

# Second coming

VDI INVESTIGATES LEADING AFTERMARKET CHASSIS OPERATIONS. **PETER CAMBRIDGE** RECOUNTS A NEW PROJECT FOR MOUNTUNE, AND IN *GOLDEN OLDIES* **MIKE MAGDA** DISCOVERS A SHOP THAT BRINGS 1960s CLASSICS INTO THE 21<sup>ST</sup> CENTURY



The aftermarket tuning industry has often been regarded as the 'dark side' of automotive engineering. There are many companies producing suspension-related products that lower the car, reduce the roll, and make it firmer. Anyone can buy these parts, combine them with others, and then fit them to their vehicles with the expectation that the end result is, for them, going to be better than standard; a standard that has been developed by teams of talented engineers to be safe, to work on a variety of roads in all weathers and all load conditions, and to appeal, in its driving manners, to a wide customer base. Will it corner better? Does it look better? Is it safe? There are no guarantees other than the reputation of the companies and now the opinions of self-proclaimed experts on the many forums. It is an exciting but difficult market for a company to enter.

Mountune, the performance engineering division of Revolve Technologies, is established as a premier tuner of Ford cars in the UK, and is rapidly expanding into Europe. It is the only company to offer Ford-approved performance upgrades through the dealer network and works with Ford to produce special editions such as the RS500. To complement the engine performance upgrades and to offer customers a complete performance package, Mountune has been developing a range of products including wheels and tires, brake upgrades, and styling components. To complete the range for the Focus RS, a suspension package was required.

The Focus RS is a brilliant performance car. The ride and handling have been tuned to make an exciting and involving car that is practical enough to be used daily and whose dynamic character perfectly

**Background**  
Peter Cambridge, the ex-Prodrive development engineer responsible for engineering the Subaru UK limited edition vehicles, as well as the Mazda RX-8 PZ and Alfa Romeo Brera S, has been working with Mountune on the vehicle dynamics of its Ford RS Focus to produce an upgraded suspension kit for the track-day customer.



MOUNTUNE FORD FOCUS RS CLUBSPORT SUSPENSION KIT (LEFT), AND THE FINISHED PRODUCT (MAIN IMAGE)

matches the aggressive looks. Mountune wanted to focus the handling for a select group of owners who take part in track days and also run their cars on the road – hence the Clubsport name.

The project was run like a mini OEM vehicle refresh program – research the market, define the objectives, plan the program, manufacture prototypes, engineer the car, sign it off, and produce the production parts. The big benefit we had was that the vehicle was already fully signed off and so would not be changing during the tuning phase – as is always the case with new vehicles – and we were setting the dynamic targets.

Our research, using magazine reviews, discussions with well-respected journalists, and our own experience in tuning a range of high-performance road cars, yielded a clear competitor vehicle and a number of areas that could be enhanced. The Mégane Renaultsport was regarded by many as being the best road car for the track, with a dynamic character that gave the driver confidence at high speed, but retained the necessary agility. The RS just required tightening up for the track with a slight change in its steady state balance and a small reduction in the throttle adjustability.

The aftermarket is dominated by cost like the OE side and providing a

kit to enhance a vehicle must offer value for money to the end customer. This limits the scope of the tuning parts and also dictates the supplier selection. I have a great deal of experience working with Eibach and Bilstein on limited-edition vehicles. The components used in the dampers are the same ones used in the OE parts and the shim stacks are built within guidelines created from the millions of cycles of testing of production dampers. The springs are specified by us but designed and manufactured by Eibach to their OE standards – good for engineering quality and marketing appeal.

The suspension tune followed conventional industry practice, with

**“The Mégane Renaultsport was regarded by many as being the best road car for the track”**

## Golden oldies

According to the Specialty Equipment Market Association (SEMA), US consumers spent nearly US\$10 billion on aftermarket suspension and handling products for their vehicles in 2010. While that number includes performance wheels and tires, it also encompasses shocks, springs, bushings, brakes, and other chassis components for the different niche groups tracked by SEMA.

Aftermarket suspension development in the USA is clearly split into three camps: upgrading late-model vehicles, ‘restifying’ popular vintage vehicles, and modifying pickups and utility vehicles for both show and off-road performance.

Truck owners are the most aggressive in addressing suspension issues, but a significant piece of that market is interested only in appearance and image by emulating monster trucks and desert racers.

