This pioneering project was a landmark hybrid car exercise in a successful venture between MG Rover and MIRA. It showcased to the press and public that a 'Responsible Performance' theme could actually make the prospects of CO_2 saving hybrids exciting, and in fact it helped both companies pave the way for a production car focussed sequel that was UK Government funded, the Ultra Low Carbon Car Challenge.

Press reports abounded at the car's 2003 launch, and the MGF Register's technical specialist Rob Bell prepared some very insightful articles covering the hybrid powertrain and the car's enhanced aerodynamics – many of the latter features remain of interest to F/TF owners to this day.

However, as an MG-R engineer enjoying his contribution to the project, I felt that more of the story needed to be told and recorded, potentially both for magazine readers and for the Abingdon archives, a natural point of reference for industry writers.

Therefore I have searched through my project files and CD's, happily not discarded back in 2005, and have prepared this article.

ADRIAN TUCKER-PEAKE

The Time was Ripe

The year 2002 was an upbeat one for Great Britain: the nation had finally shrugged off the Foot and Mouth virus and was celebrating H.M. Queen's Silver Jubilee, whilst David Beckham 'bent it' to beat Argentina in the World Cup.

The motor industry was booming with a record 2.5 million new cars sold and, closer to home, the MG TF was enjoying its highest sales volume since launch. Globally, there was a lot of new automotive technology under development, and the UK car industry and the UK Government both wanted to be key players; the UK's Automotive Council was thus established.

The Council made up a promising and well-rounded organisation, featuring representation from Government, major manufacturers like Ford, GM, Nissan, Honda, JLR and PSA, alongside specialists Morgan and Caterham and world-renowned technology providers including MIRA, Millbrook and many universities.

MG Rover stood well in the middle and made powerful contributions.

MIRA

TF 200 HPD

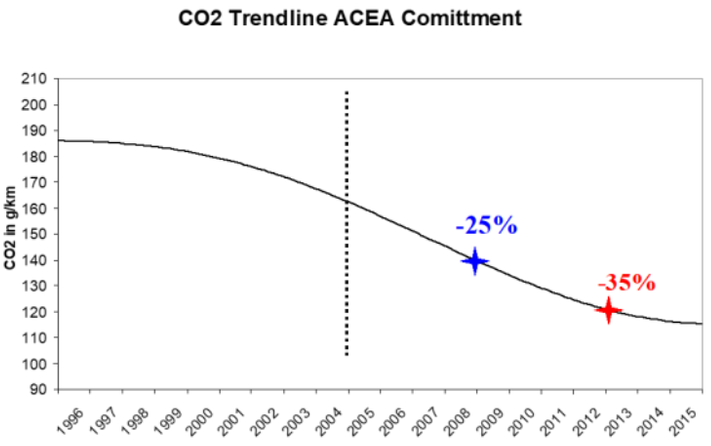
LowC VP
low carbon vehicle partnership

Environmental concerns around Climate Change (yes, back then!) were driving a regulatory focus on progressive fleet reductions of CO2 levels, illustrated by the ACEA chart.

Engine downsizing had not yet taken hold, so bold steps were being taken for high power electrification of vehicle powertrains: hybrid electric vehicles could provide a realistic stepping stone towards fully electric ones, once the re-charging infrastructure and battery technology caught up.

We were scarcely able to advance from a century of lead acid cells and a few very toxic Ni Cads that had been the staple for early EV's.

Toyota and Honda were making tentative inroads with their pioneering hybrids, and all car makers were working on such incremental products, but as the early production volumes would always be small, this route demanded too much investment for too little return to make it a sound business case for MG-R. Instead, the only cost effective route for MG-R would be a neat 'add-on' hybrid arrangement that didn't unduly compromise the existing production donor car, but crucially gave the customer additional feature benefits to increase its market appeal.



Hybrid Heartache

Although brave efforts were being made by car makers at the time, with some attraction to 'early adopters', a JD Power industry summary really highlighted the lack of appeal of these hybrids and EV's to almost every other prospective customer. Most offerings were sceptically viewed as 'worthy but dull' and a costly, high risk personal investment with attendant worries about issues like the uninformed insurance companies, sketchy servicing skills and unknown resale values. Audi launched its clever Duo, sold about 50 and stopped, Honda's tour-de-force Insight met disappointing sales while GM showcased its advanced EV1 but followed up with a recall and disappointing scrappage action. PSA did better with strong national support, but essentially the motor industry aims to make money, not cars, and with Li Ion batteries still a futuristic dream, the commercial prospects were none too promising.

Equally, the high power-to-weight ratio electrical hardware was still in its infancy – most 50 kW electric machines were mighty industrial lumps and clever four quadrant (forward and reverse direction, positive and negative torque) controllers scarce. Just a few niche manufacturers existed, none of course at all used to automotive volumes – to make progress it was not going to be simply a matter of novel engineering, there would be new suppliers to be sought out and tentative contracts agreed.

Responsible Performance

So in this challenging context what sensible route would MG-R choose, given that we needed more than a bit of concept show car fluff, but instead a powerful theme and commercial case?

