



Issue 23 November/December 2007

UCL and Group Lotus: Celebrating Colin Chapman's legacy of engineering innovation



Hot Wheels



Lotus Engineering

Change the Rules

Welcome

Sometimes it's great to see what happens when anything goes.

The business of designing and engineering cars is a constant balancing act. Many factors influence the final product: market and customer requirements affect form and function, legislation is an unavoidable factor, engineering feasibility and manufacturing practically have to be considered. There are many more, not least cost – a product can only be successful if it works on a commercial basis.

This careful balancing act is something that Lotus understands – it is critical for us to make a successful business out of niche volume cars – and it is something that our engineering clients value. It is incredibly important and at the heart of the work we do.

But great things can also happen when talented designers and engineers operate outside the normal, 'real-world' constraints. The Tokyo motor show allows the Japanese industry to play with technology. As ever, this year, there were many weird and wonderful examples.

Closer to home, the awesome Lotus Concept for Hot Wheels is the glorious result of Lotus Design being given the creative freedom to design a futuristic car to be made into a 1:64 scale toy car. Steven Crijns describes how his concept came to be. Although, if ever there was an article that was all about looking at the pictures, this is it.

Sadly it won't be on sale until next year, so too late for my Christmas list.

Peter Morgan

Marketing Manager, Lotus Engineering









News

FRANCE: Weight loss key to redesigned Mazda 6

Reducing weight and improving aerodynamics were key elements in the development of the Mazda 6, according to deputy programme manager Hajima Matsumura.

Fuel economy has been improved by 12% over the outgoing model, he said at the European launch of the new model in France.

"Weight reduction is Mazda's way of engineering — it gives better fuel economy and better driving performance." He said.

Mazda is looking at weight saving across its car lines, Matsumura said. The 2 (Demio in Japan) has been launched 100kg lighter than the previous model and the 6 is 35kg lighter.

"Because [it] is bigger and better equipped than the old car, it would have weighed 90kg more if we hadn't taken these weight reduction measures," Matsumura said.

Weight-saving measures include using up to 7% more high and ultra-high strength steel than on the outgoing model.

The five-door hatchback and saloon boast a drag coefficient of 0.27; for the estate (wagon) the figure is 0.28.

To reach that, engineers went to great lengths, said Matsumura. This included 300 hours of testing to develop a horseshoeshaped air deflector under the front of the car.

"It was very difficult to get it right while still cooling the brakes," Matsumura said, while passing the part in question around to journalists to examine more closely.

To maintain the 6's legendary quality - it is the only car to complete a German magazine's 100,000–km test without a single fault – 127 prototypes were built rather than going straight from CAE to production, said Matsumura.

The D-segment-sized 6 goes on sale here in the UK at the end of the year with prices starting at GBP15,100 and a choice of three petrol engines. Diesel models arrive in January 2008 and a ninestrong wagon range from February.

New features include an innovative steering wheel control centre, which allows the driver to operate everything from the air conditioning and navigation systems to the audio without taking his or her hands off the steering wheel.

Called a cross-functional network or CF-Net, it means there is "20 to 30% less 'look away' time than for a leading German competitor, the one with the control between the front seats," said Mazda Europe product communications manager Manuel Bortone.

Source: just-auto.com editorial team



Weight reduction is Mazda's way of engineering

GERMANY: Asian auto firms want European technology

Asian car and car parts manufacturers want to follow the example of Japan's NTN and buy companies in Europe that will give them a technological edge, an investment banker at Nomura International told an auto industry gathering.

Klaus Pflum, who heads the automotive team at Nomura, said the manufacturers could not find enough engineers in their home countries to help them stay ahead of the competition with innovative products.

"Indian and Chinese companies are looking to buy engineering power in Western Europe and countries like Ukraine and Mexico," he told the *Reuters* Autos Summit.

Given the strong demand for know-how, industrial centres in China and India faced the problem of engineers constantly switching loyalties to the company which paid the most.

Among Japanese companies, there was a reluctance to buy big companies in Europe because of the difficulties involved in integrating them into their operations.

"It is not a money problem," Pflum said.

These companies preferred to buy small, specialised outfits and let them run by themselves while making minor changes over a period of time, Pflum said.

He cited the example of NTN, which last year agreed to buy a controlling stake in Renault bearings unit SNR Roulements for about JPY20bn (US\$171m), making it the world's third-biggest maker of the product.

NTN expected the investment to help it accelerate its product development, boost its competitiveness and expand in Europe, *Reuters* said.

Source: just-auto.com editorial team



News

GERMANY: VW joins battery development alliance

Volkswagen is among the founding members of an alliance of German industries which have joined together to develop highperformance batteries for both stationary and vehicle use.

The project was presented during the Innovation Congress in Berlin with the theme 'one year of high-tech strategy – new perspectives for Germany' which was initiated by the federal ministry for education and research.

The alliance – the other companies are BASF, Bosch, Evonik Degussa, Li-Tec and Steag Saar Energie – have suggested a common start on a lithium-ion initiative to the German federal Minister for Education and Research, Annette Schavan.

