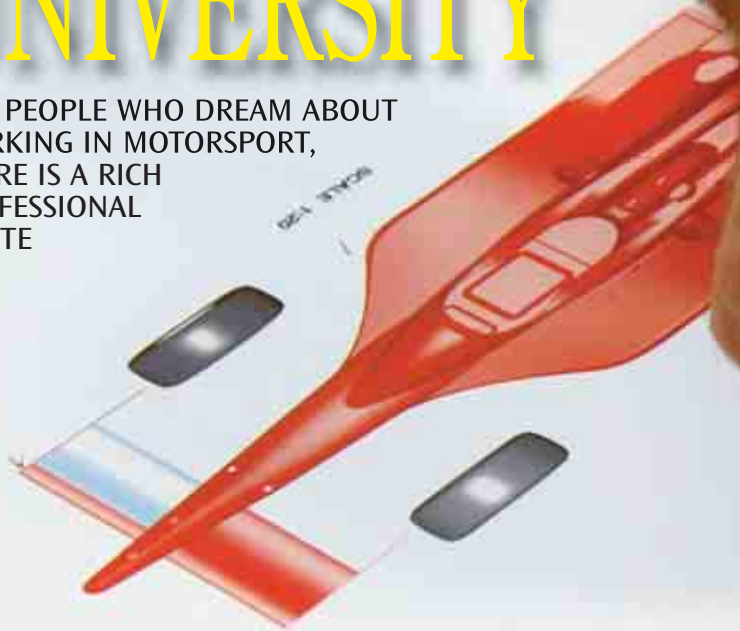


INDY

SAFETY IN RACING HAS UNDERGONE
HUGE ADVANCES: TWO AMERICAN EXPERTS
TELL US ABOUT DALLARA'S ROLE

UNIVERSITY

FOR PEOPLE WHO DREAM ABOUT
WORKING IN MOTORSPORT,
THERE IS A RICH
PROFESSIONAL
ROUTE



WIND TUNNEL

INVESTING IN THE FUTURE TO OFFER HIGH QUALITY AT LOW COST.
THIS IS HOW WE OPTIMISE THE TIME IN VARANO DE' MELEGARI

WS RENAULT

ANDREA MANCINI OF DALLARA REVEALS THE SECRETS
OF FUTURE F1 CHAMPIONS' FAVOURITE CAR



A GALLERY OF ACHIEVEMENTS



A RATIONAL USE OF THE WIND TUNNEL
IN CLOSE COOPERATION WITH CFD ALLOWS CUSTOMERS
TO STREAMLINE THEIR BUDGET AND WORKING TIMES
THUS REACHING GOALS AND ABSOLUTE QUALITY.
THIS TECHNOLOGY MUST CONSIDER THE ECONOMIC CRISIS
AND ADAPT TO ANY PROJECT, FROM F1 TO SUPERCARS
AND PROTOTYPES FOR LE MANS





If proof were ever needed of the value of Dallara's pursuit of excellence and belief in continuously investing in our facilities and extending the breadth of services at our clients disposal, then perhaps the worst financial crisis since the end of the Second World War has provided it! In its aftermath the world market for wind tunnels and aerodynamic consultancies has changed greatly. We now face the arrival of serious competition due to world – wide over capacity and the availability of new facilities and the ever increasing pressure on efficiency, quality and cost of service.

Nestled away between Italy's food valley and the Apennine Mountains, is Dallara Automobili, world leaders in the design and production of racing and high end production cars. The company has undergone some incredible upgrades in the recent years, starting in 2008 with the creation of its new wind tunnel facility, continuing last year with both a new supercomputer for the CFD and FEA departments and a radical upgrade of our 40% scale wind tunnel and finally culminating this year with the upcoming inauguration of our state of the art driving simulator.

"These facilities complete the resources existing in Dallara, second only to the quality of the dedicated people working here"" said Andrea Pontremoli, Dallara CEO. In its near 40 years of history, the continuous investments have proven successful in obtaining the results that have made Dallara one of the major racing car constructors in the world.

