PUBLISHED

"Periodico regolarmente registrato presso il Tribunale di Parma (n.16, 03/09/2010

THE PURSUIT OF EXCELLENCE

FORMULA E

2014 WILL SEE THE INAUGURAL FIA SANCTIONED CHAMPIONSHIP FOR ELECTRICALLY POWERED RACING CARS. ENGINEER PIGNACCA EXPLAINS HOW INNOVATIONS IN AERODYNAMICS AND MATERIALS CAN HELP TO CREATE A "SUSTAINABLE" FUTURE FOR MOTORSPORTS

SUPER FORMULA

THE FIRST CARS DESIGNED FOR THE JAPANESE CHAMPIONSHIP WILL BE READY THIS SUMMER. WE REVEAL ALL THE SECRETS OF A PROJECT THAT HAS BEEN DEVELOPED IN CLOSE COLLABORATION WITH THE JAPANESE DRIVERS AND ENGINEERS, THANKS IN NO SMALL PART TO THE BENEFITS OF THE DALLARA SIMULATOR

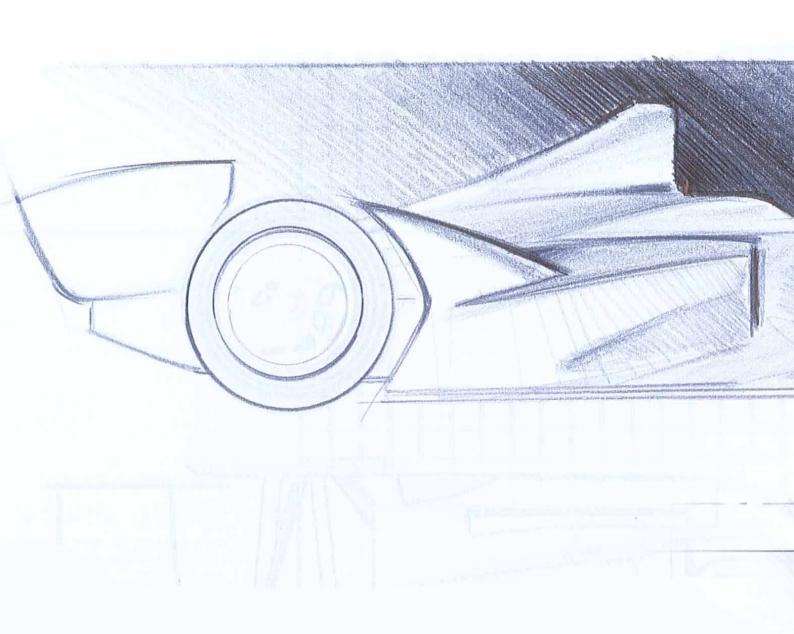


INDIANAPOLIS

THE NEW INDYCAR SEASON HAS JUST OPENED WITH THE FACTORY FROM VARANO CELEBRATING ITS 200TH VICTORY IN THE CATEGORY. BUT THE COMPANY IS NOW A FIRMLY ESTABLISHED PRESENCE IN THE USA TOO. IN A LENGTHY INTERVIEW, STEFANO DE PONTI GIVES US AN OVERVIEW OF THE PROGRESS BEING MADE IN NORTH AMERICA