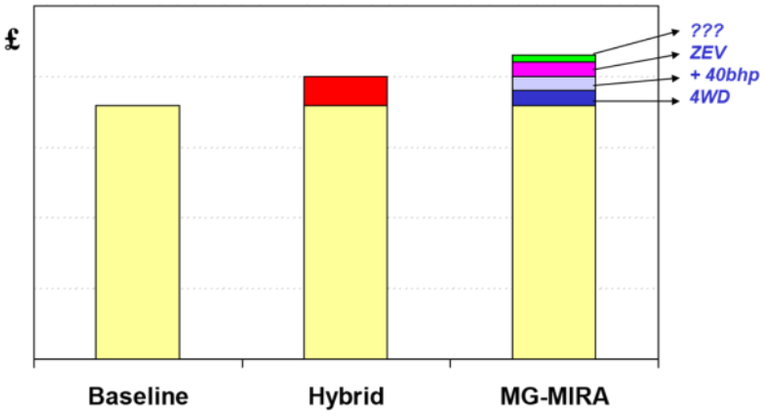
Fortunately, within MG-R's Product Development department a small team was established who were well positioned to help: the previous Rover Group had established a division called Rover Special Products who were responsible for various niche, low production volume products such as the MG RV8. This had proved the principle of deriving headline grabbing 'halo' products from a very small but focussed group of engineers.

Additionally, while the main Product Development department progressed mainstream models, there needed to be a means of looking to the future, such as for new materials and electric propulsion, whilst also tapping into sources of government grant funding. In the 2000s all these types of project were fed into MG-R's Pre Concept Group, led by Tony Spillane and under Rob Oldaker's Board level direction.

Your author was one of Tony's team, having joined from GKN's Advanced Driveline group after researching electric drive alternatives to GKN's major mechanical systems for passenger car 4WD. Emissions targets were squeezing the mechanical losses of such systems, while most of Joe Public simply wanted very occasional 4WD to get out of a snowy housing estate or off a muddy country car park. Tests showed that just an extra 20kW of part time 4WD was sufficient for most customer needs, so with the industry prospect of 42Volt 'PowerNet' systems coming along to supply the volts, and integrated starter generators arriving on some engines, the concept looked feasible.

Meantime, realising that all of the launched hybrids and EV's were aimed squarely at the worthy, fuel and planet-saving customers who reasoned with their 'head', there seem to remain an untapped opportunity to reach out to those who were also inclined to purchase with thoughts of emotion and excitement, their 'heart'. It was reasoned that a novel Responsible Performance theme could become a real PR eye-catcher that well matched the MG brand values and stimulated the buying public's imagination on the potentially varied future for hybrids. It would create the wholesome combination of having your cake and eating it, offering welcome enhanced performance while also meeting new congestion charging criteria! Alongside, with the company's ZS racers making good showings in the BTCC, there would be parallel routes to both wow the public and accelerate technical developments, much as Formula E aims to do now.

Akin to the genesis of the MG F, the sporty theme would be progressed on a tiny budget for the company to deliver maximum excitement for minimum investment. The green Responsible Performance route would have to adapt the existing production sporty car and adapt it to add performance while simultaneously reducing CO2, a real win-win hybrid! This theme aimed to address the key weakness mentioned before – CO2 saving was not a mainstream attractive sales feature, hybrids ought to offer more customer appeal for their additional cost. So while an existing car's performance could be enhanced by boosting, uprating or enlarging engines, these all bring attendant penalties in additional cooling, transmission strain and of course emissions.



On the other hand, enhancing the performance of a 2WD car by adding electric drive on the other axle offers a delightful mix of driver features, from 4WD traction, independent drive, front/rear torque variation and torque infill: such a powertrain layout is now termed a P4, or 'through the road' hybrid.

Equally, in addition to glamourous features, all manufacturers must consider the high cost and complexity issues associated with manufacturability: this aspect is vital if new models are to launch successfully. The engine bay of all modern cars is very tightly packaged and demanding for heat, assembly and crashworthiness, so clearly the introduction of large electrical systems is unwelcome here – far more attractive to shift most of these new components to the other end of the car!

Using Your Assets

Any good project begins with considering both 'the end in mind' and 'what are our assets'. The MG brand was clearly the one to promote for Responsible Performance, and of the range the TF stood out as the clear choice of donor. First, of course, it had by serendipity, inherited the R6 Metro sub frame and front suspension structure which brought a real 'do-ability' advantage to the prototype project. It was Britain's favourite sports car, so prominent in the public's awareness, and could be seen as a promotional flagship for the marque's 80th birthday in 2 years' time. A limited number of production hybrid replica 'halo cars' might also be feasible.

A second asset, and also a member of the Automotive Council, MG-R's long term proving ground and crash testing partner MIRA, just around the M42 near Nuneaton, was expanding its high tech full vehicle engineering services, so was seeking a practical 'hands on learning' hybrid project to ramp up its skills in this emerging arena. It also helped that both Rob Oldaker, MG-R's Product Development Director and John Wood MIRA's CEO were united by their shared hillclimb racing interests, both members of Shelsley's Midland Automobile Club.

