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HIGH-SPEED HEISTS

With the aim of helping his family to get on in life, Dominic Toretto used his skill behind the wheel of fast cars to take part in a series of thrilling truck heists. Due to the insistence of his sister Mia and his friend Brian, Dom would soon come to realise that he was taking the wrong path. And so he ended up collaborating with the forces of law and order, helping to resolve the biggest international challenges as a member of a secret special unit backed by the government of the United States.

When director Rob Cohen began preparing the filming of *The Fast and the Furious*, he realised from the start that he was going to present a group of characters that could easily have come from a Western. For him, Toretto and his gang were in some ways following in the footsteps of outlaws like the legendary Jesse James. The star of the franchise, Vin Diesel, saw things the same way: "Dom Toretto has earned himself the reputation of being able to rob things in motion," he was to say when they had finished shooting the first movie. "He's a modern bandit."

TWENTY-FIRST CENTURY OUTLAWS

But, how do you express that idea in the 21st century? Cohen and his team of screenwriters had no doubts. If sports cars were going to replace the horses in Westerns, Toretto's stunts had to take place on the highway. At the beginning and end of *The Fast and the Furious*, the crew manages to make our hair stand on end by offering us two explosive sequences in which a group of fast cars surround a heavy truck. The first heist is a success. The second operation gets extremely complicated when the truck driver starts fighting back.

Both operations have moments that really do seem to have been taken from a classic Western. Just as back then the outlaws leaped on to the horses to bring the stagecoach to a halt, they now jump from their cars on to the fronts of trucks to get inside the cabin and fight the drivers, a really high-risk manoeuvre!

THE PEOPLE'S CHAMPION

During the whole of *The Fast and the Furious* Brian investigates a series of robberies that are being carried out on the highways around Los Angeles. The suspects are

Robbing a police station and dragging out a safe with two high-performance cars? Only Dom Toretto and Brian O'Conner could do this. And this is precisely what they do at the end of *Fast Five* to get revenge on the trafficker Hernán Reyes.

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Many military-looking armoured vehicles have been featured in heist sequences in the *Fast & Furious* films. This Armet Gurkha F5 had an outstanding role in the fifth film in the series.

During the filming of the spectacular heists in the franchise, the stunt performers have to choreograph the scenes in order to know exactly what is supposed to happen inside and around the vehicles.

mostly looking for high-tech devices that they can easily sell later on the black market. But is Toretto really the mastermind of these operations? Some plot twists do their best to mislead the audience, until it is finally revealed that he is. In fact, at a given moment, Mia asks him to give it up and he assures her that he has to do it for the good of the two of them. Before the last job, Dom talks to his people and he reminds them: "It's the haul of the century. We've been after it for months. After this everyone can take a long vacation." Although it is discovered that Toretto was involved in these heists, when Brian is ordered to investigate them it doesn't take long for him to realise that Dom's reasons are more heroic – Dom is actually a romantic and generous bandit, like Robin Hood.



While they were planning the character's return in *Fast & Furious*, Vin Diesel directed and acted in a short film entitled *Los Bandoleros*, which explained how Toretto, after crossing the Mexican border, had settled in a poor neighborhood of Santo Domingo in the Dominican Republic. There, taken in by Rico Santos's large family, he would discover the problem that the high price of fuel was causing among the people.

At the start of *Fast & Furious*, we find Dom and Letty in action, pursuing a tanker on the roads of the Dominican Republic to steal the gasoline. "Dom doesn't just steal gas for himself," Vin Diesel says, "but for an entire neighborhood that has to pay an exorbitant price for its fuel."

THE NEW BONNIE AND CLYDE

Filmed on the twisting Templin Highway, in a mountainous area north of Los Angeles, the tanker robbery became one of the most dangerous sequences to date. The director Justin Lin knew that real fans of the franchise did not want to see computer-generated special effects. As they had done previously, the stars themselves would act in the riskiest scenes. So actress Michelle Rodriguez, suitably secured by a rope and harnesses, and thanks to her extraordinary physical fitness, was more than ready to make the big leap. She knew that it was a key moment to clearly show the nature of the couple's relationship. "Letty and Dom are on the run," she says, "breaking the law wherever they go. There's a slight 'Bonnie and Clyde' feel to it."

Ericson Core

The thrilling feeling that the *Fast & Furious* films transmit is only achieved thanks to the marvellous work of the directors of photography. For *The Fast and the Furious*, Rob Cohen wanted to have a solid professional like Ericson Core, who from an early age had known that he wanted to work in the cinema. Lack of funds did not put him off and he even slept in his van a couple of times until he finished his studies on the USC-Cinema School program. Later, he was given the chance to begin working as a director of photography by Kevin Reynolds, in the student drama *One Eight Seven* (1997) and by Brian Helgeland, in the exciting thriller *Payback* (1999). Rob Cohen gave him quite a lot of freedom to express his creativity in *The Fast and the Furious*, a film that would even arouse his interest in directing, which he later did in two interesting projects: the biographical drama set in the world of American football, *Invincible* (2006), and the amazing action film *Point Break* (2015).