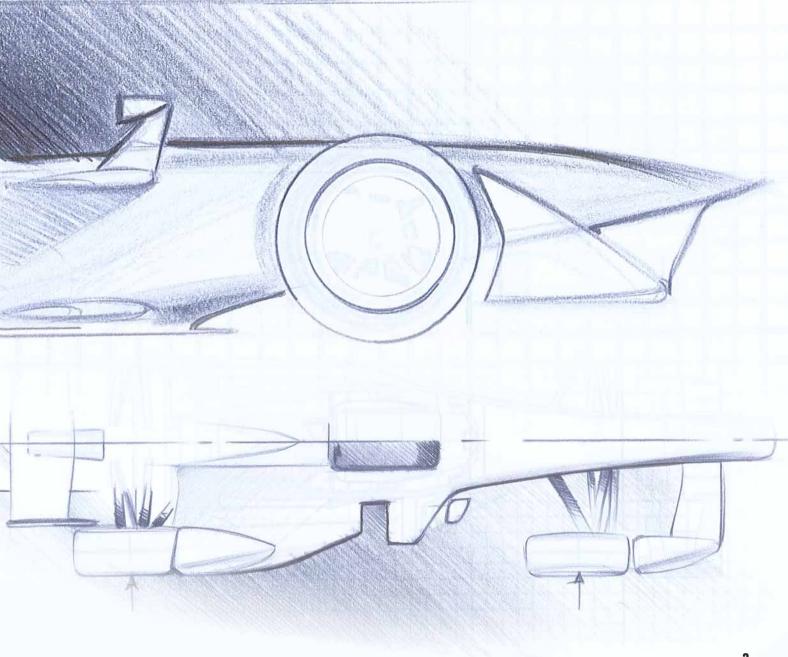


THE

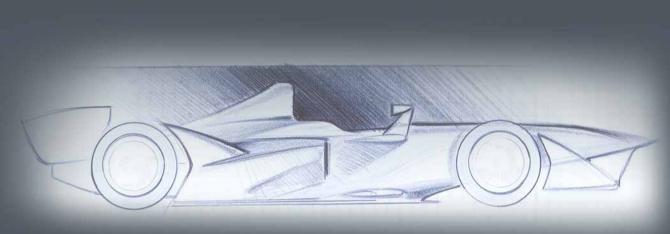


FORMULA E RESPONSIBLE FUTURE

2014 WILL SEE THE INAUGURAL SEASON OF THE NEW, TOP LEVEL FIA CHAMPIONSHIP FOR ELECTRICALLY POWERED CARS. DALLARA WILL BE RESPONSIBLE FOR MANUFACTURING THE CHASSIS AND, AS PROJECT MANAGER ENGINEER LUCA PIGNACCA EXPLAINS, THE OBJECTIVE IS TO PRODUCE A RACING CAR CAPABLE OF COMBINING EXCITEMENT, INNOVATION AND SUSTAINABLE TECHNOLOGY IN TERMS OF CONSUMPTION AND EMISSIONS







Engineer Pignacca, what were you asked to produce for Formula E?

«Spark Racing Technology (SRT) wanted to build a single-seater electric car capable of competing in the 2014 FIA Formula E championship. In order to achieve this they needed partners and they chose Dallara to design the chassis and supply the main components for it: the safety cell, the battery safety cell, the steering system, the supensions uprightss. We are practically designing the car for, and together with, them».

Do you already know how many cars you have to supply, and when? "We've got an order for 42 cars, two to be delivered in July, and the rest by March 2014".

What challenges does a project like this pose when designing the chassis for the car? Did you start from scratch or was it based on existing projects?

«At the end of the day we're talking about a racing car, and for this reason we drew on all our experience and used various components from our other models, as well from other cars. At the same time, this is a completely different type of product and it will be fun and stimulating to work on such a new concept. The greatest challenge was packaging the cells and battery modules, the safety of the monocoque, which will have a radically different rear section, and the electrical system, which will operate at very high voltage».

There's a lot of talk about zeroemission engines: in what ways is it also possible to obtain a low environmental impact by working on the type of materials that are used and the aerodynamics of the car? «We have an enormous responsibility towards future generations: as engineers and designers we have to consider all the possible aspects in order to find ways of decreasing fuel consumption and pollution. We have to have a 360° outlook. At Dallara we have a great deal of expertise in aerodynamics and the use of lightweight materials: if the aerodynamic resistance is low the car will use less fuel or current when running at a given speed. The same

applies if the weight of the car is reduced – without compromising on safety of course».

Will you be forming a working group together with McLaren, who will be supplying the electronics, engine and gearbox?

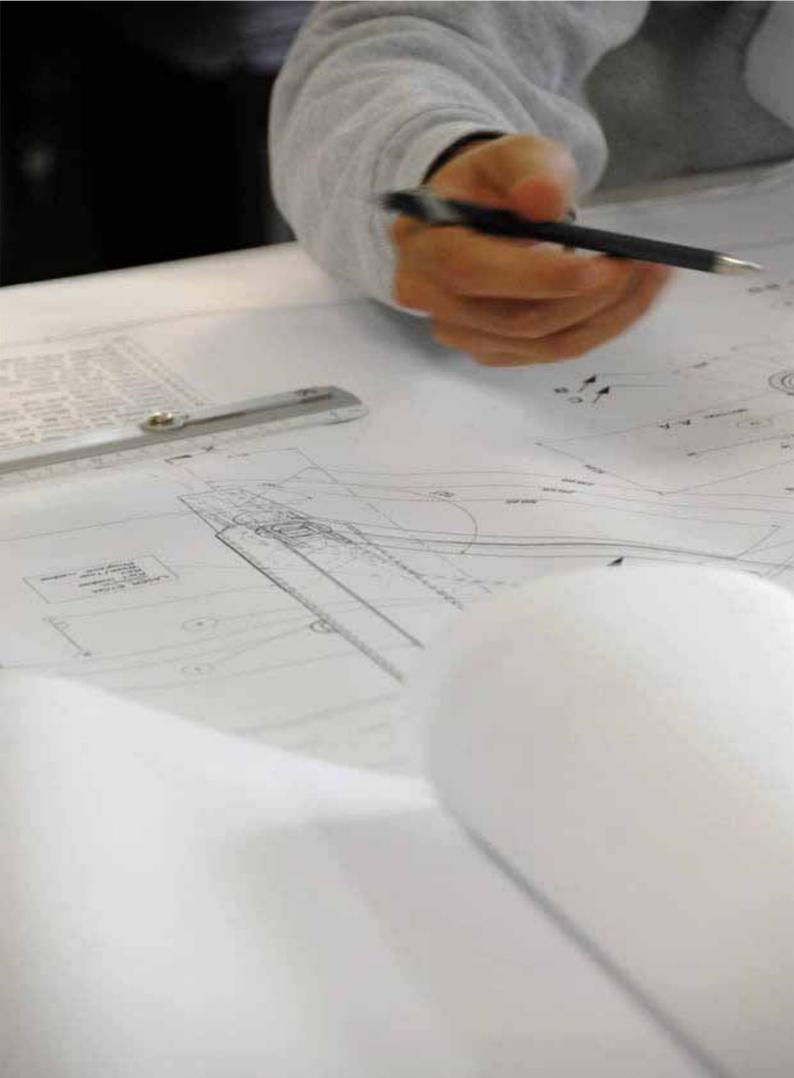
«SRT's partners for the electrical drive system and control system are McLaren Electronic Systems. Hewland will supply a specially designed gearbox».