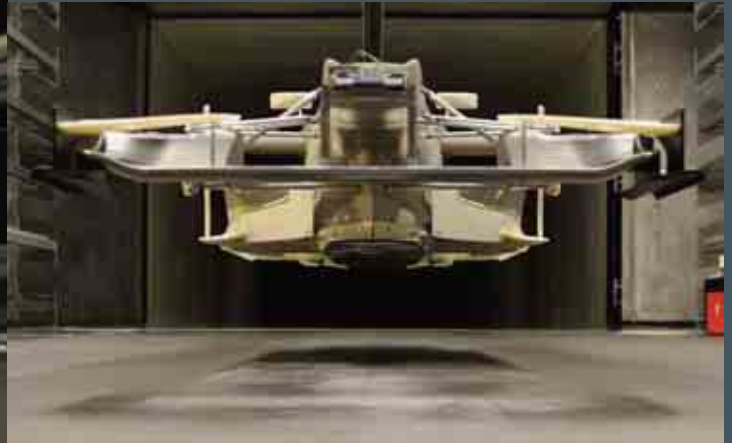
Led by an award winning engineer Dialma Zinelli, the aerodynamic department has always been at the heart of Dallara. Since 1982, when through company founder, Gianpaolo Dallara's vision, the first moving belt wind tunnel in Italy was built and continuing today with the highest level customers that regularly use our services. It is generally appreciated that preliminary aerodynamic studies give advantages not only to F1-level cars but also to road cars in general. This has made it even more challenging for engineering firms like Dallara to efficiently and cost effectively cover all of the automotive spectrum from high end road cars to F1 or LeMans projects.

Such has been the reputation of Dallara's expertise that many of the most prestigious

automotive manufacturers have beaten a path to Dallara's door to have some of the Italian design 'magic' introduced to their most exciting road cars. Collaborations and consultancies have ranged from Honda F1 to the Maserati MC12 to road cars such as the Bugatti Veyron supercar, Alfa A8C and the KTM X-Bow.

It has been due to the increase in demand for Dallara's aerodynamic services that the new facility was built next to the main factory complex. This new 60% scale wind tunnel facility, includes 1000m2 of design offices, private meeting rooms, 4 separate model shops, a machine shop and a rapid prototyping department, all secured by RFID entrances to all areas. Since its debut in 2008 an extensive software and hardware update has been performed aimed at offering customised solutions to our clients thus guaranteeing the service necessary to be at the leading edge of competition.

This has not stopped us from upgrading our smaller 40% scale wind tunnel in order to offer highly competitive services also for smaller budget projects. A new, re-designed, fully automated, internal model motion



control system and a new belt tracking system allow us to perform the whole motion envelope of any car without having to neglect any real car positions. Applying this to smaller scale models without losing in stiffness has been a challenge but has been proven successful. This has resulted not only in more detailed results but has improved the testing time thus optimising even more the wind tunnel usage of our clients.

It is widely recognized that both wind tunnel testing and CFD alone may not be enough to reach the desired results. This is true not only on projects where performance is paramount but also in projects such as high performance road cars. Our knowledge of acoustic, thermal and comfort analyses through the use of state of the art CFD and post-processing softwares are examples of the integration we regularly perform between our experimental and numerical aerodynamic areas. This is an added advantage that allows our clients to receive a complete qualitative and quantitative analysis. Using CFD in preliminary stages of aerodynamic development has also proven to be a cost effective method of preparing for a more thorough wind tunnel development

program, resulting in a more efficient use of our client's aerodynamic budget, a more optimised series of components tested in the wind tunnel, a higher quality of the results and a reduction in the time necessary to reach the desired project targets. Finally we also offer an integration with our structural analysis department in performing fluid-structure interaction analyses of critical car components.

Having such a variety of clients we also need a great selection and modularity in the tools we offer our clients. In the wind tunnel we have the capacity of customising the hardware on the models with features such as active suspensions, steering systems, load cells, pressure tapings and flow meters to mention a few and in the CFD department we have a full time R&D area dedicated to the optimisation of software and hardware tools to be put at the disposal of our CFD engineers.

In order to offer the best possible service we cannot forget the quality, efficiency and modularity that rapid prototyping can offer in wind tunnel testing. Recently we have added to our stereo lithography department

a third SLA 700 machine. We now have the capacity of producing around 9000 wind tunnel model components per year. This requires not only a very efficient use of the machines, but also an optimised design of all model components, which in turn reduces the model shop fitting time and wind-off time in the tunnel. The final result is an overall reduced time-to-test (the time need to go from the design office to the end of the wind tunnel test) and a more efficient and therefore cheaper use of our client's wind tunnel time.