The filming of this sequence demanded massive involvement from the crew and the cast. They all spent several weeks on location, using some vehicles that had been specially prepared for the occasion. Among them there was a series of Buick GNX's, capable of going very fast in reverse, and tankers adapted to be driven by remote control.

ROBBERY IN RÍO

After witnessing Toretto's daring robberies in *The Fast and the Furious* and *Fast & Furious*, anyone might think that it was impossible to see an even more amazing robbery, but they would be making a big mistake. In *Fast 5*, director Justin Lin wanted to take things even further and he immediately found an ally in screenwriter Chris Morgan, who asked him, "Do you think a Dodge Charger could drag a safe along the road?"

In the fifth movie, Toretto and company were up against a dangerous drug trafficker, Hernán Reyes. To unmask Reyes' criminal activities, Dom plans what looks like the heist of the century: robbing police headquarters in Río de Janeiro and taking with him – literally – the two safes in which Reyes has placed all the money from his illicit activities. But … taking them with him? How? Dragged out by steel cables attached to two Dodge Charger SRT8s, driven by Dom and Brian, respectively. As simple as that!

SAFES ON WHEELS

Described like this, this mission might sound like pure fantasy. Nevertheless, when the results of the thrilling final sequences of *Fast 5* were seen, audiences were left open-mouthed. It doesn't just *seem* real, it is. Once again, Justin Lin said no to digital effects and surrounded himself with a team of extraordinary stunt coordinators to make it possible. It included men like Spiro Razatos and Jack Gill, the creators, respectively, of the spectacular action scenes in *Death Race* (2008) and *Herbie: Fully Loaded* (2005). They studied the robbery in detail just as screenwriter Chris Morgan had imagined it. Then they put the power of the Chargers to the test, to find out what weight they really could pull. Based on these first tests, filming preparations began.

Despite the fact that in the film's final cut, the robbery looks like chaos in which the safes cause havoc in the center of Río de Janeiro, in actual fact the filming was planned down to the last detail. Not one single swerve or crash of either of the safes had not been perfectly prepared beforehand. To do this, the stunt coordinators asked for various models of the safes to be built. In total, six models were built, each of them with a specific job. For example, one model was merely the front of the safe, which, mounted on the radiator grille of a truck, made it possible to shoot the close-ups of the safe dragging the cars that it collided with on the way. Another one, far more sophisticated, was mounted on a platform with four wheels, steering wheel and engine, which could be driven as though it was an actual vehicle. Stuntman Henry Kingi was in charge of driving it at top speed during the filming.



The most spectacular explosions, acrobatics and manoeuvres are regular occurrences throughout the series. In the picture, a 1969 Dodge Charger narrowly escapes from a tricky situation in *Fast & Furious 6*.



DODGE CHALLENGER SRT HELLCAT

In 2008, at the height of the recovery of the muscle car market, the Dodge company launched a new generation of the Dodge Challenger, based on the model from the early 1970s. Competition from the Ford Mustang and the Chevrolet Camaro led the brand to propose a powerful "muscle car": the Dodge Challenger Hellcat.

The Dodge Challenger Hellcat is the most powerful production muscle car ever launched by a brand and it outdoes its two great rivals: the Ford Mustang Shelby and the Chevrolet Camaro.

Launched in 2015, the Dodge Challenger Hellcat is the most powerful production muscle car in history. Under its hood, this first version concealed a 6.2-litre V8 HEMI® engine capable of giving maximum power of 707hp thanks to its supercharger. Fitted with a six-speed manual gearbox or eight-speed automatic transmission, this five-metre-long car reached 199mph (320km/h) and, despite its weight of over two tons, it accelerated from 0 to 60mph in 3.6 seconds.



The 6.2-liter supercharged V8 HEMI® engine.

Two versions of the Hellcat are currently on sale: one with the same bodywork as the rest of the Dodge Challenger cars, and another, called Widebody, with wider wheel arches and 20-inch wheel rims. On this base, and for those who are not satisfied with the incredible power of the engine, the marque offers the Redeye variation, recognisable by the two air intake openings on the hood. It has the same 6.2-litre block, but with a new supercharger (the largest ever mounted on a production car, with a capacity of 2.7 litres) producing 808hp. Available only with the eight-speed automatic gearbox, it goes from 0 to 60mph in just 2.3 seconds and its top speed is 203mph.

