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slippery when wet

With a claimed 422bhp at his disposal from a rear-drive 944 Turbo Philip Raby had his hands full one rainy day in Milton Keynes. Photography by Michael Whitestone

High-power 944 Turbo



Some days, says the old adage, you're the windshield; some days you're the bug. And this is one of those days when I feel I could all too easily end up like some unfortunate insect squashed on a piece of glass. It's pouring with rain, I've a splitting headache, I'm scared silly, and – me a dyed-in-the-wool 911 nut – I'm driving a 944. A white one, at that. Oh, and I'm in Milton Keynes. Get the picture?

I have to be honest, though; I'm actually having the time of my life. Because this isn't just any old 944. In fact, it's a 1989 944 Turbo whose engine has been extensively breathed on in the best tradition of the tuning industry, and is claimed now to develop a mind-boggling 422bhp, together with the kind of mid-range torque that could pull a Boeing 747 off its stand.

Let's put it into some sort of perspective. A standard, 2.5-litre 944 Turbo offers a respectable 250bhp in its later form, while a 3.6-litre 964-model 911 Turbo can muster 300bhp. The only Porsche to equal it is today's 996-model 911 Turbo, whose twin-turbo, 3.6-litre flat-six produces 420bhp (or now 450bhp in 'S' form; see *News* on page 8). But that's tamed with four-wheel drive and Porsche Stability Management. The machine I'm driving today unleashes all its power through the rear wheels alone, with nothing more than ABS to keep it all on the straight and narrow.

It's something I'm painfully aware of the first time I put my foot down. Personally, I couldn't say if this car is genuinely producing 422bhp, but I do know one thing. It's *very* powerful, and that figure, even if a tad optimistic, can't be too far from the truth. Trust me on this. You just know these things after a while.

On soaking-wet Tarmac the massive rear tyres don't even attempt to grip, and the rear of the car fishtails angrily from side to side. I admit

it – I'm scared. So I take it rather more steadily until I reach one of Milton Keynes' many roundabouts. And there, of course, temptation gets the better of me. I floor it out of the junction, and can't help but grin as I feel the back slide round, putting me on course for the straight. Now I feel a bit more like the windshield again...

Milton Keynes, for those who've never had the pleasure of a visit, is laid out on a grid system, punctuated with countless such roundabouts. It's the last place you'd expect to have fun in a car, but that's precisely what I'm doing. A short, slithering blast from one intersection to the next, and then a slide through the junction and on to the next. And all at less than 50mph. Maybe the rain's a blessing in disguise.

But despite the weather – and its obvious huge power – this remains a surprisingly civilised car at low revs. Indeed, when the turbo's off-boost the Porsche feels much like any other 944 Turbo – a bit lifeless, in fact. Likewise the suspension, which is firm, but compliant enough to be usable every day. And the brakes inspire nothing but confidence.

Clearly, though, this is a car that could so easily turn round and bite you – big time. In these conditions it's practically impossible to regain control once the turbo kicks in, and I reckon even Jenson Button would have his work cut out. The wastegate rattles noisily, and the rear tyres jump around in protest. To add to my problems the rain's falling ever harder, and the overworked wipers are fighting a losing battle. Time to call it a day, and hand this animal back to its keeper before it bites me.

Said keeper is also the car's creator. Andrew Sweetenham (who lives in Milton Keynes, which is mainly why we're here) runs ProMAX Motorsport, a company specialising in the supply of high-performance parts for 944 Turbos and various other Porsches. Sweetenham built this car partly for his own amusement, and part-

ly to demonstrate what his company can offer. Which would appear to be quite a lot.

