

BTCC CELEBRATING INDEPENDENTS' DAY

The British Touring Car Championship's controversial switch to the Next Generation Touring Car has paid off. **Chris Pickering** visits one of its new constructors to find out why

NOT SO long ago the Next Generation Touring Car (NGTC) was little more than a concept – quite a controversial one at that, thanks to extensive use of standardised components and a radical departure from the old S2000 ethos. But now, two seasons down the line, NGTC cars have become the backbone of the British Touring Car Championship (BTCC).

The idea behind the NGTC regulations was to reduce costs and make it easier for independent teams to develop their own cars. And with that in mind, we've come to Motorbase Performance in Kent, home of the Airwaves BTCC team.

Hidden in the corner of a small industrial estate, just down the road from Brands Hatch, Motorbase is a prime example of an independent team benefiting from these new rules. Until recently, the Kent outfit had

never built a car in-house, instead buying former World Touring Car Championship (WTCC) machinery from the likes of BMW and SEAT. But with the advent of the NGTC, that all changed.

FORMIDABLE

Our visit to the factory comes almost a year to the day since the team debuted its first new-shape NGTC-spec Ford Focus ST at Snetterton in the hands of Mat Jackson. Since then it's been joined by a second Airwaves-liveried Focus driven by Irishman Áron Smith and the Addison Lee Racing car of reigning British GT Champion Michael Caine. It's a formidable line up – particularly when you factor in Liam Griffin's Arena-built S2000 Focus opposite and a pair of Porsche

Carrera Cup cars lurking in the other corner of the workshop.

The tour begins out the back with team manager Oliver Collins, where a fourth NGTC shell is starting to take shape in the fabrication area. "They all arrive as a fully functioning road car, which has to be stripped of its components and dipped in order to remove things like sound deadening material, paint and the galvanised coating," explains Collins. "It's one of the few parts of the build that we outsource – virtually everything else takes place on-site."

Freshly returned from the dipping process, shell number four has been placed on a jig ready for a pair of dummy subframes to be offered up. These represent the mandatory TOCA items produced by Buckinghamshire-



ABOVE If the introduction of NGTC regulations was seen by some as a massive gamble, it has paid off handsomely. As hoped, it has enabled independents like Motorbase, whose Focuses are seen battling here, to flourish (Photo: Peter Still/PSP Images)

based engineering company GPRM. Two standardised options are available – one for front-wheel drive configurations and one for rear-wheel drive – and all NGTC cars must use one or the other.

Precision is absolutely vital at this point, Collins explains. The tiniest error in subframe positioning will be carried through into the ride height and geometry, with potentially alarming consequences. To that end, the team spent a day with a Faro measurement arm, checking and re-checking the location of all the major fixings.

The whole shell is seam welded, with great care taken to avoid distortion. “We spend a lot of time doing a weld sequence, so we don’t put too much heat into any one area,” Collins explains. “Our first cage was 0.1 mm out in wheelbase left-to-right with 0.3 mm of twist over a 2.5-metre shell with yards of weld in it. In comparison, you’d regularly see 3 mm of difference across the struts on a road car.”

Sitting on the jig, the body structure is instantly recognisable as a Focus, but it’s already undergone some pretty dramatic pruning. Virtually all of the road car shell forward of the front bulkhead is cut away. Bosses are put in to locate the anchoring points for the roll cage, which is essentially another standardised NGTC design, albeit customised somewhat for the dimensions



ABOVE The introduction of NGTC regulations has enabled Motorbase to make the transition from a customer team, buying existing cars, to a constructor

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of the specific car.

The Motorbase car’s debut last year coincided almost exactly with the launch of the mk3 Focus ST road car. And, being a relatively new design, the shell benefits from some very up to date technology. The crash structures, in particular, help to beef up the car’s rigidity, says Collins: “The Ford shell is really good. It’s very strong in the front area because the chassis rail runs right the way to the A-post, where it becomes part of the inner arch. Originally we were going to cut that out to save weight, but one of the best things we did was leave it in, because it adds a hell of a lot of strength to the front bulkhead.”