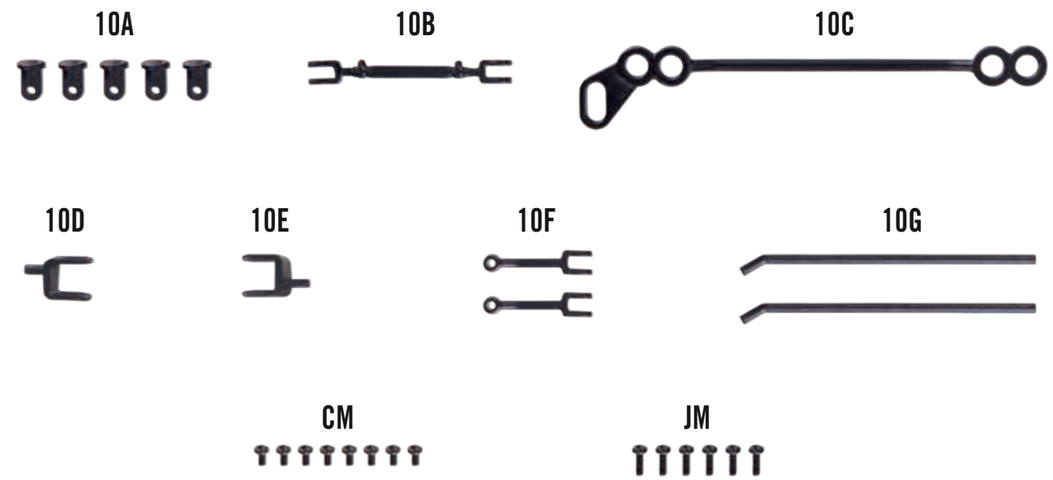


STEERING AND RIGHT SUSPENSION

With the pieces attached to the tenth stage, you can assemble the parts of the steering system and continue assembling the front right suspension.

Editor's note: The parts shown here may differ slightly from the parts supplied with this issue. This does not affect the quality or the assembly instructions in any way.

PIECES FOR THIS STAGE



10A Steering linkage ball joints (x 5)
10B Right tie rod
10C Steering arm
10D Left idler arm bracket
10E Right idler arm bracket
10F Tie rod ends (x 2)
10G Radius arms (x 2)
CM Screws 1,7 × 3 mm, (x 8)*
JM Screws 1,7 × 5 mm, (x 6)*

* Some of the parts are spares.

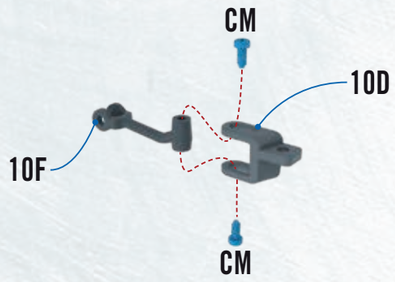
ASSEMBLY AREA



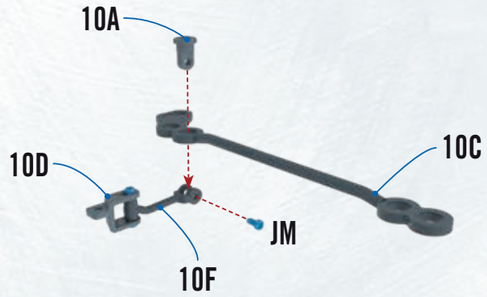
STEERING AND FRONT RIGHT SUSPENSION



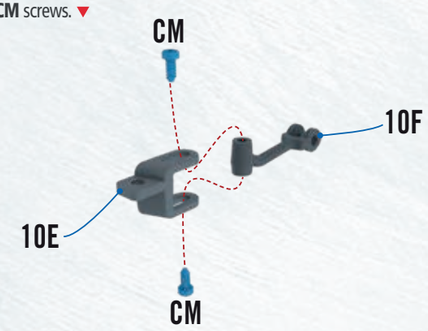
10.1 **INSERT** the cylindrical end of one of the tie rod ends **10F** into the jaws of the left idler arm bracket **10D** (indicated with the letter "L"). Join the pieces with two **CM** screws. ▼



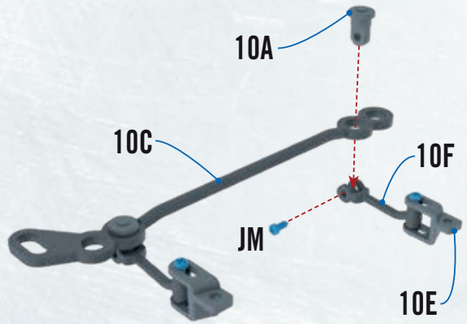
10.2 **PUT** one ball joint **10A** into the third-to-last hole in the steering arm **10C**. Line up the hole in the ball joint with the holes in the forked end of the tie rod end used in step 10.1. Use a **JM** screw to join them together, inserting it from the inside of the assembled part. ▼



10.3 **UNITE** the second tie rod end **10F** and the right idler arm bracket **10E** (indicated bythe letter "R") as you did in 10.1 above. Join them with two **CM** screws. ▼



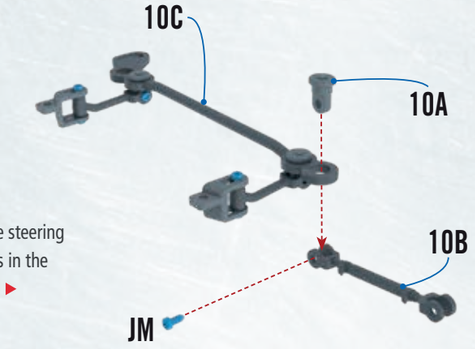
10.4 **TAKE** the assembled steering arm. Insert one ball joint **10A** into the second-to-last hole in the right end. Attach the tie rod end you just prepared and fix it in place with a **JM** screw, inserting it from the inside. ▼