In 2009 the two wind tunnels ran on both in 2 and 3-shifts, the rapid prototyping machines performed with a laser productivity of 78% based on 24 hours a day and 2 CFD cases per day were averaged. This is a testament to the efficiency that can be offered to our clients.

The combination of all the above and the never ending pursuit towards offering an always improving service makes Dallara the ideal partner with which to develop a vast range of automotive projects.

Andrea Vecchi
Wind Tunnel Manager



SAFETY IN INDYCAR SYNONYMOUS WITH

TOTAL SAFETY IS THE HOLY GRAIL IN RACING. EVERYONE IS SEARCHING FOR IT, BUT NOBODY CAN FIND IT. HOWEVER THE PROGRESS WE HAVE SEEN IN THE LAST TEN YEARS SHOWS THAT IMPROVING SAFETY IS MORE AND MORE ACHIEVABLE ON THE TRACK. THANKS TO NEW TECHNOLOGY, MATERIALS, SURVIVAL CELLS AND STUDIES ON LOAD DISTRIBUTION, DRIVERS CAN NOW WALK AWAY FROM ACCIDENTS THAT WOULD HAVE BEEN TRAGIC EVEN IN THE RECENT PAST; FURTHERMORE THEY CAN SHORTLY AFTER RETURN TO RACING. THANKS TO ENGINEERS AND PLANNERS INDYCAR TOGETHER WITH F1 IS PERHAPS THE SERIES THAT UNDERWENT THE MOST IMPORTANT PROGRESS. ON AMERICAN OVALS CARS RACE AT INCREDIBLE SPEEDS, BUT THANKS TO DALLARA'S COMMITMENT TO, DRIVERS' SAFETY IS MORE AND MORE SECURE. ONE OF THE REASONS WHICH LED AMERICAN SERIES TO RENEW THE CONTRACT WITH THE FACTORY OF VARANO DE' MELEGARI IS ITS CARE IN SAFETY THROUGH THE SEARCH FOR NEW TECHNOLOGY AND THE EXTREME ATTENTION TO THE QUALITY OF COMPONENTS. TO DISCUSS IN DEPTH THESE ISSUES WE INTERVIEWED TWO EXPERTS: **SAM GARRETT**, DALLARA'S TECHNICAL SUPPORT FOR INDYCAR, AND **JOHN DICK**, TECHNICAL DIRECTOR AT KV RACING TECHNOLOGY

R: H DALLARA





SAM GARRETT



JOHN DICK

Are you satisfied with the active and passive safety requirements, rules, standards in terms of the current generation of IndyCar?

Sam Garrett, Dallara IndyCar Technical Support: “We can never be completely satisfied. Safety is a moving target, and requires the cooperation of the constructors, the sanctioning bodies, the race tracks, the teams and the drivers. Racing is inherently dangerous so, while we constantly strive to make the cars “safer”, we can never say they are absolutely “safe”.

John Dick, Technical Director, KV Racing Technology: “I think the current safety standards are state of the art, but things like safety should always be subjected to intense scrutiny so that they may be improved”.

Which do you think have been the main contributions of Dallara to achieve those standards?

Sam Garrett: “Every generation of chassis includes everything we have learned to that point regarding safety. Each generation of chassis is the safest we have ever built. We constantly work to build a car that is as safe as possible, and yet there are still accidents that result in people being injured. Yet, historically, many of the most significant safety improvements have come after a great tragedy. We learn something from every accident, and use that information to improve the safety of all the cars for the future. We try to take something positive from every bad situation”.

John Dick: “I think Dallara have been major contributors to the improvement

in safety for the Indy Car Series. Good logical design considerations have kept the standards high, but I believe that Dallara’s quality control of critical parts has been the greatest contributor to safety over the last 8 years. It is extremely rare to have a component failure with a Dallara part. And many drivers have been shielded from harm due to the high quality standards of Dallara manufactured components.”.

How can you compare, in terms of safety, the IndyCar with other race cars you might experience – for example NASCAR, Dragster, NHRA, GT, Sportscars, Daytona Prototypes...

