

VA-VA-VRROOOM!

RENAULT RS27: POWERING RED BULL RACING INTO 2009



Despite Formula One's current compulsory freeze on engine development, there are plenty of new challenges to keep our engine specialists busy. In this, the third year of Red Bull Racing's partnership with Renault, a new limit on the number of engines per season, a lower rev limit, the complication of KERS and different aero and bodywork parameters, all of these considerations have to be taken into account.

Fabrice Lom, Renault F1's Technical Coordinator, Red Bull Racing, takes us through the changes: "We have eight engines per driver to last through all 17 grands prix, including Friday practice, so penalties are only incurred once any driver uses a ninth engine. On average, therefore, an engine has to last around three grands prix plus the equivalent of one extra grand prix to cover Friday's free practice sessions. However,

there is no stipulation that the engine used on a Friday must then be used for the remaining two days, so one can juggle the engines around within the eight engine limit. "We will see a significant drop in power from all the engines on the grid, because of the rev limit being lowered from 19,000 to 18,000rpm. As the engines were designed to run at 19,000rpm, we had our work cut out to ensure they worked as effectively as

possible with a thousand fewer revs per minute. "We are allowed to make modifications to the engine aimed at incorporating the arrival of KERS as this system changes the areas on the engine which are subject to vibrational stresses. We have carried out modifications allowed within the rules to guard against an engine breaking, simply because the car uses a KERS system. The useable rev range of

the engine also needs to be different to adapt to KERS, to cope with the fact that inevitably, gear ratios will be too long for the power on offer from the engine when the energy stored by KERS is not being released. The system impacts on the engine in that it affects its driveability, but operationally at the race track, the management of the Renault-developed KERS is entirely in the hands of Red Bull Racing."

ADRIAN NEWWEY

Chief Technical Officer
REDBULL TECHNOLOGY



WE'VE TAKEN A BLUE-SKY APPROACH...

There have been more colourful designers in F1 than Adrian Newwey, a man not known for barking at his colleagues, wearing silly shirts, or tossing his hat in the air off the pit wall, but few have proved more effective at producing race winning cars. We reckon the character in the film 'The Matrix', who sees the world through a mass of green digits in front of his eyes, is actually based on Adrian...

'THE BIGGEST CHANGE SINCE 1983'

"2009 arguably sees the biggest rule change since flat bottoms were introduced in 1983, a very major change. We have taken a clean sheet, blue-sky approach, looking at the implications of these rules and how to interpret them, while not changing things simply for the sake of it. Apart from the gearbox internals, there is hardly any carry-over from RB4."

The other big challenge was the KERS installation. "We use a battery storage system, which is heavy and therefore affects weight distribution on the car. After everything is packaged in the usual manner, driver, fuel cell, engine, gearbox, you then have to find somewhere for KERS, while maintaining fuel tank capacity and achieving the weight distribution target. RB5 carries its KERS in the base of the fuel tank."

And this year the teams return to slick tyres. "The main area of change with going back to slick tyres was in terms of weight distribution, as it will put greater strain on the rear tyres, so at the design stage, we moved the weight distribution forward a bit."

Will it all lead to more overtaking? "A bit more, but not a huge amount as people overlook the fact that circuit layout is the most important factor for generating passing moves. Last year the entire field was very close, with a very tight grid and five different chassis manufacturers winning races. A major rule change is likely to have the opposite effect, just one or two teams get it right and do all the winning."

PLACE OF BIRTH: COLCHESTER, UK CAREER HIGHLIGHTS:

