

THE PREVIOUS INSTALMENT OF NIGEL'S CW460 MEGA-BUILD SAW THE COMPLETION OF ITS POWERPLANT: A 4.6 LITRE V8 APTLY NAMED THE RAPTOR F85. PROMISING TO DELIVER A BARMY 330 PLUS BHP AND, MORE IMPORTANTLY, 330 PLUS FT/LBS OF TORQUE, THE NEXT CHALLENGE FACING MR. DEAN WAS ITS INSTALLATION. UTILISING A CONSIDERABLE AMOUNT OF BESPOKE HARDWARE NEVER BEFORE SEEN IN THE INDUSTRY, WOULD IT FIT? WELL, ALMOST ...

RUSH CW460

CHAPTER

7

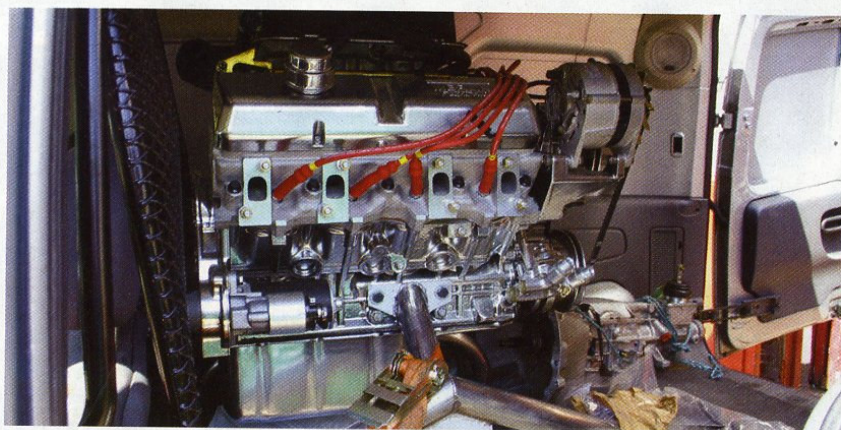


Nigel, Kit Car's Tech' Ed' and in-house builder.

Having witnessed my powerplant being painstakingly assembled by Holly at RPi Engineering in Norfolk, the return to the Dean garage in rural Wiltshire without my new baby was a little distressing. Agreeing to the V8 being centre stage on the company's stand at the Essen Retro Classic Show was only polite, but still very painful for yours truly. Naturally, wild horses couldn't keep me away from the Norfolk-based engine specialists to arrange collection on her return.

Borrowing a Vauxhall Combo - one of those small Postman Pat sized vans - the big day arrived and, with the assistance of John Cleese (or my Tom-Tom), the four hour drive didn't do anything to dampen my enthusiasm. Arriving at around 9:30 a.m. I was welcomed with the usual superb mug of coffee and ushered into Holly's build room. There she was ... my immaculate Raptor F85 still attached to the polished engine stand used at the show. It was at this point the realisation hit home yet again as to what

had been created: a totally unique combination of parts that had never before been assembled, let alone squeezed into a lightweight sports car. The performance potential was not in question, but would she fit the Rush's slight frame? Apart from the new ACT plenum assembly, my main concern was the increased height of the Merlin F85 heads. To optimise gas flow and valve positioning, the physical height of the assembly had been increased by around 20 mm, which also transposed to the exhaust port positioning. Laterally they were identical to the stock heads, but in the critical plain the increased height could be a potential issue with the headers hitting the DAX chassis. Putting this significant concern to the back of my mind, the RPi lads helped lift the unit into the Combo and secured it accordingly. A few boxes of auxiliary hardware were then pushed into the van, including the box, bell housing and flywheel assembly; more about this in a moment. Fully loaded I said my goodbyes and commenced to follow Mr. Cleese's instructions for a hassle-free return to the Dean garage.



Raptor F85 ready for its journey back to the Dean garage.