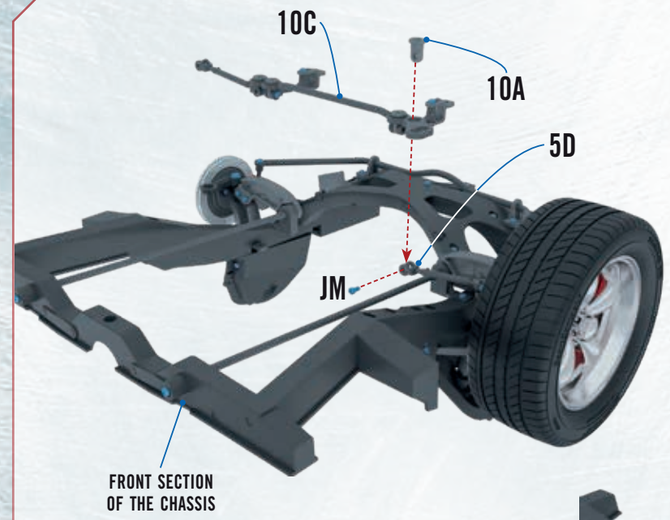


USEFUL TIP
Take a close look at the positions of the left and right idler arm brackets 10D and 10E in the assembly instructions. Each piece is marked with the letters "L" (left) and "R" (right) to indicate which end of the steering arm 10C they are fitted to.



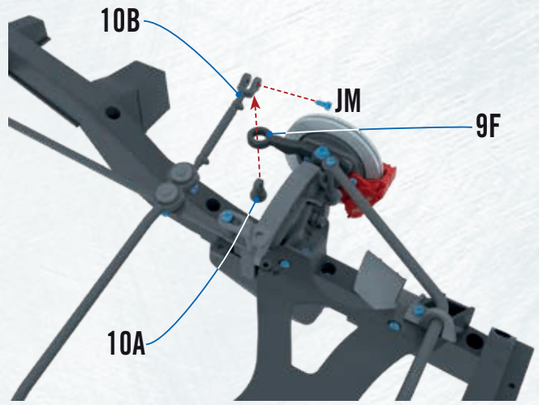
10.5 **INSERT** a ball joint **10A** into the last hole in the right end of the steering arm **10C**, and then line up the hole in the ball joint with the holes in the jaws of the right tie rod **10B**. Connect the parts with a **JM** screw. ▶

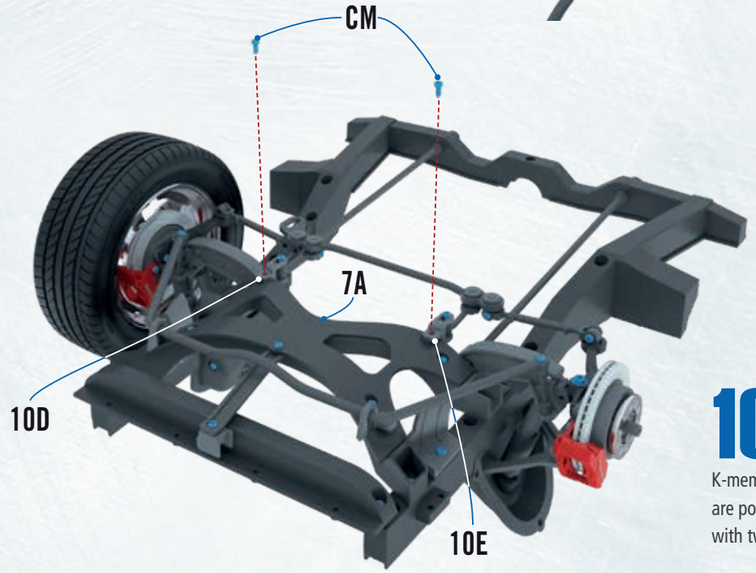




10.6 **TAKE** the chassis parts you have built so far and position them as shown in the illustration. Insert a ball joint **10A** into the second hole in the left end of the steering arm **10C**, and then into the forked end of the left tie rod **5D**. Join them together with a **JM** screw. ◀