Clearly this added integrity is a bonus, but the car derives most of its strength from the roll cage. It’s supplied as a kit of plasma-cut tubes which are welded into the shell, extending as far as the front legs of the cage. Forward of this point, the teams are free to fabricate their own means of connecting it to the front subframe – not that you’d ever know on the Motorbase cars, because the two structures blend seamlessly into

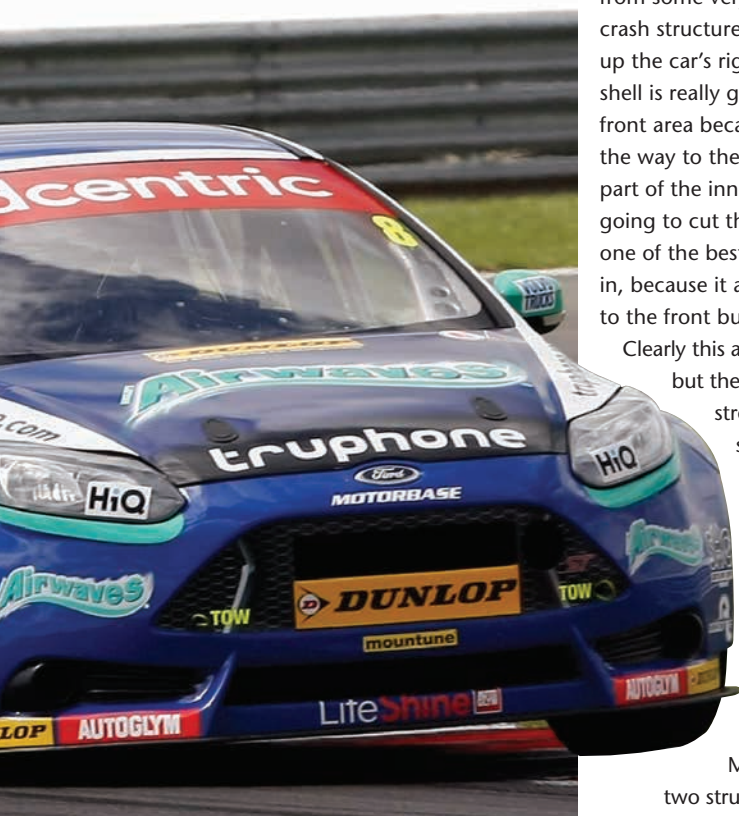
one another. It’s virtually impossible to tell where the TOCA parts end and the bespoke fabrication begins.

All the cages are bound by MSA safety regulations, governing tube sizes and materials. Once the design has been finalised, it has to be passed on to the MSA that runs a series of crash simulations for homologation. “Physical crash testing gets very expensive, so this is definitely preferable for us,” comments Collins.

FLEDGLING RACECAR

From the fabrication area it’s a matter of yards across to the main workshop. It’s here that the fledgling racecar really starts to emerge. Part of the exhaust tunnel is cut away to allow the driver to be moved towards the centre of the car, improving side impact safety and weight distribution. Similarly, a cutout is made in what used to be the rear seat area for the fuel tank, while the inner wheel arches are removed and replaced with wider examples to accommodate the new wheels and tyres.

Next comes the bracketry for the various ‘bolt-in’ components. Things like the steering column mounts and the stays for the fibreglass bumpers all have to be made from scratch, with each little job adding up ►



to a considerable overall workload. Even the gear tower is a minor work of art, with a neatly-crafted lattice of steel tubes that supports the extension for the Xtrac six-speed sequential gearbox.

The devil truly is in the detail, explains Collins: "Since the NGTC rules have come in I think some people reckon we just get a kit of parts and bolt it together. And if you were to strip the car, as it stands now with all the development work done, you could indeed put it back together again in a matter of days. But it takes a hell of a long time to build one from scratch. It's often simple things like brackets for the bodywork or the ducting for the intercooler that mount up."