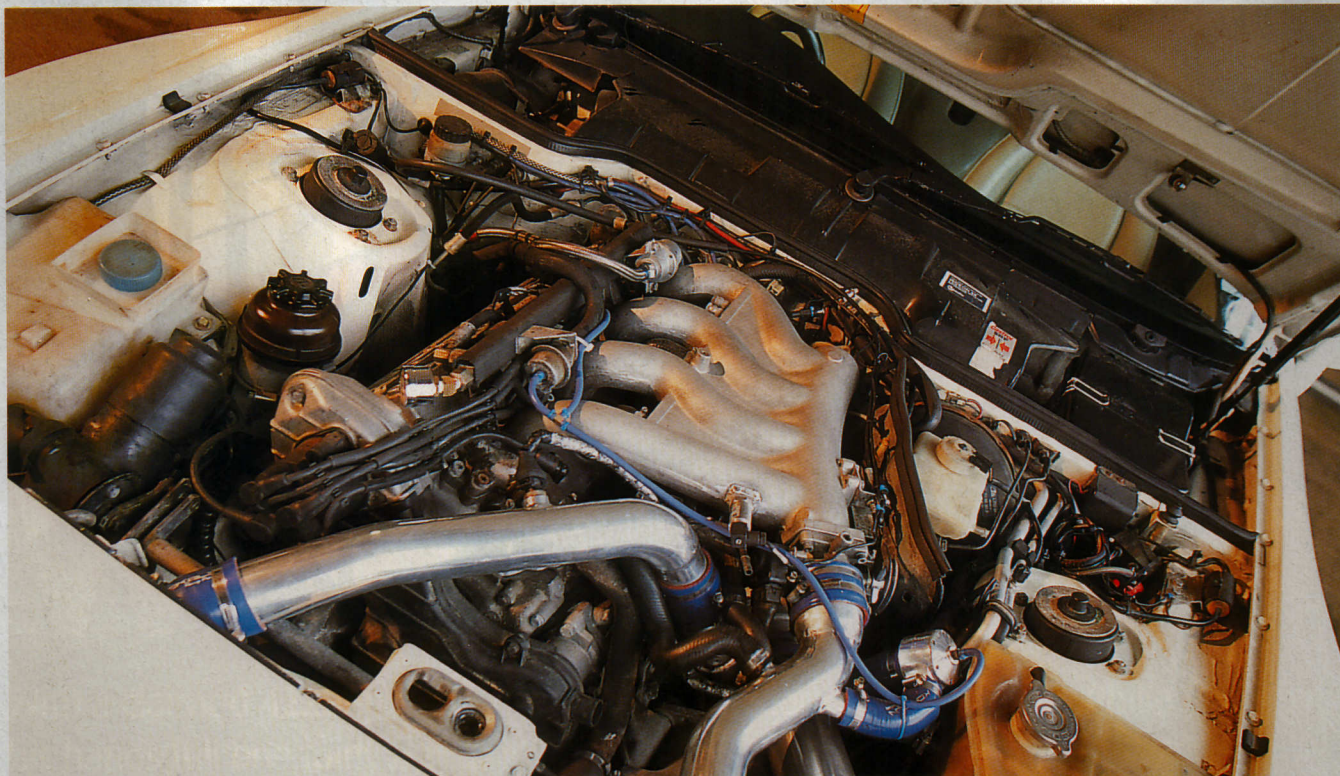
'It all started in 1999, four years after I bought the car,' recalls Sweetenham. 'The engine – which was still standard at the time – was burning oil because of worn piston rings, and so it was due for a rebuild. I thought it would be a great opportunity to try to coax some more power out of it. Luckily, though, the cylinder bores were fine, so essentially all I did was fit a longer-stroke crankshaft from a 944S2.'

In conjunction with shorter Carillo connecting-rods and Mahle pistons (both sourced from the USA and sold by ProMAX), this increased the capacity from 2.5 to 2.8 litres, at a cost of some £2100. Sadly, however, the extra swept volume had disappointingly little effect on the power. 'When we put the car on the rollers it showed only a 10bhp increase,' admits Sweetenham. 'But I did notice a worthwhile improvement in torque when I drove it.'

Not surprisingly, Sweetenham wanted to achieve rather more than that, so the next step was to fit a product from his own stable in the form of a ProMAX Dual Port Wastegate. 'The standard 944 Turbo wastegate has a relatively soft spring,' he explains. 'This protects the



Neat gauge (above) at the end of the fuel rail indicates fuel pressure at this point. Engine (below) looks standard apart from pipework to the turbocharger



A sharp intake of air

One of the modifications made to Andrew Sweetenham's 944 Turbo was to replace the standard air-mass metering system with a MAP (manifold absolute pressure) sensor.