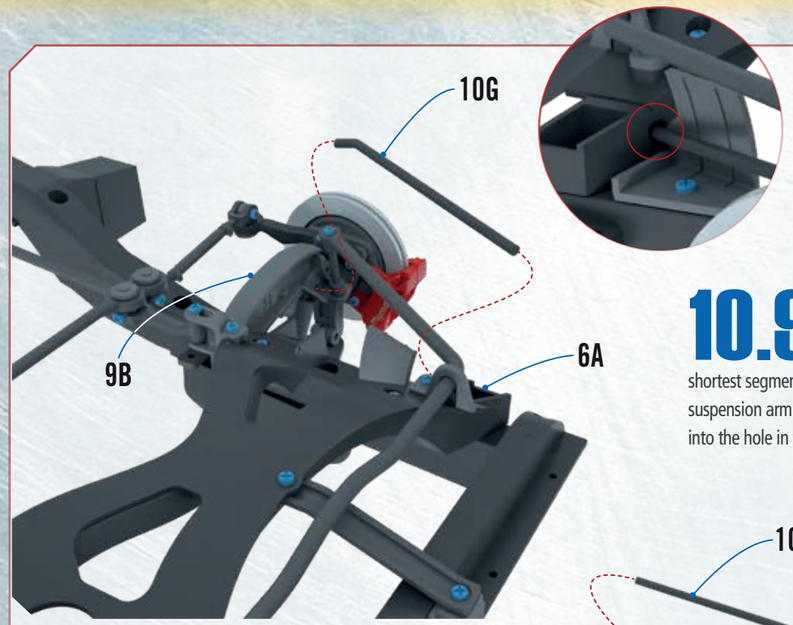
10.7 **ALIGN** the free ends of the right tie rod **10B** with the front right knuckle arm **9F**. Insert the last ball joint **10A** into the hole in the knuckle arm **9F** from underneath and then into the laws of the right tie rod. Join the parts together with a **JM** screw. ▶



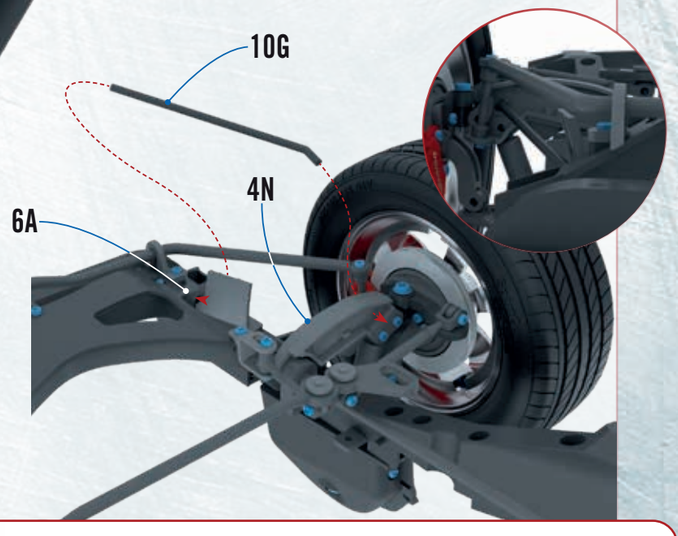


MODEL-MAKER'S TIP
You can change the wheel alignment slightly by varying the position of the screws that hold the idler arm brackets and the tie rod ends together.

10.8 **ALIGN** the left and right idler arm brackets, **10D** and **10E**, with the holes in the edge of the chassis K-member **7A**. Look at the illustration to ensure they are positioned correctly and then fix them in place with two **CM** screws. ◀



10.9 **Look** carefully at the front suspension radius arms **10G**: they are slightly bent. Take one radius arm **10G** and insert its shortest segment into the indicated small hole in the front right suspension arm **9B**. Insert the other end of the radius arm **10G** into the hole in the front chassis crossmember **6A**. ◄



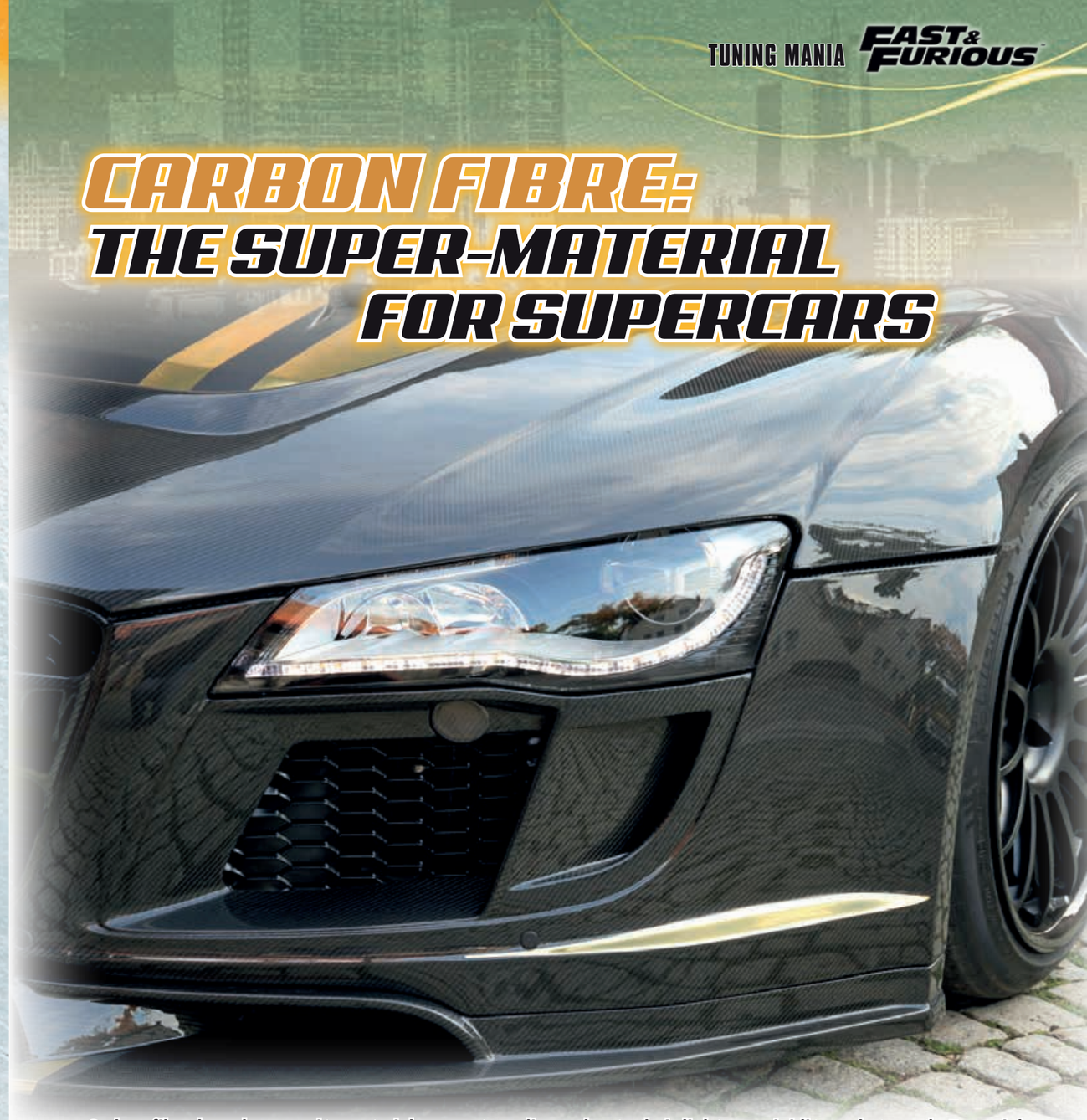
10.10 **Insert** the second radius arm **10G** into the left side of the chassis. The shortest segment goes into the front left suspension arm **4N** and the longest into the front chassis crossmember **6A**. ►