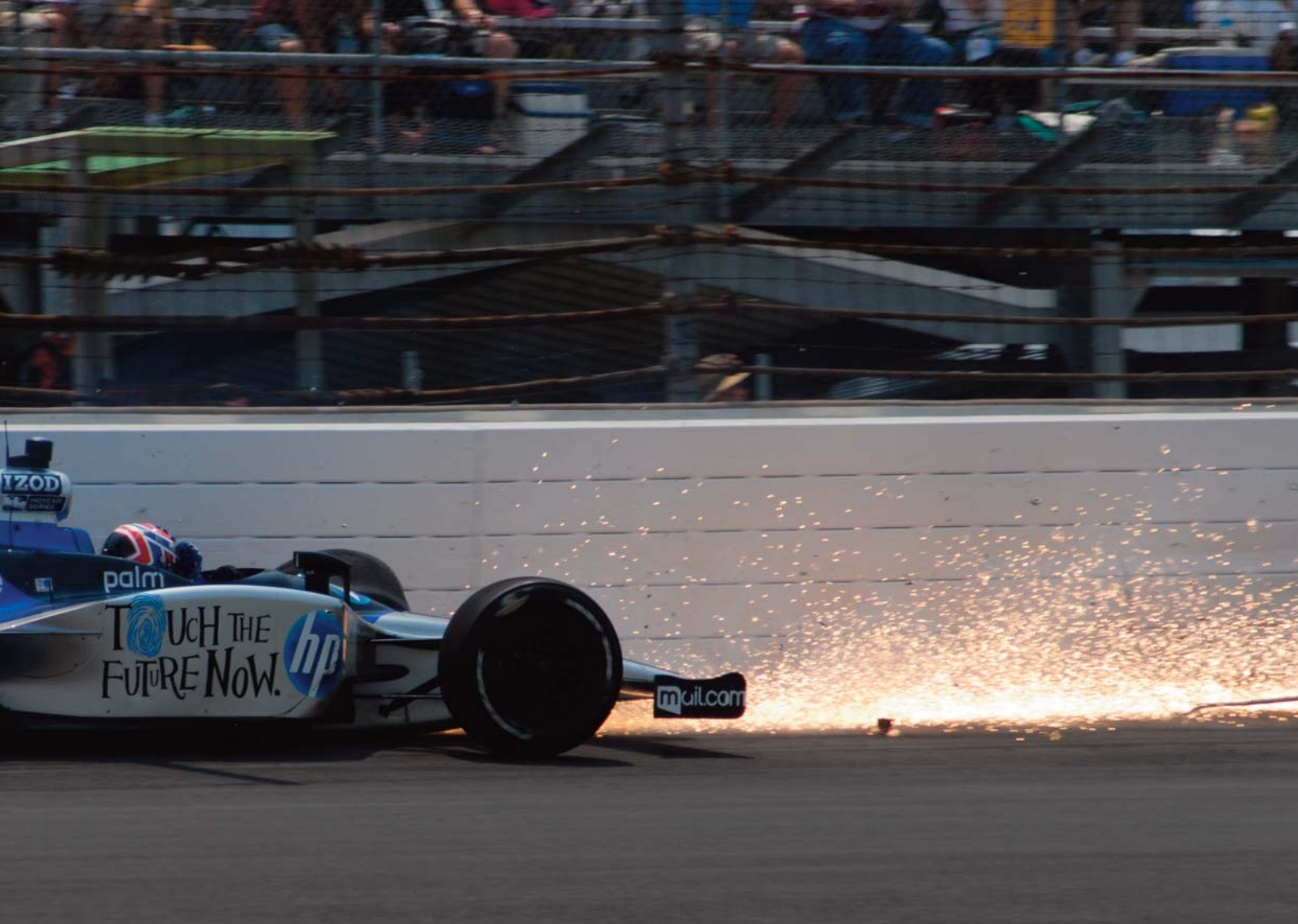
Sam Garrett: “My recent experience is with the IndyCar Series chassis, which clearly has the highest safety standards of any vehicle that I have ever worked with. When I think back over the years about the various series that I have been involved with, I have to cringe a bit regarding the relative safety of those early cars. Although the standards were acceptable for their time, the level of safety compared to what we have now is quite scary. Club racing cars with their minimum roll cage requirements - at least the speeds are relatively low! The IMSA GTP cars - those cars were really fast, and they all used aluminium monocoques! But none of them compare to the speeds we see in the IndyCar Series, and the consequent violence of the crashes. We regularly see accidents with loads in excess of 100G, and occasionally as high as 200G! And still the drivers not only survive, but are able to race again”.