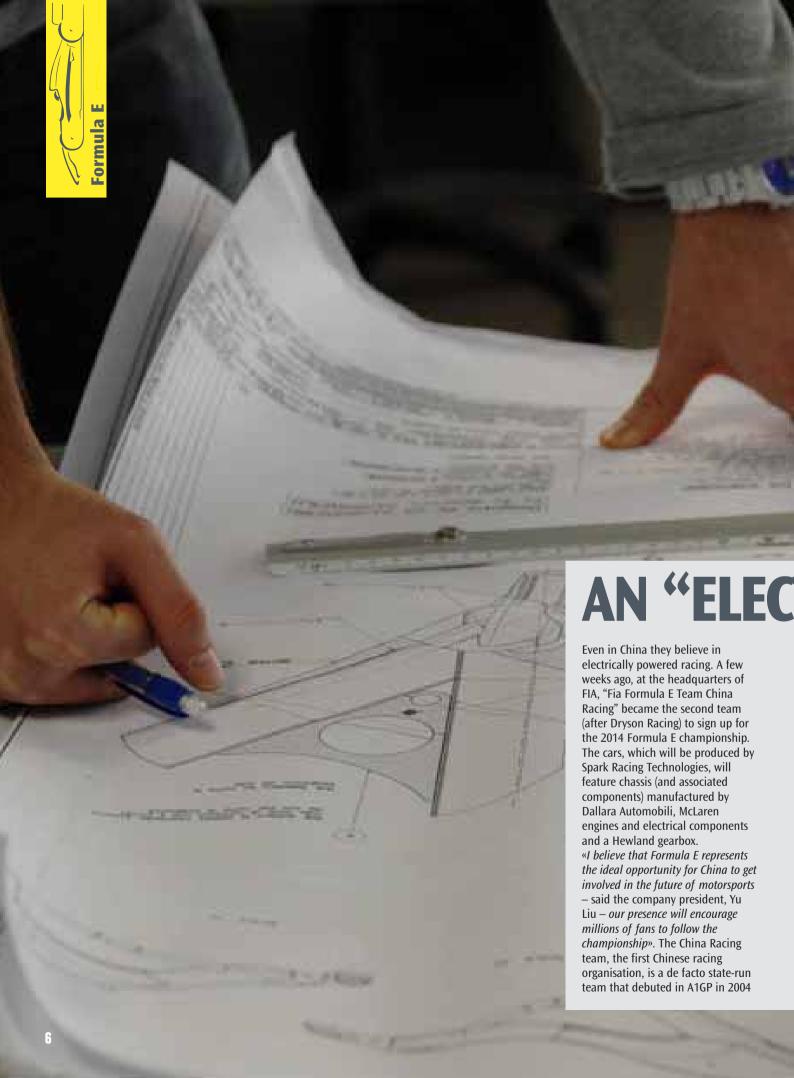
Does Formula E really represent a glimpse of the future? Is this type of car the answer to the drive to reduce the cost and environmental impact of competitions, while ensuring increasing safety standards?