With today’s sophisticated suspensions, auto makers leave little room for improvement in late-model performance cars. High-end adjustable shocks, usually developed by racing companies like Penske Shocks and Pfadt Race Engineering, are making the biggest headlines, although there is still strong demand for basic upgrades, so cars can be more competitive in weekend track days or at an autocross.

Making a classic car handle perform like a modern sports car is perhaps the most challenging trend in the aftermarket today. Specialty suspension companies are completely redesigning the frames and suspension components of cars from the 1950s, 60s, and 70s. Modifying the engines had always been easy for classic car enthusiasts, but only recently have aftermarket suspension companies made a serious engineering effort to correct

all the handling problems that handicap older cars.

“It really starts with the tires,” explains Kyle Tucker, who started Detroit Speed with wife Stacy (both are mechanical engineers with OEM and racing backgrounds). “Now that we have modern tires, we can get into the vehicle dynamics and get more aggressive with camber curve, spring rates, and shock curve – both static and dynamic.”

In a methodical approach, Detroit Speed uses a ROMER coordinate measuring arm to map out a vehicle’s dimensions and analyze the stock suspension geometry. The engineers then use Solid Works and WinGeo3 suspension geometry software to design new suspension components, including tubular control arms to replace stamped units and multilink rear suspensions to replace leaf-spring setups. Detroit Speed also designs complete subframe

replacements with new suspension geometry and coil-over conversions.

Detroit Speed outsources stamping, forging, and hydroforming operations, but handles all other fabrications and assemblies in-house. Shock absorbers are built by Sprint Cup supplier JRI Shocks to Detroit Speed’s specifications, then tuned by Detroit Speed.

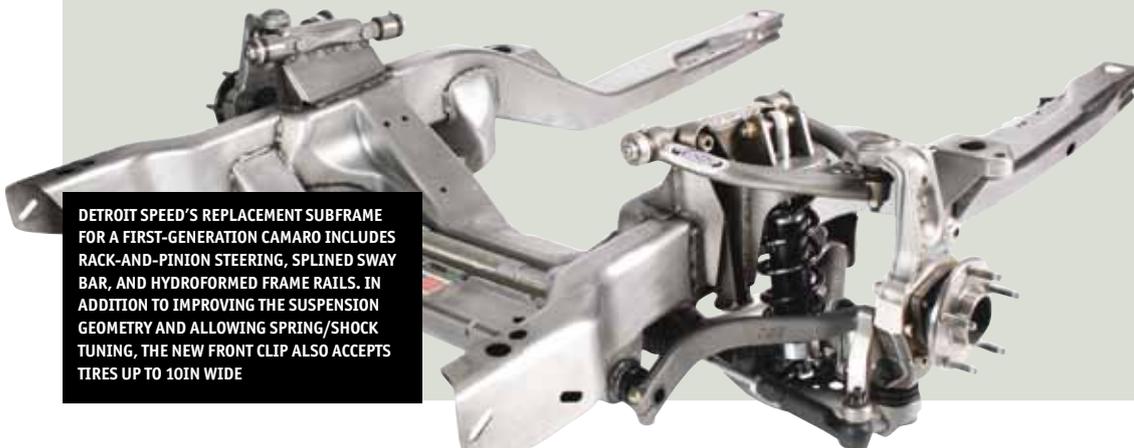
Meanwhile, Art Morrison builds replacement frames with updated suspension geometry, coil-over shocks, and fitment for wider tires. His most popular frame bolts up to 1955-1957 Chevy bodies with no modification, and will pull up to 0.94g on the skid pad. An Art Morrison replacement chassis for a 1953-1962 Corvette will go to 1.05g.

“We also give them a ride soft enough that it doesn’t feel like you’re riding in a [Nissan] GT-R,” quips Morrison.

Two full-time engineers at Morrison measure stock vehicles with a FaroArm, then use AutoCad, WinGeo3, and SolidWorks to design new frames and suspension parts.

“It allows us to do all the ‘what ifs’ before we go to the shop,” says Morrison, who started out by developing drag racing chassis in the 1970s.

Morrison will also develop a full-frame chassis for a unibody car. A recent project mated a new Nissan Cube body with a Morrison chassis that supported a 600bhp, 6.2-liter Chevy LS9 supercharged V8 engine.