- 1977-1980 STUDIED AERONAUTICS AND ASTRONAUTICS AT SOUTHAMPTON UNIVERSITY AND WROTE A THESIS ON GROUND-EFFECT AERODYNAMICS, WHICH IMMEDIATELY LANDED HIM A JOB WITH FITTIPALDI AUTOMOTIVE
- 1982 JOINED MARCH, DESIGNED THE MARCH GTP CAR WHICH WON TWO CONSECUTIVE IMSA TITLES
- 1984-1986 DESIGNED THE MARCH 85C AND 86C, WHICH WON THE INDIANAPOLIS 500 THREE TIMES, WHILE THE 85C AND 86C WON THE CART TITLES IN '85 AND '86
- 1986 A BRIEF SPELL WITH THE FORCE F1 TEAM WAS FOLLOWED BY A RETURN TO CART TO RACE ENGINEER MARIO ANDRETTI. REJOINED MARCH TO DESIGN THE 881 F1 CAR, BEFORE BECOMING TECHNICAL DIRECTOR WHEN LEYTON HOUSE TOOK OVER THE TEAM
- 1990 JOINED WILLIAMS AS CHIEF DESIGNER, OVERSEEING THE FW14 AND THE OTHER WILLIAMS-RENAULTS WHICH WERE THE DOMINANT FORCE IN THE '90S, WON 58 GRANDS PRIX, FOUR DRIVERS' AND FIVE CONSTRUCTORS' TITLES
- 1997 JOINED MCLAREN, TOOK MIKA HAKKINEN TO TWO WORLD CROWNS
- 2006 JOINED RED BULL TECHNOLOGY

STRAIN ON THE TYRES!



JUST ONE OR TWO TEAMS...

WILL DO THE WINNING!



SEBASTIAN VETTEL IN THE SPACE RACE

A glance at Sebastian Vettel and you wouldn't suspect he was Formula One's most promising talent. His slight frame, wide smile and keen sense of humour are not the traditional first impressions of a racing driver. But beneath that apparently relaxed youthful exterior lies steely determination, great race craft and incredible car control. It all seems to come easy to the man who became F1's youngest-ever pole-sitter and then race winner in Monza last year.

Sebastian Vettel wrote himself a small line in the F1 history books at the 2006 Turkish Grand Prix where, as a 'Friday Only' driver for the BMW-Sauber team, he became the youngest competitor to take part in a grand prix weekend at just 19 years of age. And, on that first day in the spotlight, he set the quickest time on what experts reckon to be one of the most demanding tracks on the calendar.

Vettel has been part of the Red Bull family for several years now and the talent-spotters seem to have got it right with the cool kid from Heppenheim in Germany. His outwardly relaxed

manner hides a sharp mind and a keen will to win, something he did a lot of on the nursery slopes of Formula BMW. How does 18 wins from 20 race starts sound? Or 15 pole positions, 16 fastest race laps and 387 points scored out of a possible maximum of 400? His F1 race debut came at the USA GP in 2007, deputizing for the injured Robert Kubica. He came home eighth. His full-time career began later that year, when he first donned the Toro Rosso race suit in Hungary. His highlight of that first season was a fourth place in China, which made up for the disappointment and controversy of his collision with future team-mate Mark Webber a week earlier in Fuji, when both men seemed to be heading for the podium.

2008 did not start well, with Sebastian only completing a total of 39 laps in the first four grands prix, but then came that historic Monza victory and promotion to the senior Red Bull team for this year. And 2009? "My target is to win the world championship as soon as possible and moving to Red Bull Racing is a step in the right direction."

STARDATE 2325: THE STARSHIPS OF THE FEDERATION INTERNATIONALE DE L'ASTRORACE HAVE GATHERED FOR THE YEAR'S BIG RACE. IN THE COCKPIT OF THE RED BULL RACING FLEET'S RB5 IS NEW PILOT SEBASTIAN VETTEL, DRAFTED IN TO REPLACE THE TEAM'S INJURED REGULAR RACER. IT'S BIG RISK. IS THE KID READY?



BRIDGE? THIS IS VETTEL. TRANS-WARP KERS DRIVE IS ON LINE AND ACTIVE. LAUNCH SEQUENCE INITIATED. READY FOR LAUNCH.

ON THE BRIDGE...



WELL, THIS IS IT COMMANDER NEWEY. YOU THINK THE KID'S GOT IT?

I WON'T LIE TO YOU ADMIRAL HORNER IT'S A RISK. I WATCHED HIM WIN A POD RACE IN THE MONZA SECTOR LAST YEAR AND HE WAS AMAZING. BUT THIS IS DIFFERENT. HE'S ONLY FLOWN THIS TYPE OF CRAFT A FEW TIMES AND HE'S UP AGAINST THE BEST PILOTS IN NINE SYSTEMS...