UNLOADING

As described by my darling daughter last month, once home this white van man enlisted the help of the neighbouring pub's owner to carry the Raptor F85 into the garage. Astonishingly, two could lift

the whole assembly with only a few grunts here and there. This is where the Buick derived lump wins hands down compared to cast iron small blocks, especially in agile road rockets like the Rush and Westfield Seight (OK, you could squeeze a 302 into

the DAX chassis, but the sublime handling would undoubtedly suffer). With the Vauxhall van fully unloaded I opened my garage mini fridge, cracked open a can of Fosters and celebrated the arrival of my long-awaited V8.

FLYWHEEL AND CLUTCH

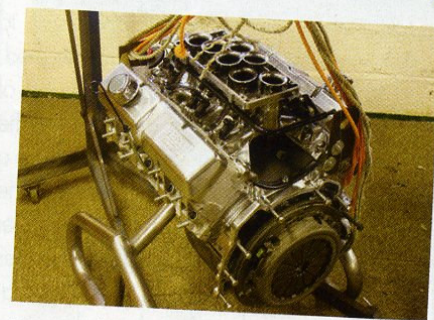
After a good night's sleep I awoke with a plan of action for the day: engine installation. Before I could unpack the lifter, however, there was the small question of fitting the flywheel, clutch assembly, slave cylinder, gearbox, speedo drive and a few other bits besides. It is at times like these that fifty years of working in the motor trade come in handy, so a call to my father saw him gracing our doorstep within twenty minutes flat. You see, even though he won't admit it, he likes to get involved. Maybe he's worried I'll leave something loose, but more likely, my insane approach to building cars reminds him of his irresponsible youth.

Cups of tea in hand, we admired the RPi hardware and decided on a line of

attack. First job: fit the flywheel and clutch assembly. Utilising brand new TVR components, the flywheel was positioned on the crankshaft and bolted into place with high tensile fasteners. Fully lightened and dynamically balanced this assembly would ensure optimum throttle response. This is always an advisable upgrade since a lightweight kit car simply doesn't need to maintain inertia like a two tonne Range Rover.

Next came the bespoke spigot bearing. This mounts in the end of the crankshaft and supports the primary shaft emerging from the gearbox. Since I had opted for a special set of cogs (more about this in a moment) Holly had turned up a phosphor bronze alternative which was simply tapped into position.

Utilising my father's trusty alignment tool, the clutch plate and pressure plate were duly

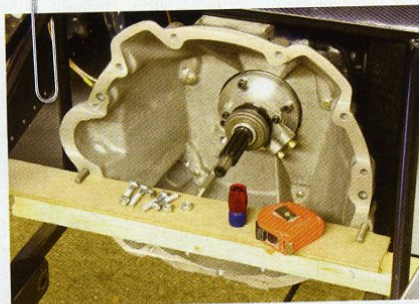


Pressure plate and clutch assembly in situ.

bolted to the flywheel. As he always stresses during this process, it is critical the pressure plate is torqued down equally around its circumference to avoid distorting the sprung fingers. If at any time these become damaged, the end result can be a juddery clutch.

SLAVE CYLINDER

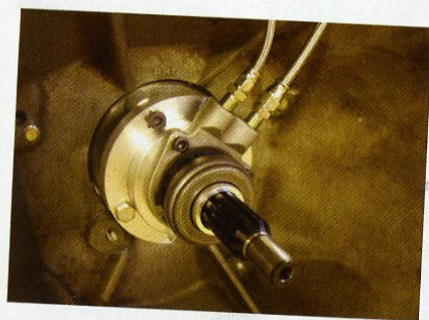
Unlike any project I have previously built, the CW460 utilizes a concentric clutch slave cylinder. This sits within the bell housing and mounts on the gearbox primary shaft. Such a set-up is very popular in motorsport due to the significant reduction of moving parts, such as the release fork, release shaft and guide tube. This not only reduces weight but also provides an extremely positive clutch action, increases reliability and a longer working life. Unlike some other offerings, the RPi solution incorporates a slave cylinder which is not integral to the bell housing, allowing cost-effective maintenance at a



Accurate measuring was required to ensure box and engine would mate with no problems.