The goal is to increase substantially the energy and performance density of the batteries and to accelerate their possible use in production.

VW group research chief Juergen Leohold said: "In the future, there will be parallel use of various automotive drive systems, all the way to purely electric drive. A high-performance lithiumion battery as the energy carrier will be a key technology. Therefore, it is sensible and necessary to combine the potentials for the research and development of this battery in an alliance for innovation. This way, synergies can be exploited and the development accelerated.

"For Volkswagen, this initiative is an important step on the way to zero-emission operation of vehicles."

The partners will invest around EUR360m in this project in future years. Germany's federal Ministry for Education and Research will provide an extra EUR60m.

Source: just-auto.com editorial team

SPAIN: Small cars seen as key to India's explosive market growth

The Indian car market and industry will continue to grow strongly as small cars are snapped up by rising numbers of urban middle class consumers according to Vinay Kothari, board member at Force Motors, a maker of utility vehicles in India.

Speaking at the IESE Business School's Automotive Sector conference in Barcelona, Kothari said that projections for rapid market growth in India reflected demographic and income trends. In addition, the market is also facing a lift from the arrival of a number of small low-cost cars - such as Tata's one-lakh car - that will enable owners of two-wheelers to more easily upgrade to four wheels.

Renault is also planning a sub-Logan 'one-lakh fighter' that would be made in India with Bajaj Auto. The Indian light vehicle market could be approaching 5m units a year by 2013 from under 2m now, Kothari said.



Tata aims to produce a 1 lakh car

"And small cars are growing very strongly. By 2015 the market for small cars in India could be as much as 3m units a year," he added.

But isn't congestion in India's big cities already at a level suggesting road capacity is at saturation point? If there is barely room for the two-wheelers to park, where will all the four-wheelers go?

Kothari told just-auto that the primary market in India for the new breed of small of cars is not in the big cities but in the smaller cities and rural areas where incomes are growing and space is not such a problem.

"You won't see very many Tata one lakh cars in Mumbai or New Delhi," he said.

Source: just-auto.com editorial team

UK bioethanol plant opens but govt still cool on incentives

The UK's first mass-scale bioethanol factory has finally opened, one month after British MPs voted to accept the Government's Renewable Transport Fuel Obligation (RTFO). Together, these two events turn biofuels from somewhat of an abstract topic in the UK into a very commercial reality. Despite widespread media coverage – which more often than not has focused on their negatives as opposed to their positives - biofuels have largely been confined to niche areas of UK motoring to date.

The major supermarket chains of Tesco and Morrisons have for some time blended 5% ethanol into some of their petrol supply, but they have never advertised this and have simply sold it as standard unleaded. Meanwhile certain manufacturers - most notably Swedish brand Saab and the UK's favourite carbuying make Ford – have been actively promoting their flex-fuel cars which can run on the much more concentrated blend of bioethanol E85 (85% ethanol and 15% unleaded petrol). But the situation is rapidly changing. By 2010, 1m tonnes of biofuel will be needed if 5% of all petrol and diesel sold in the UK does come



News

from renewable sources as per the Government's wish. We are told that this move will deliver "significant and immediate" carbon savings, to the tune of between 2.6-3m tonnes of carbon dioxide (CO₂) each year in fact. The RTFO also means that the UK will have one of the most sophisticated and robust biofuel reporting systems in the world, forcing all suppliers to prove that their biofuels have been produced and sourced in a sustainable and CO₂ efficient manner.

700,000 tonnes of sugar beet grown on 10,000 hectares of East of England land will be the fuel's raw material. Importantly, no new land has been turned over for this - previously British Sugar used the beet it now turns into fuel for its staple sugar production, but European Union sugar reforms capped the amount it can produce and the World Trade Organization (WTO) now prevents it from exporting this surplus supply and 'dumping' it on world markets. So instead of putting farmers out of business and closing down some of its manufacturing facilities, British Sugar made a foray into road transport fuel.

State-of-the-art combined heat and power (CHP) systems utilise excess energy from the adjacent sugar factory (which is the world's largest and most efficient) to produce ethanol that boasts greenhouse gas savings of between 60-70% on a lifecycle basis compared to fossil fuels.

In addition, the site exports 50m/W electricity back to the national grid, enough to power 200,000 homes in Norfolk, and even uses other excess CO_2 gas and hot water from the site to cultivate between 70-100m tomatoes each year, making it one of the UK's largest tomato producers!

High-quality top soil washed from the beet as it arrives from the fields is sold to end users such as Hyde Park in London, while Wissington is also the UK's biggest animal food production site in the UK on a daily basis, turning the waste fibre from the beet after the sugar has been extracted from it into pellets for farm animals, to name but two examples.