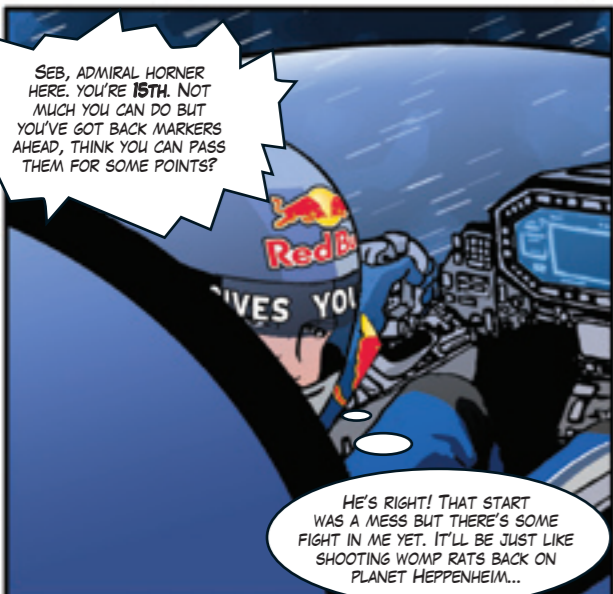


HAMILTON'S ON POLE, BESIDE HIM IS RAIKKONEN AND BEHIND THEM ARE KUBICA AND MASSA. AND FIFTH ON THE GRID IS RISING STAR VETTEL OF RED BULL RACING. THE LIGHTS ARE LIT, FOUR, FIVE... THEY'RE OUT...

WE'RE RACING!

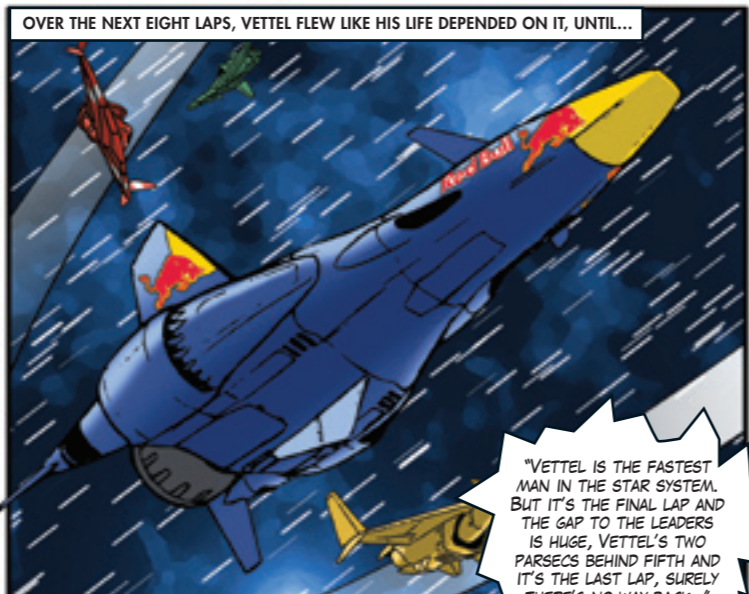


"AND VETTEL'S GOT A PROBLEM! LOOKS LIKE HE WAS CLIPPED AT THE START AND HE'S DOWN TO 15TH. DISASTER FOR THE NEW BOY!"



SEB, ADMIRAL HORNER HERE. YOU'RE 15TH. NOT MUCH YOU CAN DO BUT YOU'VE GOT BACK MARKERS AHEAD, THINK YOU CAN PASS THEM FOR SOME POINTS?

HE'S RIGHT! THAT START WAS A MESS BUT THERE'S SOME FIGHT IN ME YET. IT'LL BE JUST LIKE SHOOTING WOMP RATS BACK ON PLANET HEPPENHEIM...



OVER THE NEXT EIGHT LAPS, VETTEL FLEW LIKE HIS LIFE DEPENDED ON IT, UNTIL...

"VETTEL IS THE FASTEST MAN IN THE STAR SYSTEM. BUT IT'S THE FINAL LAP AND THE GAP TO THE LEADERS IS HUGE, VETTEL'S TWO PARSECS BEHIND FIFTH AND IT'S THE LAST LAP, SURELY THERE'S NO WAY BACK..."



