

RENAULT ENERGY F1-2015

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FOREWORD

'It is often said in testing times one gains greater understanding about oneself. Although it can be difficult to accept change is needed, the lessons of last season required us to do just that. The Renault you see this year is consequentially very different to 2014. Amongst the many alterations, we have strengthened our operations and procedures, and created new areas for development to generate performance.

There is a real hunger to challenge for on-track success throughout the season, both from Renault Sport F1 and the wider Renault Group.

While we are well aware of the scale of the challenge we continue to face and the depth of the competition, we have a quiet confidence. 2015 is a year of opportunity for Renault Sport F1 and we can't wait to get started.'

Jérôme Stoll
President



01

INTRODUCTION

RENAULT: BRINGING THE FRENCH FLAIR TO F1

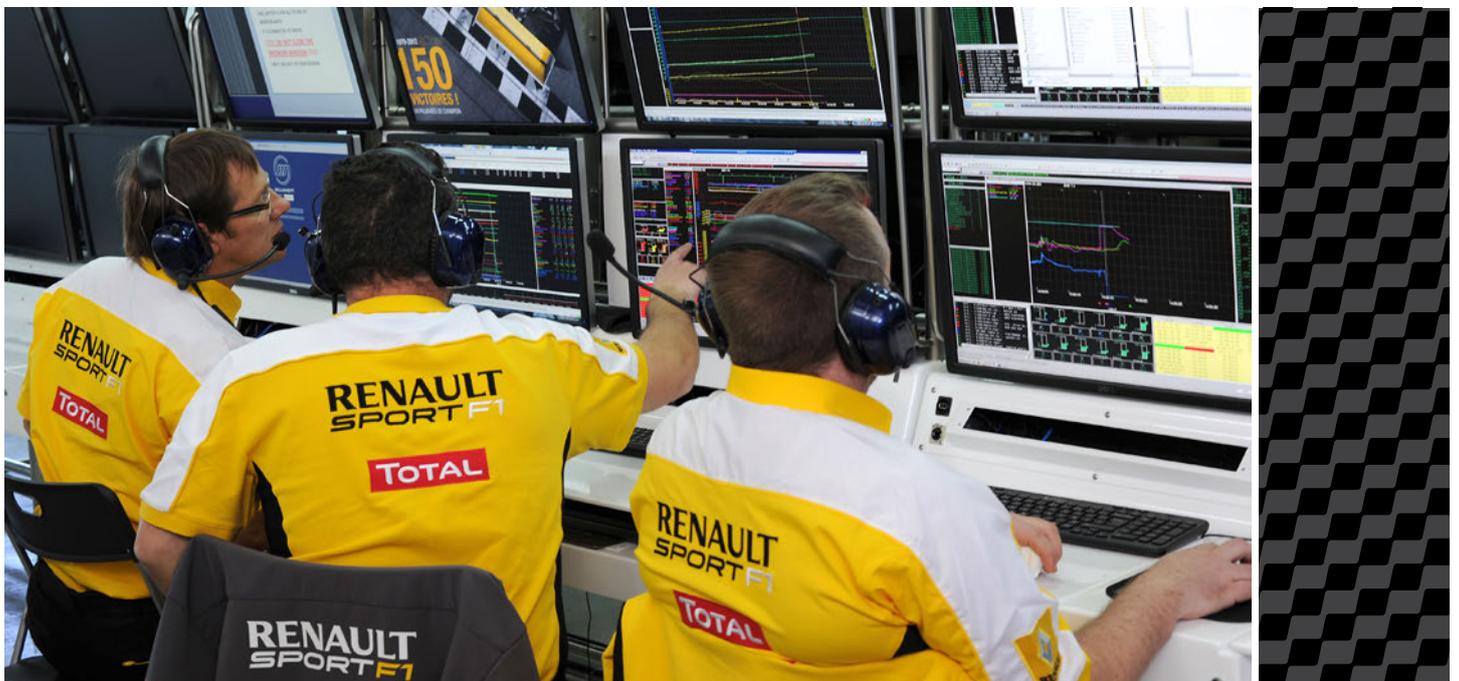
For more than 35 years Renault has brought the French touch to Formula 1.

Since 1977 the French manufacturer has added its own blend of innovation, style and flair to the sport. From the 1970s turbocharged car emblazoned in the bright yellow colours of the Losange via the V10 engine that dominated the 1990s to the all-conquering V8 that powered the fist-pumping Sebastian Vettel to four consecutive titles, Renault's radical technology has always captured remarkable success.

In 2014, Formula 1 welcomed a radical new wave of technology with the introduction of avant-garde powertrain technology. Renault Sport F1 now fully intends to dedicate its technical prowess and creativity to this new discipline and replicate its past successes.

'To succeed in Formula 1 requires pure passion, hard work and constant innovation. We set the bar high but expect even more.'

Cyril Abiteboul
Managing Director



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RENAULT IN 2015

Renault enters the 2015 season with two objectives: to deliver competitive power units that run reliably and improves on its 2014 performance. After a tough season last year, the French manufacturer has taken a back to basics approach to achieving these aims, with a structural reorganization of its Viry-Châtillon headquarters the cornerstone.

'F1 constantly moves forward at a very fast rate. The sport evolves, technology evolves and the competition never sleeps so Viry needs to evolve at the same rate,' Managing Director Cyril Abiteboul explains. *'Viry needed a refresh. We did not suffer from a lack of resources or finances in 2014, it was simply that the resources were not joined up in time or used to their optimum.'*

'In the short gap between seasons we have therefore taken a number of steps forward. First and foremost we have implemented a new organizational structure. There is a numerous of changes in this new structure. I'll underline three of them to indicate where the focus will be in 2015.'

'This new structure will emphasize the need for perpetual change and adaptation within Renault Sport F1. This will be achieved through two new streams led by Rob White and Jean-Paul Gousset. As Chief Technical Officer, Rob will use his in-depth knowledge of Renault Sport F1 to set the strategy and road map for the acquisition, development and utilization of technical skills within the company. Naturally this will always be with a close eye on our F1 project.'

'In parallel, F1 performance is driven by human performance. Jean-Paul, who was previously head of production, is now appointed as Organization Performance Officer, and becomes responsible for organizational matters, procedures and protocols, from the small details to the large changes that together create and harness the racing spirit we want to see in Viry-Châtillon.'

'Another substantial change is the creation of the Development Department, headed by Naoki Tokunaga. In addition to overseeing the Engineering Department, which is still managed by Jean-Philippe Mercier, Naoki will be directly responsible for Performance and Reliability Groups. These two groups are tasked with clear responsibilities as their name suggests, and allow us to get closer to the organizational model of F1 teams nowadays. This should build natural bridges and synergies with our customers.'

'The last noticeable change is that Rémi Taffin will now oversee all track and factory operations, including assembly and dynos, in addition to continuing to look after the track operations. Regrouping all operations under one person aims to bring the excellent spirit of the track to the factory, simplifies our lines of communications, allows us to simplify our lines of communications, allowing us to respond to changes or needs more quickly and ensure overall quality control and cost efficiency towards our internal and external customers.'

'It is still very early to see the direct effects but all the changes are made for long term gain. We should start to see the full impact in development by the mid-season with greater flexibility, dynamism and efficiency across all our operations.'