The subframes are one aspect of the car where a 'bolt on' philosophy very much does apply, however. Both ends are held on by a combination of locating pins and draw bolts, and both come supplied as pre-fabricated units from GPRM. Perhaps unexpectedly for a touring car, the NGTC suspension is all inboard-mounted with pushrod-activated spring and damper units.

The wheels are housed in a new set of fibreglass bumpers and arches, which have been taken out to the maximum width allowed in the regulations, giving the Focus a distinctly steroidal appearance. All bodywork designs have to be okayed by TOCA and it's no secret that the organisers like the cars to look the part. To that end, they all use a side-exit exhaust, positioned on the left-hand side of the car. That's because the vast majority of tracks on the calendar run clockwise, so the audience gets a perfect view of the sheets of flame produced on overrun, and indeed the greatest exposure to the engine noise.



ABOVE The Penske dampers might be a spec component but freedom to tailor the damping curve means the hours spent on the team's Roehrig shock dyno are crucial to performance at the racetrack



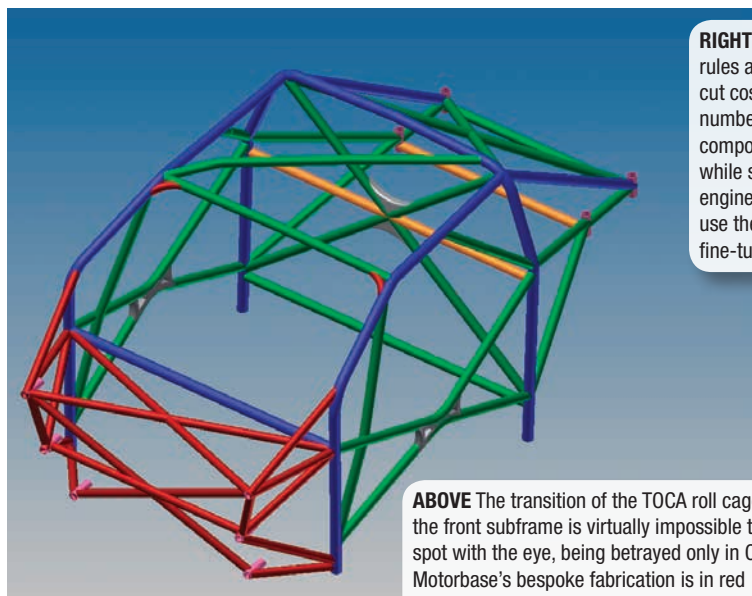
BELOW Creating the bracketry takes time. The gear tower features a lattice of steel tubes that supports the extension for the Xtrac six-speed sequential gearbox

TOUGH PENALTIES

Power comes from a 2-litre turbocharged Ford Duratec engine built to the NGTC regulations by Mountune, just over the Thames in Essex. It's effectively the same unit that saw action in the team's Arena-built Focuses, which features a spec turbocharger from Owen Developments and a raft of internal modifications. New pistons and valves, a revised compression ratio and bespoke camshafts help to push the heavily production-based engine to around 340 bhp, while maintaining durability.

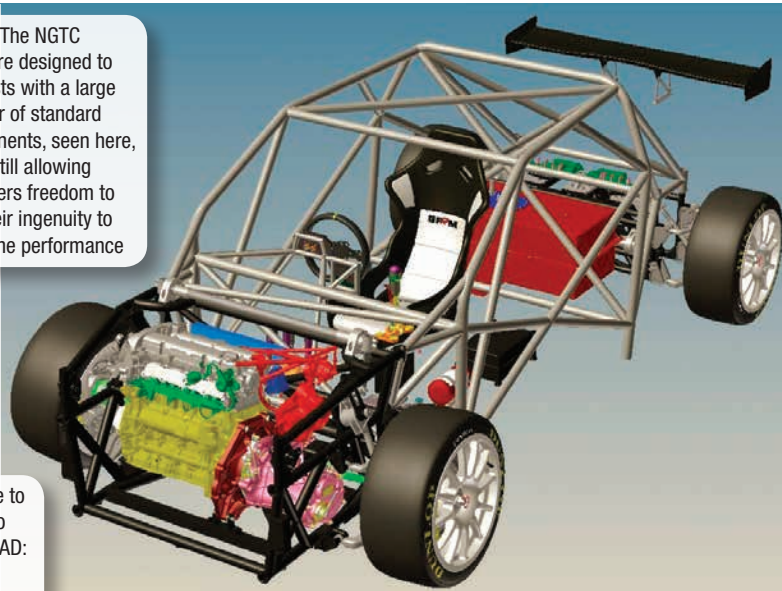
Each engine covers 2,500 km in between rebuilds, which represents just over half a season, with tough penalties imposed if teams use more than two engines.