The ECU needs to know how much air is being sucked in to the engine at any given moment, so that it can ensure the correct amount of fuel is being injected into the cylinders. Thus some form of sensor has to be installed in the intake system.

The original system consisted of a flap in the air intake that's deflected as air flows past it. The more air being sucked into the engine, the more the flap deflects. A potentiometer senses the deflection and sends a signal to the ECU. Simple and effective, but by its very

nature the flap restricts the airflow, too.

The conventional way of overcoming this is to fit a mass airflow (MAF) sensor, also known as a hot-film conversion. This uses an electronic device in the airflow that is smaller – and thus less restrictive – than the flap.

But Wayne Schofield decided instead to use a MAP (manifold absolute pressure) sensor. Put very simply, this uses an unobtrusive sensor, with no moving parts, in the inlet manifold to measure air pressure, and a microprocessor interface then computes a simulated volume/airflow signal that is sent to the ECU. In other words, the ECU is tricked into thinking it's getting a signal from an original-type flap sensor. ■



engine by not allowing full boost at high revs. Which is fine, but it means you lose power. I replaced it with the dual-port wastegate, which has a stiffer spring. This, together with a manual boost controller, allowed the turbo to produce a full one-bar boost.'

In order to maximise the modified engine's potential Andrew turned next to ECU mapping guru, Wayne Schofield of Chip Wizards. He's now based in Rochdale, Lancashire (having started out in the north-east), but travels round the UK, working at local rolling-road facilities.

'Wayne remapped the ECU and pushed the power up to 312bhp,' explains Sweetenham. 'But once I got the car out on the track I realised I might run into problems. At the end of one intensive session the engine-oil temperature was reading over 120 degrees Celsius, and I was blowing a cylinder-head gasket at a track-day at least once a year.'

Clearly something had to be done, so

Andrew sat down with Wayne Schofield and developed a plan of action that would ensure that the engine ran cooler and – most importantly – developed even more power.

Wayne supplied larger-capacity Siemens fuel injectors rated at 55lb/hr – compared with the standard car's 34.5lb/hr – in order to allow more fuel to flow into the cylinders. Then Sweetenham fitted a new ProMAX Stage Two intercooler and a larger turbocharger from US-based manufacturer Kokeln, plus a Kokeln stainless-steel air-intake system – what that company calls a hard pipe kit.

After that Schofield put the car back on the rollers for another remap and achieved a maximum output of 328bhp. Good enough, you might think, but for Sweetenham just 16bhp more than the engine's previous incarnation was still disappointing for a £1500 outlay (which covered the injectors, turbocharger, intercooler, pipework and fitting). 'We decided the engine

couldn't draw in enough air because the intake was being restricted by the airflow meter,' he explains. 'The good news, though, was that it was now running significantly cooler.'

So it was back to the drawing-board, where Schofield came up with the bright idea of replacing the cumbersome and restrictive airflow meter with a MAP (manifold absolute pressure) sensor, suggesting that a unit from a 1990 E36-model BMW M3 could be made to fit. 'Wayne was very enthusiastic about this,' says Sweetenham, 'and he reckoned that we could easily get another 50bhp from the engine. I was sceptical, but I put my confidence in Wayne and left him to get on with it.'

A couple of weeks later Sweetenham went to a local rolling-road to see how Schofield was getting on. 'He was very excited, and soon I could see why. The dyno readout quickly reached its limit – 280bhp at the wheels – and that suggested there was quite a lot more





power to come. The only solution was to find another rolling-road that could cope with it.'

A suitable facility (with the added advantage of a recently calibrated dyno) was soon found at ABG Motorsport in Runcorn, Cheshire, and Sweetenham and Schofield eagerly watched as the revs rose. 'On the first run we hit just under 400bhp at the flywheel, which I was pretty chuffed about,' recalls Andrew.

'But Wayne was confident he could get even more, so he did some fine-tuning of the ECU map until he was happy he'd squeezed the absolute maximum from the engine.' And that was an incredible 421.9bhp at the flywheel at 6000rpm, with 385lb/ft of torque at 4200rpm. Now the cynical among you will, of course, wonder if the dyno was over-reading – many do. Maybe it was. But let's say the rollers were five per cent out – that still gives 400bhp. Even a 10 per cent error gives 380bhp.