Although the competition will again be tough, Renault hopes to deliver upwards of the three victories secured last season. *'We knew what we had to do over the winter and we know what we have achieved,'* Cyril finishes. *'We believe we have made a very big step in performance and will be more reliable. We do not know where the others will be: we may not have erased all the gaps, but we are confident that we have gone a long way to making up the deficit of last season. Our objective is to close the gap as much as possible and give Red Bull Racing and Scuderia Toro Rosso a more competitive car on most circuits, independently of their characteristics and sensitivities.'*



03

UPGRADING THE RENAULT ENERGY F1

2015 may be the second year of competitive use for the revolutionary power units, but they still remain a huge challenge for engine manufacturers. *'Year two of a new engine is always difficult,'* Renault Chief Technical Officer Rob White explains. *'The 2015 power unit project was started six months before the 2014 units took to the track, ie. before we had any significant experience of the technology. Then we also needed to consider the issues arising during the season. It creates a need to be both forward thinking and reactive.'*

'Splitting resources between projects is therefore a delicate balancing act, in the short, mid and long term. While certain decisions can be taken upstream, a number of design decisions were taken quite late in the day, in order to benefit from the experience of the 2014 power unit. The result is a power unit that is very different to its predecessor.'

RINGING THE CHANGES

'We have made some fundamental changes to gain performance and reliability. We have upgraded every system and subsystem, with items that will give the most performance prioritized. The principal changes involve the internal combustion engine, turbocharger and battery. The ICE will have a new combustion chamber, exhaust system concept and variable trumpets, as permitted by the 2015 regulations. The compressor is more efficient, while the energy recovery systems are able to deal with more severe usage.'

'The 2014 unit was already well placed in its centre of gravity, however we have tidied up the packaging to give greater ease of integration into the chassis. Additionally many systems and functions have been rationalized and simplified to further ease the task. In short, there are very few carry over pieces between the 2014 and 2015 power units.'

All the performance changes have been carried out under the 'token' system. The power unit is divided into sections and subassemblies, with a value allocated to each. The value is indicated by a number of tokens, with a total of 66 tokens per power unit. For the 2015 season, an engine manufacturer is permitted to select 32 tokens, or 48% of the engine.

IMPROVING RELIABILITY

With just four units per year now permitted, one fewer than in 2014, the required durability is increased and reliability is even more critical this season. Renault has taken measures to improve reliability for 2015. *'Admittedly last year our record was not the best we could have hoped for,'* admits Director of Operations, Rémi Taffin. *'But we worked very hard and made real improvements on reliability in the second part of the year.'*

'In fact we already had 2015 in mind last year as we ran all the parts to the life expected this season. That is, instead of running for the distance demanded by a five-per-year cycle, we tested them based on a four-per-year cycle, or 20% more than required.'

'Having just four units to play with this year certainly gives us less flexibility,' he continues, *'And when a part has an issue it will be a lot more difficult to use again. However we feel prepared knowing that the parts have been running to the lifecycle needed for some time with very few issues.'*

The aim this year is clear, but modest, as Rob ventures: *'First and foremost we need to run reliably, be quick and closer to front. We have made a significant step forward relative from 2014 and, although it is hard to quantify where we will be relative to the competition, what we can say is that we are on course to achieve our own performance objectives.'*



04

RENAULT ENERGY F1-2015 POWER UNIT

The radical power units feature a turbocharged internal combustion engine coupled to potent energy recovery systems. They are hailed as the most sophisticated power plants ever seen on track. The V6 engine and its electrical motors is powerful, yet fuel efficient, capable of producing 850 horsepower using just 100kg of fuel per race.

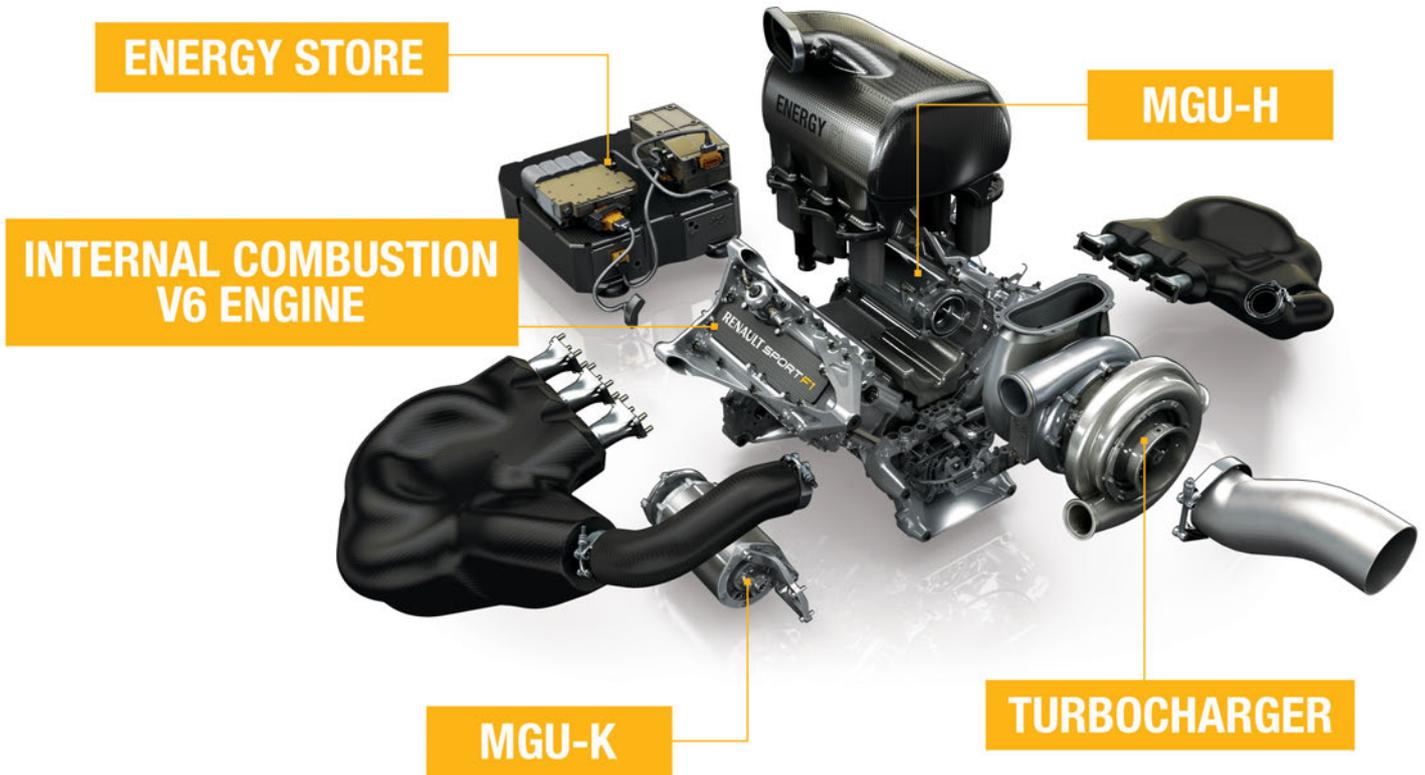
KEY ELEMENTS

- 1.6l turbocharged V6 internal combustion engine
- Direct injection
- Max engine speed of 15,000rpm
- Potent Energy Recovery Systems incorporating two motor generator units – the MGU-H, recovering energy from the exhaust and the MGU-K recovering energy from braking
- Electrical energy recovered stored in a battery
- Combined maximum power output of 850bhp
- Double restriction on fuel consumption: fuel quantity for the race limited to 100 kg with fuel flow rate limited to 100 kg/hr max
- 4 Power Units permitted per driver per year



05

RENAULT ENERGY F1 DECODED



INTERNAL COMBUSTION V6 ENGINE

V6 is shorthand for an internal combustion engine with its cylinders arranged in two banks of 3 cylinders arranged in a 'V' configuration over a common crankshaft. The Renault Energy F1 V6 has a displacement of 1.6 litres and will make around 600bhp, or more than 3 times the power of a Clio RS.