SUDDENLY, A GHOSTLY VOICE FILLED VETTEL'S HEADSET:

SEB... SEB...

OBI-WAN SCHUMI? BUT YOU'VE BEEN GONE FOR YEARS!



YEAH, ERR, I'VE BEEN A BIT BUSY... BUT I'M BACK NOW, SO SHUT UP AND THINK! THERE'S A SMALL UNSTABLE DWARF STAR ON THE ENTRANCE TO THE EIS MOSLEY TURN...

OF COURSE! THAT'S IT!



MIND, BODY AND SPIRIT KID! LET GO... USE THE FORCE, USE THE FORCE...



THE TINY SHIP FLEW TOWARDS THE HEART OF THE COLLAPSING STAR...

WARNING! WARNING! HEAT TOLERANCE EXCEEDED, VELOCITY EXCEEDED! SYSTEMS CRITICAL!

JUST TWO MORE SECONDS... AND... FIRE THRUSTERS!!



"AND THE STAR HAS GONE NOVA, BUT WHERE'S VETTEL. HE'S..."



"...IN THE LEAD!! AND VETTEL WINS! INCREDIBLE!"



LATER...

YOU DID IT KID! I HEAR THEY'RE HOLDING A RACE IN THE ANTIPODES SYSTEM. THINK WE'VE GOT A SHOT?

SURE! AFTER ALL, IT'S IN THE STARS!

CLASSIFIEDS... CLASSIFIEDS... CLASSIFIEDS... CLASSIFIEDS...

"OUR SPONSORSHIP PORTFOLIO HAS BROADENED AND WE ARE PLEASED TO WELCOME OUR NEW PARTNERS. IT IS VERY ENCOURAGING THAT THEY HAVE CHOSEN TO COME ON BOARD AND IT DEMONSTRATES THEY WERE CONVINCED BY WHAT THEY SAW IN US, OUR FACILITIES AND OUR POTENTIAL."



FEELING FRUITY?

Rauch gets your juices flowing!
With a turnover of 691.3 million Euros in 2007, the Rauch Group is the biggest producer of fruit juices and tea beverages in Austria and plays a determining role internationally as well. The company lives by its motto: highest quality standard in all domains, from the freshness and quality of the fruit via the production and packaging through to the marketing.



INVEST IN YOUR TRUST FUND!!

Get rich on technology!
With 25 years of experience, Trust is a global company providing affordable, technology products for PCs, notebooks, iPads, MP3 players and gaming devices. With its brand promise "Life is More! Trust us", the company provides a wide range of products which are carefully designed to perform seamlessly with the latest features of your computer.



LOG ON!

Connect your stuff with Logwin!
The Logwin Logistics Group is one of Austria's largest and most efficient logistics companies and the domestic market leader in business sectors such as logistics outsourcing.



ABLE SIEMENS!

They're not in shipping you know!
Siemens is Red Bull Racing's 'digital backbone' providing the staff at Red Bull Technology with everything they need to generate the many terabytes of data needed to design the RB5. Engineering data is created in Siemens NX design software and managed with Siemens Teamcenter PLM system, ensuring accuracy and consistency.



PLATFORM BOOTS UP!

Tricky software stuff made easy!
Platform Computing provides software that dynamically connects IT resources to workload demand according to business policies. Our customers use our solutions to improve IT productivity and reduce data center costs.



SIMULATING SUCCESS

MSC – nothing to with Michael Schumacher!
MSC Software Corporation is the leading global provider of integrated enterprise simulation solutions that enable radical improvement in the time and costs associated with designing and testing manufactured products, helping the team get the car from drawing board to track in double-quick time.



OMG IT'S DMG!

Turning heads globally!
DMG, part of the Gildemeister Group, is responsible chiefly for the manufacture worldwide of cutting machine tools. The core business areas of 'Turning', 'Milling', 'Ultrasonic' and 'Laser' are complemented by automation and software solutions for machine tools and solar tracking systems. Complicated, yes, but if you couldn't machine a new bit for the car you'd be stuck in the Stone Age, trying to create fire by rubbing two boy scouts together.