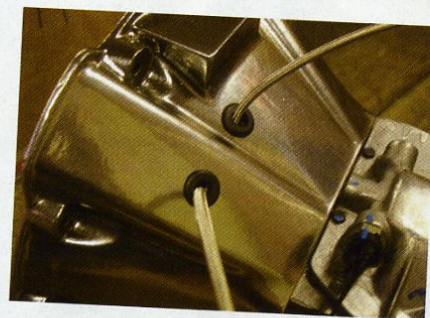
later date. The plumbing is straightforward, with the braided hose from the master cylinder passing through a hole in the bell housing prior to attachment to the slave cylinder. Another braided hose then exits the bell housing casing to allow for the bleeding of the system.

Not trusting such a new-fangled set-up, my father insisted on measuring everything in sight. How far the gearbox primary shaft sat in the spigot bearing; what clearance there was in the bell housing for the pressure plate and how far the release bearing was away from the pressure plate. If all that were not enough, he disassembled the slave cylinder to see how it worked. I guess this is



Concentric clutch slave cylinder complete with spacer.

experience for you and minimizes the risk of overlooking something. Problem is, if something is wrong it's engine and box out time for readjustment. Guess what? He was bleedin' right! Everything was spot-on apart from one thing: the release bearing was too far away from the pressure plate. Since concentric set-ups have very little throw, their initial adjustment is critical. 'No problem,' he said and trotted off home. Ten minutes on his trusty lathe produced a precision aluminum spacer, all in imperial measurements of course. 'I don't trust those damn millimeter things,' he often grumbles. Once in situ, out came the ruler yet again and everything was rechecked. Only then did he give the go-ahead for box and engine to mate.



Feed and bleed lines to slave cylinder.

GEARBOX SELECTION

As explained in my Tech Products pages a couple of months back, until very recently a kit car builder considering the installation of a Rover V8 powerplant

(regardless of age or state of tune) had the following candidates to choose from in the cogs department:

Option 1. The LT77 fitted to the Rover SD1, early Range Rovers, Sherpa Vans, Land

Rover Discovery and TVRs, which was in production for well over a decade.

Option 2. The R380 used in the Morgan Plus 8 and MG RV8 models in two wheel drive format. The box is also available in

four wheel drive format, as found in numerous Land Rovers, but conversion to rear wheel drive is expensive and involved.

In my case, the 300 plus ft/lbs of torque concerned everyone involved in the project, so RPi Engineering developed a brand new setup for the Raptor F85. The solution: the legendary T5, a five-speeder developed for a broad range of vehicles including the Ford Mustang, TVR Cerbera, TVR Tuscan and a few less glamorous American SUVs. Dimensionally the box is only very slightly larger than the R380 but it required the fabrication of a new bell housing design to accommodate the Ford and Rover bolt patterns. In some kit car applications the installation may require slight chassis modification (a case in point being my Rush), however this variation is now a standard offering from DJ Sportscars and I'm sure more manufacturers will follow suit. As regards the position of the gearlever, this is about 15 mm closer to the

bell housing than our older candidates. Having sat in my Rush, the gearstick is perfectly positioned, so this slight discrepancy has no undesirable side effects. Even though slightly larger, the T5 is considerably lighter than the LT77 and R380 - by a third in fact - shaving off over 16 kilos. This significant saving is thanks to a die-cast aluminium

casing, rather than the cast iron affairs of the older duo. Utilizing the latest tapered roller bearings and selector technology, the end result is durability, easy gear change and reduced noise operation. Mated to my 3.36 Sierra Cosworth rear differential, the gearing makes for some interesting statistics below:

GEAR SHIFTS	SHIFT POINT AT 3,000 RPM	SHIFT POINT AT 5,000 RPM
First to second	22 mph	37 mph
Second to third	34 mph	57 mph
Third to fourth	49 mph	82 mph
Fourth to fifth	66 mph	110 mph
Top speed	Quick ...	Even quicker ...