STAGE 10 FINAL RESULT



You can admire the result of this assembly session in the illustration. Put the section of the chassis you have assembled in a safe place.

CARBON FIBRE: THE SUPER-MATERIAL FOR SUPERCARS



Carbon fibre-based composite materials are extraordinary due to their lightness, rigidity and strength. Essential in Formula 1, they have also become the norm in the world of super sports cars, and of course in tuning.

A large number of materials and technical solutions have come to automobiles from the aeronautical industry, in which enormous investments are usually made in research, and the biggest priority is combining the reduced weight with high mechanical properties.

The world of aviation has for example provided Maraging steels with excellent mechanical properties, titanium alloys and new aluminium alloys, among others. The development of long-fibre composite materials and thermostable resins also started due to the possibility of making use of their extraordinary weight and mechanical strength. These materials were then transferred to the automobile industry, and they have been very successful in Formula 1 racing cars.

Carbon fibre is normally used to replace the bodywork with new ultra-light pieces that considerably reduce the car's weight.

What a monocoque!

When the Lamborghini Aventador was presented, everybody was surprised to see its carbon monocoque. And no wonder: it was a body in one single piece – very rigid, and therefore, safer – similar to the one used in Formula One cars. In actual fact, the monocoque is not a single piece, although it acts as if it were: the structure is composed of different parts with specific functions that are joined together during the compression process. The new body weighs only 147.5kg (the whole chassis weighs no more than 230kg). Thanks to this technology, a torsional rigidity is achieved of 35,000 Nm/degree, which greatly improves steering control and precision. Moreover, it should be mentioned that each monocoque manufactured in the Italian firm's own plant is made with a degree of precision of 0.1mm.





Interior component parts also affect the weight of an automobile. This is why the seats of super sports cars usually have carbon backrests. Every gram saved improves performance!

Nowadays, the composites industry continues to evolve, but production techniques and the most common materials have been consolidated for some time. In fact, anyone can purchase fibres and resins in several formats. Nevertheless, when someone wishes to obtain the best results, and more so in the case of manufacturing structural pieces, specific machinery must be used, such as the autoclave, something that not everybody can afford.

HOW A COMPOSITE MATERIAL IS CREATED

From a chemical and a physical point of view, there are two quite separate stages in the production of this type of material: the making of the resin matrix, which holds everything together, and the making of tough insertions (also called "reinforcements"). The latter consist of fibres that can either be unravelled or combined to form fabrics in which they are grouped together, arranged and oriented in a carefully studied way.

Carbon fibre was created in the late 1950s in Ohio, when Roger Bacon created a composite material with graphite filaments arranged in sheets. In 1969, a British company manufactured the first fibre fabric, as it is now known.

How pieces of carbon fibre are produced

There are three methods of doing it depending on the type of fibre, the shape and the purpose of the piece. In Resin Transfer Moulding (RTM), pre-shaped rolls of carbon fibre are used that are impregnated with resin and then hardened by heating. In pre-preg, or pre-impregnation, on the other hand, the supplier impregnates the carbon fibre with a thermostable liquid resin, stores it at low temperature, and finally the material is laminated and distributed in moulds before being hardened in an autoclave at a controlled temperature and pressure. Lastly, with the braiding method, carbon fibre fabrics are produced using a method derived from the textile industry.