SIX-SIDED SOLUTIONS

Hexagon measures up!
Precision is the key to fine tuning for performance and the interchangeability of parts. With Hexagon's metrology solutions, Red Bull Racing saves valuable time in race car and wind-tunnel model set-up, without compromising accuracy.



SAY IT, THEN SPRAY IT!

Founded in 1969, USI Italia is specialised in the design, production and sales of spray booths for cars and commercial vehicles, preparation areas for cars and commercial vehicles, large vehicles such as trucks, buses and trains, and a line specific for shipyards!
And of course, they also build them for racing cars.



BULL IN BED WITH PUMA SHOCKER!

Uniforms, boots said to be involved!
PUMA and Red Bull Racing are entering their third year of a long-term partnership. PUMA supply racewear, teamwear and footwear to the team and the drivers for use both on and off the circuit. PUMA also designs, produces and sells the Red Bull Racing merchandise line.



WIZARDS OF OZ

'Wheel' get you to the flag!
OZ Racing Wheels have an incredible history in motorsport. The company has been at the top in high-level motorsport for over 30 years producing wheels that transcend mere function and become works of art and technology combined with typical Italian flair. Plus they look really sweet on the RB5.



GF AGIECHARMILLES

You can't pun their name!
GF AgieCharmilles is the world's leading supplier of machines, automation solutions and services to the tool and mould-making industry as well as to manufacturers of precision parts and components.



GET A GRIP!

Take it to the Bridge(stone)!
People say that tyres are the boring bit of F1 but without them you have to race on wooden hoops and that would be useless. That's why the RB5 is shod with superb Bridgestone tyres. They've won everything in Formula One and are a bunch of geniuses when it comes to making tyres that won't fall apart after only two laps of somewhere boiling like Sepang.



TIGHTEN YOUR BELTS!

No slowdown with Sabelt!
Sabelt are the chosen safety harnesses of the most important F1 teams – Red Bull Racing included. Leadership in the field is based on the use of first rate materials and continuous study in the Research and Development sector to assure the highest levels of performance.