Whatever the figure, Sweetenham knew he now had a seriously powerful car, and had to uprate the suspension and brakes to suit. 'The suspension has Koni adjustable dampers and the optional Porsche M030 Sport springs,' he

explains. The brakes, meanwhile, received more radical attention. 'The discs are 12.5-inch ventilated jobs from a 928GTS, and the calipers are 993 Turbo Big Reds. The pads are from a 3.6-litre 964 Turbo.'

Finally, then, it was time to see if the car went as well as the rolling-road figures suggested it would, and a trackday at Castle Combe circuit in Wiltshire was duly booked. 'The car was incredible,' grins Andrew. 'I was lapping as quickly as one minute 16 seconds, which is only a second slower than the full-blown Porsche Cup racers were achieving back in 1999. But the car's still in full road trim. I certainly raised a few eyebrows!'

It's easy to see why owners of more exotic Porsches were taken by surprise. Sweetenham has cheekily kept his 944 Turbo looking pretty much standard. And when that includes the less than glamorous white paint and the Linen interior, this is a car you're unlikely to look twice at, especially in a pit-lane full of modern Porsches including GT2s and GT3s.

But more observant onlookers may spot the Big Red calipers behind the smart Cup-style

How much did it cost?

Shown below are prices for some of the major items from ProMAX motorsport used in this car. All prices exclude fitting and VAT

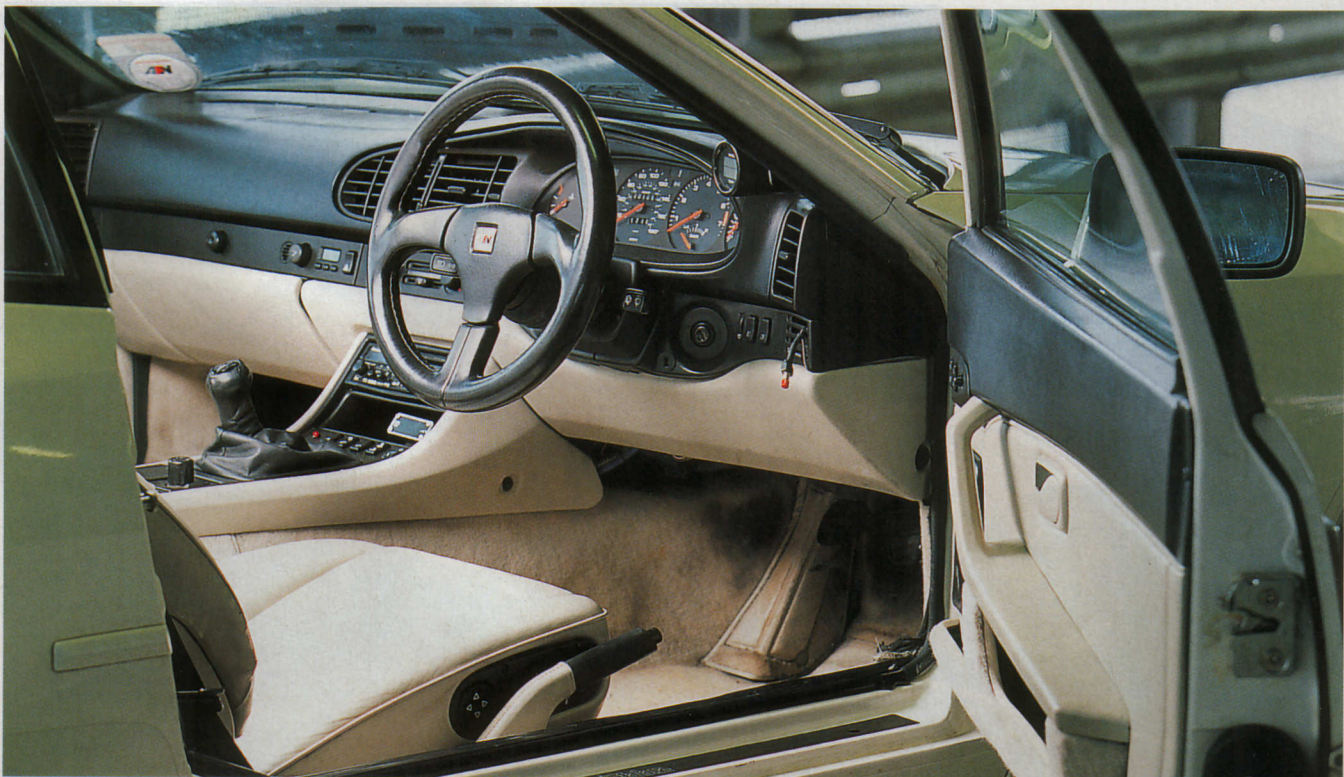
Carillo connecting-rods (set)	£1099.00
Mahle pistons (set)	£1149.00
Dual-port wastegate	£459.95
Kokeln turbocharger	from £899.95
MAP sensor kit	£749.95
Fuel-rail pressure gauge	£59.95
Siemens 55lb/hr fuel injectors (set)	£329.00
Widefire cylinder-head gasket	£69.95
Total	£4816.75