DIRECT FUEL INJECTION

All Power Units must have direct fuel injection (DI), where fuel is sprayed directly into the combustion chamber rather than into the inlet port upstream of the inlet valves. The fuel-air mixture is formed within the cylinder, so great precision is required in metering and directing the fuel from the injector nozzle. This is a key sub-system at the heart of the fuel efficiency and power delivery of the power unit.

TURBOCHARGER

A turbocharger uses exhaust gas energy to increase the density of the engine intake air and therefore produce more power. Similar to the principle employed on roadcars, the turbocharger allows a smaller engine to make much more power than its size would normally permit. The exhaust energy is converted to mechanical shaft power by an exhaust turbine. The mechanical power from the turbine is then used to drive the compressor, and also the MGU-H (see below).

WASTEGATE

On conventional turbo engines, a wastegate is used in association with a turbocharger to control the high rotation speeds of the system. It is a control device that allows excess exhaust gas to by-pass the turbine and match the power produced by the turbine to that needed by the compressor to supply the air required by the engine. On the Renault Energy F1 power unit, the turbo rotation speed is primarily controlled by the MGU-H (see below) however a wastegate is needed to keep full control in any circumstance (quick transient or MGU-H deactivation).

MGU-K

The MGU-K is connected to the crankshaft of the internal combustion engine. Under braking, the MGU-K operates as a generator, recovering some of the kinetic energy dissipated during braking. It converts this into electricity that can be deployed throughout the lap (limited to 120 kW or 160bhp by the rules). Under acceleration, the MGU-K is powered from the Energy Store and/or from the MGU-H and acts as a motor to propel the car.

MGU-H

The MGU-H is connected to the turbocharger. Acting as a generator, it absorbs power from the turbine shaft to convert heat energy from the exhaust gases. The electrical energy can be either directed to the MGU-K or to the battery for storage for later use. The MGU-H is also used to control the speed of the turbocharger to match the air requirement of the engine (eg. to slow it down in place of a wastegate or to accelerate it to compensate for turbo lag.)

BATTERY (OR ENERGY STORE)

Heat and Kinetic Energy recovered can be consumed immediately if required, or used to charge the Energy Store, or battery. The stored energy can be used to propel the car with the MGU-K or to accelerate the turbocharger with the MGU-H. Compared to 2013 KERS, the ERS of the 2015 power unit will have twice the power (120 kW vs 60 kW) and the energy contributing to performance is ten times greater.

INTERCOOLER

The intercooler is used to cool the engine intake air after it has been compressed by the turbocharger.



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RENAULT ENERGY F1-2015 POWER UNIT TECHNICAL SPECIFICATION

ENGINE	ENERGY F1-2015
Displacement	1.6L V6
Number of cylinders	6
Rev limit	15,000rpm
Pressure charging	Single turbocharger, unlimited boost pressure (typical maximum 3.5 bar abs due to fuel flow limit)
Fuel flow limit	100 kg/h
Permitted Fuel quantity per race	100 kg
Configuration	90° V6
Bore	80mm
Stroke	53mm
Crank height	90mm
Number of valves	4 per cylinder, 24
Exhausts	Single exhaust outlet, from turbine on car centre line
Fuel	Direct fuel injection
ENERGY RECOVERY SYSTEMS	
MGU-K rpm	Max 50,000rpm
MGU-K power	Max 120kW
Energy recovered by MGU-K	Max 2MJ/lap
Energy released by MGU-K	Max 4 MJ/lap
MGU-H rpm	>100,000rpm
Energy recovered by MGU-H	Unlimited (> 2MJ/lap)
GENERAL	
Weight	Min 145 kg
Number of Power Units permitted per driver per year	4
Total horsepower	Approx 850hp

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OUR TEAMS

INFINITI RED BULL RACING



The Red Bull Racing-Renault collaboration started in 2007 and has grown into one of the most successful engine-chassis partnerships in the history of the sport, with four consecutive world championship titles. Red Bull Racing was created in 2005 from the Jaguar Racing F1 team, which had itself been born from Stewart GP. Success came rapidly – and has been a standard feature ever since.

In just eight years, the Red Bull-Renault duo has scored 50 wins, 57 pole positions and 44 fastest laps. Led by Sebastian Vettel, in 2013 secured the quadruple-double: four consecutive constructors' and drivers' championships. Such an achievement has only been seen once before in the history of the sport, and more than 20 years ago.

2014 was a challenging year for the partnership, with 'just' three victories. The pair however enters 2015 with renewed energy to regain its position at the top of the championship.

Drivers



Daniel Ricciardo (AUS)



Daniil Kvyat (RUS)

SCUDERIA TORO ROSSO



Scuderia Toro Rosso joined the Renault fold for the first time in 2014.

The Red Bull junior team has competed in the FIA Formula One World Championship for ten years. The team was created with a view to finding two extra cockpits for the stars of the future coming through the ranks of the Red Bull Junior Driver Programme. When the team was first established it operated partly as a satellite to Red Bull Racing, running a car designed mainly by Red Bull Technology.

However, for several years now Scuderia Toro Rosso has run completely independently, with all car design and manufacturing work completed in-house in Faenza.

Currently the team has one win and one pole position to its name, both courtesy of Sebastian Vettel, who produced the fairytale result at the team's home race, the Italian Grand Prix in Monza back in 2008.

Drivers



Max Verstappen (NL)



Carlos Sainz (ESP)

INTERVIEW WITH CYRIL ABITEBOUL



**INTERVIEW WITH
CYRIL ABITEBOUL**
Managing Director

It's been a short winter break this year, but Renault Sport F1 has nevertheless made a lot of progress. Can you explain the areas where you have moved forward?

In the short gap between seasons we have taken a number of steps forward. First and foremost we have implemented a new organizational structure.

Our new structure will emphasize the need for perpetual change and adaptation within Renault Sport F1. This will be achieved through two new functions. As Chief Technical Officer, Rob White will use his in-depth knowledge of Renault Sport F1 to set the road map and a strategy for the acquisition, development and utilization of technical skills within the company, always with a close eye on our F1 project. As everyone knows, F1 performance is driven by human performance so we have created another stream in parallel to manage all organizational matters, procedures and protocols. Jean-Paul Gousset, who was previously head of production, is now responsible for this area, from the small details to the large changes that together create the racing spirit we want to see in Viry-Châtillon.

Another substantial change is the creation of the Development Department, headed by Naoki Tokunaga. In addition to overseeing the Engineering Department, which is still managed by Jean-Philippe Mercier, Naoki will be directly responsible for Performance and Reliability Groups.

With all our operations streamlined, there will be a seamless link between factory and track, giving further leverages for managing the workforce and activity workloads, plus will create career paths. Rémi Taffin will oversee all track and factory operations, including assembly and dynos, in addition to his previous role as head of track operations. Regrouping everything under one person simplifies our lines of communications, allowing us to respond to changes or needs more quickly and ensure overall quality control and cost efficiency.