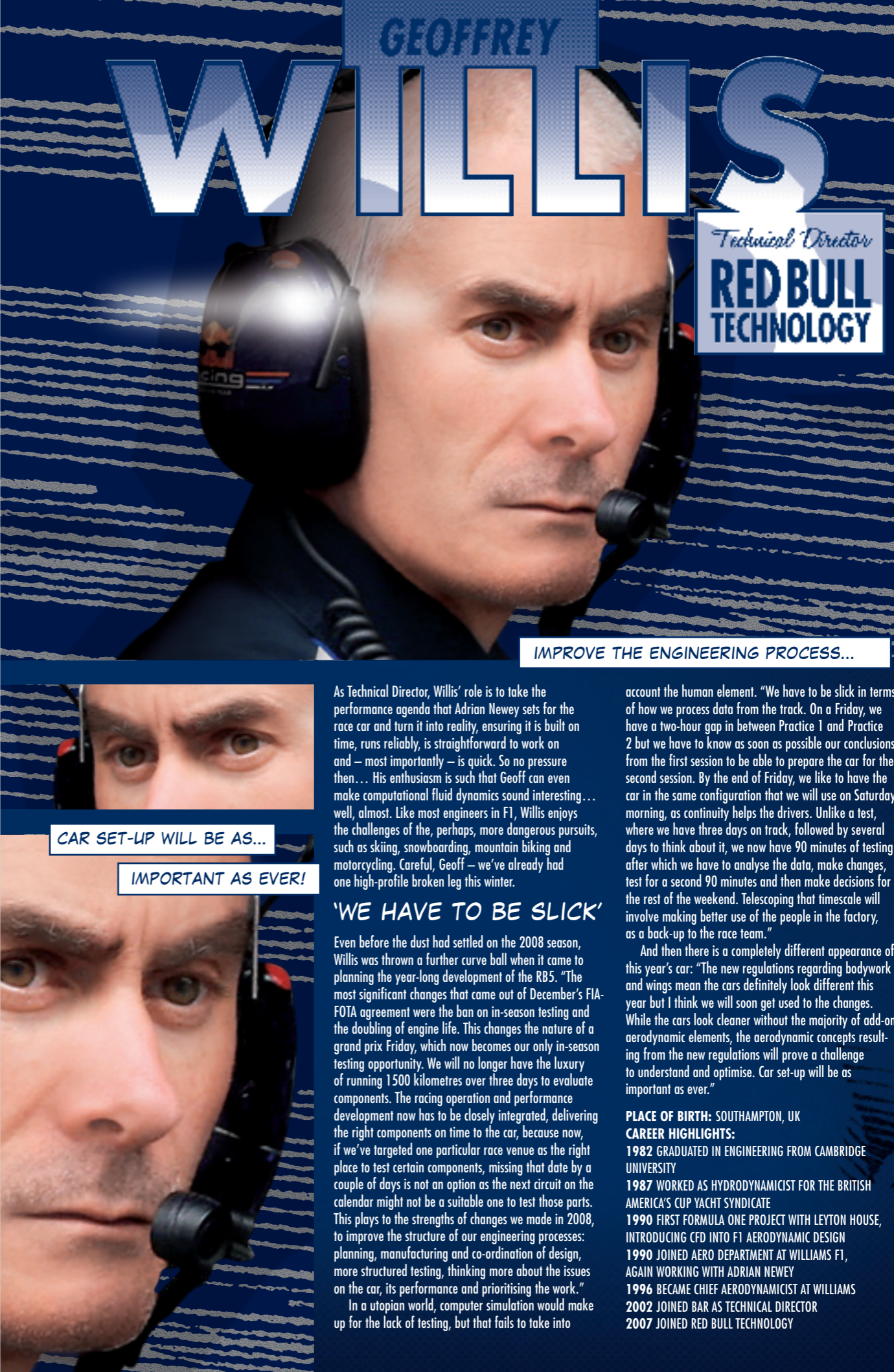


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WILLIS

Technical Director
RED BULL TECHNOLOGY



IMPROVE THE ENGINEERING PROCESS...

CAR SET-UP WILL BE AS...

IMPORTANT AS EVER!

As Technical Director, Willis' role is to take the performance agenda that Adrian Newey sets for the race car and turn it into reality, ensuring it is built on time, runs reliably, is straightforward to work on and – most importantly – is quick. So no pressure then... His enthusiasm is such that Geoff can even make computational fluid dynamics sound interesting... well, almost. Like most engineers in F1, Willis enjoys the challenges of the, perhaps, more dangerous pursuits, such as skiing, snowboarding, mountain biking and motorcycling. Careful, Geoff – we've already had one high-profile broken leg this winter.

'WE HAVE TO BE SLICK'

Even before the dust had settled on the 2008 season, Willis was thrown a further curve ball when it came to planning the year-long development of the RB5. "The most significant changes that came out of December's FIA-FOTA agreement were the ban on in-season testing and the doubling of engine life. This changes the nature of a grand prix Friday, which now becomes our only in-season testing opportunity. We will no longer have the luxury of running 1500 kilometres over three days to evaluate components. The racing operation and performance development now has to be closely integrated, delivering the right components on time to the car, because now, if we've targeted one particular race venue as the right place to test certain components, missing that date by a couple of days is not an option as the next circuit on the calendar might not be a suitable one to test those parts. This plays to the strengths of changes we made in 2008, to improve the structure of our engineering processes: planning, manufacturing and co-ordination of design, more structured testing, thinking more about the issues on the car, its performance and prioritising the work."

In a utopian world, computer simulation would make up for the lack of testing, but that fails to take into

account the human element. "We have to be slick in terms of how we process data from the track. On a Friday, we have a two-hour gap in between Practice 1 and Practice 2 but we have to know as soon as possible our conclusions from the first session to be able to prepare the car for the second session. By the end of Friday, we like to have the car in the same configuration that we will use on Saturday morning, as continuity helps the drivers. Unlike a test, where we have three days on track, followed by several days to think about it, we now have 90 minutes of testing after which we have to analyse the data, make changes, test for a second 90 minutes and then make decisions for the rest of the weekend. Telescoping that timescale will involve making better use of the people in the factory, as a back-up to the race team."

And then there is a completely different appearance of this year's car: "The new regulations regarding bodywork and wings mean the cars definitely look different this year but I think we will soon get used to the changes. While the cars look cleaner without the majority of add-on aerodynamic elements, the aerodynamic concepts resulting from the new regulations will prove a challenge to understand and optimise. Car set-up will be as important as ever."