Glass, aramid and carbon fibres, of which there are several kinds, are used in the car industry. The basic material and the manufacturing process determine their characteristics, which can vary greatly, especially with respect to their density (and, therefore, their weight), their strength and their rigidity.

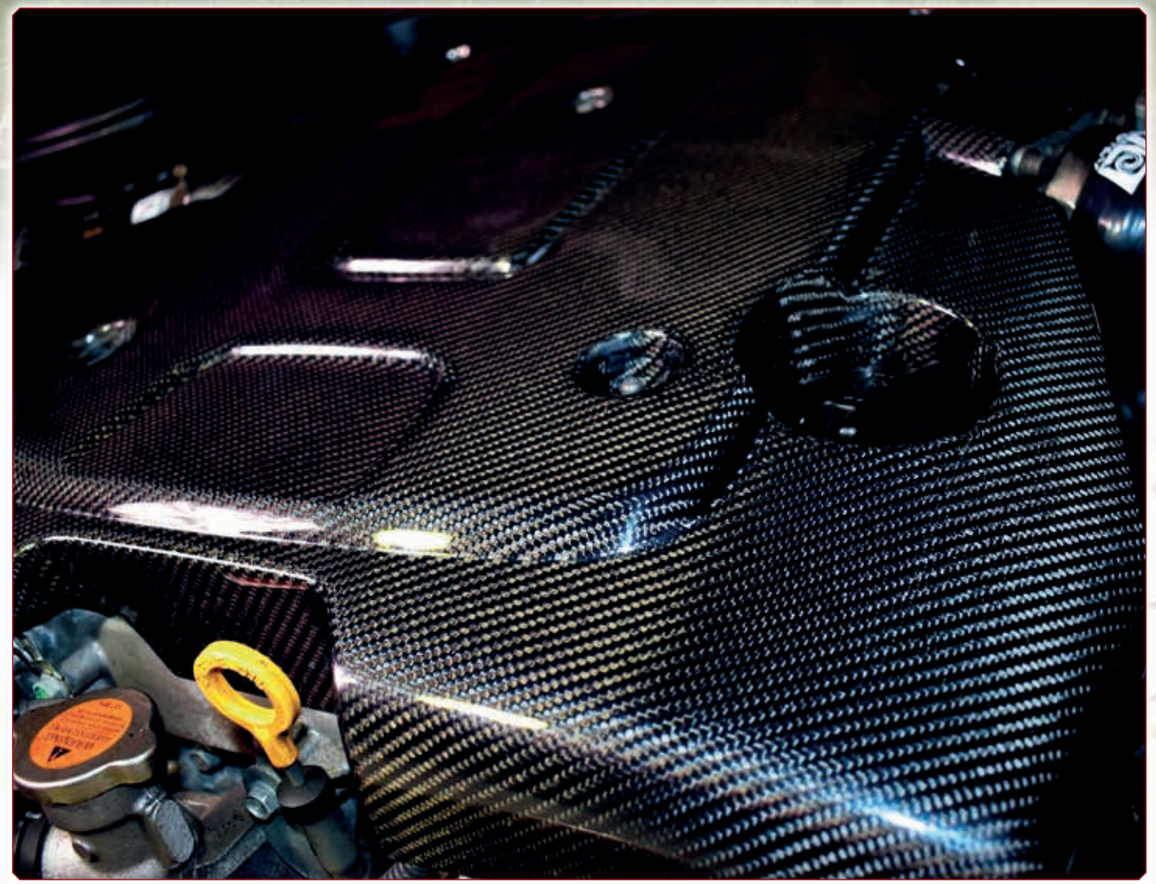
The fibres, measuring just a few microns in diameter, may be grouped together in bundles or braids to form yarns. Depending on how the fibres are arranged, materials can be obtained with greater rigidity and resistance to traction in one direction than in another.

The resin matrix keeps the fibres together, protects them and distributes the loads. Epoxy resins are far and away the most used.

After incorporating the fibres or the fabrics, the matrix, still in a liquid state, is subjected to a hardening process through polymerisation and, above all, the reticulation of the molecular chains. For this, a catalyst is normally used, also known as a "hardener". The process is sped up by the use of heat, or actual "cooking" in the oven. The relationship, in terms of volume, between the fibres and the matrix defines the characteristics of the end product. In most cases, the fibres represent 45-65% of the total.

The sky is the limit for creativity: carbon fibre can also be used to embellish and lighten an air intake.





Carbon is also used for aesthetic reasons. Its great resistance to high temperatures has made it possible to design this very peculiar engine compartment.

MASS-PRODUCTION

Producers of composite materials do not usually work with fabrics or fibres on one hand, and matrixes on the other, before joining them together with the aid of a special mould. Instead of that, they prefer to do it with pre-pregs: already impregnated fabrics that are placed in the matrix and which have already passed through the catalyst. The use of these semi-finished products speeds up the whole manufacturing process and makes it easier. Pre-pregs, however, must be kept refrigerated to delay the reticulation process. The "cooking", in such cases, is usually done in an autoclave and not in an oven, as you might imagine, so that the operation can be done under pressure in carefully controlled conditions.