What advantages do you hope to gain from this new structure?

It is still very early to see the direct effects but all the changes are made for long term gain. We should start to see the full impact in development by the mid-season with greater flexibility, dynamism and efficiency across all our operations.

Are the changes linked directly to 2014 performance?

Not specifically. F1 constantly moves forward at a very fast rate. The sport evolves, technology evolves and the competition never sleeps so Viry needs to evolve at the same rate. Viry needed a refresh. We did not suffer from a lack of resources or finances in 2014, it was simply that the resources were not joined up in time or used to their optimum. We are not in any way pointing fingers at individuals, these changes are simply to improve the collective.

How will the changes benefit Renault's partner teams?

The performance and reliability groups are tasked with clear responsibilities and allow us to get closer to the model of F1 teams nowadays, which should build natural bridges and synergies with our customers. Replicating the structure of a team in our own organization means we will fit more easily into the team culture and create more natural communications. With fewer 'hurdles' to jump we should be more creative, freer to execute decisions and implement actions as a result.

Will personnel from the larger Renault Group continue to be seconded to Renault Sport F1?

Yes, more than ever. We need to create strong and genuine links between road cars and competitive sport in both directions. Renault needs to help our F1 division and F1 needs to help Renault. The personnel we have on board bring new knowledge to us and, in turn, take some lessons of F1 back to road car development when they return. At present there are Renault personnel in several departments that will bring gains to road car areas, for example, fuel efficiency and electrical systems.

What are Renault Sport F1's aims for 2015?

We knew what we had to do over the winter and we know what we have achieved. We believe we have made a very big step in performance and will be more reliable. We do not know where the others will be: we may not have erased all the gaps, but we are confident that we have gone a long way to making up the deficit of last season. Our objective is to close the gap as much as possible and give Red Bull Racing and Scuderia Toro Rosso a more competitive car on most circuits, independently of their characteristics and sensitivities.

INTERVIEW WITH ROB WHITE



INTERVIEW WITH ROB WHITE

Chief Technical Officer

What are the challenges going into the second year of the power units?

Year two of a new engine is always difficult. The 2015 power unit project was started six months before the 2014 units took to the track, ie. before we had any significant experience of the technology. Then we also need to consider the issues arising during the season. It creates a need to be both forward thinking and reactive.

Splitting resources between projects is a delicate balancing act, in the short, mid and long term. While certain decisions can be taken upstream, a number of design decisions were taken quite late in the day, in order to benefit from the experience of the 2014 power unit. The result is a power unit that is very different to its predecessor.

What are the principal changes to the Renault Energy F1 for the 2015 season?

We have made some fundamental changes to gain performance and reliability. We have upgraded every system and subsystem, with items that will give the most performance prioritized. The principal changes involve the internal combustion engine, turbocharger and battery. The ICE will have a new combustion chamber, exhaust system concept and variable trumpets, as permitted by the 2015 regulations. The compressor is more efficient, while the energy recovery systems are able to deal with more severe usage.

The 2014 unit was already well placed in its centre of gravity, however we have tidied up the packaging to give greater ease of integration into the chassis. Additionally many systems and functions have been rationalized and simplified to further ease the task. In short, there are very few carry over pieces between the 2014 and 2015 power units.

This year the power unit is broken down into 'tokens'. How does this system work?

This year there are regulatory limits to do with 'token' spend that determine the number of changes we can make. The power unit is divided into sections and then subassemblies associated to it. The total number of tokens within the power unit is equal to 66. Five out of the 66 tokens are not available for change as they are frozen. An engine manufacturer is able to select 32 token areas, or 48% of the engine, which he would like to change. As the technology gets more mature next year and beyond there will be fewer and fewer tokens available to spend. Clearly the juggling act we need to perform is which areas of the power unit are the most worthwhile to attack for performance reasons.

How has Renault decided to allocate its tokens?

We have used the majority of the tokens for the first race and our use of tokens during the course of the season will be relatively modest. It then becomes a matter of strategy about when you introduce the remaining tokens; whether to introduce at the start of the season when the technology is relatively immature but could give greater relative performance, or later in the season when the part has had more testing miles but the impact on performance will be potentially less. We can still make changes for reliability under the sporting regulations. We have therefore prioritized token spend to make as much headway as possible with performance.

What are your aims for 2015?

First and foremost we need to run reliably, be quick and closer to front. Our honest expectation is that we will make a decent improvement but it is difficult to quantify the gain relative to our competitors who will also progress. What we can say is that we are on course to make a significant performance step and resolve the principal reliability weaknesses by the time we get to the first race.

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INTERVIEW WITH RÉMI TAFFIN



**INTERVIEW WITH
RÉMI TAFFIN**
Director of Operations

Are there any particular areas of the power unit you have worked on to give performance?

We have made lots of changes to the power unit across all areas from last year. We won't go into specifics about each and every part we have changed, but we will arrive in Melbourne with a very different engine to last year. This year we can cash in up to 32 tokens over the season and we plan to use a great deal for Australia, with some saved for use during the year to give flexibility.

Reliability is also a big topic in 2015, with only four power units permitted this year. What steps have you taken to improve reliability?

Admittedly last year our reliability record was not the best we could have hoped for but we worked very hard in this area and made some real improvements on reliability in the second part of the year. In fact we already had 2015 in mind last year as we ran all parts to the life expected this season. That is, instead of running for the distance demanded by a five-per-year cycle, we tested them based on a four-per-year cycle, or 20% more than required. Even though we pushed the parts harder than they needed to go last year, it gave us the starting point for 2015.

How has the reduction in units changed your approach?

Having just four units to play with this year certainly gives us less flexibility and when a part has an issue it will be a lot more difficult to use again. However we feel prepared knowing that the parts have been running to the lifecycle needed for some time with few issues.

With two teams in 2015, how has the structure of the track operations changed?

With two teams this year, both of which are part of the Red Bull family, we have been able to allocate resources in a more effective way. Each team will have a track support leader overseeing the engine engineers and technicians – one more person than previously. In the past the track support leader would also run a car, but this year his role will be to make sure the entire operation at the track works as well as possible rather than specifically look after one driver. This effectively frees them to look at all areas of the power unit and performance as a whole. The two track support leaders will also be able to share information between themselves, doubling the data we have per session and, in theory, moving forward at a much quicker rate.

And how have operations at the factory been modified?

In the past assembly, dynos and track operations were linked but essentially separate departments, but now they will be regrouped under the banner of operations to create a seamless link between factory and track. From the arrival of the parts, through to inspection, assembly, dyno testing and then running on track, one department will be responsible. Accordingly resources have been reallocated based on our updated priorities, allowing us to homogenize and optimize our decisions and subsequent actions.

What advantages will this update bring?

Formula 1 is a fast-paced industry and having one department running operations streamlines everything. When decisions need to be taken, they can be made much quicker, and we will be able to allocate budget and resources to implement them. The framework was already there, but we have just trimmed things down and rationalized the structure. We should therefore be able to respond faster to requests and requirements, which will in turn bring greater reliability and performance from our technology.