PLACE OF BIRTH: SOUTHAMPTON, UK

CAREER HIGHLIGHTS:

1982 GRADUATED IN ENGINEERING FROM CAMBRIDGE UNIVERSITY

1987 WORKED AS HYDRODYNAMICIST FOR THE BRITISH AMERICA'S CUP YACHT SYNDICATE

1990 FIRST FORMULA ONE PROJECT WITH LEYTON HOUSE, INTRODUCING CFD INTO F1 AERODYNAMIC DESIGN

1990 JOINED AERO DEPARTMENT AT WILLIAMS F1, AGAIN WORKING WITH ADRIAN NEWAY

1996 BECAME CHIEF AERODYNAMICIST AT WILLIAMS

2002 JOINED BAR AS TECHNICAL DIRECTOR

2007 JOINED RED BULL TECHNOLOGY

OPERATION RB5

MISSION OBJECTIVES

1: YOUR MISSION, SHOULD YOU CHOOSE TO ACCEPT IT, IS THE CONSTRUCTION OF A FRONT-RUNNING FORMULA ONE RACE CAR, TO BE READY FOR ALL-OUT ACTION IN MELBOURNE, AUSTRALIA ON 29-03-09.

2: YOU HAVE ONLY THIS TOP SECRET FACTORY, LOCATED SOMEWHERE DEEP IN THE REMOTE, FORGOTTEN COUNTRYSIDE OF BUCKINGHAMSHIRE, ENGLAND. STUDY ITS FACILITIES CAREFULLY, COMMIT THEM TO MEMORY AND REMEMBER, SECRECY IS PARAMOUNT!

THE FACTORY

The entire factory has undergone major changes over the past 12 months and, for much of 2008, it was a construction site, as the company expanded into a third building and reshaped the existing facilities. Around 600 people work at the factory: approximately 70 for Red Bull Racing, while the rest are employed by Red Bull Technology.

RACE TEAM

Building Two is where the race cars are actually assembled and the process is pretty much the same as it's always been, with the technicians working in the Race Bays, assembling the cars.

WIND TUNNEL

Only one part of the company is not located in Milton Keynes and that's the wind tunnel. From the outside it clearly shows its 1950s roots and the Concorde supersonic jet was designed there. Inside, it houses a world class air-path: retro-chic on the outside, high-tech inside.

OPS ROOM

This is the team's version of Mission Control, where engineers are linked in real-time to the data coming back from the race track. Here, engineers can see all the data from the cars, watch video footage of the on-track action and talk to the team on the pit wall.

MODEL SHOP

Every schoolboy's dream toy-box is where the 60% scale models of the car are produced, along with any new aerodynamic devices due to be tested in the wind tunnel. The main material used for these models is resin, using a Rapid Prototyping process, where the resin is cured by laser – a truly jaw-dropping process.

GEARBOX DYNO

Another great piece of kit to play with, this works with three motors, two of them replicating the inertial forces, such as resistance, from the wheels and from the aerodynamics, while the third one simulates the effect of a 1000 horsepower engine.

DRAWING OFFICE

Wind tunnels and simulators represent the high-tech side of F1, but the sheer manpower of the Drawing Office is equally impressive, with around 200 designers and engineers all working together in the same environment. In the past, they were dotted around the facility, but nothing can beat the human element of being able to communicate face to face, which is why they now share the same working environment.

MANUFACTURING

Housed in the team's newest building, imaginatively named 'Building Three' is the Machine Shop, which is now three times its original size. The team produces 85% of all the F1 car's components on site and all the exotic materials used in the car are cut and shaped here. Half of Building Three is home to the Composites department, which produces all the carbon-fibre elements of RB5. Generally, F1 takes existing technologies and pushes them to the ultimate, but in the case of composites, F1 can really claim to lead the way. This building is also home to the Computational Fluid Dynamics department, which is the sport's very effective and efficient shortcut to finding out if an aero theory will work, rather than wasting time modelling and wind tunnel testing components which might not.

NEXT YEAR: RB6 VS GODZILLA!



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