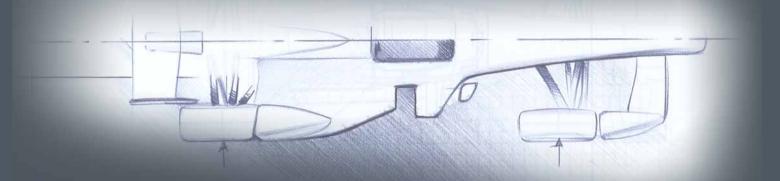
«As always, the races will show the

«As always, the races will show the world that the developments made by the motoring industry can function at the very highest level. If we do our work properly, Formula E will act as a launch pad for promoting this concept all over the world. We have many challenges ahead of us and numerous practical problems to solve before we can answer the second question. But I'm certain we're up to it».

"We have an enormous responsibility towards future generations: as engineers and designers we have to consider all the possible aspects in order to find ways of decreasing fuel consumption and pollution. We have to have a 360° outlook. At Dallara we have a great deal of expertise in aerodynamics and the use of lightweight materials: if the aerodynamic resistance is low the car will use less fuel or current when running at a given speed. The same applies if the weight of the car is reduced — without compromising on safety of course"







Is it possible to envisage a complete competitive organisation for electrically powered cars, from the feeder competitions right through to an elite championship?

«Why not? Battery technology is the key to success for electric cars. The world's leading motor manufacturers and many of the brightest engineers are working hard on it, and we will be seeing some major breakthroughs over the next few years that will open up the way for new and exciting challenges».

Do you think that races fans will be able to adapt to races that are so...... quiet? After all Le Mans and the latest Ferrari and McLaren supercars have already adopted the new hybrid technologies.

«The debate about noise and Formula E is still open.

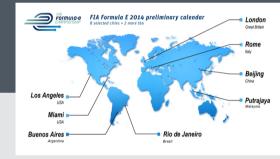
Some feel that noise is an essential element for the race-going public, whereas others, and this is the majority view, believe that we are beginning to attract fans whose tastes are different. We could play rock music during the races, for example, and the fans would be just as happy. Some purists even point out that we will be able to enjoy the screech of the tyres on the bends; at the moment traditional, noisy cars drown out the noise of the gearbox, so the public has no idea what it sounds like. But this high pitched sound will soon be very familiar to every fan. We'll have a better idea after the first race».

Could Formula E be the first step

towards a zero-emission production car for Dallara as well?

«Engineer Dallara has been dreaming of building a production car for a number of years, and now his dream is coming true. Nevertheless, given the current state of battery technology, it's highly unlikely that our production model will be electric or hybrid. However, as I said, sometimes engineers perform miracles...».

Stefano Semeraro



TRIFYING" CALENDAR

under the patronage of the Asian giant's Ministry of Sport. The drivers include Qinghua Ma, CongFu Cheng, HopIn Tung, and competes in numerous organised race events in Beijing, Shanghai, Chengdu, Zuhai and Ordos. Evidently satisfied, Alejandro Agag, the CEO of Formula E Holdings, who are organising the event, declared: «We fully expect to feature a number of Chinese drivers in Formula E». The 10 races that FIA expects to organise in the first season will all be held on street circuits; currently races are already planned for Roma and Barcelona, but obviously, with the advent of China Racing it's highly likely that the championship will also take in Beijing or Shanghai. Zero emissions, but big ambitions.

Speeds will be limited to around 220 km/h (but with acceleration from 0 to 100 in three seconds), zero emissions and "roar", and maximum stints of 25 minutes between recharging. In fact, battery life is the Achilles' Heel of the new technology and this means that, in order to complete a full one hour race, it will be necessary to switch cars. However, with respect to its predecessors, Formula E has a very significant advantage: street circuits. The low-pollution engines, and "soft" environmental impact, could convince large cities that have decided to invest in green technologies to host an event. In fact, important metropolises such as Mexico City, Sydney, Cape Town, Moscow, Rio de Janeiro, Miami, Los Angeles and Berlin have already expressed

an interest. FIA has awarded the licence to organise the championship to Formula E Holdings Ltd, a Hong Kong consortium whose main investor is Enrique Banuelos a Spanish businessman, and whose chief executive, Alejandro Agag, is a nephew of the ex-Spanish Prime Minister Aznar and has already been involved with Gp2, Gp3 and F.1 in the past. Another important figure involved in the project is Paul Drayson, ex-Minister for Science and Technology under Tony Blair, and a keen gentleman

«Competitions like this, organised in big city centres, will definitely attract large crowds — enthused Jean Todt — and will offer the chance to share the values promoted by FIA, such as clean energy and sustainability, with an audience of young fans». Will we soon be seeing Formula E events taking place on the same weekends as its big sister, and maybe even taking her place in the not-too-distant future; who knows? It's difficult to say, although the future certainly seems to be moving in that direction. Cities such a Seoul are already experimenting with new concepts based on the concept of small car lanes featuring an electrical coil installed under the road surface, capable of supplying the vehicles with electrical energy. And there's one more electrifying element that the Formula E package offers its prospective customers - the prize money: 2 million dollars for the winning team, and 4 million for the drivers. Gentlemen, connect your batteries.