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KEY PEOPLE



President:
Jérôme Stoll



Managing Director:
Cyril Abiteboul



Chief Technical Officer:
Rob White



Director of Organisational Performance:
Jean-Paul Gousset



Director of Projects:
Axel Plasse



Director of Development:
Naoki Tokunaga



Director of Operations:
Rémi Taffin



Director of Economic Performance:
Yves Arbeille



Secretary General:
Marie Jourdain



JÉRÔME STOLL

Jérôme Stoll is President of Renault Sport F1. In addition to his duties as Chief Performance Officer and Executive Vice President Sales & Marketing of the Renault Group, Jérôme is also the link between the Renault Executive Committee and the F1 hub at Viry-Châtillon.

Jérôme graduated from the Ecole Supérieure de Commerce de Paris (ESCP) and the Centre de Perfectionnement aux Affaires (CPA/HEC). He joined Renault industrial vehicles in 1980, whereafter he became Managing Director of Berliet Nigeria, a Renault industrial vehicle subsidiary.

In 1987, Jérôme joined Renault's Finance Department and became Finance and Administrative Director at Renault Automation in 1989. After six years he was appointed Director of Industrial Purchasing, and subsequently Director of Powertrain Purchasing.

When Renault Samsung Motors was acquired by Renault in 2000, Jérôme became President and Chief Executive Officer, departing in 2006 to join Renault do Brasil as Chief Executive Officer and ultimately a member of Renault's Management Committee.

In March 2009, he was appointed Executive Vice President, Sales & Marketing and Light Commercial Vehicles, and Chairman of Renault Retail Group.

In September 2013, Jérôme became Chief Performance Officer along with Executive Vice President Sales & Marketing. He was appointed Chairman of Renault Sport F1 in July 2014.



CYRIL ABITEBOUL

Cyril heads up Renault Sport F1, overseeing all aspects of the company to ensure optimum performance and excellence from every department. Using a team of more than 200 engineers, designers, technicians and support staff, Cyril takes overall responsibility for the performance of the power plants used by Renault

Sport F1's partner teams. Additionally, he sets the commercial, marketing and communications targets for Renault Sport F1 to ensure the Renault Group takes full advantage of its F1 activities.

Cyril knows Renault and F1 inside out. After graduating from the Institut National Polytechnique de Grenoble, he joined Renault in 2001 and worked in various positions at company HQ in France and at the F1 team in Enstone. He became Development Director of the Renault F1 Team in 2007 and Executive Director in 2010 before moving back to Viry in 2011. As Deputy Managing Director, Cyril oversaw all contractual relations, marketing and communications activities with partner teams and created a solid platform for Renault as it re-established itself as an engine supplier.

Cyril's astute commercial sense and business acumen led to him being head hunted by the Caterham F1 Team in 2012 to become team principal.

Cyril rejoined Renault in September 2014 to become Managing Director of Renault Sport F1.



ROB WHITE

Nowadays Rob is one of the most experienced engine technical directors in the sport. Starting as a graduate trainee, he worked for over 16 years for engine specialist Cosworth, first on Indy engines, winning races and championships and subsequently in F1 as chief engineer.

Rob joined Renault F1 Team in 2004 as Technical Director (engine) before stepping up to become Deputy Managing Director (engine) in 2005.

Under his stewardship, Renault experienced its most successful period in the sport. Back to back championship wins for Renault F1 Team in 2005 and 2006 closed the V10 era and opened the V8 era, which subsequently concluded with four consecutive titles for Red Bull Racing from 2010 to 2013.

In his new role of CTO, Rob is determined to improve the technical leadership of Renault Sport F1, and allow our structure to write a new successful chapter of Renault in motorsport.



JEAN-PAUL GOUSSET

Jean-Paul occupies a pivotal role within Renault Sport F1: overseeing ongoing organizational performance in every area. The Frenchman was previously Renault Sport F1 Director of Production, allowing him a unique insight into the roles, responsibilities and

ultimately targets of each of the company's departments.

Jean-Paul's motorsport career started in 1986 when he joined the Ligier team as a senior designer. Over the next 15 years he moved between France and the UK to work with some of the biggest contemporary names in the sport, including Larrousse, Lola Cars, Leyton House and Team Lotus.

In 1994, Jean-Paul took a brief hiatus from F1 to join Citroen Sport as head of the design office as it prepared a Paris-Dakar entry and WRC prototype. Following two years intensive development he would return to the UK to take up the position of design office manager with TWR, but returned to France in 1999 to rejoin his old team, which had been taken over by Alain Prost and rebaptised Prost Grand Prix. As head of the design office he contributed to the team's haul of points before moving across to Renault Sport F1 in 2003.



AXEL PLASSE

Director of Projects Axel Plasse takes charge of all on-going activities to deliver maximum reliability and performance to Renault's clients. To do so, he manages the current year's engine development, plus evolutions for the coming seasons. Additionally he oversees advanced studies and the allocation of

technical and financial resources within tight timeframes.

Having joined Renault Sport in 1993, Axel understands the intricacies of designing and engineering an engine from drawing board to world championship domination. His first role was dyno and later track testing the V10, which powered five drivers to titles and monopolized the constructors' championship for six consecutive years.

When Renault withdrew from F1 at the end of 1997 Axel remained with the company, working on production engines until its return to the sport in 1999. As head of the test department, he laid down the framework for the latest championship assault before moving to become project leader for the 2005 V10, which gave Fernando Alonso and Renault F1 Team their first championship success. Axel subsequently became head of design and simulation, aiding Renault to become the dominant engine supplier for the V8 engine era.



NAOKI TOKUNAGA

As Director of Development, Naoki manages the performance targets for the Renault power units in line with project objectives. Carefully assessing performance opportunities versus risks, he sets the technical specification and design for the power unit's hardware and control software. In addition to

overseeing the Engineering Department, Naoki is directly responsible for the new Performance and Reliability Groups, plus reaches out to Renault's external partners and suppliers to assess future developments on and off track.

Naoki's wide-ranging career path and experience allows him to move seamlessly between his multiple tasks. After graduating from university in Japan he joined the Nissan Motor Company, working on projects including the World Sport Prototype Championship, prestigious Le Mans 24 Hours, British Touring Car Championship and Japanese GT.

In 2000 he moved into F1 with Benetton Formula, first as a vehicle dynamics engineer. Naoki quickly moved through the ranks, becoming head of control systems in 2002 with Renault F1 Team, helping Fernando Alonso win back-to-back world titles. He then moved up to head of KERS development in 2007, before his promotion to Deputy Technical Director in 2010 with Lotus F1 Team.

Naoki joined Renault Sport F1 in 2012 as it prepared for the introduction of the new generation power units.



RÉMI TAFFIN

Rémi takes responsibility for the on-track engine performance of Renault Sport F1's partners, mobilizing the teams of engineers and technicians in the dynos and assembly department at Viry to provide reliable and competitive engines. He then manages the transition to track by overseeing the

engineers integrated to Renault's partner teams to ensure the highest levels of support.

Remi has a wealth of track experience. He joined Renault Sport in 1999, working across Renault's prestigious roll call of clients, including British American Racing, Arrows, Benetton and Renault F1 Team. He has worked directly with two world champions, Jenson Button and Fernando Alonso, engineering the latter to victory in his two title-winning years.

He stepped up to manage track activities with the creation of Renault Sport F1 in 2011. Attending all races and tests throughout the season, Rémi oversaw all track engine performance and customer support for the four Renault-powered teams and was instrumental in the four world titles secured by Red Bull Racing in the V8 era.



YVES ARBEILLE

Yves is Director of Economic Performance at Renault Sport F1. After graduating from the École Nationale Supérieure d'Arts et Métiers engineering school, Yves obtained a Doctorate in Mechanical Engineering. He joined Renault in 1982 and over the next 20 years occupied a variety of positions in

various international regions, including Renault FASA Madrid, Renault

OYAK Turkey and the Renault-Nissan Purchasing Organization.