Looking ahead with 'the end in mind' to possible broader MG-R commercial exploitation of add on 4WD hybridisation, was the coincidence of MG-R already being ahead of the curve with novel Crossover concept ideas, soon launching StreetWise and already investigating a follow up CountryWise R75 Tourer targeted at softroader capabilities, featuring larger Freelander tyres, an increased ground clearance and limited slip differential. The concept car had proven quite capable, but clearly the next step could be a light duty add-on 4WD. This would preferably be an electric 'e-Axle' to avoid a major floorpan tear-up.

Project Planning

So with shared interests, a kick off meeting in August 2002 agreed on the purpose, the final objectives and the work share for a project expected to run for about 18 months. It is timely to introduce some key players here, and where the author came in, i.e:

MIRA	- Project Manager	Steve Sadler
	- Electrical Engineering	Derek Charters and Chris Mellors
	- Aerodynamic and Fluids	Martin Jones
	- Design & Fabrication	Dave Bees and Gordon Croft
	- Modelling Simulink	Adrian Carlin
	- Public Relations	Richard Adams
MG Rover	- Technical Manager	Adrian Tucker-Peake
	- Prototyping & CAE	Phil Higgs/Dave Benbow/Robin Nickless
	- Powertrain	Steve Wood
	- Corporate Design	Dave Arbuckle
	- Business case and P.R.	Kevin Jones

Setting Targets

These were stimulating times for us engineers and it soon became clear that the demonstrator car could benefit considerably from both the novel hybrid layout and from complementary aerodynamic refinements. This work would promote many exciting feature opportunities to catch the eye of the media and public who were somewhat jaded about hybrid products. The e-Axle could offer so much more than simple traction and power boosts, for example:

High μ (grip) acceleration boost	- power
Low μ " - "	- traction
Low μ hill climbing	- traction
Torque infill through gear changes	- power
Hill launch	- driveability
Traffic crawl	- driveability and emissions
Manoeuvre creeping	- driveability
Steering turn-in response	- handling
High / Low μ lift-off stability	- handling
Front/rear power balance	- handling
Engine starting	- cost saving

Additionally, the Longbridge Chassis experts pointed out that the front biased hybrid installation could equalise the car's weight distribution towards 50/50, plus it would increase the mid-engine car's polar moment of inertia – a property that affects a car's response and steadiness in a turn and expressed as k^2/ab. The MGTF had a relatively low figure of 0.73 versus a typical target for road cars of 0.9, which is reflected in its quick turning response but also a tendency towards limit oversteer. In order to mitigate this oversteer, the production car has a high level of geometric understeer 'dialled in' as standard, so the hybrid might be more easy to drive on the limit.

Beyond hybridisation, MIRA had a wealth of automotive aero drag, lift and cooling expertise coupled with a sound awareness of much untapped potential with the TF, so it was agreed that all of this should be explored in parallel both to complement the car's higher performance but also to address the expected cooling issues for a compact set of electrical components working very hard. Unlike combustion engines, these devices don't like getting hot – they lose their magnetism or evaporate electrolyte.

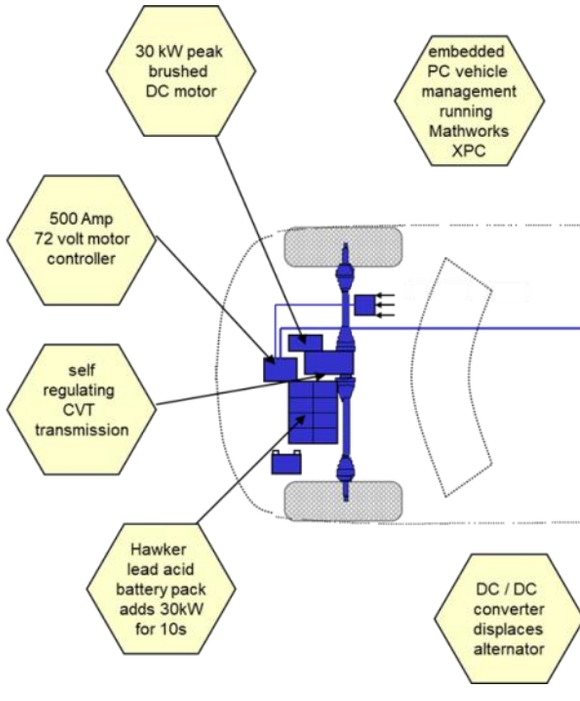
"The Wooden Car" built by Fred as a private venture – the first petrol-electric hybrid car, produced 1927.

We might have thought we were innovating, but it is sobering in many creative projects to find that it has 'all been done before'! Here we note the Petrelect hybrid of 1927, yet another product of the remarkably fertile mind of one of the car industry's unsung polymath heroes, Dr.Frederick Lanchester. This Coventry-built Hybrid powertrain Tourer featured engine stop/start, electric boost, electric reverse, ZEV mode and cylinder disablement!

Within a few weeks the build targets were agreed for this demonstrator prototype. There were no key external influences guiding the final publicity launch timing, but a running car within 12 months, then refinement and launch after another 6 months seemed reasonable given other commitments for everyone involved.