John Dick: “I am sure that Indy Car racing is more potentially dangerous than all other forms of motorsports due to the high speeds that are achieved on ovals. We have all seen crashes where drivers have experienced loads of 100+ G’s and walked away with nothing more than sore muscles. I am positive no other form of motorsports, with the possible exception of Formula 1, could apply such loads to their drivers and have a safe result. They are simply not engineered to distribute those types of accelerations without driver injury”.

Do you remember the situation that made you realise that IndyCar had such a high level of safety?

Sam Garrett: “There have been so many- Davey Hamilton and Kenny Brack at Texas, Dario Franchitti at Michigan, Tony Kanaan, Vitor Meira and Mike Conway at Indy, Will Power and Nelson Philippe at Infineon...!!



There have been so many times when a car has literally disintegrated before my eyes. In those cases, you hold your breath, your stomach is in a knot.... You fear the worst, and feel as though you're going to be ill, and you get no relief from these feelings until you learn that the driver has miraculously survived. Afterwards, you get a chance to inspect the remains of the car. At first glance it seems completely destroyed- bits of jagged metal and carbon fiber, covered with oil and dirt- are all you can see. But, on closer inspection, you see that the monocoque, the safety cell for the driver, has survived. It is massively scarred- scratched and gouged, with bits broken off, and sometimes even cracked open in spots, but still basically whole. And you recognize how the driver was able to survive".

John Dick: "I can recall an accident involving Alex Barron at Indianapolis

in 2002. During practice for qualifying, a mechanic left the front anti roll bar disconnected after a set up check. Alex went out in the morning and went flat through turn 1 and had the car snap loose on the exit. As I recall the crash data, he had peak accelerations of over 100 g's and sustained 78 g's in an aft direction. Although Alex was extremely sore, he was back in the T car two days later. It was a horrendous accident that occurred at over 228 mph!"

Can you suggest an area where safety could be further improved? Do you have any advice for the engineers at Dallara?

Sam Garrett "My suggestion is to continue to use the knowledge acquired in all the areas that we work in. We must not only increase the safety of the cars in case of accident, but work towards preventing accidents. Let's

hope that the concepts we are working on to be used in the next generation, such as systems that prevent the wheels from getting stuck to one another, the aerodynamic stability that keeps, as much as possible, the car on the track, and prevents it turning over , they might be able to help and improve the safety in reducing both the severity and the probability of accidents".

John Dick: "The area which I think the open wheeled cars are inadequate is the position of the cockpit. Apart from the helmet, the driver's head is completely exposed, and we know from experience that the helmet is completely inadequate in protecting a driver's head in high speed impacts. I believe we need to find a solution that can come between a tyre and a driver's head. Something like the cage protection in dragsters".

Alessandro Santini

Flies over the curb
at Le Castellet.
This model of Dallara car
will retire at the
end of 2011
to be replaced by
the new T012





THE DRIVERS' FAVOURITE

ACCURATE DESIGN, LOW COSTS,
GREAT PERFORMANCE AND DRIVING PLEASURE:
ANDREA MANCINI, TRACK ENGINEER
AT THE TEAM DRACO EXPLAINS WHY THE F1 DRIVERS
OF TOMORROW LIKE THE DALLARA T08 SO MUCH



The World Series Renault 3.5 will be the first European single brand Dallara championship to set off this season (apart from the GP2 Asia race in Imola). The launch is set for 17th April on the Alcaniz circuit in Spain. As always, it will be nine races, including Montecarlo, which support compliments the F1 championship. It is one of the most famous and most important categories in the continent which, thanks to Renault's "open gate" (and open paddock) policy, attracts an average of 150,000 spectators every race weekend. It is the third model of the Dallara car for the WSR 3.5. At the three-year period 2002-2004 began with the T02 model; when however the competition was not under the control of Renault, but managed by the Spanish RPM organisation, using Nissan engines. It continued with T05 and finally the T08, which is still in use. In fact, to contain the costs during this period of economic crisis, Renault has decided to extend the T08's life for another year, it will retire at the end of 2011, making way for the car of the future, the T012. Andrea Mancini, track engineer at Draco, one of the most important teams in WSR since 2005, winning the championship in 2009 with Bertrand Baguette, describes the characteristics of the car that he worked on.