As you can see, leisurely gear changes at 3,000 rpm should produce a usable vehicle for cruising and overtaking. However, note the second to third shift point if I use 5,000 rpm. This will allow me to stick her in second at standstill, engage the electronic traction control - yep, real F1 stuff

- and let the immense torque of the Raptor pull me all the way up to 60 mph (5,300 rpm) without a gear change. I predict this will produce some mind-numbing 0-60 times, since stirring the stick is extremely time-consuming when you are talking tenths of seconds. Can't wait!

ONE LAST THING...

Once the engine and box were at one, they were ready to be craned into their new home, well almost. Prior to this monumental event the chassis had to be removed from its stands and sat on some serious wheels and rubber... but what make and design? Wheel and tyre selection are one of the most important decisions a kit car builder will make. Apart from the obvious aesthetic appeal, the necessity to select the correct size and offset is critical. Another factor is also integral strength of the rim and the abilities of the rubber. Starting with the rims, there are several types of construction available:

Single cast alloy

The single cast alloy hub, as the name suggests, is a one-piece aluminium casting. Created by pouring molten metal into a mould, tens of thousands of identical rims can be produced in rapid succession. Such rims are relatively inexpensive due to the economies of scale. The downside, however, is that sizes and designs are extremely limited and quality of manufacture can vary dramatically.

Three piece

Three piece wheels are the ultimate and

come in two forms, differing only in centre material: cast or billet. An inner and outer rim made from spun aluminium is bolted to either side of the centre. This allows for maximum flexibility of width and offset.

Considering the cast centre first, this is obviously less expensive than its close cousin made from billet. The most common example is the Halibrand replica fitted to almost every Cobra copy in existence. Billet is the ultimate due to the optimum strength it provides once manufactured. Unlike the casting process, which introduces numerous air pockets within the aluminium, military grade billet is machined to the given design. It is regarded as supreme, the only negative being the cost.

Only the ultimate would do for my CW460 and, as such, it was one company renowned in the kit car and motor racing scenes for producing the best of the best: Image Wheels (www.imagewheels.co.uk).

Having selected the source and construction, the next decisions were a little more involved: size and design. The

standard rim diameters for the Rush as recommended by DAX are 15, 16 and 17 inch, but the CW460 deserved something a little different - 18 inch in fact. Contacting Peter at DJ Sportscars resulted in the generation of new drawings defining offset and PCD, along with the recommended tyre sizes. Next came the design, and I must admit this took a little while. It needed to be aggressive and yet complement the style of the proposed body form. After days of indecision involving all family members, I took the bull by the horns and opted for the amazing Billet 101s. Seldom utilised in the kit car scene, I thought this aggressively angular design would complement the apex roll bar and ensure plenty of billet material was left in the centres to cope with the horses. Another 'Dean' requirement was the need for adequate clearance for the Wilwood racing brake callipers, far larger than the standard Cosworth items. The full specification of the wheel package is as follows:

	FRONT	REAR
Design	Billet 101	Billet 101
Diameter	18 inch	18 inch
Width	7.5 inch	9 inch
Fasteners	Exposed fasteners	Exposed fasteners
Finish	Clear ceramic	Clear ceramic



Huge 18 inch Image billet alloy wheels.

Due to the rather large diameter of the rims, some elastic band tyres were required; according to Peter's calculations the fronts needed to be



9 inch wide rears shod with ultra high performance Toyo rubber.

205/35 x 18 and the rears 245/35 x 18. As with the rims, the CW460 required some rather up-market rubber to transfer the power and, as fitted to all Image wheels as standard, Toyo was the make of choice. Speaking directly to Toyo, their technical department immediately recommended the 'Proxes T1-R'. Described as Toyo's Ultra High Performance range, in their own words 'the T1-R utilises a special performance compound and tread pattern which gives incredible road holding in all conditions.' Hmm ... that will do nicely, I thought, even though I'm not considering taking her out in the rain too much! However, requiring such a specialist tyre in addition to rather unusual sizes caused a slight problem, a four week problem in fact, because they had to be shipped-in especially for the project. I still remember the call from a Toyo representative saying the container had arrived and my tyres were at the docks. In retrospect this delay didn't cause an issue, since Image were as busy



Note the minimal clearance to the Wilwood racing callipers.

as usual and required six weeks to turn my rims around anyway.