In 2001, following the signature of the Renault-Nissan Alliance, he became the first General Manager of RNPO before becoming Manager of the Body Equipment Engineering Department in 2003 and Monozukuri Manager at Renault in 2007, whereby in charge of optimizing component sourcing in synergy with Nissan.

Yves joined Renault Sport F1 in 2012 as Deputy Managing Director of business and administration, tasked with creating coherent business strategies with Renault's partner teams and within the Renault Group. In his current role Yves works to ensure maximum economic efficiency and performance from both external suppliers and the services provided by Renault Sport F1 to its partners.



MARIE JOURDAIN

Secretary General Marie has the wide-ranging task of ensuring Renault's F1 operations are successfully activated and exploited, both internally within the Renault Group and externally in business, marketing and communication activities. Marie also oversees commercial, contractual

and legal operations to guarantee consistency and legal compliance across all projects.

Marie is a lawyer by profession and graduated with an honours degree in Intellectual Property from Paris II Panthéon Assas University in 2003. She gained subsequent membership of the Paris Bar in 2005. Marie previously worked for international law firm Clifford Chance from 2004 to 2008, where she advised on the protection and enforcement of IP laws on national and cross-border projects with several high-level clients. In 2006, Marie was able to combine her passion for sport with her legal prowess when she was seconded from Clifford Chance to IMG to work on the commercial and legal opportunities afforded by the 2007 Rugby World Cup.

Marie then joined a French boutique IP & IT law firm before starting her own law firm in 2010. In 2012, Marie's success at national and international level caught the attention of Renault and she was enlisted to manage the legal affairs and, latterly, the commercial endeavours of Renault Sport F1.

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2015 CALENDAR

1  **AUSTRALIAN GRAND PRIX**
15 MARCH 2015 

2  **MALAYSIAN GRAND PRIX**
29 MARCH 2015 

3  **CHINESE GRAND PRIX**
12 APRIL 2015 

4  **BAHRAIN GRAND PRIX**
19 APRIL 2015 

5  **SPANISH GRAND PRIX**
10 MAY 2015 

6  **MONACO GRAND PRIX**
24 MAY 2015 

7  **CANADIAN GRAND PRIX**
07 JUNE 2015 

8  **AUSTRIAN GRAND PRIX**
21 JUNE 2015 

9  **BRITISH GRAND PRIX**
05 JULY 2015 

10  **GERMAN GRAND PRIX**
19 JULY 2015

11  **HUNGARIAN GRAND PRIX**
26 JULY 2015 

12  **BELGIAN GRAND PRIX**
23 AUGUST 2015 

13  **ITALIAN GRAND PRIX**
06 SEPTEMBER 2015 

14  **SINGAPORE GRAND PRIX**
20 SEPTEMBER 2015 

15  **JAPANESE GRAND PRIX**
27 SEPTEMBER 2015 

16  **RUSSIAN GRAND PRIX**
11 OCTOBER 2015 

17  **UNITED STATES GRAND PRIX**
25 OCTOBER 2015 

18  **MEXICAN GRAND PRIX**
01 NOVEMBER 2015 

19  **BRAZILIAN GRAND PRIX**
15 NOVEMBER 2015 

20  **ABU DHABI GRAND PRIX**
29 NOVEMBER 2015 

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RENAULT STATISTICS

OVERALL STATISTICS

- 12 Constructors' titles
- 11 Drivers' titles
- 168 race wins
- 213 pole positions
- 168 fastest race laps
- 6587,5 points scored
- 450 podiums
- 299 races led
- 54,006km led

	V6 1977-1986	V10* 1989-1997 2001-2005	V8 2006-2013	V6 ERS 2014-
Constructors' titles	0	7	5	0
Drivers' titles	0	6	5	0
Total race starts	482	842	746	152
Wins	20	85	60	3
Pole Positions	50	99	66	0
Fastest laps	23	88	56	3

**Including rebadged Playlife, Supertec and Mecachrome engines*

ENGINE MANUFACTURER PAR EXCELLENCE

Renault has competed in Grand Prix racing for over 35 years, and has enjoyed success in every engine formula, as both an engine supplier and constructor. To date, it has won 12 constructors' world titles and 11 drivers' world titles in the championship, plus more than 160 wins. It also holds the overall record of pole positions for an engine manufacturer.

Since its entry into the championship in 1977, Renault's hallmarks have been technical innovation and excellence. It introduced the first turbocharged V6 into F1, leading to a genuine revolution that totally changed the face of Formula 1 and enabled unprecedented engine speeds to be reached.

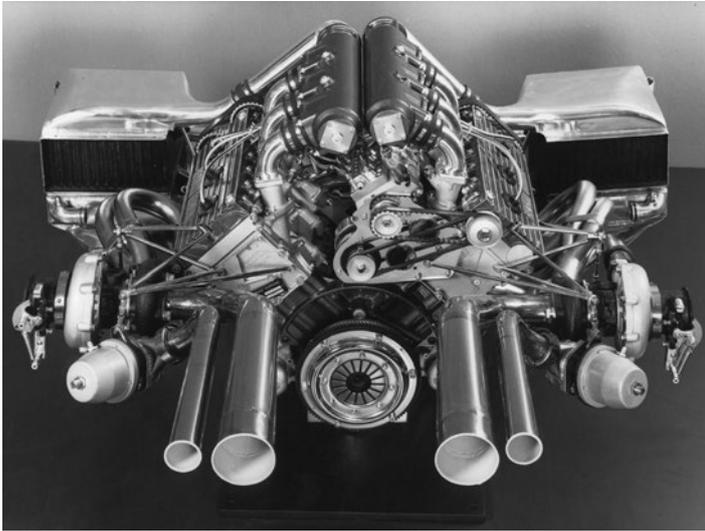
Subsequently Renault dominated the 1990s with a brand new V10 architecture, which remains one of F1's most famous engines. Using this unit, the Williams and Benetton teams dominated the series, with six consecutive world championship crowns.

More recently, Renault set the tempo in the eight-year V8 era, winning 60 GPs, 66 pole positions and 5 constructors' and drivers' championships. An unprecedented statistic sums up its success: over 40% of the available V8 victories were powered by Renault.



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THE STORY STARTS



The Renault journey started when Amédée Gordini, who had created Grand Prix cars under his own name, was recruited to design high performance cars for Renault. A new factory was founded at Viry-Châtillon, on the edge of the motorway leading from Paris to the south of France. It was inaugurated on 6 February 1969, and it was to be the launch pad for motor sporting success over the following decades.

THE FIRST RENAULT

The initial focus was on a new 2-litre V6 engine, which was officially launched in January 1973. The engine soon proved to be competitive in the prestigious European 2-litre sportscar series. That was followed by a move into the FIA World Sportscar Championship with a turbocharged version of the engine.

Renault Sport was founded in 1976, and that year saw the birth of a parallel single-seater programme with the V6 engine in European F2.

In sportscars the turbocharged Renaults proved to be incredibly fast, and everything came together in 1978 when Didier Pironi and Jean-Pierre Jaussaud scored a historic victory at Le Mans, with another Renault coming home fourth.