Launch boost electrical power – 160 + 40 PS for 10s duration
Cut 0 – 60 time from 6.9s to 5.9s
Electric 4WD operational on high & low μ surfaces to 60+ mph
Hot shift e-Axle torque infill during 1^{st} – 2^{nd} gear full throttle
City Drive 2 pedal motoring (1) engine idle, e-Axle drive to 20 mph
(2) engine off battery ZEV crawl
Driver interface: battery state of charge, EV selector, safety cut out
Drag reduction 10 % and Lift reduction to zero
50 / 50 weight distribution, max added mass 140 Kg
No deterioration in ride comfort quality
High quality interior and exterior upgrades, P.R. logos

We can see that these features are very different to those that were so characteristic of all generic hybrids of the time, showing an electrical system that was primarily peak power-focussed for short spurts of duty instead of energy focussed for long periods of ZEV driving – these latter cars naturally carry much larger and heavier battery packs of a different chemistry for steady power delivery.



Parts Selection

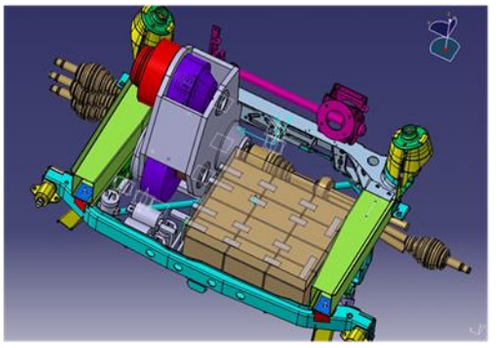
With the desire to have the car running within 12 months, and the infancy of high power automotive electrical parts, expediency was the order of the day to achieve practical learning-by-doing, as we found to be so much more informative than the standard industry approach of 'tear-down' benchmarking that is common practise to unveil the approaches and innovations taken by competing companies. Of course, the first hazard with that approach is putting in place adequate safety measures for engineers and fitters to confidently peel open a sealed 400 Volt battery pack! So what follows is a summary of key items, the selection issues and choices made – the majority were UK made and 'off the shelf'.

TARGET BENEFITS TO CUSTOMER

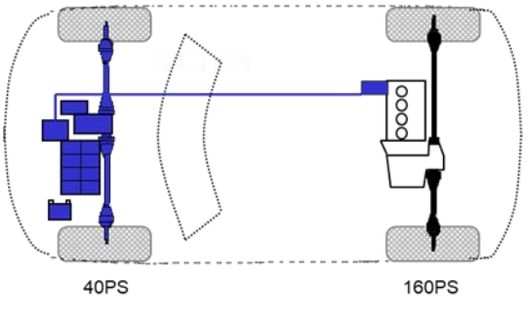
STYLE
based on function
links to racers & SV

AERO.
zero lift at speed
drag reduced 6%

PERFORMANCE
40PS electric boost
0-60 5.9 vs. 6.9s



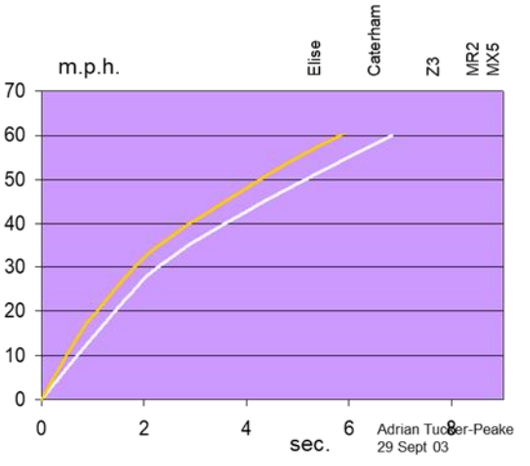
HANDLING
4WD acceleration traction
balanced wt distribution



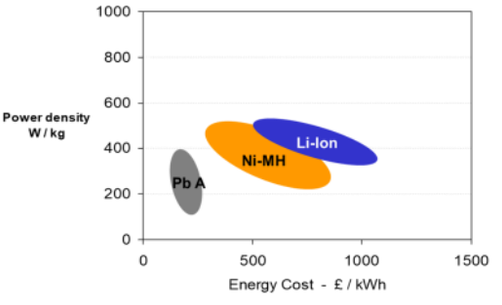
EASY DRIVING
powershift acceleration
Urban mode 'automatic'

SAFETY
4WD stability enhances
'safest sports car'

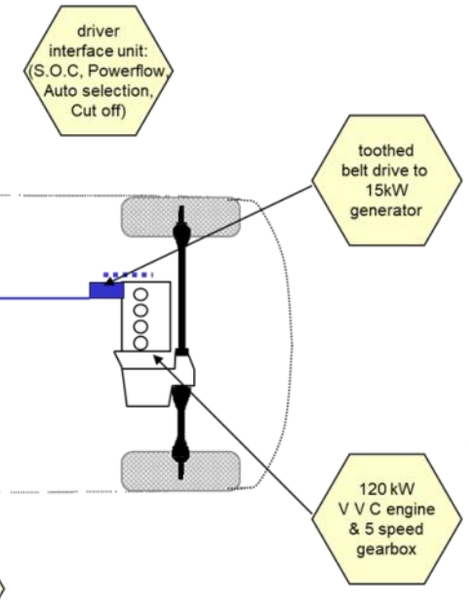
ECONOMY
cleaner boost than turbo's
more efficient 4WD



Batteries: Li Ion were a distant dream, NiCad OK but rejected for toxicity, NiMH good in the Prius but need extensive monitoring and cell management. Lead Acid (PbA), though is good for high current discharge as for your starter motor and a good range of sizes were available. P 14 Small Hawker Lead Gel units were proven in motorsport, so likely to prove rugged enough for short periods of high discharge current. We needed about 80 Ahr for the EV mode so 12 off SBS8 7Ahr units in two 'strings' gave 84Ahr and 72Volts. These were packaged up by MIRA in an aluminium housing and output via a pair of 200A contactors.



