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LIGHTWEIGHT WHEELS

Do lightweight alloy wheels really improve a car's performance? We went to find out.

We all know the script – 'saving weight will make your car faster'. There's no better place to start than by removing weight from your wheels.

Reducing a car's unsprung weight and rotational mass is widely regarded as one of the key areas to improving a car's performance, not only in a straight line but through the corners too.

Removing weight here is also worth a lot more than simply lightening the rest of the car. There are many claims as to the exact figure, but the consensus is that

every kg of unsprung weight you can lose is worth 4kg of chassis weight. So by simply saving a few kg on your wheels can make a big difference.

All that is theory, and as we know theory and reality don't always match up. That's why we headed to Bruntingthorpe with a boot full of wheels, tyres and timing gear to find out for ourselves exactly what difference lighter wheels makes.



THE CAR AND DRIVER

We used Daniel Rowbottom's well-sorted Fiesta ST. Producing a healthy 215bhp thanks to a set of Jenvey throttle bodies, Fast Road cams, exhaust system and custom remap. Coupled with stiffer, lower suspension, and huge 330mm discs and eight-pot calipers the car was ripe for some lightweight wheels and made the perfect test bed to highlight any performance differences they offer.

Dan is no McDonalds car-park handbrake specialist either. He's a proper race driver, having competed in and won championships in various karting categories, Radicals, and much-acclaimed SEAT Cupra Cup. He is now even planning to head to the US where he hopes to be in an Indy car within the next few years.

So with a car which was perfect for the test, and a driver who can obviously handle it and give informative feedback, the scene was set for the testing to begin.

THE TEST

To find out what difference the lighter wheels make we conducted four performance tests.

As lightweight wheels help the car's braking ability as well as acceleration, we tested this first. The braking element saw us recording 100-0mph and 60-0mph times. Each test consisted of three runs and an average deceleration time was calculated.

Next, to show what difference the wheels make to the car's

handling characteristics we completed three timed laps with both the standard and lightweight wheels fitted. We recorded the lap times and worked out an average time for each set of wheels.

The third test was to gain standing start acceleration times. We did three runs on both the standard and lightweight wheels, this allowed us to work out average acceleration times.

The final test was designed to eliminate

traction issues, therefore we recorded 30-80mph in-gear acceleration times too. Again we conducted three runs with each of the wheels fitted and calculated an average.

All the performance figures were recorded using highly-accurate Racelogic Performance Box timing equipment, and lap times were recorded using a stopwatch. After each test we asked Dan for feedback on how the car felt and if he thought it performed any differently.

THE WHEELS

To keep the test fair and comparable we chose a set of lightweight wheels with the same dimensions (7x17in) as the standard Fiesta ST rims.

We also needed a set that are easy to get hold of and are achievable for most people.

Therefore we chose the Team Dynamics Pro Race 1.2s. These lightweight race wheels have received

good press from all who have used them.

After weighing the two wheels we were surprised at the difference. The standard ST wheels are regarded as quite a light, production alloy wheel, but the Team Dynamics motorsport wheels are considerably lighter.

Despite many manufacturers quoting weights without a tyre,

you don't drive with just rims so we weighed the wheels with the tyres fitted and ready to bolt on. The standard ST wheels were a hefty 20.87kg, whereas the Pro Race 1.2s were just 17.6kg. That's a 12kg reduction, and if the 1kg of unsprung weight is worth 4kg of chassis weight rule is applied, that's the equivalent of removing a massive 48kg!

THE TYRES

We fitted both sets of wheels with exactly the same tyre to ensure fairness. We used the Maxxis MA-Z1 in 215/40x17 guise. We chose this tyre because it is a well-regarded high-performance road tyre, and is exactly the kind of rubber most people will be using on their Fast Road cars. We have also heard excellent feedback about its ability to perform well in wet and dry conditions, and given the traditional British summer weather we never know what we're going to get on the test day, making the MA-Z1 a safe bet to achieve some representative times.



Team Dynamics Pro Race 1.2s not only look the business but are 3kg lighter too!





BRAKING

The braking test gave Dan's ST the chance to show off how good eight-pot brakes really are. They didn't disappoint with the car notching up some seriously impressive deceleration figures. Another major advantage of these brakes is that they didn't suffer from brake fade, meaning that the times are as accurate as possible. With standard brakes fitted we would have undoubtedly run into brake fade issues.

