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WHY ARE SUPERCHARGERS AND THE S2000 SUCH AN IDEAL COMBINATION? WE INVESTIGATE THE WORKINGS OF TTS PERFORMANCE'S DEMO CARS AND DISCOVER TRACTABLE SETUPS THAT ARE ALREADY BREAKING 600BHP.

WORDS & PHOTOS: JOE CLIFFORD

To anybody with the remotest interest in mechanics, few sounds are as glorious as a Honda engine on VTEC. Nowhere is that sensory bombardment more intense than in the S2000, the centrepiece of which is the screaming F20C 2.0-litre four-pot that produces 240bhp at a whopping 8300rpm. In anybody's book, that is a lot of power in a modestly proportioned, naturally aspirated (NA) engine. And while many owners have spent thousands trying to improve that original output, Honda did such an impressive job that most are lucky to extract nothing more than a handful of extra ponies without an awful lot more noise.

Turbo conversions are a sure-fire way of boosting performance. But the way a turbo delivers its power has a negative effect on the addictive characteristics of the S2000, namely throttle response and power delivery. In addition most turbo conversions are designed for left-hand drive cars, where the brake servo and ABS system is not in the way. That is why you will see few turbocharged S2000s in either the UK or Japan. Nevertheless, the most effective way to increase the power of an S2000 remains forced induction, but I feel the best method is supercharging.

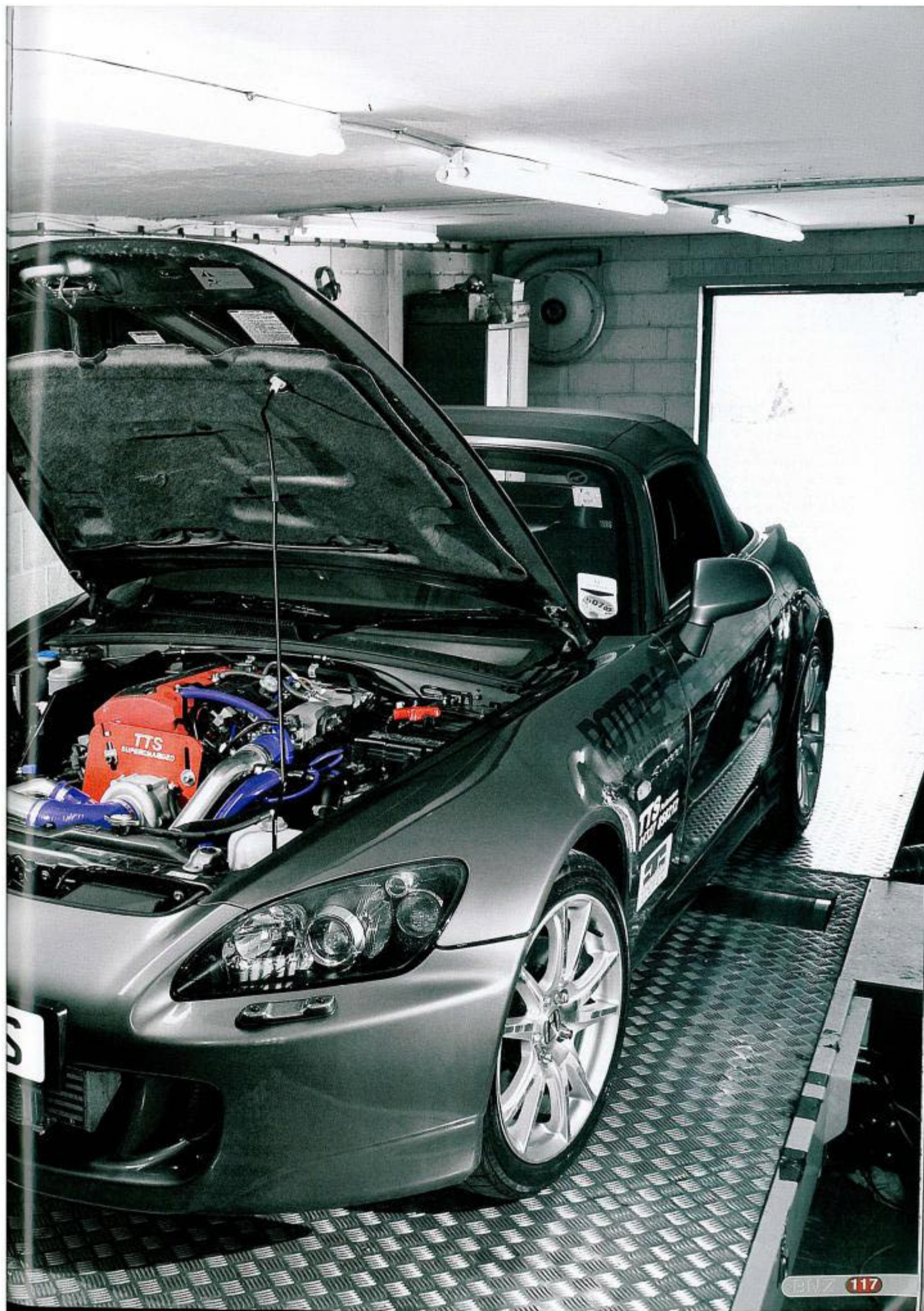
At the end of the day, it's all about understanding how an engine breathes. The higher an NA engine is tuned, the easier it is for a supercharger to help it produce power; and the inclusion of high-lift cams within a VTEC system only serves to better exploit the extra flow produced by the supercharger (the only slight cause for concern is the F20C's high 11.8:1 compression ratio, though that can be circumnavigated by reducing ignition advance at the top end).