Boost levels are set individually based on flow bench results for the specific cylinder head designs, Collins explains: "Some heads are naturally better than others. The Duratec and the Honda engine, for example, are quite restrictive compared to the Swindon engine, but TOCA adjusts the boost level to maintain the same power output. The car's performance is then monitored throughout the season and the lap times are fed into an ►



ABOVE The transition of the TOCA roll cage to the front subframe is virtually impossible to spot with the eye, being betrayed only in CAD: Motorbase's bespoke fabrication is in red

RIGHT The NGTC rules are designed to cut costs with a large number of standard components, seen here, while still allowing engineers freedom to use their ingenuity to fine-tune performance



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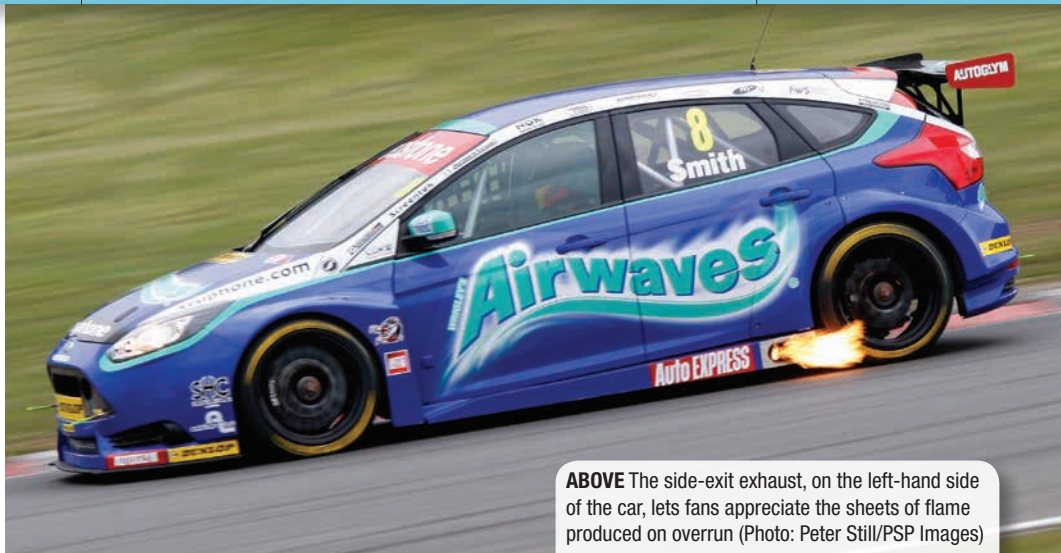
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ABOVE The side-exit exhaust, on the left-hand side of the car, lets fans appreciate the sheets of flame produced on overrun (Photo: Peter Still/PSP Images)

equation to change the boost levels. It seems to be working well this year: the ones with maximum boost adjust are going fastest in a straight line, while the ones with minimum boost adjust are going slowest."

Running costs are said to be somewhat cheaper than S2000, but the big difference comes in development. Collins estimates the set up cost for a reasonably competitive two-car team at about a million pounds – a tenth

of what he believes it would take a manufacturer team to set up a WTCC campaign.