The difference between the two wheels was clear. The average 60-0 times were very similar, but from 100mph the car stopped on average half a second quicker with the lighter wheels fitted.

It's worth noting the distance covered too. The average 60-0mph with standard wheels was 132.9ft, and with the Pro Races fitted was 128.6ft.

While these results may be similar, 100-0mph was a different story. The average time on standard wheels was 5.3secs at 376.1ft. With the lightweight wheels this dropped to 4.8seconds and the distance was 28.5ft less.

Also, although the difference isn't massive, the peak deceleration G achieved with the standard wheels fitted was 0.97G, but with the lighter wheels this was recorded at 1.07G. So it is clear the wheels have made quite a dramatic improvement when it comes to braking.

STANDARD ST WHEELS	
60-0mph:	5.3secs
100-0mph:	132.9ft
Peak decel G:	0.97G
TEAM DYNAMICS PRO RACE 1.2	
60-0mph:	4.8secs
100-0mph:	128.6ft
Peak decel G:	1.07G

DRIVER COMMENT "I could really feel the difference under braking. The car braked straight and true with both sets of wheels but actually felt more composed and more stable with the Pro Race wheels. I am surprised at the results, I knew the brakes were good but I honestly wasn't expecting the wheels to make quite so much difference in the braking times."

TEST ONE

HANDLING

One of the best things about Bruntingthorpe is that not only can we use the two-mile runway to test acceleration and braking times, it also has a comprehensive handling circuit too.

With a tight and twisty section as well as fast sweeping corners it makes the ideal test bed to see what differences the lightweight wheels offer over the standard items in terms of handling.

Even with the standard wheels fitted it was soon apparent that Dan knew how to throw his little ST around a track. The average lap times were more than respectable at 1min 28secs, and we were all intrigued to see how much time, if any, he could shave off using the lighter wheels.

When we sent Dan out with the Pro Races fitted all eyes turned to the stopwatch. On

his first lap Dan managed to reduce the lap time by a huge 3.5secs. He explained that the lighter wheels gave a sharper and more predictable turn-in. Coupled with the clear braking advantages we know about from the previous test you could see he was visibly quicker. The lighter wheels

gave Dan more confidence to chuck the car into the bends too, as on his final lap he put in a storming 1min 23.9secs, which was almost 4secs quicker than his fastest lap with the standard wheels fitted. Even the other two runs were 3secs quicker than with the standard wheels fitted.

STANDARD ST WHEELS	
Average lap time:	1min 28.6secs
Best lap time:	1min 28.2secs
TEAM DYNAMICS PRO RACE 1.2	
Average lap time:	1min 24.3secs
Best lap time:	1min 23.9secs

DRIVER COMMENT "In this test the difference between the two wheels is like night and day. The Pro Races make the car feel so much more nimble and agile, and you can really feel the difference through the tight and twisty mid-section of the lap. Turn-in is so much sharper and as a result you can get on the power earlier and carry more speed through the corners."

TEST TWO

STANDING START ACCELERATION

Weather conditions weren't ideal for standing start acceleration times. The greasy surface meant that the Fiesta ST wasn't going to set any world records, but Dan immediately commented that the tyres performed well, especially when they were warmed up.

With the standard wheels fitted we were impressed by the ST's 0-60mph times of less than 7secs. The 0-100 and quarter-mile times were also respectable, and set the bar quite high for the lightweight wheels to beat.

With the Pro Race 1.2s fitted it was clear that Dan was having more difficulty trying to stop the front wheels from spinning up. With the standard wheels he could manage the traction issues by short shifting into second

and then nailing it, but with the lighter wheels on he had to feather the throttle to avoid wheelspin in second too.

This wasn't because the lighter wheels offered less grip but because the lighter rotational mass took less engine effort to turn, so when he put the power down the wheels simply lost traction. The resulting acceleration times were slightly slower than with the standard wheels fitted.

STANDARD ST WHEELS	
Average 0-60:	6.9secs
Average 0-100:	17.8secs
Average quarter-mile:	15.7secs @ 94mph
TEAM DYNAMICS PRO RACE 1.2	
Average 0-60:	7.4secs
Average 0-100:	18.0secs
Average quarter-mile:	15.9secs @ 94mph

DRIVER COMMENT "I was surprised at how well the standard wheels performed. The car feels more alert with the lighter wheels fitted, but they do want to spin up easier, and by a noticeable amount too. I had to feather the throttle in second to keep the grip there. I reckon in dry conditions the times would be reduced with the lighter wheels fitted."