"We arrived at the World Series Renault with Draco, coming from F3000. And straight away I noticed a substantial difference: instead of having four shock absorbers like the cars we were used to, the Dallara had three, one at the front and two at the back. A different, interesting and appealing philosophy, and once I understood the systems at work, I have to say that I found it a very pleasant car to work with, which involves you completely in the development".

What struck you the most about the WSR Dallara?

"The reliability of the vehicle, incredible, and the value for money that is incomparable with other categories. Maybe there are series which use more powerful motors and are therefore more powerful than our cars, but this brings with it an inevitable increase in costs and mechanical

failures. The Draco team has raced every year since 2005, tens of thousands of kilometres, and I cannot remember having one serious problem".

What do you like about the World Series Renault?

"I admire the organiser's professionalism, we have not seen any favouritism since we arrived in the competition. Everything is out in the open, the technical checks are impeccable and this is important. Because all the teams including Draco know, that the team that wins, does so for one reason only: because they worked better than the others. It is a fact that there are no feuds in World Series Renault, unlike in other championships".

What has impressed you about the cars that have been available to you?

"The T05 was a development of the T02 and I remember it as a robust, practical and reliable car. The T08 immediately had some modifications, the idea was to get closer to the look of the F1 car at that time. The visual impact was impressive, but it led to a loss of speed as a result of the various wings and spoilers. Later, these were removed with a positive knock on effect for the performance of the T08. We will use it again for the fourth season, one more than usual, but it has successfully passed the bodywork, torsion and rigidity tests. They are fully within the limits".

What do the drivers in WSR say about the Dallara car?

"I do not remember one driver, of the past drivers or current rivals that I have spoken to, saying a bad word about the car. They like the down force at high speeds, it is very good and is close to the style demanded by F1, going quickly into the bends to have the best possible grip. And in fact, when Baguette and Winkelhock, my ex-drivers, tried the BMW and the Spyker, despite the difference in power, they adapted quickly because they were used to going into corners at speed".

Massimo Costa





Winkelhock, on the left, and Baguette, underneath with Mancini, the two Draco drivers who over the years have passed from the Renault Series to testing with F1





FOCUS



THE F

RACING IS A DREAM FOR MANY ITALIAN GRADUATES TOO. DALLARA IS ALREADY IN CONTACT WITH ITALIAN AND FOREIGN UNIVERSITIES AND AMONG FUTURE PROJECTS, THERE IS A SPECIFIC ROUTE FOR "PROFESSORS" OF MOTORSPORT

FACTORY OF ENGINEERS

For many recently graduated engineers, who are keen on the world of racing and cars in general, working for Dallara is a dream come true. Work and personal interests are inextricably united. Nothing could be more exciting, if the saying "nothing great in the world has been accomplished without passion" is true. To achieve this goal, we asked Dallara management which features a young person aspiring to join the car company in Parma should have, and how about the relationship with the academic world. We began from the top, with the person who started the company and made it grow, the engineer Gian Paolo Dallara, who is president of the society.

Engineer Dallara, how do you judge Italian universities?

"From a didactic point of view Italian universities, I'm talking about the engineering departments, are excellent. Young people graduating from our universities have nothing to begrudge to the good graduates from other countries; they have developed the capacity to learn well, that is what our business requires, a business in constant evolution".

Which universities collaborate with Dallara?

"We have various contacts with Italian and European Universities (Pisa, Parma, Modena and Reggio, Bologna, Graz, Brescia, Milan Polytechnic and

Turin Polytechnic), but currently we do not have any specific collaboration contract".

Will there be projects between Dallara and the universities in the future?

"More and more, we feel the need to create a Master in motorsport, focused on the vehicle dynamic, the aerodynamics and the driving simulator. We are already in contact with an American university in Indiana and with an Italian one".

The subject gets interesting and more in depth in the following pages with the engineer, Andrea Toso, head of research and development and the American market.





Engineer Toso, what are the characteristics that a graduate who wants to work for Dallara must have? Which courses should they follow?