When the rims and tyres eventually arrived there was no question - the wait was worth it. You simply cannot beat precision machined wheels for visual appeal and reassurance they will hold firm when you are pulling serious 'g' on a track day. Naturally, such high performance hardware does not come cheap.

DESCRIPTION

COST

Four Image wheels, design Billet 101. Clear ceramic finish on inner and outer rims (inc cleaner and delivery)	£2,051.55
Toyo Proxes T1-R 205/35 x 18 (X 2)	£245.38
Toyo Proxes T1-R 245/35 x 18 (X 2)	£293.08
Total	£2,590.01

THE WHEEL MOMENT

Fitting the wheels only took ten minutes, but what a moment! Always described in my builds as the 'wheel moment', it is one of those milestones which quickens the heart - suddenly the chassis becomes a car and the open road seems a little closer. Harry

and his team had made an amazing job of the three piece alloys, with the front calliper clearance being an astonishing sub 1 mm - fag paper stuff! They almost look like they are brushing the milled Wilwood text as they revolve. It was another Fosters moment ...

IN SHE GOES

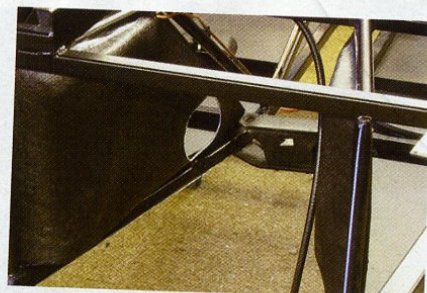
At last we were ready to crane the Raptor into its new home and as ever my father had made sure it wouldn't drop off the hoist. This meant not one, but two hefty ropes wrapped around the all-alloy V8. Already in place was the bespoke propshaft from DAX. Cranking the V8 up to a rather heady height to clear the front of the chassis highlighted the first issue. The gearstick was simply too tall to clear the firewall chassis member, so off it came ... as did the water pump pulley, crankshaft pulley, gearbox speedo drive, engine mounts and a few other smaller items not worth mentioning. Slowly pushing the hoist forward I guided the



Engine patiently awaiting its new home.

nose of the gearbox into the propshaft, at which point we got stuck again. By this time over an hour had passed and tensions were starting to run a little high. Next

component to be discarded was the gearbox mounting plate, only to be slid back in once the prop had found its home. Who needs the gym when you have a Raptor F85 to install? The engine



The Tremec box is a little larger than the standard DAX options, hence a few clearance holes were required.

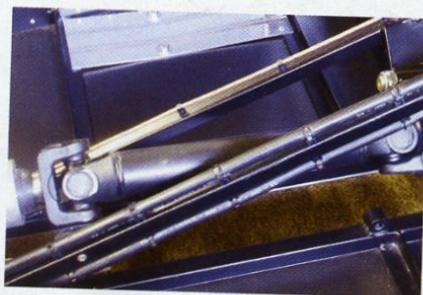
just needed to be lowered and, sure enough, the passenger side head fouled the chassis. This time there was no choice but to get the hacksaw and remove a few millimetres of high grade aluminium to finally allow the block to sit home. Phew! Bolting on the engine mounts, the hoist could finally be removed, which required about ten

minutes of untying numerous double, treble and quadruple knots.

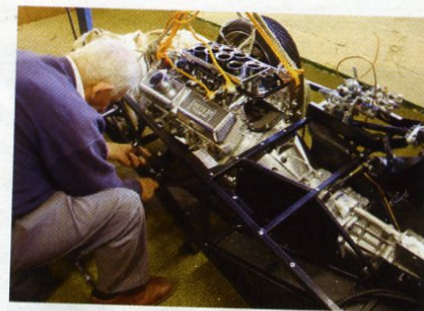
Standing back a few paces to admire our work, the full impact of my creation hit home. The CW460 is more like an engine with a chassis attached, rather than the reverse. The V8 is colossal in the fragile spaceframe, but oh boy! What a sight! Off I went to the mini fridge once again.