**DETROIT SPEED'S REPLACEMENT SUBFRAME FOR A FIRST-GENERATION CAMARO INCLUDES RACK-AND-PINION STEERING, SPLINED SWAY BAR, AND HYDROFORMED FRAME RAILS. IN ADDITION TO IMPROVING THE SUSPENSION GEOMETRY AND ALLOWING SPRING/SHOCK TUNING, THE NEW FRONT CLIP ALSO ACCEPTS TIRES UP TO 10IN WIDE**

## New metal from the German tuning giants



ABT Sportsline AS6

The renowned Volkswagen Group fettler has offered up its vision of the Audi A6 Avant. The load-lugger gets a significant power hike to over 540Nm of torque in the TFSI model, while the bi-turbo diesel now pumps out 700Nm. Ensuring that this is transferred effectively, ABT has fitted 30mm-shorter springs as well as a choice of obligatory oversized alloys, available in 19-, 20- or 21in fitments.



Brabus Bullit 800

The Mercedes specialist's latest creation is the frankly bonkers 800bhp, 1,420Nm-producing Bullit 800 coupe. Beneath the skin of the C-Class coupe body, are a custom, Brabus-reinforced LSD and gas-pressure, height-adjustable coilovers, developed in cooperation with Bilstein, Brabus's technology partner. Number 11s can be left on the tarmac through a choice of Continental, Pirelli or Yokohama 275/25 R20 tires.



Gemballa Tornado

Based on the Porsche Cayenne, the wide-bodied Tornado SUV uses carbon panels to shave more than 70kg from the factory car. 'Stage one' engine mods see power raised to 580bhp, while the latest 'stage two' package will bring 700bhp and 1,000Nm. Keeping this craziness in check are Brembo-sourced 420mm discs and six-pot calipers – hidden behind 22in wheels, wrapped in 335/30 R22 rubber bands.

“The initial phase of the tuning produced a car that felt like the natural evolution of the RS. With the higher ride frequencies, the car felt smaller and lighter”

spring rates being selected to give the desired ride frequencies and pitch behavior. The ride heights, spring aid rates, and contact points were all set to provide the steady state balance and basic ride characteristics we desired. Changing the ride height affects the roll centers and position on the bump steer curves, and these were considered. Altering any of the kinematic and compliance characteristics is not within the scope of a small project like this. Only optimization of the static geometry settings, to suit the new suspension tune, can be achieved.

The dampers were tuned on the road and checked on the track. The random nature of our British roads, especially in Warwickshire, provides ideal input for choosing the settings. Some projects I have worked on in the past have required the damping rates to be started from scratch to achieve the desired characteristics, but the RS was different. The standard damper rates are a superb

compromise, giving a fine balance of comfort and handling (described as “playful” by one journalist), that we effectively copied into a tuneable shim stack to use as our starting point.

The initial phase of the tuning produced a car that felt like the natural evolution of the RS. With the higher ride frequencies, the car felt smaller and lighter. The body control was very tight – for a road car – giving the impression of there being no roll. Traction and stability were good, but aspects of the ride would require improvement.

Mat Jackson, the British touring car driver, has links with Mountune. He assessed the car at the Bedford Autodrome, before the damper tune was finalized to give a racer's view of the track performance and to set a lap time. It is quite possible to create a tune that feels very sporty, but is actually slower than the standard one around a track. The car was quick, setting lap times faster than some more exotic machinery, but a

little more control was necessary. Feedback like this is invaluable when producing a tune aimed at track use.

The final phase of the tuning focused on improving the ride and adding a little more body control. More compliance and high-speed control was created by changes to the damper shim stacks. The static geometry was then optimized, within the standard Ford tolerances, to provide the best initial steering response and feel to match the revised character. The final suspension specification was signed off through testing in high and low  $\mu$  conditions in the two-up and fully laden conditions.

The production parts have now been produced and the first batch of kits are with customers. The feedback so far has been extremely positive. Mountune has entered the suspension-tuning market with a product engineered to complement its current range of tuning packages and to build on the dynamic performance of the standard RS. 

**SUBSCRIBE TODAY - REGISTER ONLINE  
TO RECEIVE THE NEXT ISSUE FREE!**

Find To receive future copies of Vehicle Dynamics International free of charge,  
or to register a friend or colleague, please sign up online now!

[www.ukipme.com/recard/vdmcad.html](http://www.ukipme.com/recard/vdmcad.html)