Stefano De Ponti, Dallara CEO for the USA, takes stock of the situation at the factory in Indianapolis, and the future projects. The success of the new single-seater and our attention to "customer-care" has further strengthened our already close relationship with IZOD IndyCar, while the interactive Museum is playing an increasingly important role in gaining the trust of University and the local authorities. Our next aims are the development of the IndyLights project and consultancy with important companies outside the motorsports sector









Left/right:
an image of the
Dallara Museum
in Indianapolis
Below: the entry
to the complex.
Facing page:
a view of the
production area



Which aspects of Dallara's proposal were most popular with the Americans?

"Further shortening the chain of contact between the teams and the company was very well received. Dallara USA has become a well-established presence, with a technical and commercial organisation capable of providing the teams with immediate responses to their requests. The improvements to our customer-service were greatly appreciated too, thanks to the increased production of spare parts. This is an important aspect, since, in Europe, Dallara has always provided the categories with chassis and service through a network of distributors, whereas in America the teams deal directly with us when the need

to purchase parts or ask for technical information. This means that we have a very high profile in the field, and this is very important factor in the States. In addition, the car has been a great success, offering excitement on the track together with high reliability. It's a very resilient single-seater: From the outset we promised that there would have been significant savings for the teams, thanks to the reduced need for maintenance and spare parts, and we were able to maintain that promise. In one sense this actually translated into a slight loss of business for us in terms of spare parts, but at the same time it represented an advantage for the teams and demonstrated that we were very serious about keeping costs to a minimum».

The museum was inaugurated successfully? How has it been received by the public?

«We're still quite a long way from achieving the numbers we had hoped for, but this is partly due to a series of unfavourable technical factors that we hadn't bargained for. In fact, the museum is located in an area that is being heavily redeveloped, this means that there is always building work in progress and road closures, which tended to limit the flow of traffic, however things are now starting to get back to normal. Nevertheless, opening an interactive zone proved to be very good idea. It's the ideal solution for the more curious visitors, but







also for schools and universities (editor's note: STEM, Science Technology Engineering and Maths) We have initiated a series of programs, in association with STEM, designed to combine entertainment, which is of considerable interest to the IZOD IndyCar Series since it represents the potential to increase the fan-base, with educational aspects that are more of interest to the colleges (almost exclusively private institutions) as a way of attracting future engineers who will be involved in the motoring sector, although not necessarily motorsports. Thus the museum interactive zone represents a ideal tool for both requirements. The presentation is very simple, it is based on a series of

photographs and films that can be activated via touch-screens, and explains the principles of physics and mechanics in very simple terms, as well as illustrating the research our company carries out into the materials and safety aspects that we apply to the motorsports sector; there is also a ten minute film that tells the personal and professional story of Engineer Dallara and the Dallara company».

What is the current economic state of motorsport on the other side of the Atlantic, and how popular is it?

"American motor racing is essentially

«American motor racing is essentially divided into two groups: Nascar, and all the rest. From both a cultural point of view –

since Nascar, although universally popular these days, has its roots in the southern states – and a marketing angle, as can be seen from the reaction to Danica Patrick's pole position at Daytona. The aim of Nascar is to create the figure of the "heroic" driver, through a series of new personalities that are used as a platform to attract investment from the sponsors. The cars are fitted with bodywork, spoilers and bumpers that are designed to make them resemble production vehicles that anyone can buy. This is obviously out of the question for the IZOD IndyCar Series. Nascar still enjoys very healthy television ratings, although the stadiums are maybe not as full as they were once. The IZOD IndyCar Series offers a



product that is competitive on any type of circuit and winning formula, as can be seen from that fact this year's championship features 26 cars for the first time in a number of years. Due to the turnover at the management level, the IZOD IndyCar Series has experienced some difficulties at both the commercial and marketing levels in recent years. The current management team is highly dynamic and has a great deal of experience in marketing strategies, and this will definitely benefit the category. The joint venture between Grand-Am and the Le Mans Series represents another interesting development in the covered-wheel sector that will benefit numerous manufacturers, giving them the chance to race on various

important and historic tracks. The aim of the marriage between these two categories, one essentially European both from a commercial and a technical standpoint, and a typically American organisation like Grand-Am, with its close ties to Nascar, is to find the right balance and then produce a set of technical regulations by 2014 in order to attract other manufacturers».

Dallara is also highly thought of, both in Italy and internationally, for the quality of consultancy that we provide to the most famous motoring brands. Have you already received requests for collaboration in America too?