"I'm sure if you'd told some of the big factory teams building S2000 cars that they could have had the first car on track for £300,000 and subsequent cars on track for £250,000, they'd have bitten your arm off. They were spending tens of millions at one point," he says.

There's no doubt the new format has been a success.

Ironically, though, perhaps one of its few drawbacks stems from its main advantage. "With an S2000 car if you found something you didn't like you could just redesign the part and fix it. Here – if it's one of the major components – you have to engineer a way round it," says Collins. "Similarly, because we've got good facilities here there are things that we could fabricate in-house or commission from our own suppliers at a lower cost if we had the freedom to do that, but that wouldn't always work for the smaller teams."

At the other end of the scale, he admits, there are some things that even a reasonably well-established team like Motorbase would have struggled with, were it not for the NGTC components: "We weren't equipped to take on some of the design work that TOCA has taken care of with the NGTC parts – there are probably only three teams in the paddock that would have been."

LIMITLESS FREEDOM

In some respects the Motorbase facility feels like a major manufacturer team in microcosm. Aside from the open plan expanse of the main workshop and the fabrication area out the back, there's a clean room on the ground floor where things like gearbox rebuilds take place. The next part of our tour, however, takes us upstairs.

Richard Townsend is the team's

chief mechanic and principal fabricator. He's also the resident suspension guru, carrying out damper rebuilds and many hours of dynamometer work on the team's Roehrig shock dyno in a small room above the workshop.

Externally, the Penske dampers are another spec component, shared between all the NGTC cars, but there is a huge range of pistons and shims to choose from inside, which gives the engineers virtually limitless freedom to tailor the damping curve. And that's before you consider a bewildering array of wishbone mounting positions that allows the teams to change their roll centre positions at will, as well as introducing positive or negative dive and squat geometry.

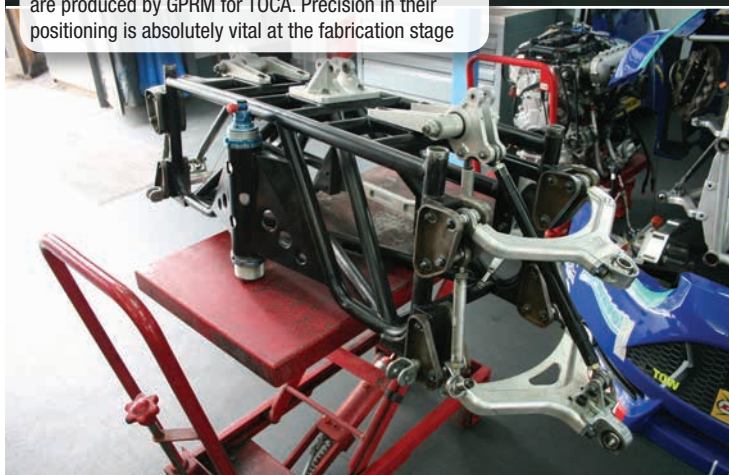
"A lot of the performance comes from damper tuning, and you can really get it right or really get it wrong," comments Townsend. "There are various windows where the car will work. For sake of argument, there are some times when going softer on the dampers will improve matters and so will going firmer, but in the middle you can really lose yourself."

At times it appears the NGTC suspension layout is deliberately idiosyncratic to keep the engineers on their toes. The rocker ratio for the pushrod system, for example, features a falling rate rather than usual rising rate characteristic, making setup somewhat complex. It's a marked departure from the S2000 machines, which had to follow the road car architecture – typically consisting of McPherson struts on the front and torsion beams on the rear.

"If you try to apply S2000 thinking to an NGTC car it doesn't work. It is a very different animal," says Townsend. "There are times when you think, 'If I do this it'll move the car towards oversteer' but in reality it does completely the opposite. Even once you've worked out the ►



ABOVE & BELOW The front (above) and rear subframes are produced by GPRM for TOCA. Precision in their positioning is absolutely vital at the fabrication stage



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ABOVE The 2-litre turbocharged Ford Duratec built to NGTC regulations by Mountune. Engines cover just over half a season between rebuilds

“If you try to apply S2000 thinking to an NGTC car it doesn’t work”

basic trends there are a lot of things which aren’t straightforward and linear.”