With Le Mans success finally secured, Renault could now focus on its other goal – Formula 1. The option to run a turbocharged engine had been in the rules for many years, but nobody had dared to pursue it until Renault. It had quietly begun track testing with a 1.5-litre version of the turbo engine in 1976, and a short programme of races was scheduled for the following year.

The V6 turbocharged RS01 made its debut in the 1977 British GP in the hands of Jean-Pierre Jabouille. Nicknamed the ‘Yellow Teapot,’ the car retired from its first race, but not before it had made a big impression. Four further outings at the end of the year provided more valuable experience.

The education process continued through 1978 until Jabouille earned the first points for Renault – and for any turbo engine – with fourth place in the US GP. The quest for reliability went hand-in-hand with the pursuit of performance, and gradually Renault achieved both targets. Jabouille duly scored the marque’s historical first win on home ground in Dijon, having started from pole.

Meanwhile the engineers continued to experiment and progress was rapid. The team went from 520/530bhp in 1979 to over 1,000bhp in the space of five years. When Alain Prost joined in 1981 the Renault team had developed into a regular pacesetter, and a World Championship contender. Indeed Prost only just missed out on the title in 1983.

Meanwhile one-by-one other teams followed the turbo route, in effect acknowledging that Renault had got its sums right.

In 1983 the company became a supplier for the first time, joining forces with Lotus. Supply deals were also extended to the Ligier and Tyrrell teams in subsequent seasons. In Portugal 1985 Ayrton Senna scored his first-ever GP victory with Renault power, and the Brazilian proved to be one of the stars of the season.

The Renault management decided to close the works outfit at the end of 1985, and focus instead on supplying engines to other teams. Indeed in 1986 the Senna/Lotus/Renault combination proved to be the fastest on the grid, as the Brazilian took eight poles – although frustration on race days meant that he scored only two wins.

In 1986 the entire field used turbo engines, and power figures were boosted to way beyond 1,000bhp, a figure even the Renault engineers could not have foreseen just a few years earlier. However, a new challenge was on the horizon. The FIA had decided that turbos were simply now too powerful and thus had to go, and a new formula for 3.5-litre normally aspirated engines was drawn up. Turbos were to be gradually reined in and phased out over the 1987 and ’88 seasons, before being outlawed completely by 1989.

Renault’s first turbocharged F1 adventure had lasted for 10 memorable seasons from 1977 to 1986. Its innovation had revolutionized the sport, and its legacy endures to this day as the sport returned full circle to the evocative V6 turbos in 2014.

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A RETURN TO POWER

After withdrawing from the sport at the end of 1986, Renault returned in 1989 with a new partnership with Williams. In its first year of competition the new partnership won two Grands Prix, and two further wins followed in 1990. During the latter season Adrian Newey joined Williams as chief designer, and then Nigel Mansell – who had used Renault power at Lotus – rejoined the team.

It was the start of an incredible era. By the end of 1991 the combination was the one to beat, and in 1992 Mansell proved so dominant that he secured Renault's first world championship by August.

Former works Renault driver Alain Prost joined Williams in 1993, and he too won the title before retiring. Further championships followed for Damon Hill in 1996, and for Jacques Villeneuve in 1997. Williams-Renault also won the constructors' title in 1992, 1993, 1994, 1996 and 1997.

In 1995 Renault expanded its involvement with a new collaboration with the Benetton team. Michael Schumacher won the championship in 1995, while Benetton won the constructors' title – ensuring that with its two partners Renault scored six straight title successes between 1992 and 1997. Between 1995 and 1997 Renault engines won 74% of races.

With its goals achieved and new records secured, Renault officially departed Formula 1 at the end of 1997. Williams, Benetton and later the new BAR team used Renault-based engines under the Supertec, Mecachrome and Playlife names, however work continued in a small development cell at Viry.

Renault's official absence was to be a short one. In early 2001 it was announced that the company had bought the Benetton team, and was to return in a full works capacity. The Renault name returned as Benetton's engine supplier that season, and then in 2002 the team was reborn as Renault F1 Team, with the chassis department based at Enstone, UK, and Viry the engine division.

In 2003 Fernando Alonso gave the new team its first pole in Malaysia, and then the young Spaniard followed up with his and the team's first win in Hungary. The following year Jarno Trulli gave Renault victory in the most prestigious race of the year in Monaco.

In 2005 Alonso was the man to beat as he won the drivers' title and Renault took the constructors' version, the last titles of the V10 era.



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V FOR VICTORY IN THE V8 ERA

Despite the huge change from V10 to V8 technology for 2006, the Renault F1 Team was able to sustain its momentum as it again captured both titles with Fernando Alonso.

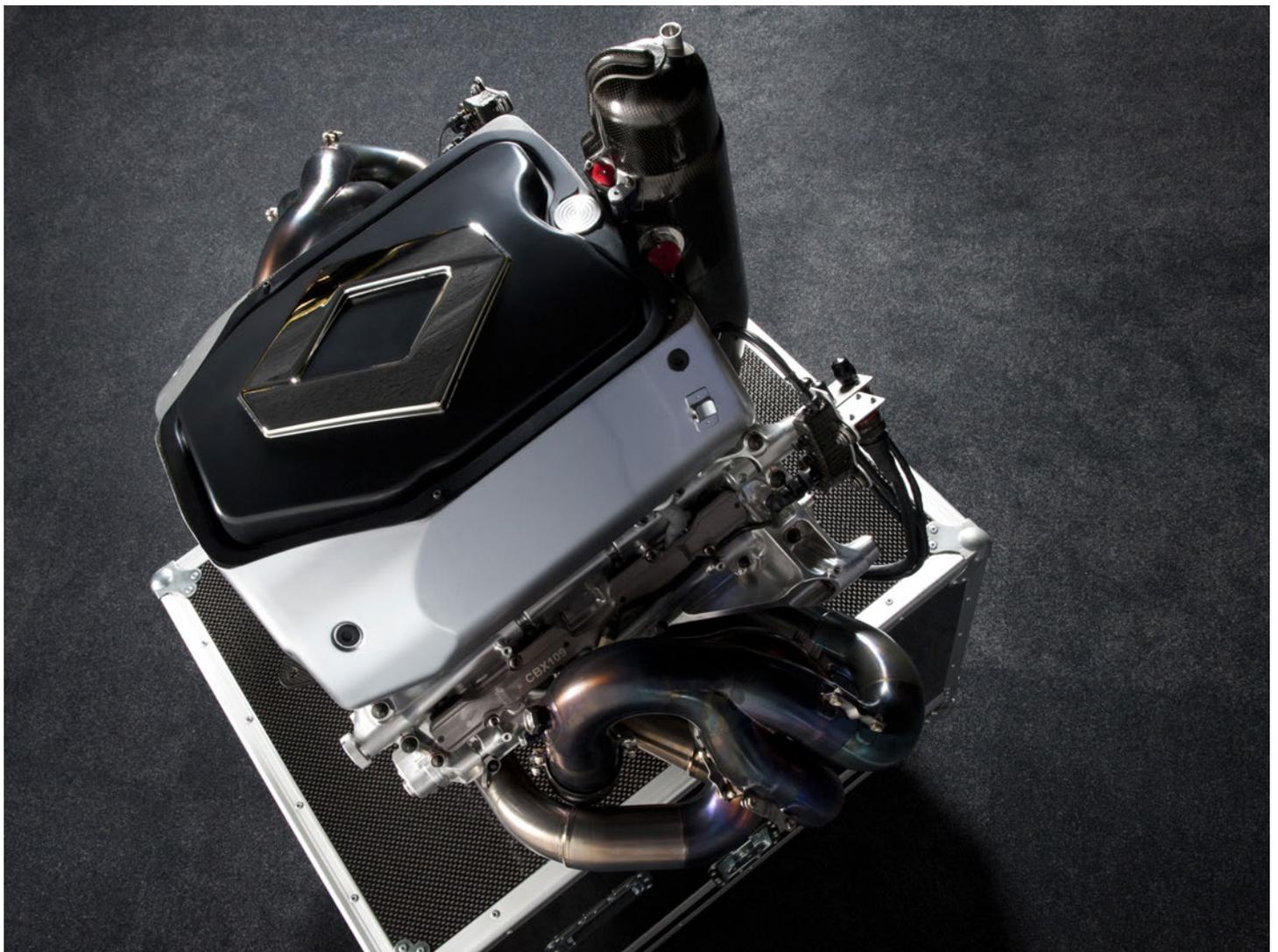
Supplying other teams had long been a Renault policy, and in 2007 a new partnership was formed with Red Bull Racing.