Impressive as these statistics are, however, the truth is that British Sugar's current efforts are a drop in the ocean in terms of the UK's biofuel needs, producing little more than 5% of the 1m tonnes needed by 2010 for the RTFO. just-auto asked Lord Rooker, the Minister for Sustainable Food and Farming and Animal Health from the Government's Department for Environment, Food and Rural Affairs (DEFRA), if the Government has any plans to incentivise further UK production of biofuels. After all, the more biofuel that countries like the United Kingdom can generate themselves for their own needs in a tightly controlled manner, the less they will rely on biofuel supplies from less regulated parts of the world. His answer was a fairly concise "no" - the Government will not be putting any money into UK biofuel production: this is for industry to do.

So what about financial incentives for car drivers then, encouragement to buy Saab and Ford's flex-fuel cars that offer far greater CO_2 savings than cars running on a 5% biofuel blend, or indeed encouragement to purchase other low-emission vehicles



British Sugar's Wissington Plant, Norfolk

on the market? One of the most urgent challenges identified by the Government's very own King Review, which examines how to take the carbon out of road transport, was the need to "develop a strong and rapidly-growing market for low-emissions cars." The conjecture here is that purchasing incentives are the very tool needed to create this market.

"There shouldn't be any reason to do this," was Lord Rooker's rather surprising answer. "As long as the motoring public has absolute confidence in the fuel and sees other cars and buses running on these new types of fuels such as bioethanol E85, there won't be any problem transferring over."

Jonathan Nash, Managing Director of Saab Great Britain, which offers a 'BioPower' flex-fuel variant across its whole range, expresses his frustration at this approach. "I am surprised by Lord Rooker's response," he says.

"It is already evident that in order for consumers to make the right choice, there should be no cost penalty. In this respect, the government does need to support this emerging environmentally-friendly technology. There are examples from all over the world - not least from Saab's home market of Sweden - showing that financial encouragement is the key to changing consumer behaviour, especially when the technology is relatively new and when you're dealing with expensive purchases like new cars."

Despite this perceived lack of assistance, all parties say they will not be thwarted by an unsupportive Government and will carry on in their efforts. Saab will carry on lobbying for additional incentives, both for buyers of its own flex-fuel cars and to encourage the domestic production of biofuels in the UK. Likewise, Ford will launch new flex-fuel variants across some of its best-selling cars next year, including the Mondeo and S-Max. British Sugar's parent company - Associated British Foods (ABF) – meanwhile is about to begin construction of a GBP200m bioethanol factory in the north of England with oil giant BP and US chemical company DuPont. This factory will dip into the UK's 2-3m tonne surplus of grain supplies which are currently exported, to produce some 330,000 tonnes of ethanol each year - enough to supply one-third of all the cars in the UK with a 5% biofuel blend.

Source: just-auto.com editorial team





A prize of a lifetime

It was a day that Nandish Banasi will never forget. A-once-ina-lifetime experience to spend an action-packed day at the Lotus factory. What better way to leave your homeland for the first time than to visit one of the most famous automotive plants in the world?

Those weeks spent designing and crafting the model that won him this prize in the 'Build a Scorpio' contest organised by *AutoCar India* and Lotus proved more than worthwhile. Russell Carr, Head of Design at Lotus Design, set the challenge to plan and style a passenger vehicle based on a chassis provided by Lego. These designs were to be merged with real-world design issues in mind and rolled out in a scaled-down prototype of what a Mahindra Scorpio - currently one of the most popular SUV models in India - of the next generation would look like.

Russell was part of the judging team that short-listed the final 20 competitors. The designs were rated on four essential criteria: styling, originality, workmanship and feasibility. Each of these was rated on a scale of ten, except styling and originality, which were given additional weighting due to their importance. After much deliberation, Nandish's model was then selected as the winner, which gave him this unforgettable opportunity.

Russell Carr said; "Nandish's design had a uniquely-sporty attitude amongst all the entrants. It was well proportioned, had good stance and some distinctive features. Nandish showed great ingenuity in finding ways to apply detail to the model and we were delighted to welcome him into the Lotus community."

Naturally, the day started in a Lotus Elise as transportation from the nearby guest house to the Lotus factory proved a memorable one. There were no signs of the journey from Mumbai to London, and then on to Norfolk taking its toll on Nandish, who had plenty of adrenalin pumping through his veins. There was however no time to admire the beautiful surrounding countryside as Nandish was straight into the Lotus Design studio to meet Russell Carr.

Anyone who can create a model as expertly as he has done and has put such time into the task is welcomed admiringly into Russell's domain. The first thing Nandish spotted when entering the studio with Russell was the Lotus M250, a fantastic looking car that was first shown at the Geneva Motor Show several years ago, but never put into production.

While getting a guided tour of the hi-tech facilities and given a crash course in Lotus design philosophy and history, Nandish produced a series of photographs illustrating a



Head of Lotus Design, Russell Carr with Nandish Banasi

portfolio of models he has designed and shaped from motor bikes through to aeroplanes. This further impressed Russell and Barney Hatt, one of Russell's team who helped Nandish produce his winning model using ALIAS, a digital design tool on the computers in the design studio.

After the morning spent in the studio, the afternoon began in the famous Lotus manufacturing plants. A fully guided tour starting in chassis components right the way through to final quality inspection and everything in between had Nandish wide-eyed in amazement.