Electric Machines: There was a limited supply of high power to weight ratio machines available, and we needed two – one as the engine driven generator, displacing the standard alternator, and the other as the front e-Axle traction drive. A preferred variant was the permanent magnet type of machine, popular on the Japanese hybrids and in other niche applications for its very high torque and efficiency. This is still the case, though Tesla do well nowadays with their lower cost induction type motors.



We needed short bursts of 40PS (30kW), simple air cooling for simplicity and high torque to minimise extensive and potentially noisy gear reduction stages. Honiton-based Lynch had been manufacturing their PM 'Pancake' type motors for decades, and these had found favour with specialist builders of E-Bikes, small EVs, E-Boats and others. Their D127 72V machine mostly met the brief, even better when given 10second boost up-rating by AVT.

Controllers: A pair of Brusa 500A units also came from AVT – so much easier to get a compatible 'set' through a single supplier. Each was configured with the appropriate operating 'quadrant', i.e. drive for the e-Axle and regen for the generator. We were not aiming for the more complex regeneration option at the axle, since the short power duty wouldn't bring any benefit, and also most hybrids of the time suffered from a corrupted brake pedal feel as two systems tried to co-operate in slowing a vehicle down – not ideal for a fun driver's car!

12Volt Supply: With a considerable bank of 72V on board, there was no need for the standard car's big starter battery, so we downsized using one of the Hawker batteries. This saved 13kg and it was charged via a small DC-DC converter.

Throttle: Two distinct output signals were required from the driver's pedal :- (1) a linear delivery of high power from the combined engine and e-Axle, through to powerful 200PS acceleration, then (2) a much more prompt delivery of low power in EV mode in a congested urban environment. These contrasting needs could not be met practically via a typical Bowden cable, so it was replaced with a 'drive by wire' potentiometer, via a CAN interface to the Vehicle Monitoring Unit. Matters such as this one reminds us that for all the added hardware, power is nothing without control, and MIRA conducted extensive Simulink modelling to ensure all diverse systems behaved themselves once running in the demonstrator. We didn't want to inadvertently stretch the MG's wheelbase through a mistaken 'push-me-pull-you' effect between the two drive axles!

Transmission: Electric machines produce their highest torque from 0 rpm, as is well demonstrated in the neck-snapping launch of Teslas. Lynch's pancake motors were excellent for launch support off the line, but risked damaging over-speeding above 5000 rpm, so another choice of specifications presented itself. The generator unit on the engine could safely be geared down via its toothed belt drive, but how to handle the e-Axle traction motor? A fixed low drive ratio would help off-the-line but run out quickly, while a multi-speed gearbox introduced risk and complexity, and possibly whine. In fact it is only in recent years that suitable multi speed geartrains for electric drivelines have proved successful for models like the BMW i8 – Tesla abandoned their attempt with much anguish in their early days!

So the final option was a CVT, and MIRA located a suitable self-contained unit of the type used in snowmobiles. Through a differential it offered a ratio range from 9:1 up to 2.5:1 so 4WD could assist right up through a 60mph acceleration run. It was quite a bulky unit, but usefully for a one-off demonstrator it offered scope for later experimentation.

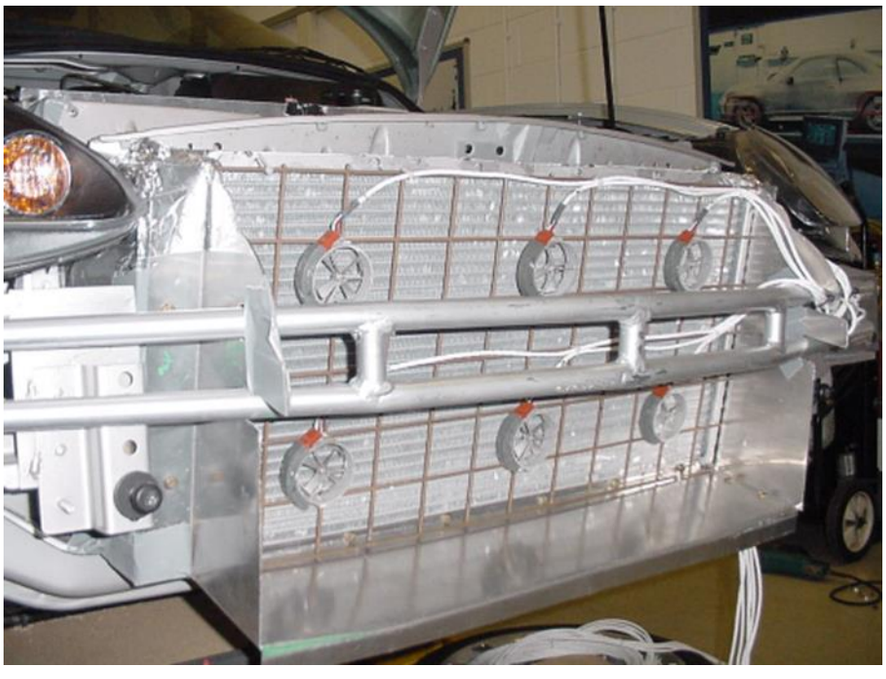
Aerodynamics: MIRA's Thermofluids engineers had measured the aero properties of MGF & TF during their respective development stages and knew there were plenty of opportunities to 'go at' for this prototype. Their work on drag and lift reduction and its relevance to MGF / TF owners and 'tweakers' has been thoroughly reported in excellent, entertaining articles by Rob Bell, namely Ultimate MG & FasTForward, so there is no need to duplicate here. Suffice to say that their airflow analysis and wind tunnel experiments indicated considerable merit in ducting the radiator cooling air out and up over the bonnet, rather than down beneath the car, balanced by a tidy bootlid spoiler to control the wake.



