations with the SAS further reduced the need for handover, as by sharing assets, we were able to remove the need for the ambulance service to retrieve patients from stages. Clearer lines of communication were established with the SAS Air Desk – the department within the organisation with responsibility for allocating air assets – with the intention of clearly defining responsibility for different aspects of incident and retrieval coordination and informing decisions made on scene regarding the immediate destination of casualty evacuation from the scene of the incident.

Finally, two doctors, both trained in pre-hospital care, and both with significant rally experience, were tasked as ‘fast response’ assets, and are deployed to the scene of an serious incident, not to add additional medical expertise (although this is obviously an added benefit) but to provide scene management, information transfer triage and on-scene decision-making capability.

Additional developments have taken place in subsequent years. The First on Scene training has been expanded, and is now compulsory for competitive crews: the logic being that the first person to arrive at the scene of an injury is either the non-injured competitor in the car involved in the incident, or the next competing car on the road, if both competitors are injured. Further negotiations with local emergency services have allowed the rally to have access to the UK emergency



Fig4: The event's single resuscitation bed on standby, should an accident occur

“ NEITHER THE SKILLS, NOR THE EQUIPMENT TO PROVIDE ADVANCED RESUSCITATION ARE PERMANENTLY PRESENT ON THE ISLAND ”

services ‘Airwaves’ network, which allows secure, encrypted, point-to-point communications in an area that otherwise has limited cellular network coverage. The utility of this facility was shown in a subsequent incident when two casualties were extricated from a car, were admitted to hospital, and the stage restarted, within 60 minutes of the initial “urgent” radio call: a performance which would have been extremely difficult without a secure communication network.

Further improvements are planned. Civilian



Portable gas analyser, loaned by Abbot Point of Care, and subsequently purchased by NHS Highland

pre-hospital services are able to deploy teams capable of delivering anaesthesia, and advanced airway management, chest decompression and resuscitation at scene, and we should be capable of delivering a similar standard of care. Further equipping the ‘fast doctors’ to provide this capability, working closely with experienced paramedics, is the ambition.

SUMMARY

In summary, careful system analysis identifies barriers to high-quality, joined-up trauma care. It also highlights opportunities for improvement, most of which can be achieved with little additional resource. We would recommend this approach to others wishing to improve their quality of rescue and medical provision for motor sport events in the UK and around the world.

APPENDIX: MSA UK MINIMUM RESCUE UNIT EQUIPMENT

GENERAL

Beacons (to be visible 360° with low mounted high-intensity units at the rear)
 Radio - 81.575MHz FM
 Protective equipment for each crew member
 Fire resistant blanket (1m x 1m minimum)
 1 x 6kg dry powder extinguisher
 1 x 6 litre light water/AFFF fire extinguisher
 2 survival blankets, 1 Warning triangle
 Vehicle powered lighting and torches
 Suitable cutters for harness, straps, etc
 1 gallon (5 litre) clean, fresh tap water
 Environmental Spill Kit – Medium

TOOLS

2 hacksaws and supply of blades
 1 small bow saw, 1 small axe
 1 pair tin snips, 1 1m crowbar
 1 pair bolt croppers (minimum 18in)
 1 pair mole grips, 1 general tool kit to include AF and metric spanners, sockets, allen keys, "Torex" and other drivers
 1 glass breaker
 2 hammers, large and small
 Selection of flat, Phillips and Pozidrive screwdrivers
 Equipment suitable for securing/stabilising and towing vehicles
 1 opaque sheet suitable for covering vehicle
 1 trolley jack 1015kg or air jack system

POWERED TOOLS

1 powered metal cutting saw with an adequate selection of blades
 1 cutting saw (electric, air or hydraulic)
 1 pedal cutter 3cm minimum jaw opening
 1 large spreader

1 large shear to cut A, B, C pillars (Spreader and shear may be combined)
 Hydraulic ram and extensions

NOTE: For all categories of unit there should be adequate compressed air supply, and hydraulic power supply for the range of equipment carried on the vehicle. Battery-powered equipment should come with an adequate supply of charged batteries.

MEDICAL

1 automated external defibrillator with monitoring capability
 1 resuscitator with oxygen reservoir & mask
 4 oropharyngeal airways including no. 2, 3, 4
 1 pulse oximeter
 1 laryngoscope plus spare batteries and bulb
 6 cuffed endotracheal tubes (2 x 7.0, 2 x 8.0, 2 x 9.0) with syringes to inflate
 1 portable suction machine (able to obtain 300mm Mercury vacuum)
 Full selection of suction catheters including Yankauer type
 'i-gel' supraglottic airways (in sizes 3, 4 & 5)
 1 portable Entonox set (1 spare cylinder)
 1 portable oxygen set (900 litres in not more than 3 cylinders). Regulator to be capable of delivering 15 litres/min
 Supply of non re-breathing masks
 2 adult sets of extrication collars or 2 adult adjustable extrication collars
 2 Spinal Immobilisers (e.g. KED, RED, TED)
 1 chest drain kit
 1 pair heavy duty scissors
 Scalpels, blades and artery forceps
 Cricothyroidotomy kit (or "mini trach")
 1 sphygmomanometer

1 stethoscope
 6 intravenous giving sets
 12 intravenous cannulae (three each 14, 16, 18, 20) and suitable fixation
 4 x 500ml Hartmann's solution or equivalent
 1 Combat Application Tourniquet (CAT)
 A comprehensive selection of dressings (including large sizes) and bandages
 A supply of burn dressings (including 'Watergel' type dressings) which should include unused clean plastic bags
 A sterile solution for eye irrigation
 Selection of splints
 1 stretcher (ambulance cot type)
 1 scoop stretcher

1 long board with head immobilisation system and straps
 Disposable surgical gloves, sharps container and plastic bags for clinical waste
 Report cards
 1 Vacuum Mattress

Note: it is strongly recommended that some device is carried which allows the operator to perform resuscitation whilst isolated from the casualty's oral secretions.

BASIC FIRST AID KIT

First Aid Kit in compliance with requirements for 11–20 employees as detailed by HSE code of practice (ACOP 1997)



The Mull Rally has been held annually on the remote Scottish island since 1969

+ CALL FOR SUBMISSIONS

Every issue of AUTO+Medical contains a scientific research paper that looks at the various medical issues that surround motor sport.

All submissions are welcome so if you have a study that you feel would be suitable for publication in future issues of AUTO+ Medical, please send it to:
medical@fia.com

For each submission please include a summary of the research and all necessary contact information.

The editorial board will evaluate each submission before it is accepted for use in the magazine.

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