wheels and wonder if there's more to the car than meets the eye. But then plenty of people fit red calipers for mere cosmetic reasons.

Even when the engine starts up there's nothing to suggest there's anything out of the ordinary about it. Sweetenham has resisted the temptation to fit a large-bore exhaust (even though it might unleash yet more power), pre-



Digital boost gauge and engine-oil-temperature gauge (above) sit neatly on the edge of the dashboard. Interior (below) is otherwise standard 944 fare



ferring instead to keep to the standard system, which is both quiet and refined (an important consideration for trackdays, where noise limits are strictly adhered to).

It's only when you look inside the car that you get the feeling something's up. And only then if you know what you're looking for. There's an innocuous-looking adjustable boost knob in the centre console, rendering the ash-tray unusable. And there's a neat combined digital boost and oil-temperature gauge on the dashboard, plus an air/fuel-ratio display, both of which would perhaps be more familiar to drivers of Japanese performance cars than Porsche enthusiasts.

Lift the bonnet and you'll spot the new plumbing for the

turbocharger, intercooler and air-intake system, while a neat little touch is an analogue fuel-rail pressure gauge.

All in all, then, this really is a 'Q' car. A machine that you can drive through the streets at low revs and quite probably pass completely unnoticed. But get that turbo on boost and you'll blow away most other things on the road. Assuming said road is dry, of course.

Andrew Sweetenham, not surprisingly, is delighted with his car. 'The engine now runs at sensible oil temperatures, with the reading never exceeding 85-90 degrees Celsius,' he claims. 'Before, it was routinely hitting 120 degrees. That means I can now drive the car at high speed and be confident the head gasket won't blow. All I need to do now is sort out the suspension - it's fine on the road, but far too soft for circuit work. Once that's done I'll be able to get my track times quicker still.'

Or at least he should be able to, provided the track's dry. In the wet, a four-wheel-drive conversion is all that's needed. Who said Milton Keynes was dull and boring? ■



Facts & figures

Modified 944 Turbo

Engine All-aluminium in-line four. Two valves per cylinder actuated by single belt-driven overhead camshaft. Fitted with 3.0-litre 944S2 crankshaft, Carillo connecting-rods, Mahle pistons, 55lb/hr Siemens fuel injectors, Widefire cylinder-head gasket, Kokeln Club turbocharger with adjustable boost, Kokeln Stage Two intercooler, K&N air filter, custom-made stainless-steel inlet tract, remapped ECU. Royal Purple Synthetic 10W/40 engine oil

Capacity 2.8 litres

Maximum power 421.9bhp (claimed)

Maximum torque 385lb/ft (claimed)

Transmission Standard rear-mounted, five-speed gearbox driving rear wheels through standard Turbo clutch

Suspension Up-rated with adjustable Koni dampers and Porsche M030 Sport springs

Brakes Up-rated with 12.5-inch 928GTS ventilated discs, 993 Big Red calipers, and 965 (ie 964 Turbo) friction pads. ABS fitted as standard

Wheels & tyres 17-inch Mille Miglia Cup replica light-alloy wheels with Kumho 225/45 (front) and Continental 255/40 (rear) tyres

Contacts book

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See also the interesting Kokeln website at www.kokeln.com