The end result yielded the following transformational gains, all of which would considerably improve the car's speed and stability:

C_D	0.346	→	0.323	
C_{LF}	0.160	→	-0.002	(downforce!)
C_{LR}	0.085	→	-0.089	"

Additionally, the engineers investigated the potential hybrid system cooling issues that might arise either in the hot engine bay or in the boxed in front end. So as the Figures show, they mapped airflow through the standard poorly ducted radiator – improved enormously by the bonnet-top outlet, modelled temperature distribution within the battery box and doubled up the engine bay top vents. The pleasing outcome of all the sound engineering was a purposeful, sporty look where form followed function.



Cooling issues addressed on the radiator

Preparations and Build

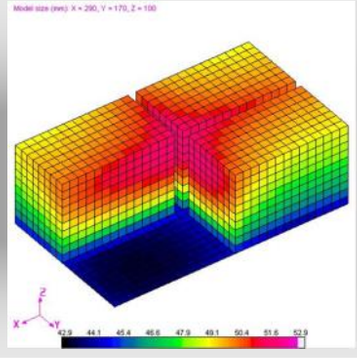
Component orders were placed through October, while much parallel work continued at the premises of both party's engineers. As is common with demonstrators there are a host of details that need to be confirmed and sorted alongside the mainstream priorities in order to prepare a well-rounded car. Here are some examples that may be of generic interest to TF owners.

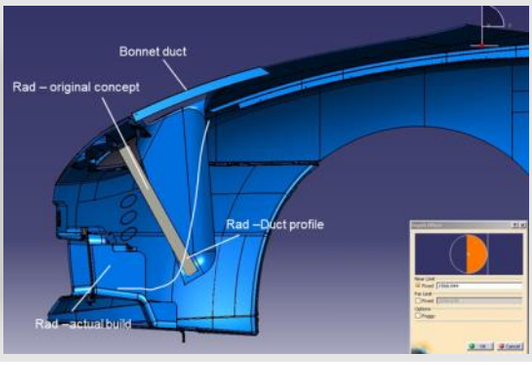
MG-R

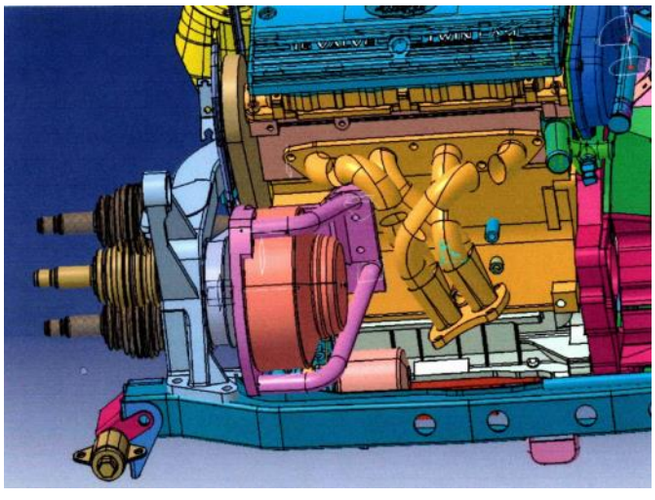
New VVC engine prepared – run in for 30 hours on the bench rig - output 166 PS on 98 octane fuel
Air intake pipe moved – standard one is behind the engine for passing EU noise regulation was so shifted to LH side scoop Additional 115k front axle mass lowered trim height 15mm, so spaced Sport front springs were fitted
Standard EPAS was ideal for ZEV mode, but likely at its capability limit with additional front mass – castor angle slightly reduced
Supplied common size lightweight 7" x 16" wheels for both front and rear axles and extra pair of driveshafts
Risk of CVT/servo packaging clash and a remote unit not viable – set CAE boundary for transmission envelope
Moulded SMC underbonnet ducts and bonded to an opened-up steel bonnet, cut extra engine bay vents and grafted on a bootlid lip spoiler