The hustle and bustle of the Lotus production line quickly made way for the serenity of an empty test track as Nandish looked on, not quite believing what he was about to experience.

Paul Adams, one of Lotus' vehicle dynamics team arrived in a Lotus Elise that Nandish soon became very acquainted with. After conversations between Paul and Nandish, the time came to pull the necessary crash helmets on and take their seats. In the driver's seat, Nandish had a look of nervous anticipation. With a quick movement of his foot, Nandish was suddenly flying around the infamous Hethel test track, cutting through the crisp Norfolk air.



After numerous laps, the Elise pulled over and Nandish and Paul swapped positions. Then the fun began. Paul delivered a speed that Nandish had never encountered before, with the tyres screaming for mercy and a ride and handling experience only imaginable in a Lotus. A speechless Nandish appeared from the Elise beaming and struggling to catch his breath.

After an action-packed day, a walk from the test track, to the Classic Team Lotus facilities - something which Nandish had been looking forward to all day – was in order. Arriving with a hint of nostalgia in the air, Nandish received a very warm welcome from Clive Chapman, son of legendary Lotus founder, Colin. Filled with amazing artefacts and memorabilia, Nandish looked fascinated as Clive guided him around the factory and explained momentous events from the enthralling Lotus history.

With the night drawing in, one of the most unforgettable days of Nandish's life was drawing to a close. The only thing left for Nandish was to go away with Lotus gifts, reminding him of a truly memorable day.

Source: Matthew Reed, Lotus Engineering



Nandish is given a guided tour of Classic Team Lotus by Clive Chapman



Barney Hatt, one of Russell's team, helps Nandish produce his winning model using ALIAS, a digital design tool on the computers in the design studio



Lotus Engineering opens dedicated office in Japan

Lotus Engineering, the world-renowned automotive consultancy division of Group Lotus plc, has opened a representative office in Tokyo and has appointed Hiroyuki Hori as business development manager for Japan.

Lotus Engineering anticipates a threefold increase in work from the Japanese market this year compared to 2006/7.

Mike Kimberley, chief executive officer for Group Lotus plc said, "With Japanese companies at the forefront of the automotive industry, we foresee increasing opportunities for our worldclass engineering and technologies in that market. The new representative office is a very positive commitment to delivering the very best service to our clients in Japan as our work there grows. I would like to welcome Mr Hori to the Lotus family and look forward to his contribution in building on Lotus Engineering's extensive history of client consultancy work in Japan."

"With Japanese companies at the forefront of the automotive industry, we foresee increasing opportunities for our world-class engineering and technologies in that market"

Mr Hori, 44 is a Japanese national and has spent his career to date in automotive engineering in his home country. He began his career as a project engineer with ESTECH Corporation, an engineering services provider in Yokohama, and then with AVL Japan as a senior engineer.

Fluent in English as a second language, Mr Hori holds a master's degree in Mechanical Engineering from Sophia University in Tokyo. He is married with a daughter.



Hiroyuki Hori

Hori is looking forward to his new challenges: "I am excited about the opportunities for me to drive forward the Lotus Engineering business in Japan, where the company is very well respected for its core strengths in the development of efficient performance, exciting niche vehicles and driving dynamics.

"I am very grateful for the warm welcome my colleagues have given me, and I look forward to building on past successes and contributing to an even more successful future for the Lotus Engineering business." he said.

Contact details for Lotus Engineering's representative office in Tokyo, Japan:

Hiroyuki Hori, Business development manager, Lotus Engineering (Japan) 1-11-7-1108, Higashikanda, Chiyoda-ku, Tokyo 101-0031, Japan

Email: hhori.lotuscars@grace.ocn.ne.jp



UCL and Group Lotus: Celebrating Colin Chapman's legacy of engineering innovation

Twenty-eight iconic Lotus cars converged on UCL (University College London) to mark the 25th anniversary of the death of Colin Chapman, Lotus founder and UCL alumnus. Chapman founded Lotus in the 1950s and was a driving force behind Formula One for many years. His designs and technical innovations formed the basis for some of the most successful racing and sports cars ever made.

The diverse range of cars was gathered from museums and private collections around the country and included grandprix winners driven by Jim Clark, Graham Hill, Mario Andretti, Emerson Fittipaldi and Ayrton Senna. A sample of Lotus' iconic road cars was also on display, including the Elan, Elite, Europa, Esprit and Exige. Alongside the vehicles was an exhibition of original Lotus drawings and some previously unseen photographs and designs from The Ron Hickman Collection.

Held in partnership with Group Lotus, the event not only celebrated Colin Chapman's contribution to automotive design but also recognised the ongoing research connections between UCL and Lotus Engineering.

The exhibition was followed by a formal dinner with distinguished guests from the world of motor-racing, including Damon Hill (son of Graham), Sir Stirling Moss, John Surtees and Patrick Head. During proceedings the UCL President and Provost, Professor Malcolm Grant, announced that Group Lotus and Colin Chapman's family have founded a Masters Scholarship at UCL in Colin's memory.