“If we think about an engineer interested in working for Dallara now, in particular in technical areas (planning, structural analysis, aerodynamics, vehicle dynamics, research and development etc.), he should choose mechanical engineering or aeronautical engineering. We have recently added to our assessment the participation in Formula SAE competitions, where young people can design, construct and drive competition cars and where all is based on a single set of international regulations, shared by universities across the world. Formula SAE offers competition at a national level in Italy, Germany, in the United Kingdom, Austria, Brazil, Australia, Japan and in the United States (in the near future also in Spain, India and China), with a world final reserved to the best teams”.

Is there a perfect “route” for a student who wants to work for Dallara? Which steps would you suggest?

“The first optional step is the development of a thesis about Dallara. Next step is an apprenticeship for both students and graduates. At the end of the apprenticeship, which would last about six months, a fixed time contract can be proposed, which would last from twelve to eighteen

months. The final phase is a permanent contract”.

We were speaking about Formula SAE, where Dallara has been sponsor for few years. How important is it for a student to get this experience?

“We are more than a sponsor, I would refer to Dallara as a sure and passionate partner. The economic contribution that Dallara will bring to the competition is limited. Dallara managers voluntarily take part as judges during the competition, free of charge. Furthermore, our young engineers work as board members for technical briefing or as assistants during practice sessions.

During Formula SAE events Dallara is able to watch out the best prospects and it is not unusual, after the competition, for some of them to be contacted for an apprenticeship. Personally I think the participation in this competition is even more important than attending certain courses”.

Is there some link between American and Italian Universities?

“Universities in general, and technical faculties in particular, teach you a job. Being a graduate in Italy gives you a legal standing, it is not the same in the United States. There have been many attempts at proposing a grade valid in both countries, but so far without success. Through the participation in Formula SAE young European engineers, Italian ones in particular, are able to complete their theoretical training, in general at a much higher level than their American counterparts, gaining

practical experience. Furthermore it is not unusual for American universities to participate in European events and vice versa. This mixture of students and professors is the best example of the creation of links and collaborations.

In my opinion participation is worth more than attending a master (which you usually have to pay for) because it gives young people solutions to many matters such as managing time, economic and human resources, knowledge organisation. Everything is reflected in the quality of the results: performance, lap times, costs, etc...”.

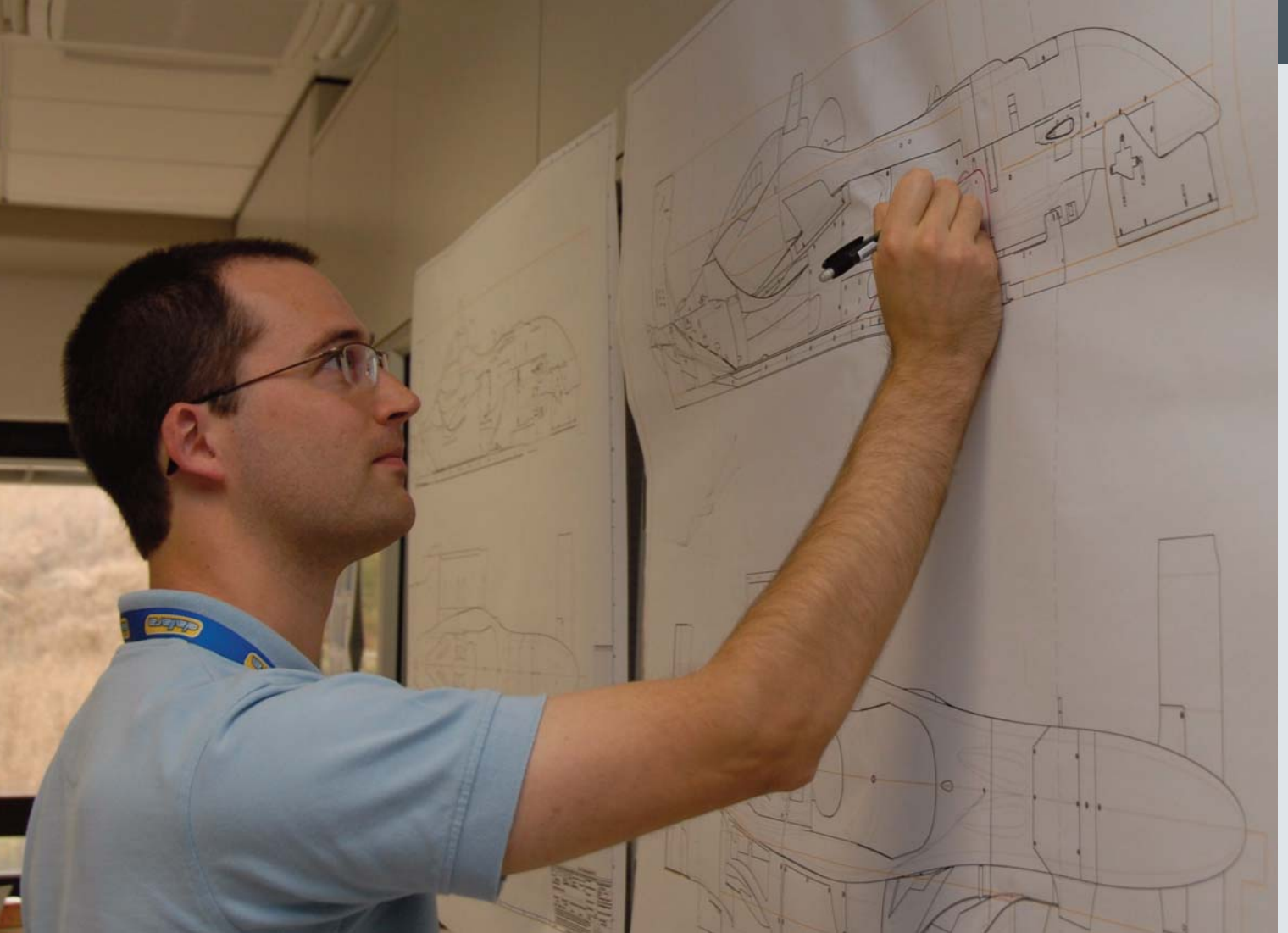
Are there Dallara scholarships to study in America?