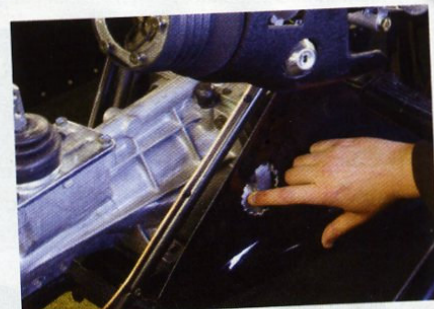
Engine mounts in situ.



Bespoke propshaft to mate Tremec to Ford Cosworth, now a standard part from D J Sportscars.



In she goes - after a couple of hours of blood, sweat and tears.



This is why the holes were needed.

EXHAUST SYSTEM

Feeling very confident at how well the installation had gone (even though a few bits had to be reattached prior to start up) we decided to keep going and fit the exhaust system. Much like the wheels and tyres, you get what you pay for and, in my opinion, the dual side pipe system from DAX stands head and shoulders above any other. Fabricated from highly polished stainless steel, the body-hugging side pipes are 100% SVA friendly. Sub 101 dbs, correctly radiused and, naturally, containing the high flow catalytic converters and Lambda sensors required to make the Raptor breathe nice and cleanly. Unlike the Tojeiro system, the Rush utilises a one-piece construction which makes fitment a little challenging. The problem is these exhausts are made in a jig and, once released, the header



Exhaust system bolted to Merlin heads. Nigel, seriously relieved they missed the chassis members.

pipes tend to move slightly. This is not an issue until you try and fit them on the heads. Many builders have commented on the difficulty of this job; to avoid this trauma I requested studs to be fitted to my Merlin F85s rather than utilising bolts. This allowed the use of a piece of wood to tweak each header pipe in turn until they aligned with the

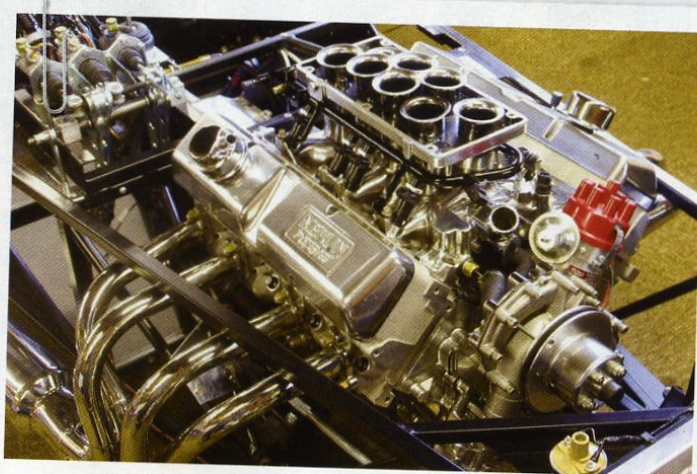
corresponding port. Ten minutes for the driver's side and fifteen for the passenger side. Simple. Luckily the higher Merlin exhaust ports did not pose a problem since chassis clearance was more than adequate. Wheels on, V8 installed, and two highly polished side pipes in situ - what a sight!



Tailpipes attached to chassis using rubber mounts.



Tremec at home.



Raptor F85 at home.

TOTALS TO DATE

BUILD	ACTIVITY SUMMARY	TIME (HRS)	COST
Part 1	Order build packs 1 - 5	0	£5,434.00
Part 2	Source and prep donor parts	8	£1,410.15
	Collect build packs from DAX	8	£75
	Chassis preparation	3	£0
	Panel chassis	24	£0
Part 3	Filment of final drive and suspension components	48	£0
	Research into non-standard items	20	£0
Part 4	Research and filament of braking system	26.5	£905.71
	Handbrake and pedal box	2.5	£141.00
	Fuel system	10	£580.56
Part 5/6	Extensive research into engine and gearbox specification including build	100	£14,100
Part 7	Fitting engine, box, wheel and tyres	40	£2,590.01
	Wheel and tyre package		
	Exhaust system including cats		£2,984.50
Totals to date		290	£28,220.93

THAT'S IT FOR THIS MONTH

Yet again I have run out of space, but the CW460 is coming together in leaps and bounds. Next month I'll be covering a multitude of smaller jobs, but what follows are the scribings of my daughter. I dread to think what she's got to say this month!