Source: University College London

Jim Clark's historic GP car



Twenty-eight iconic Lotus cars converged on UCL to mark the 25th anniversary of the death of Colin Chapman



Getting to grips with vehicle stability systems: A different approach from Lotus

In recent years, with the vast progress in electronics, the operation of a car by a driver has become much simpler. Engine management systems have made cold starting straightforward and predictable. Vehicle stability control systems now save the less-skilled or unlucky from injury or embarrassment. Driving has become an easier skill to master, thanks to electronic control systems. However, the overly risk-averse implementation of these systems in mass-market applications has arguably turned driving into a safe, but uninvolving activity.

Conversely, Lotus sportscars are all about driver involvement – interaction between man and machine – with innovation in engineering directed at performance. They have always featured advances in technology; the Esprit was first fitted with anti-lock braking (ABS) in 1990. Lotus has long been active in engine control technology, with the Esprit being the first car to achieve the Californian Air Resources Board (C-ARB) strict On-Board Diagnostics (OBDII) certification. The introduction of traction

control on the Elise/Exige platform, however, has an interesting history. First developed during the Series 2 Elise program in 1999, it was not introduced into production until 2005. The reason was not one of technology, but of philosophy. In the final few years of the last millennium, traction control systems in road cars were over-eager in activation, smothering any hint of wheelspin and hampering any meaningful forward progress. It was overtly a 'safety' system, therefore perceived as something that should not feature on a 'driver's car'.

The concept and execution of what is now known as the Lotus Traction Control System (LTC) is also rooted in the last millennium; its inspiration is from the Formula One motivator of achieving the ultimate performance. The concept is to enhance performance through maximising traction, rather than the more common approach of eliminating wheelspin. The maximum performance is to be accessed when the maximum grip is achieved between the road surface and the tyre. At this point the greatest level of acceleration (or traction) is achieved.

The Lotus Traction Control System execution is integrated within the Lotus Engine Management System. Inputs come from measuring all four wheel-speeds. A set of modular algorithms, embedded within the engine management system's operating program, calculates the level of wheelspin. Using the front wheels as a reference of the vehicle's speed, the level of spin of the rear (driven) wheels can be calculated. The thresholds of wheelspin for activation of the control elements vary with a number of parameters e.g. vehicle speed, accelerator pedal input, vehicle



The Lotus 2-Eleven makes great use of both the LTC and the LVLC systems





The LTC is a performance enhancing technology, not a 'kill-joy' safety net

attitude (i.e. straight-line or cornering) and driver setting. This method of determining wheelspin is common in many high-performance road cars. The way in which the Lotus system controls wheelspin, however, is normally reserved for race cars.

In most road cars, the traction control uses two main methods of intervention: brake application and throttle reduction. Brake application of an individual spinning wheel is a rapid and effective way to stop wheelspin. Extended intervention via braking can lead to brake overheating, so it is not a suitable method for track use. Reducing throttle opening is a relatively-slow means of reducing engine torque delivery to the wheels and hence reducing wheelspin. The physical process of reducing or interrupting airflow into the engine to reduce engine torque output and then re-establishing the engine torque output, after excess wheelspin has eliminated, can be in the order of several seconds.

The Lotus system ingeniously intervenes by reducing engine torque output, but by cutting combustion events. A carefullydesigned algorithm selectively misses fuel injection events relative to the level of wheelspin, as well as the engine operating parameters. With injection events that can occur once every two-thousandths of a second, the effective intervention time is imperceptible to the driver. The driver's awareness of the LTC functioning is mainly audible (the audible effect to the driver is similar to that of a rev limiter), with the blinking of the yellow tell-tale lamp as a visual reminder of the maximised acceleration being experienced.

To develop the system, rigorous development and validation was required in varied conditions. From initial trials at Lotus' Hethel test track, the system underwent testing in Northern Europe to assess performance in very low grip conditions. As well as the vehicle dynamic performance testing on ice- and snow-covered lakes, Lotus' vehicle dynamics and powertrain engineers worked together to evaluate the effects of extended periods of operation on the powertrain and emissions systems. Since race car systems have no requirements to fulfil long-term emissions durability, little previous data was available. However, for road cars, it was important to ensure that long-term durability was not degraded using combustion intervention.

"In most road cars, the traction control uses two main methods of intervention: brake application and throttle reduction"

An extension of the LTC system is the ability for the driver to vary the wheelspin threshold, now dubbed Lotus Variable Traction Control (LVTC). This gives the driver the ability to fine-tune the slip threshold to suit driving style and conditions. LVTC received the severest of validation programmes during a season in the British GT Championship. The three Lotus Sport Cadena Exige



GT3 cars that won the 2006 Championship were equipped with the same system that is now available as an option on Exige S and first seen in production on the 2-Eleven Launch Edition.

Another 'first' seen on the 2-Eleven Launch Edition vehicles was the Lotus Variable Launch Control (LVLC), yet again a seemingly-new technology that Lotus has quietly had a long history with. The Espirt V8 carried launch control strategies from its introduction in 1995 and all Lotus cars with Lotus Engine Management Systems have had some form of launch strategy. It was, however, the prototype 'Circuit Car' that was equipped with an overtly performance-enhancing launch control system. Its first public appearance was planned as the Centenary Celebration event at the famous hillclimb venue of Shelsey Walsh in 2006, so standing start performance was critical.