“I would not say scholarships. There is no need to promote or give incentives for the training of these skills. Universities educate many more students than can be taken on and, which is more important, the average level is very high. Not everybody who wants to work in the racing sector is able to fulfill his or her dreams, in general only the best, or the most committed and passionate, are able to achieve it.

Anyway, the racing experience, even only Formula SAE, remains a crucial stage of training, both cultural and social, valid for any profession”.

What kind of career opportunities exist and how do you decide which experience is important? Could you tell us some figures about these job opportunities?

“I would not talk about a market, when opportunity meet ability and



passion. It is quite clear that the motor industry is going to evolve towards the electric propulsion and hybrid cars, with more and more importance being put on aspects connected with the consumption of fossil fuels, emissions and noise reduction.

As a consequence the cars of tomorrow will be designed according to weight, acoustics and energy efficiency; it is not difficult to imagine how motor racing will adapt to this new system of social and economic values. Racing will always exist, but the systems of values will change, and therefore the technical regulations. At a world level, there are less than 100,000 people employed in motorsport and it is common that after few years engineers change occupation, for example moving to the R&D departments of large car

manufacturers or their suppliers. Honda in Japan is an example of a company that has provided a clear professional route, successfully offered to young engineers”.

Finally we talk to the Engineer Andrea Pontremoli, MD and Director General who has over twenty years of experience with IBM.

Engineer Pontremoli, is the business opening up to the non-specialist departments? What are the non technical skills that an excellent SME like yours might need?

“In the past, business was very connected with the product, and therefore with the type of mechanical and aeronautical/aerospace engineer. Today products are changing and as a result the range of requested skills is broadening. First of all more

emphasis is put on emerging profiles like software, robotics and graphic engineers.

Secondly, there is always more interest in the car industry compared to racing. This industry requires more than just technical skills, such as managing abilities and customer care. Finally, all these factors affect the company at a strategic level, pushing it more toward the automotive world, but keeping its racing soul and its racing DNA.

The idea of making a Dallara road car, will require marketing and communication skills”.

Our long interview ends here. We leave satisfied with this “factory of engineers”, this technical school that is slowly opening to new horizons.

Alessandro Santini

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THE PURSUIT OF EXCELLENCE

On the road since 1972.

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- Aerodynamics: wind tunnel and computational fluid dynamics (CFD).
- Research & development: vehicle dynamics and driving simulator.



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