These foibles place a huge emphasis on testing. Pre-season running is unrestricted and the teams are allowed four tests per driver once everything gets underway. Here, Townsend explains, a methodical approach is essential: “After a test or the final session of a race weekend, the first thing we do is set the car down with all the setup parameters recorded. Then we come back here and dyno all the different damper settings we’ve used over the weekend in order to cross reference the data to the driver’s feedback so we understand what worked well.”

Following a slow start to the season Motorbase has recently returned to form, and the team attributes this resurgence largely to setup. It’s a topic which is still posing a learning curve – even for some of the most experienced personnel on the grid.

Lately, the series seems to have settled into something of a sweet spot, but there are still a few points of contention. Perhaps not surprisingly, the rear-wheel drive cars’ standing start performance continues to raise a few eyebrows and they tend to suffer from less tyre wear, simply because they use the four corners more evenly – something which is particularly relevant on the newly introduced soft tyre option. The flipside to this, is that the rear-wheel drive cars take longer to generate heat on the hard tyres.

“Historically, pretty much every touring car series with a mixture of front and rear-wheel drive cars has imposed a higher minimum weight limit on rear-wheel drive,”

Collins observes. This isn’t in force currently in the BTCC, but you get the feeling it might be on the horizon.

TITLE DREAM

As the visit draws to a close we get a brief chance to chat to team owner David Bartrum. I’m curious to find out what his take is on the move to the NGTC format.

“We always used to be what I called ‘a £300,000 touring car team’. We’d go out and buy existing cars up to that sort of value and go racing,” he says. “The move to building our own NGTC cars pushed our budgets up a lot further, and initially it didn’t feel like we were saving money because we did everything in-house to get set up. Now, though, the running costs are coming down and the parts are proving quite hardy.

“A lot of the bigger series like WTCC require millions of pounds to develop a successful car. As you can see from the number of teams that have popped up in the BTCC, it has become very competitive this year and you can go in with an NGTC car and be competitive out of the box. The grids have grown, the talent levels have grown and it’s possible for the independent teams to do well. When I first went racing in 2006 I never had aspirations of being able to win the championship given the number of works teams there, but now it’s a possibility.”

Motorbase’s transition from a customer team to a constructor in its own right was made possible by the resources it had to hand, Bartrum explains: “The money for

Suppliers

Engine	Mountune
Gearbox	Xtrac
Brakes and air jacks	AP Racing
Fuel tank	ATL
Dampers	Penske
Turbocharger	Owen Developments
Intercooler	PWR
Hoses	Samco
Tyres	Dunlop
Power steering	DC Electronics
Engine management	Cosworth
Fire safety	Lifeline
Fasteners	AeroCatch
Wheels	Team Dynamics
Subframes	GPRM



new cars has to be found during the winter, so if it can be spread as material costs and salaries over the course of the build it’s often easier to swallow than paying for a car in one go. I don’t think we could have done it differently.”

To date only five companies have built NGTC shells. Even some of the manufacturer-backed teams have outsourced theirs and Bartrum is understandably proud of the achievement. “I think I’m right in saying we’re the only team on the grid that’s done everything itself,” he comments.

The next step could well be to sell NGTC cars to other teams. And with the BTCC grids more or less full as they are that means looking further afield. “I think in time the NGTC regulations will be taken up by other championships in Europe, but at the moment we’re the only ones. Once that opens up we can sell cars. If somewhere like Sweden decided to adopt the same rules it’d be great for the manufacturers and the suppliers.”

Whatever the future holds, it’s clear the NGTC format has made its mark on the BTCC. Costs have come down, components are lasting longer and it’s easier than ever before to get a competitive touring car off the shelf. Perhaps more importantly, it seems to have struck a good balance between cost control and the freedom for teams to exercise their ingenuity. **RT**