"The LTC and LLC systems that are now available allow Lotus road car drivers to experience race car technology"

The purpose of 'launch control' is to maximise acceleration from standstill and reduce driver induced variations in performance. A standing start, or launch, is a balancing act for any driver; a launch control system takes control of the balance of engine torque and wheelspin. The Lotus implementation of launch control has some novel features. It is fully automated and requires no driver input to initiate i.e. no buttons to press to start the procedure. It is fully integrated with the traction control system, since it is also executed as part of the Lotus Engine Management System. The vehicle has a seamless transition from launch to traction control modes, as a positive side effect of this integration. The dual functionality of the minimum number of driver controls (one button and a single rotary knob) for setting launch and traction control systems is an elegant solution in the finest Lotus tradition.

The initial concept and development called upon the motorsport experience within Lotus Engineering's Powertrain Controls Group with development tests performed using road-specification Elise and Exige vehicles at the Hethel test track. The integration into



Finding maximum grip is core to the Lotus Traction Control System

the brand-new 'Circuit Car' prototype was achieved a few short hours prior its world debut. The Lotus Launch Control System progressed from this very public test session through the rapid development and validation phases of the Lotus 2-Eleven. The addition of a fully driver-variable setting, integrated with LVTC and using no additional components, has proved a valued and potent performance enhancement to an already high-performing Lotus vehicle.

"The vehicle has a seamless transition from launch to traction control modes, as a positive side effect of this integration"

The LTC and LLC systems that are now available allow Lotus road car drivers to experience race-car technology. Lotus Engineering has vividly demonstrated that the 'character' of a car can be enhanced electronically, when many believed that electronics could only be smothering. The LTC is a performance enhancing technology, not a 'kill-joy' safety net. So following a great tradition at Hethel, engineering development of a performance enhancing technology has broken a widely-held perception.

> Source: Paul Birch, Lotus Engineering



Tokyo Motor Show: green but still wacky

A visitor to recent motor shows around the world could not fail to notice that the car industry has turned green. Alternative fuels and how to preserve the planet have dominated the themes.

While this was very much the case at the Tokyo Motor Show in October, it was good to see that the 'wackiness' which has been such a feature of past Japanese shows still thrives and this year continued with the theme of personal mobility.

That is, how to make motoring more fun and easy. Japanese engineers and designers have a knack of coming up with ideas and things that you never knew you needed.

There was much from which to choose, but the highlights included personal mobility concepts not just from Toyota and Nissan, as you might expect, but also the Europeans, notably Volkswagen and Audi.

Take the Toyota RiN which focused on "increased comfort" and "serene, healthy living".

Toyota described it like this: Through their relationship with the vehicle, drivers are encouraged to re-evaluate themselves and, furthermore, to turn their attention to society and nature, producing a healthy rhythm for both mind and body. This is how the concept was described in detail:

- It promotes a healthier well-being thanks to features such as seats that help maintain good back posture and image displays aligned with the driver's psychological state that are conveyed within the meter cluster of the "moodtraining" steering control.
- In addition to featuring comfortable, heated seats, an oxygen-level conditioner and pinpoint humidifier, it uses green glass that reduces infiltration of ultraviolet and infrared light and makes the surroundings seem brighter and clearer to increase cabin comfort.
- It creates a feeling of harmony with the surrounding environment by using sliding doors with a low window as well as headlights with light distribution control that take into consideration pedestrians and vehicles coming in the opposite direction.
- It uses the motif of the deep-rooted and tall-growing Yakusugi tree (a variety of Japanese cypress) for its exterior and interior design to express both "harmony with nature" and "healthy mind and body".
- It contrasts deep green with beige in its interior colour scheme to richen the complexions of those onboard and evoke a healthy mental and physical feeling.

Another star at Tokyo was Toyota's i-REAL, not a car at all, but a kind of motorised seat and, according to insiders, it could see the light of day in production terms before too long.

The i-REAL represents the next stage of Toyota's personal mobility vehicle development, following earlier concepts the PM, i-unit and i-swing. It uses three wheels (two at the front and one at the back), in low-speed mode, shortening its wheelbase to allow it to manoeuvre naturally among pedestrians at similar eyesight height without taking up a large amount of space; in high-speed mode the wheelbase lengthens to provide a lower centre of gravity and better driving performance.

To ensure safe handling, both to the driver and those around the vehicle, the i-REAL employs perimeter monitoring sensors to detect when a





Toyota RiN concept

collision with a person or object is imminent and alerts the driver by emitting a noise and vibrating; at the same time, it also alerts people around it of its movements through the "pleasant use of light and sound".

At the Tokyo show two years ago, Nissan's Pivo concept was undoubtedly the star. This year, inevitably, came Pivo 2.