««We're working on it. The opportunities are

already there. Thanks to our presence in the racing sector we are continuing to increase our profile in America. It is important to remember that racing car manufacturers are usually penalised by a preconception: outsiders frequently view motorsports more as a "sport" than an industry. It is important to overcome this approach and we have achieved this thanks to innovative know-how and our skills in the fields of materials and simulation, which enable us to offer our partners an efficient product and demonstrate the savings that can be made. In the USA, and in Indiana in particular, local authorities are well aware of the business side of motorsports: an active, dynamic business that employs



Left: the joy on the face of a visitor to the Dallara factory during a lap on the IZOD IndyCar two seater prepared specifically for the fans.
Right and below: more images from inside the complex, including the banquetting and conference hall: a facility that is proving popular with American companies interested in organising events at the factory





thousands of people and thus represents income, which is, of course, a fundamental aspect. This means that local authorities are more than happy to welcome new initiatives, providing them with assistance and subsidies. For example, we recently played host to representatives of the Indiana Motorsport Association at *Indianapolis*, together with the new state deputies and senators. The aim of the visit was to get to know the companies involved in the motorsports sector. They visited the factory, and were very surprised by what they found. Although Indiana cannot compete with Detroit, where the giants of the motoring industry are located, there have always been motoring companies with

production facilities in Indianapolis: they are making every effort to identify innovative technological solutions, and this means that our company, which is always at the cutting edge, is the ideal partner».

The new governer of Indiana also visited the factory in Indianapolis. How did the meeting go?

«Following his election as the governor of the State of Indiana, Mike Pence selected the Dallara factory as one of the three locations of his investiture ceremonies. We hosted a family-day, attended by Mr. Pence and all his family; he stayed with us for the whole morning, signing autographs and chatting with visitors and fans. He was dressed in jeans and a t-shirt: he's a very down to earth person and gives the impression that he wants to serve the community, approaching new concepts with an open and curious mind, exactly like we do at Dallara. On another occasion, Engineer Pontremoli and Governor Pence participated at an award ceremony for the best drivers and teams from last year here in Indiana".

Will Dallara be branching out into any other made in USA categories over the next few years.

«We are on the verge. We are waiting to see what happens in 2014 with the new regulations in the sports-car sector, as well Group photo during the visit by the Indiana deputies and senators to the Dallara factory Centre, in jeans: the Governor of the State of Indiana, Mike Pence.

Behind. in glasses. Stefano De Ponti. Dallara CEO for the USA



as how things develop in the IndyLights category where, as we stated earlier, the onus is more on the participating drivers, thus creating a sort of training school above all for oval track racing, before moving up to the IZOD IndyCar category. In Nascar, the Juan Pablo Montoyas and Dancia Patricks of this world had to work their way up through a series of regional championships before they could take part in the main competition, whereas ex F.1. drivers, for example, are able to move directly into IZOD IndyCar, without having to experiment with oval track racing first. It's not just a question of training pilots, but also of using them in order to increase the value of the category».

Does your presence in North America also form a base for expansion into the south of the continent? Brazil is booming and is set to become the centre of world sport over the next few years.

«Brazil definitely represents a growing economy. But when we talk about Brazil in this context, we're talking almost exclusively about San Paolo: the boom is much less evident in the rest of the country. We intend to return there to race with the IZOD IndyCar Series because, at the end of the day, Brazil is the only country that can offer economic coverage, and an organiser capable of ensuring that the event generates an income. China was supposed to copy the Brazilian model, but the operation was not successful».

In the past you have mentioned Dallara's possible involvement in projects outside motorsports: could you tell us which sectors you had in mind?

«The opportunities are out there, for example, in aeronautics, aerospace and green technologies: use of materials, vehicle structures, etcetera. However, it's necessary

to go through a very complex certification process, which requires some highly specific requisites. But, as I say, the opportunities are out there».

In conclusion, what is the overall impression of your experiences in the USA, since the union with Dallara?

"Motorsport is my life, and it's always been my dream to work in the American racing sector, because I love the United States and their history, and I share their values. I'm an Italian with an American heart, and Dallara have granted me a fantastic opportunity: I'm living my own personal American Dream. Despite all its economic and social problems, I believe that America is still the Land of Opportunity. Not just in economic terms but also in the broader, meritocratic sense: here, if you've got the right stuff, you'll get ahead".

Stefano Semeraro













The Dallara IndyCar Factory is located less than 1/3 of a mile from the historic Indianapolis Motor Speedway. More than 22,500 square feet of interactive and hands-on exhibits centered around engineering and technology of the world's fastest sport! While you're here enjoy Street-Legal IndyCar 2 Seater, Racing Simulators, Dallara factory tours, Green Screen Photo Op, and Gift Shop.