The rigidity of these materials is obtained due to their high elasticity and to a carefully studied arrangement and orientation of the fibres according to a well-calculated design of the structure.

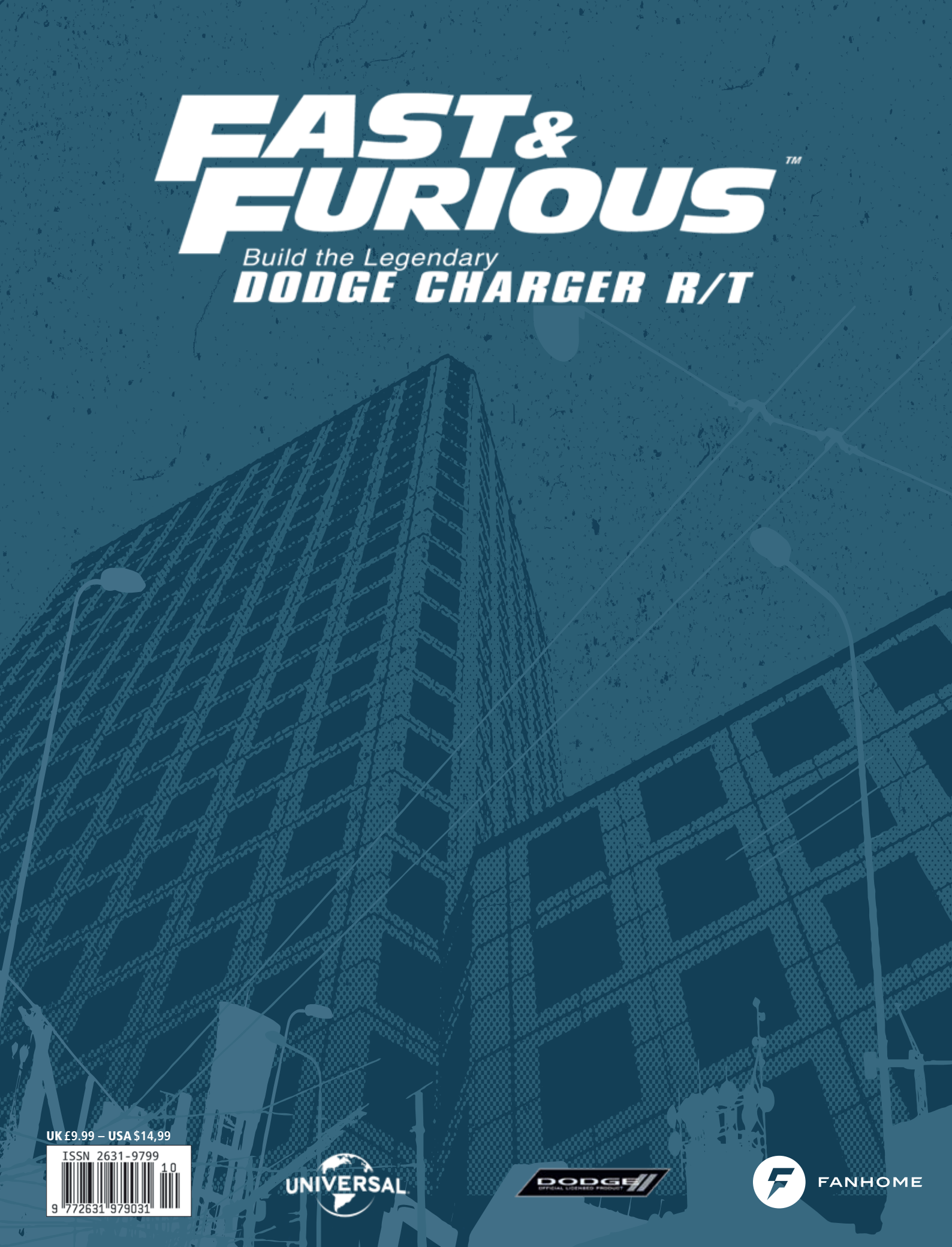
APPLICATIONS

After reading about the properties of carbon, extremely lightweight and hardwearing, we can better understand why it is used so much in the manufacturing of racing cars. Not only is it used for the bonnet, the door panels and the mudguards, it also gives excellent results with interior component parts, such as seat frames, and the aerodynamic appendages with which road holding is improved (front splitters, air dams, rear spoilers and diffusers).

As you can imagine, with carbon an engine's performance is greatly improved, since it significantly reduces the weight of the car, and consequently performance is improved with regard to acceleration and top speeds. The use of carbon fibre makes it possible on average to reduce the weight by 50%. A bonnet made of sheet metal, for example, weighs somewhere between 15 and 18kg, while one made of carbon weighs between 8 and 12kg. All together, nearly 100kg can be eliminated, and more if the right components are used.

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