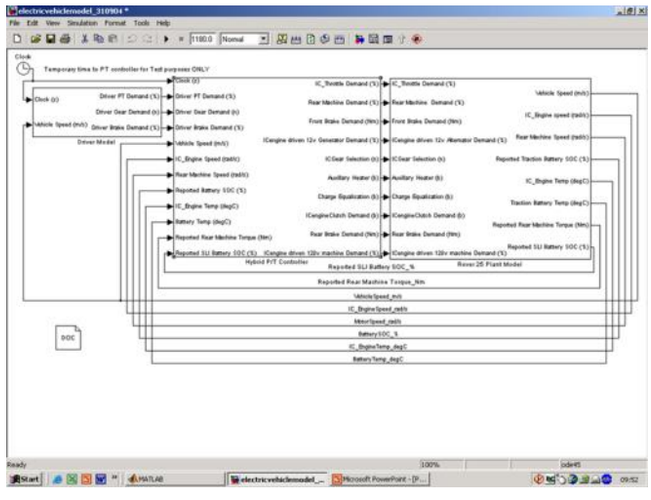
MIRA

Benchmarked donor car's performance, ride and handling and kinematic rig geometry: measured 6.8s 0-60 by 5000rpm and drop the clutch – best performance on a cool day with hot powertrain.
Found acutely unequal bump steer and corrected it by easing the rack up one side
Fabricated all front radiator ducting and modified front bumper vents, then battery box, bus bars, generator bracket and heat shields
Continued the complex control logic modelling and implementation to the Mathworks system controller.









Test Runs & Finessing

All hybrid electrical systems had been installed by the end of Spring 2003, with cabling tidily connecting everything and a bright electric blue finish applied to make a clear statement in due course ; it just needed the control algorithms to be confident and loaded! MIRA was well equipped with its internationally renowned proving ground tracks so the tentative initial trials could begin in July in safety and security. Pleasingly for all of us learning a new technology in a novel configuration, the assessments went well with just the engine generator breaking up due to its unaccustomed engine mounted vibrations – soon fixed by AVT.

The design guys at Longbridge and MIRA had taken oversight of the car's presentation so after some PR debate about its name, 200e-Power…. hmmm, fortunately it was felt that 200 HPD made a clear statement about both the power and the pioneering Hybrid Performance Development. Appropriate badging, kick plates and decals were made, and the interior trimmed smartly in a monogram blue – a very professional look inside and out.

Bright electric blue made a clear statement

Executives from both parties assessed the car on MIRA's gradients, urban route, high speed banking and low µ circles: they confirmed the pleasing handling and improved stability, and all enjoyed the delightful mix of blasting acceleration, then just trickling along peacefully with no effort in ZEV mode – truly Responsible Performance.

To get an independent view, expert driving assessor John Lyons was invited; he relished the predictable response and especially the controlled 4WD drifting of the sports car on the low µ circles, a spectacle captured on film and video.

John Wood drifting at MIRA

Launch & Promotion

A dynamic car needed dynamic photography, so a concise video was produced to introduce its configuration and capabilities. Wheels up on a ramp showed off its 4WD, high speed banking promoted new found stability, while John's opposite lock drifting contrasted so well with the push button engagement of serene ZEV city mode. As the P.R. 'machine' kicked in, an excellent relevant and local opportunity arose for MG-R and MIRA to co-launch the car to the media.

Just as governments were adopting greater environmental concerns, so was motorsport and with fortunate timing the Motorsport Industry Association launched its inaugural Clean Racing conference in Birmingham on 22nd October. Presenters from BMW, Shell, Cosworth and BTCC spoke of their Green initiatives and the new sporting hybrid car perfectly fitted the meeting's agenda. Rob Oldaker and John Wood were invited to present and then launch the car during the day – it certainly captured the interest of the many TV and press journalists who readily picked up on the exciting new theme for future hybrid cars and the potential for motorsport showcasing. Rob Oldaker enthused 'our holistic approach combines electric traction with aerodynamic advances, driving the perception of hybrid cars forward into the realms of driving excitement'. John Wood noted that 'our simulation techniques have configured the hybrid to deliver clean, additional performance when the driver needs it most'. One idea already bandied about was that of a limited use 'push to pass' electric boost button to add racing excitement, media interest and racing enthusiast acceptance of electric power capabilities.

Thus began a flood of stimulating presentations and demonstrations: to MG-R and MIRA staff, the DTI in London, Driving the Low Carbon Future at the NEC, to IMechE members at Bristol University and to Transport Minister Alistair Darling at the Green by Design show. Our pop-up display was getting well used and the outcome was a realm of positive, complimentary reports from the specialist and general press, all of which proved 200 HPD to be a stimulus for the MG brand, a showpiece for MIRA, an inspiring hybrid vision for enthusiasts, practical learning and encouragement for auto engineers and tangible support for governments and motorsport seeking low CO2 solutions.