1201 Main Street I Speedway, IN 46224 317-243-7171 I www.indycarfactory.com

Open Monday - Saturday, from 10 a.m. - 6 p.m. Dallara factory tours - 11 a.m., 2 p.m., and 3 p.m.

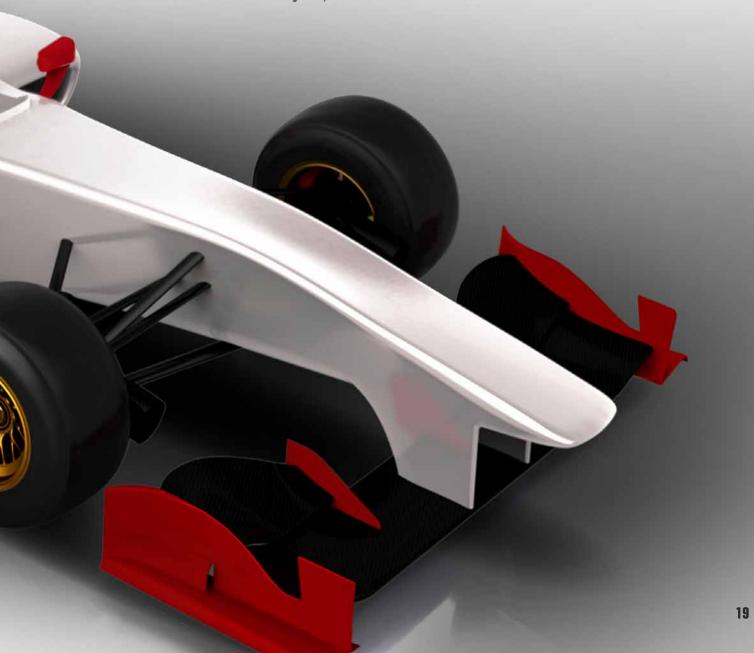






SF14 LREADY A HIT

Walter Biasatti, the Dallara SuperFormula manager, on the latest developments in the project: The encouraging "functional tests" carried out by the Japanese drivers on the simulator in Varano, and the ongoing collaboration with engineers from the major far eastern manufacturers involved in the category all contributed to what appears to be a very promising vehicle. The first cars will be delivered in July, ready for the 2014 championship





Engineer Biasatti, what stage is the SuperFormula project at? A few months ago you told us you were expecting a rather "demanding" winter: Was it more or less difficult than you expected? "We are in the final stages. We have been

«We are in the final stages. We have been producing of a large part of the components since the beginning of February, we have just started laminating the first chassis and we expect to start the

type testing very shortly. To this end, we have already carried out some preliminary tests, with positive results».

What can you tell us about the tests that have been carried out up to this point?

«We have done a lot of work on the simulator, and Honda and Toyota have both been here for two sessions. together with their engineers and leading drivers: Takuya Izawa for Honda and Kazuki Nakajima (ex Williams F1) for Toyota. They were very important tests that provided us with a lot of information and interesting ideas. The SF14 is the first car that we have defined "virtually"; i.e. defining the

principle design parameters before we even writing the first line of the project, and it has proved to be a highly efficient way of working. This new approach is a definite advantage for the project».

As you mentioned before, several Japanese drivers have been to Varano in order to try out the simulator: can you tell us something about their reactions and



maybe a couple of anecdotes during their visits?

«The first driver to try the simulator was Nakajima who already had some experience of other simulators and so had some idea of what to expect. This meant that he was ready to go right from the start without any need for acclimatisation. A few weeks later it was Izawa's turn. He had never been in a simulator before so needed to be "broken in"; but after a couple of hours he was already fully operational. Both drivers carried out the same tests, so as not to give either an advantage over the

other, completing over 100 laps a head. In order to establish a frame of reference, they tested their current cars on the Suzuka track, after which they tested various configurations on the SF14. Some of these were then adopted as solutions to be implemented on the "real" car: this is the great advantage of the simulator, the fact that it is possible to be certain about various aspects of the configurations before taking them out onto

the track. Both drivers' times were the same as they regularly achieve on the track, but more importantly the feeling was the same as they are used to experiencing in the real cars. Normally, when drivers use the simulator for the first time, they tend to say things like "the simulator did this, or that". However, when they really start getting used to it, this changes to "...the car under steers, the car hasn't got enough traction...": this means that the simulator is really doing its job and that the drivers feel as though are driving a real car: and this is exactly how the Japanese drivers reacted".