The dark blue cars soon moved up the grid, and in 2009 Sebastian Vettel gave RBR its first victory and earned the team runner-up spot in the constructors' championship. In 2010 both drivers were title contenders from the start of the season. At the end of the year Vettel emerged triumphant as the youngest champion in the history of the sport, while Red Bull-Renault earned the constructors' championship.

The 2011 season marked the dawn of another chapter in the company's history as it returned to its core activity of engine supply, releasing its remaining shares in the Renault F1 Team. Instead it concentrated on its power supply to Red Bull Racing, Lotus Renault GP, as Renault F1 Team was now known, and Team Lotus. Williams F1 Team came back to the Renault fold in 2012.

Sebastian Vettel and Red Bull Racing proved unstoppable in the World Championship, with four consecutive World Championship titles. It was the first time in over 20 years that a constructor-engine partnership achieved such an unbroken run of success. In fact, only once in the history of the sport has a partnership achieved a similar feat (McLaren-Honda from 1988 – 1991).

Throughout the era, the V8 engine developed by 250 engineers at Viry-Châtillon dominated. With five of the possible eight crowns, over 40% of the available wins and a record number of pole positions, Renault was the most successful engine manufacturer of the V8 engine formula.



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RENAULT AND TOTAL: AN ENDEARING AND SUCCESSFUL PARTNERSHIP



Renault and Total are delighted to confirm the continuation of their long-term commercial and technical partnership for a further five years.

The two French groups have a shared competitive history stretching back more than 35 years, when the first Renault Formula 1 car took to the track in 1977. The partnership has since yielded 12 constructors' titles and 11 drivers' crowns across three different engine eras.

This success is due to an excellent working relationship on all levels and one sole objective: to win at the highest level of motorsport.

Over the years of collaboration, the competitive spirit and dedication of Renault and Total have created several innovative solutions to flourish in the complex landscape of Formula 1. Latterly the duo have taken on the test posed by the 2014 technical regulations, which require a V6 1.6 litre turbocharged engine coupled to potent energy systems. With a double limitation on onboard fuel mass and flow (100kg and 100kg/h respectively), the challenge has been to improve fuel consumption with no power drop off. The combination of Total's innovations in fuel technology and Renault's engine creativity has created a radical alchemy. The new units are 35% more efficient than the previous V8 generation while matching the power output. In short, the power units are the most energy efficient power plants to ever be used in competitive motorsport and amongst the most powerful.

Cyril Abiteboul commented, 'We are naturally very pleased to continue our hugely successful and enjoyable relationship with Total. Over the years of collaboration we have achieved unrivalled success as an engine supplier and a great deal of that success is due to our partners, Total.'

'Last year we faced yet another huge challenge together when we took on the 2014 technical regulations. Total yet again demonstrated its capacity to adapt and produce outstanding technical products. Never one to rest on its laurels, it continued to push the boundaries and introduced significant upgrades throughout the season to allow Renault and its partners to make substantial performance steps at each race. These efforts contributed greatly to Red Bull Racing's three victories and second position in the constructors' championship last year.

'We now look forward to a further five years of working together and building on our past successes and endeavours.'

ABOUT TOTAL

Energy is vital to economic development and improved standards of living. Wherever it is available, energy helps drive progress, but its sustainability requires an evolution in how it is used and managed.

This is the environment in which Total conducts its business. With operations in more than 130 countries, Total is a top-tier international oil company and a world-class natural gas operator, refiner, petrochemical producer, and fuel and lubricant retailer.

The nearly 100,000 employees leverage their globally acknowledged expertise so that together, they can discover, produce, refine and distribute oil and gas to provide products and services for customers worldwide.

Total is also expanding its efforts by developing energies that complement oil and gas — today, solar energy and tomorrow, biomass.

As a responsible corporate citizen, Total does its utmost to ensure that its operations create economic, social and environmental benefits in the communities where it operates.



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TECHNICAL PARTNERS

CD-ADAPCO



As an official supplier of CFD and CAE technology to Renault Sport F1, CD-adapco products continue to play a critical role in the ever improving performances of the team.

CD-adapco is the world's largest independent CFD focused CAE provider. Its core products are the technology-leading simulation packages, STAR-CCM+ and STAR-CD.

The scope of activities, however, extends well beyond CFD software development to encompass a wide range of CAE engineering services in fluid dynamics, heat transfer and structural engineering. Its ongoing mission is to inspire innovation and reduce costs through the application of engineering simulation software and services.

A privately owned company, CD-adapco has maintained 17% organic year-on-year growth over the last five years. CD-adapco employs over 550 talented individuals, working at 21 different offices across the globe.



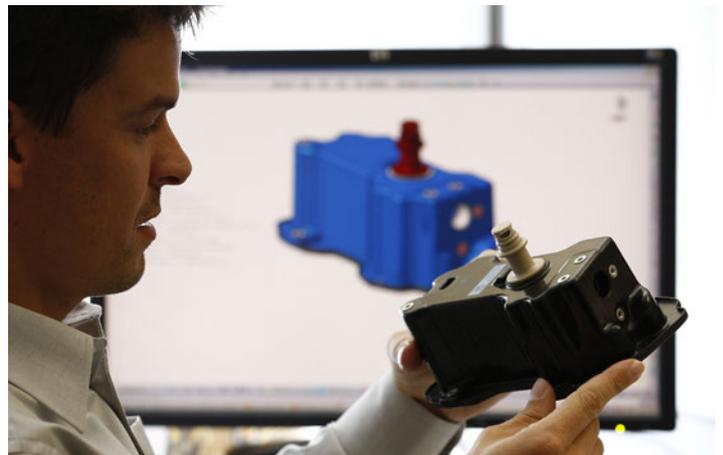
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Elysium Inc. develops interoperability solutions for digital design and PLM markets, with millions of files translated and thousands of customers worldwide.

Founded in 1984, Elysium is headquartered in Hamamatsu, Japan, and has additional offices in Southfield, MI, and Huntington Beach, CA. Elysium currently supports data exchange among CADCEUS, CATIA V4/V5, DELMIA, ACIS/SAT, SIMULIA Abaqus, SolidWorks, 3D XML, Inventor, OneSpace Modeler, Pro/ENGINEER, Wildfire, NX I-DEAS, NX, JT, Parasolid, XVL and the IGES, STEP, and STL standards.

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