A supercharger delivers boost instantly and from idle because it is spun from the crank. This also means that performance gains linearly match revolutions, accentuating rather than masking the natural characteristics of the engine. When the throttle butterfly is only partially open and the supercharger is producing too much compressed air for the engine to consume, excess boost is dispersed through a blow-off valve and no extra fuel is pumped through the injectors. Hence the reason why cruising along in a supercharged car can be as economical as a standard car; as long as the throttle pedal is not mashed to the carpet and the revs are below the VTEC engagement point.

In that regard it is possible to engage the high-lift cams from just above idle in a supercharged VTEC engine but economy suffers terribly. Similarly, leaving the F20C's engagement point at 6800rpm will waste boost pressure up to that point and produce an immense kick through the rear wheels when it comes in, something that could prove tricky to control on the road. Instead, most find that a revised VTEC point of 5000rpm allows the boosted power to arrive with a pleasing kick. It remains civilised but peppier than standard up to that point and increasingly exciting to the rev limit, where you'll suddenly realise that you are bordering on supercar speeds. Think quarter-miles in a smidgen under 12.5sec and 0-100mph in around ten seconds.

Delve inside the S2000's F20C engine (it shares no similarities with any other F-series engine other than bore spacing) and you'll find many properties shared with the K20A powering the EP3 and FN2 Civic Type-R. Hence the reason why Richard Albans of Silverstone-based supercharging specialist





AP1 HONDA S2000 – RACE CAR

TTS Performance saw the S2000 as a natural progression from the EP3 demo/project car he had campaigned so successfully on road and track. Nevertheless, it was no rushed project. That the Rotrex supercharger conversion he designed looks understated is actually a result of, as he put it, "a lot of head-scratching and development to evolve the conversion." Ignoring for a moment the gorgeous anodised CNC'd mounting plate with its integral adjustment for different 'chargers and pulley sizes, attention to detail is particularly evidenced in popular stage two guise seen on the previous spread, where the S2000's engine, gearbox, differential, exhaust system and catalytic converter remain completely standard. "The only thing you may want to change is the clutch," Richard continued. "But that depends on how brutal you are with the drivetrain." He runs a Stage 2 Competition Clutch package, which is said to be as silky as standard yet can handle 50% more torque.