"While the latest concept shares many of the original features, now there is a robotic agent to share every trip"

Pivo 2 builds on the popularity of the first concept, powered by advanced compact lithium-ion batteries while still featuring that unique rotating cabin – meaning no reverse gear is required. The first Pivo became a cult hit at shows from Beijing to Geneva.

While the latest concept shares many of the original features, now there is a robotic agent to share every trip.

Where the first Pivo, with its fully-rotating cabin design, made reversing obsolete, the Pivo 2 takes that easy mobility concept to a new level. Each of the four wheels are powered by Nissan's



The highly-innovative Robotic Agent

advanced electric In-wheel 3D Motor and can turn through 90 degrees to allow Pivo 2 to drive sideways as well as forward.

Thanks to the highly-innovative Robotic Agent, you are never alone in the Pivo 2.

With conversations possible in Japanese and English, the Robotic Agent has been created to work with Pivo 2 to make every journey less stressful. It provides a unique interface through which to communicate with Pivo 2 on everything from basic vehicle functions through to the nearest available parking.

European carmakers, it seems, have got the Tokyo message with Volkswagen and Audi choosing the Japanese show to unveil concepts for their upcoming small cars.



Nissan's Pivo2 concept







The VW space up! concept

The VW space up! takes its inspiration from the up! concept vehicle which was unveiled at the Frankfurt Motor Show in September. Modest external dimensions belie the vehicle's versatility. Its spacious interior features four individual seats, three of which can either be folded or removed completely to allow for up to 1,005 litres of luggage space.

Access to the boot area in confined spaces is made easier through the adoption of a pair of side hinging rear doors intersected by a Volkswagen roundel. As with the up! concept the space up! features a translucent panel at the rear into which are set the car's high-intensity LED brake lights.

The space up! concept was penned by a team led by chief designer of the Volkswagen Group, Walter de Silva. It shares many traits with the up! including the simple, cohesive lines running through the vehicle.

de Silva said: "The space up! offers maximum space on the smallest of platforms. Despite the character of the car we have avoided superfluous gimmicks of any kind. This has created a very confident design."

Access is gained through unique butterfly doors hinged on the A and C pillars, allowing for uninterrupted access to the front and rear seats. Clean surfaces are joined by intuitive and highly-advanced touchscreen panels through which both climate and entertainment functions can be accessed. The screen in front of the driver relays information on the vehicle's critical systems as well as instantaneous readings of the levels of CO_2 being emitted by the vehicle.

Development of production versions of the up! family of vehicles is already underway with the aim of bringing a road-going version to the market before the end of the decade. Audi paid homage to Japan's flair for miniaturisation with its new sub-compact metroproject quattro design study. Condensing the premium quality, innovation and design progressiveness for which the Audi range is renowned into less than 4 metres of road space, the metroproject quattro could provide clues to the look and packaging of a future Audi sub-compact production car – the A1.

Power for the Vorsprung durch Technik study is provided by a modified version of the 1.4-litre Turbo FSI petrol engine recently adopted by the A3, combined with a lithium-ion battery-powered electric motor mounted behind the rear seats which reduces fuel consumption and emissions by around 15%.

The highlight of the typically meticulously-finished cabin is the new, removable hand-held Audi mobile device, which not only offers mobile telephony, GPS navigation and audio and video playback, but also serves as the control unit for numerous vehicle systems which can be set and adjusted from outside the car. The driver can, for example, enter destinations into the satellite navigation unit, program the audio system or switch on the heating from the comfort of an armchair at home before setting off.



The Audi Metroproject Quattro concept

Using the same operating principle as the Multi Media Interface (MMI) infotainment control system that is highly regarded in today's production Audi models, the Audi mobile device not only brings optimum user friendliness, but also maximum space efficiency by integrating several communications devices that were previously only available separately into a single unit. The handheld, touch screen system, which is able to recognise both Latin and Japanese characters and even decipher handwriting, communicates with the car by way of a WLAN connection.

Source: just-auto.com editorial team



Hot Wheels

Lotus has teamed up with Hot Wheels, the global die-cast brand, to design, develop and produce a Lotus Hot Wheels concept vehicle. A 1:5 scale model of this design was on display at the annual SEMA Show at the Las Vegas Convention Centre on 29 October-2 November 2007.

The Designers Challenge was created as a way for Hot Wheels to honour the world leaders in the automotive industry and have them actively participate in the Hot Wheels 40th anniversary celebration in 2008. The Lotus Concept, designed by Steven Crijns, design manager at Lotus, will be part of a new 40th anniversary Designers Challenge 1:64 scale product line, which will become part of the Hot Wheels product range in spring 2008.

The Challenge

The brief from Hot Wheels was to design a car that captured the core essence of speed, power, performance and attitude, while also encompassing the distinct attributes of the Lotus engineering philosophy and brand. The top three designs from each automotive manufacturer were presented to a panel of judges that included editors from the *Los Angeles Times, Car and Driver and Men's Journal,* along with Hot Wheels designers and executives. The winning design from each of the six car manufacturers – Dodge, Ford, General Motors, Honda, Mitsubishi and Lotus - was selected to go into production. The result from Lotus is a stunning open-top two-seat sports car concept.