Media reveal at the Clean Racing Conference, Birmingham . Rob Oldaker can be seen in the bottom picture on the right

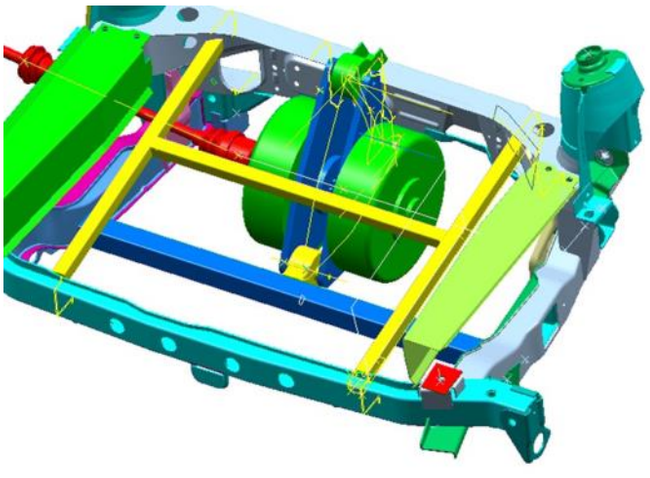
Spin Off Studies

From the valuable collaboration between two Midlands partners and the serendipity of the MG TF's construction emerged a pioneering car that excited everyone involved. It showed a sparkling opportunity for emerging powertrains and can claim to be the world's first hybrid Sports Car concept – Toyota finally got their 4WD GRMN 250bhp sports hybrid concept shown in 2011!

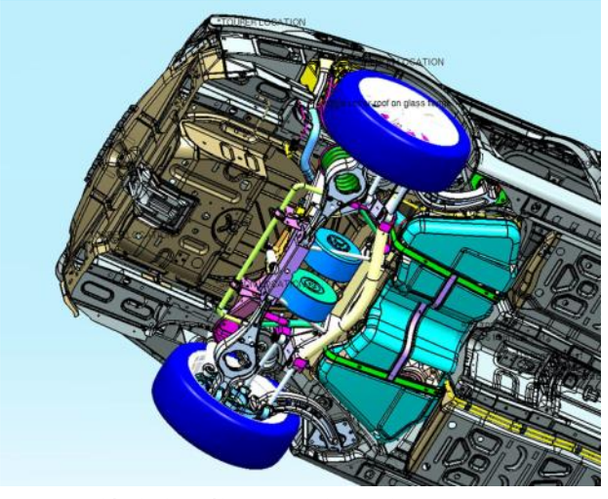
The end of the project, though, was just the seed corn beginning of spin-off studies that pursued the central theme of presenting enticing customer delight features, beyond the worthy emissions reduction: this approach would present a much more viable production business case.

For us, some spin-off studies were just desk-top exercises while others led to government support for greater things…..

Marketing proposal for 50 off replicas as an end-of-run halo product
Pre Concept design for a 120V NiMH pack and twin motor e-Axle, bringing the thrilling prospect of dynamic torque vectoring- very MG!
Calculations for a motorsport hillclimb TF, using ultra capacitors to boost power instead of batteries (later madly demonstrated by BMW!)
Commissioned a design proposal for a high profile Ministerial R75 saloon
In pole position to apply for government's EST funded Ultra Low Carbon Car Challenge, a competition launched in 2003 to seek future UK production of low emission passenger car fleets. MG-R applied with MIRA and were successful in our bid for £4.5 million, rewarded with the comment 'your bid is head and shoulders above the others for production feasibility'. But that's another story….



Twin motor e-axle



Proposal for high profile ministerial R75 saloon

RELEASE IMMEDIATE
October 22, 2003

MIRA AND MG DEBUT 'HYBRID PERFORMANCE DEVELOPMENT' AT KEY MOTORSPORT EVENT

An exciting new technology concept was unveiled today (October 22), at the Motorsport Industry Association's 'Clean Racing Conference', by Rob Oldaker, product development director, MG Rover Group and John Wood, managing director, MIRA. The 'Hybrid Performance Development' is a petrol/electric powered MG *TF* featuring a combined output of 200Ps deployed through its four road wheels. MG Rover Group and MIRA engineers have worked together to produce the '200 HPD' specification, derived from the popular MG *TF* sports car, producing functional and environmental benefits, with a wider performance capability potential for motorsport.

Rob Oldaker, commented: "The 200 HPD is the culmination of two talented Midlands-based companies, bringing together their expertise to create this MG car, that perfectly illustrates the vision of the Clean Racing Conference."

John Wood, added: "We set objectives to produce an enhanced performance car that anticipated environmental requirements, while expanding today's sports car driving experience. The car achieves this with 'responsible performance' where the innovative hybrid solution sharpens acceleration, at no expense in tailpipe emissions, yet also offers customer benefits like all-wheel-drive traction and the low-speed clutchless operation of 'City mode'."

The holistic approach combines electric traction with aerodynamic advances, driving the perception of hybrid cars forward into the realms of driving excitement. Motorsport has a renowned capacity for efficient development of components and systems while stimulating the public's interest. This is a new opportunity for the industry to accelerate both technical progress and customer excitement of these hybrid technologies that are capable of giving a competitive edge with green credentials.

Note to Editors
Last week H.M. Government confirmed that MG Rover Group, Powertrain Limited, MIRA and Pi Technologies made a successful bid to secure a matched-funded proposal for the build of an ultra-low carbon technology demonstrator passenger car.

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