IN GEAR ACCELERATION

With the previous standing start test highlighting issues surrounding traction, accelerating the car from a rolling start eliminated any wheelspin problems related to getting the car off the line. It also virtually eliminated any chance of driver input affecting the results. The point-and-squirt nature of this test would also show what affect the wheel's weight has on the car's performance.

The Fiesta ST's short gearing is very well suited to this type of acceleration and the standard wheels performed well again, with an average 30-80mph time of 8.8secs. However, the lighter Pro Race 1.2s showed a

considerable improvement on this, being almost half a second quicker on average over the three runs.

Dan also commented on the car's improved throttle response with the lighter wheels fitted, and how it felt quicker from the driver seat too.

If the theory of having lighter wheels and less rotational mass will improve acceleration times is true, that would certainly explain the noticeable difference between the two wheels that we experienced in this test.

STANDARD ST WHEELS	
Average 30-80mph:	8.8secs
TEAM DYNAMICS PRO RACE 1.2	
Average 30-80mph:	8.3secs

DRIVER COMMENT "The first thing I noticed was how much more responsive the car felt with the lighter wheels on. The throttle response was a lot sharper, and by a surprising amount too. The times show a clear difference in the performance, and this was something I could actually feel while driving the car."

"THE FIESTA ST'S SHORT GEARING IS WELL SUITED TO THIS TYPE OF ACCELERATION."





Fast Ford's mechanic Matt got busy fitting the new wheels



RESULTS

STANDING START ACCELERATION

STANDARD ST WHEELS

Average 0-60:	6.9secs
Average 0-100:	17.8secs
Average quarter-mile:	15.7secs @ 94mph

TEAM DYNAMICS PRO RACE 1.2

Average 0-60:	7.4secs
Average 0-100:	18.0secs
Average quarter-mile:	15.9secs @ 94mph

IN GEAR ACCELERATION

STANDARD ST WHEELS

Average 30-80mph:	8.8secs
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TEAM DYNAMICS PRO RACE 1.2

Average 30-80mph:	8.3secs
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BRAKING

STANDARD ST WHEELS

60-0mph:	3.2secs
100-0mph:	5.3secs
Peak decel G:	0.97G

TEAM DYNAMICS PRO RACE 1.2

60-0mph:	3.0secs
100-0mph:	4.8secs
Peak decel G:	1.07G

HANDLING

STANDARD ST WHEELS

Average lap time:	1min 28.6sec
Best lap time:	1min 28.2sec

TEAM DYNAMICS PRO RACE 1.2

Average lap time:	1min. 24.3sec
Best lap time:	1min 23.9sec



DRIVER COMMENT

"The tests have been great fun to do and have produced some interesting results. I know all about the physics of reducing unsprung weight but I have to admit I was surprised by how much difference the Pro Race wheels made, especially on the handling circuit. "They really did transform the car and if I didn't know would quite happily believe you if you told me that someone had removed 50kg from the car! I would strongly recommend fitting lightweight wheels for anyone who wants to improve their car, as they clearly have performance benefits in all areas."

CONCLUSION

We all know the theory behind fitting lighter wheels, but until you've actually seen the results for yourself it is easy to be sceptical of 'fit these and you will improve your car' claims.

From these tests it is clear that reducing the unsprung weight and rotational mass from your car to make it faster is far from just a theory. It's a fact. Despite having slight discrepancies in the results of the standing start acceleration tests, which can reasonably be attributed to poor weather conditions, the Team Dynamics Pro Race 1.2 lightweight alloys outperformed the standard wheels in all other aspects.

The biggest differences could clearly be seen in the handling test where the car was much faster, and according to Dan felt much nicer to drive, more nimble, and gave him the confidence to carry more speed through the corners.

Perhaps the most surprising results were the braking test times. We were anticipating that the lighter wheels would offer slight performance advantages but were

expecting the results to be marginal. When the braking time from 100mph was reduced by half a second we were all amazed.

Overall it is clear to see the benefits offered by lightweight motorsport wheels, and with rims like the Team Dynamics Pro Race 1.2 available at such reasonable prices it doesn't make sense to fit anything other than lightweight wheels to your fast Ford.

THANKS

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