Lotus Design's international reputation for designing visuallydynamic and exhilarating sports cars perfectly fitted the brief for this programme and the opportunity to design a concept that was free from the typical technical and legal constraints was relished.



Sketches of the Hot Wheels concept

Design

This was a dream job for the design team because for many of them it was Hot Wheels, when as children, stirred their passion for cars and design was ignited. The design and build offered unique challenges because it had to work as a toy, therefore the designers had to remember how specific views, features and tactile qualities of toy cars fascinated them as children.

The 1:64 scale Hot Wheels cars are barely 75mm long so specific attention went to create a bold shape with generous features that would work well at this scale. Another challenge was to create an exciting design that not only worked well as a car, but also



The finished scale model



Feature



Striking looks of the Hotwheels Concept



CAD stage of the design



The clay model

as a toy. The car needed to be recognisable as a Lotus without having to turn it over to look at the badge underneath, so elements are taken from the Elise and Exige such as the headlight design, the Lotus 'mouth', the pronounced wheel arches and trademark bonnet graphics.

Steven Crijns was keen for the design to express the Lotus philosophy of performance through light weight; therefore the shrinkwrapped body is kept to an absolute minimum to save weight.

The dynamic voluptuous curves make the car look agile and fun to drive. Bold aerodynamic aids are incorporated to achieve exceptional Lotus handling. The top exit radiator at the

"The most challenging restriction was that the whole design would have to be made with only four main components: body, glass, chassis and interior"

front, a distinctive Lotus design feature, the rear diffuser and a large rear wing all provide down force helping the vehicle stick to the road. In addition, large side air intakes and an open rear end aid engine breathing. Inside the car, the exposed centre spine is part of the structure and incorporates the switches and gear linkage and supports the rear wing.



The CAD model

Once the designs were agreed, a CAD model was created on ICEM Surf.

Although there weren't the usual challenges of designing around crash structures, incorporating passenger and pedestrian safety legislation, there were other challenges to overcome. The car had to also be able to perform the Hot Wheels loop. This meant front overhangs had to be restricted. The toy needed to be strong and without sharp edges and also had to fit on a Hot Wheels chassis. The most challenging restriction was that the whole design would have to be made with only four main components: body, glass, chassis and interior.

"The paint shop finished the work with an excellent paint job in Lotus Chrome Orange, a perfect colour for a toy"



Preparing moulds and dry fitting all components



Preparing the fibreglass body for paint and moulding the wheel spokes

Building the 1:5 scale model

Once the design was finished, a 1:5 scale model was produced for the SEMA Show in Las Vegas. The decision was made to build a clay model by hand rather than mill the CAD data, the reason being that when scaling up a design from 1:64 to 1:5, every surface would have to be modified. Building the model by hand meant that the design could look its best at the given scale. The CAD model was used as a basis for a tape drawing which in turn was used as a basis for the clay model.

The model was built in the same way as the 1:64 scale Hot Wheels toy that will follow. It features four main components. There is a one-piece exterior body shell and the interior extends to the



Lotus Chrome Orange paint goes on







Aluminium details



Don't you wish you were a kid again?

outside to incorporate the back part of the car. The perspex is wedged between the exterior and interior and all these components combined bolt down onto a chassis that incorporates the rear diffuser.

All modelling was completed in-house. The wheel rims and centres, as well as the steering wheel and lights were machined from a solid piece of aluminium. The fibreglass body and perspex screen were made in the tool room and pattern shop.

The paint shop finished the work with an excellent paint job in Lotus Chrome Orange, a perfect colour for a toy.

Final assembly was completed in the design studio with the high level of detailing resulting in it taking longer than normal to complete. From building the armature to shipping the model to Las Vegas, the duration was 12 weeks.

Reaction

The SEMA Show in Las Vegas proved to be an enormous success with an amazing collection of Hot Wheels models throughout the ages. Over 60m toy cars were sold in 2006 and this was the first time in the history of Hot Wheels that they accepted designs from external companies, putting Lotus in a very exclusive list.

Mike Kimberley, chief executive officer of Group Lotus plc said, "We are delighted to have worked with Hot Wheels, who share our passion and enthusiasm for all things automotive. Lotus Design has a global reputation and is responsible for the design of all Lotus cars, including Europa, Exige and iconic Elise and many designs for our engineering clients globally. The same design team who created this stunning concept is also designing our new range of cars, the first of which, codenamed Project Eagle, will go into production at the end of next year."

Source: Steven Crijns, Lotus Design



Group Lotus plc

Head office: Lotus Cars Ltd Hethel Norwich Norfolk NR14 8EZ United Kingdom

Editor: Peter Morgan

just-auto.com

Head office: c/o Aroq Ltd Seneca House Buntsford Park Road Bromsgrove B60 3DX United Kingdom

Contact: Mike Gove

This newsletter was produced for Lotus Engineering by Aroq Ltd. © 2007 All content copyright Group Lotus plc and Aroq Ltd.