External clues to this car's new forced induction status are few, just a discreet intercooler custom made to fill the grille area alongside a Mocal oil cooler for the supercharger's self-contained lubrication system. But with the bonnet up, other additions come to light such as the intake tubing and oil reservoir, while the fuel rail hides 750cc injectors instead of the standard 310cc items (the fuel pump remains standard). Electronically, new standalone engine management is needed to run the whole shooting match, with TTS recommending AEM's EMS offering as the ECU of choice. Prices are listed without new engine management as a large proportion of S2000 owners already appear to run EMS.

So taken has Richard been with his road-spec, Stage 2 S2000 that he has built another supercharged demo car. But this time it is a full-on race conversion, what he calls his 'Stage 3' package, seen opposite. Amazingly, the engine is still completely standard from internals to compression ratio, so retains the same low-end driveability. Yet when the supercharger is allowed to dedicate its 23psi of boost to the engine, this S2000 goes on to produce 619bhp (or to be more precise, 528.63bhp at the wheels).

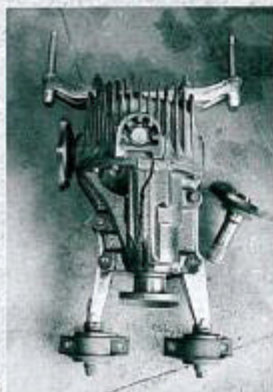
Just like TTS's previous project, this was not a simple bolt-on and play conversion. Detonation became a serious problem from 500bhp upwards, and was only partially solved by advancing the ignition. An AEM

water injection kit was therefore added to restore the status quo, filled with methanol and water in proportions of 9:1. This allowed further fine-tuning of the ignition timing, which produced an extra 80bhp, but reaching a power plateau didn't satisfy Richard. He knew there was a little bit more to come.

At this point he tried a specialist fuel additive called Power Pour that is actually designed for drag bikes/cars required to run on pump fuel. Thanks to its secret petrochemical cocktail, the liquid reduces detonation in engines experiencing high cylinder compression. It has already been used to good effect in Richard's supercharged Suzuki Hayabusa drag bike, where an incredible 18:1 air/fuel ratio would have destroyed the engine, but it came away unscathed. So with a bottle of Power Pour in the S2000's tank and a further mapping session on the rolling road, detonation is suppressed and the incredible result was that aforementioned 619bhp output.

As you can probably imagine, many S2000 owners have been sceptical that Richard's race car truly produces that sort of power with minimal engine modifications. Proof comes in two forms – rolling road graphs and numerous sessions at high-profile drag events. I've seen the graphs myself alongside the curves produced by stages one and two, and they're as beautifully linear and you could ever hope to expect from a tuned engine. And then there is the physical evidence of Richard's recent visits to Santa Pod, which have elicited a dead-on, 11sec run. Yet the ferocious mixture of Mickey Thompson Street ET radials and dumping the clutch at peak torque has revealed the car's one weakness, it's differential. The internal gears were pushed apart so forcefully that they cracked the casing.

Undeterred, Richard is investigating a known differential upgrade, that of installing a Nissan R200 item sourced from the Z31 300ZX. This differential is said to be good for 1000bhp but does require a custom propshaft and driveshafts to fit. With this in place a ten-second run should be a given. Then there is his crazy idea of a twin supercharger setup, whereby the second 'charger sits in the place of the air conditioning pump. Imagine that, 40-50psi of lag-free and progressive boost. TTS Performance could soon be home to the world's fastest Honda S2000, an eight-second car that Richard remains determined to still use as a daily driver. 🚀



Pushing 619bhp through the drivetrain has revealed one weakness – the standard differential. Richard Albans has discovered that a Nissan R200 diff could fit



TTS S2000 TUNING PACKAGES

TUNE	SUPERCHARGER	INJECTORS	BOOST	POWER	COST
Stage 1	Rotrex C30/84	650cc	7psi	c270bhp	£3220**
Stage 2	Rotrex C30/94	750cc	10psi*	c365bhp*	£3450**
Stage 3	Rotrex C38/81	1000cc	23psi	c525bhp	£4600**

*Option for 15psi and c400bhp with smaller pulley

** Including VAT but without AEM engine management at £1207.50

CONTACT:

TTS Performance (01327 858212 or
www.tts-performance.co.uk)