TEENAGER'S TAKE

Hi there again. It's me, Evie, daughter of the kit car freak. Well, this month the baby has actually started to look like a car. At last! Dad received the wheels and tyres the other day which are as thin as elastic bands. You'd think he would wear them through in no time, the speed he goes down the road. In typical Dad style he had a drink afterwards to celebrate fitting them without a hitch. He seems to be celebrating quite a lot these days – not a good example to set this impressionable fourteen year old (yes, I've had a birthday since the last time I wrote). All this means, of course, that the car is now on the ground and, sure enough, the complaints have started. 'Oh, can you run the bath love, my back is killing me.' 'Have we got any Radox/Deep Heat/massage oil?' and 'OK if I borrow your back support?' etc., etc. Do all men complain like this?

One thing he's not complaining about is the attention he gets from passersby. It was OK at first as only a few people

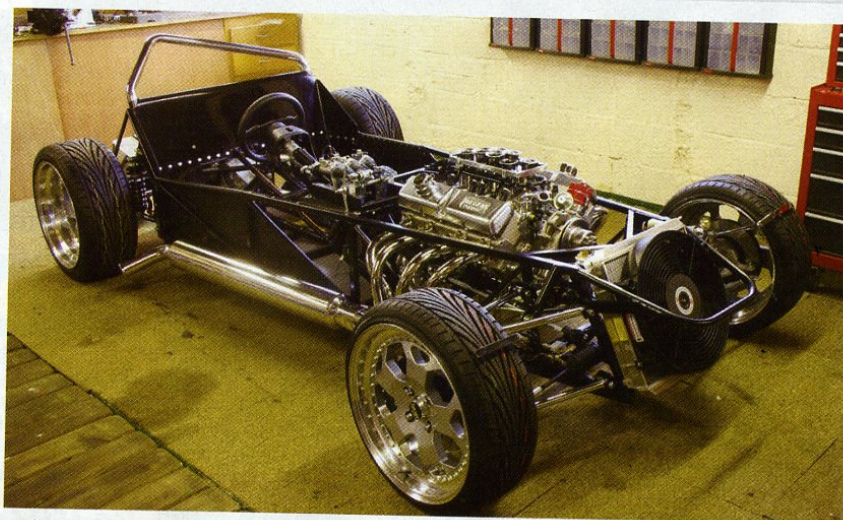
would stare from the pub car park next door, but now it's getting beyond a joke. Good thing we've got a double door to the garage; that's just for his head!

So, Dad was white van man once again this month as he had to drive to Harlow to collect his exhausts. He wouldn't allow them to be sent by courier, get this, 'in case they got dented'. Mum didn't seem to have much to say about the matter; I think she thought a 300 mile round trip was better than putting up with him going on and on about any tiny imperfection in the shiny chrome. But 300 miles?

It's been quite a busy month as although the engine went in last month, it came out again ... went in ... came out ... and then back in again for minor

adjustments. I honestly think Dad spends more time looking after his car than ... oh, I don't know ... his teeth? Unfortunately I'm not joking. I'm just glad I was at school when this was going on. Mum said she had to keep her head down: there's only one thing worse than stressy Dad, and that's Dad and Popsy both stressed together. It's definitely a case of like father, like son!

Apparently a spanner was actually flung the other day. Something earth-shattering probably happened, like a bolt didn't do up correctly or Dad hit his hand on something. I'm glad the main parts seem to be fitted to the car now. Hopefully the spanner days are almost at an end ...



Looking good!



Nigel's daughter, Evie, with another Teenager's Take.