What are the most challenging aspects of the regulations?
«Our main challenge involves implementing

«Our main challenge involves implementing the FIA F1 2010 safety regulations; but the real challenge lies in packaging the car itself. The fact that we had to install a Kers, the servo-steering, two different engines, and three pedals instead of two, caused no end of headaches.... Nevertheless, it's proving to be a stimulating project and very rewarding from a technical point of view.

How is the collaboration with Honda and Toyota engineers responsible for designing the engines organised? How stimulating is it working with someone from such a diverse industrial and sporting background?

«Quite apart from their technical abilities, what strikes you straight away is the spirit of competition between them. We are in constant contact with them, and there is a continuous exchange of information; we have never had any problems and



everything has gone smoothly».

What are the next stages in the program? When will we be able to see the car at

«We still have to do a few sessions in the wind tunnel before we can be sure that we have the definite form of the bodywork; after which we can start production of these components. We should have defined the car's electrical system, together with the engineers from Honda and Toyota, by

the middle of April. At that point we will prepare the first monocoque and start type testing the car, after which we will begin assembling the first complete car, while simultaneously starting work on the second one. The first two cars will be ready for testing by the end of July 2013».

In your opinion, what are the factors that could convince drivers to try their hand in this type of single-seater?
«We're talking about a car that has similar

specifications to the GP2 or the WSbR 3.5; i.e. light, high performance vehicles with a lot of down-force and the same turbo engines that will be used in F1 from 2014. It will definitely be a highly challenging competition, with races that last an hour and a half and include pit-stops and featuring some top class tracks: I would say that the SuperFormula is a very attractive package».

Stefano Semeraro





E FIA F3 EUROPEAN AMPIONSHIP Mitchell Gilbert, **Mucke Motorsport** David Beck. **Dallara's commercial** department Felix Rosenqvist, Mucke Motorsport TO SOL Mattias Persson / Motorsport Publication 23



n Wednesday 20th March a delegation of drivers from the FIA F3 European Championship visited the Dallara headquarters in Varano dè Melegari.

In the company of the championship marketing manager, Christoph Hewer, they listened to a presentation by the design manager, Engineer Luca Pignacca, after which they were accompanied by Dallara technical personnel on a tour of the workshops where the models are prepared for the wind tunnel, the rapid prototyping and composites processing areas, the post-rig and the driving simulator. The day was a great success and Dallara wishes all the drivers the very best for the 2013 season!

Those present:

Team Carlin

Jordan King Nicholas Latifi Jann Mardenborough Harry Tincknell

Ma-con

Sven Müller André Rudersdorf

Mücke Motorsport

Mitchell Gilbert Roy Nissany Felix Rosenqvist

Prema Powerteam

Lucas Auer Eddie Cheever Alex Lynn

URD

Lucas Wolf















Mattias Persson / Motorsport Publication



DALLARA WINS THE 2013 PTC AWARD

The company's foresight in realising the long-term importance of CAD and continuing commitment to innovation were acknowledged with this award presented in Parma

allara means racing cars, but above all it means technology, because creating a car requires around eight months of virtual simulations, which, given the very short turnaround between one championship and the next, means that there is rarely more than one month available for the assembly phase. In this context, state-of-the-art design and calculation tools are fundamentally important and, having realised this back in 1993, Dallara chose PTC, the market leader in the American Product Life Management (PLM) sector, as its partner in this ongoing process of innovation.

The prestigious «PTC Live Tech Forum» is held in Italy on an annual basis and is

dedicated to PTC's innovative technologies and company strategies. This year the Forum was held in the Hotel Parma e Congressi in Parma on 6th March and was attended by the managing director of Italia PTC, Stefano Rinaldi, who presented the company's "vision" and its future prospects. During the course of the event, which featured interesting discussions. presentations, demos, and contributions from other companies who have chosen PTC to develop their products, Dallara, together with Ansaldo Breda and the Pavan Group were presented with the PTC Awards. Dallara was selected to receive this award for the following reasons: «for having been among the very first companies to adopt

parametric CAD tools, transforming the way it designed its products, and for having chosen Pro/ENGINEER over twenty years ago». «For being one of the first companies to understand the need for a PLM system in order to transform its processes and the way they are managed, when PLM was still in its infancy».

«And, last but not least, for its commitment to the use of PTC solutions in transforming not only the way Dallara creates its products, but also how its provides support and service to its customers». Stefano Rinaldi presented the award to Luca Pignacca, the Dallara design manager.

Alessandro Santini





PROFESSIONAL DRIVING SIMULATOR



... AND MANY MORE CIRCUITS!



www.dallara.it

dallara

THE PURSUIT OF EXCELLENCE

On the road since 1972.

- Consultancies, design and production of racing cars and high performance road cars.
- Aerodynamics: wind tunnel and computational fluid dynamics (CFD).
- Research & development: vehicle dynamics and driving simulator.

