FAST & FURIOUS™

103

Build the Legendary

DODGE CHARGER R/T



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ICELAND: ICE AND FIRE

On their tour around the globe, in *The Fate of the Furious* the script required the stars of the franchise to visit the frozen wastes of Iceland. There they took part in one of the most awesome chases in the history of the franchise.

The implacable cyber-terrorist Cipher's ambition to control the world and terrorise the major powers knows no bounds – she is even prepared to launch a nuclear missile. In order to achieve this, she forces Dom Toretto to go to a remote, impregnable Russian military base in the frozen locality of Vladovin. In the meantime Letty, Hobbs and the rest of the team have managed to anticipate Dom's movements and they also go there, with the aim of neutralising him. This is the start of a pulsating adventure that ends with a thrilling pursuit over the ice.

SOMETHING COMPLETELY NEW

"Ice and fire. We wanted to give audiences something they had never seen before," says director F. Gary Gray. And, of course, they succeeded. The famous sequence on the ice in *The Fate of the Furious* has made history, with as many as 16 vehicles speeding over the ice, explosions all around them and a nuclear submarine pursuing them. Could it be any more exciting?

The difficulties appeared when they began planning how to film this frantic pursuit. The first thing they had to do was find the ideal location, and they found it in

With her powerful Rally Fighter, Letty Ortiz leads the dangerous operation that takes her team to the remote Russian base of Vladovin.

Iceland: to be precise, Lake Myvatn, one of the most popular places in the country due to the beauty of its scenery, and for being surrounded by spectacular natural wonders like the Dimmuborgir lava fields or the Námaskard hot springs.

The crew set up the film's base camp in Skútustaoir, a tiny village on the south side of the lake. There they found themselves looking at the enormous white expanse of the frozen lake. The image of the cars driving over this immense sea of ice at top speed could not be more attractive. But was it safe to have the cars driving over the ice? Wouldn't there be the risk of the ice breaking and the vehicles sinking into the ice-cold water?

NIGHTMARE ON THE ICE

The film's producers contacted a local team to ensure that it was possible to shoot on the surface of the ice.

"Every day, the security personnel made holes in the ice to check the thickness and where we could film," recalls Spiro Razatos, the second unit director. "Except for the submarine, everything you see on the screen is real. This is what makes *Fast & Furious* so special. Nothing can beat reality."

As you might imagine, on the frozen lake the temperature was extremely low. This affected not only everybody working on the movie but the cars too, which required special maintenance to prevent them from icing up. Dennis McCarthy, the franchise's vehicle coordinator, and his team worked flat out to ensure that the fleet of cars they had taken to Iceland would perform perfectly. And it wasn't easy, because as well as facing the challenge of the frozen surface, the stunt performers had to dodge the explosions that later, at post-production stage, were used to create the sequence of the submarine controlled by Cipher suddenly surfacing.

"At the beginning we were only allowed to have a maximum of 10 cars on the ice at any one time. In the second week, there were 28 to 30 vehicles. We had snowmobiles, armored personnel carriers, a Lamborghini, a tank, Hobbs's vehicle. It was amazing," the second unit coordinator, Andy Gill, says.

AN EXCEPTIONAL TANK

McCarthy had assigned a vehicle to each character according to their personality. Of course, Dom got behind the wheel of a Dodge Charger specially adapted to perform as never before on ice. Hobbs was driving a Dodge Ice Ram truck; Little Nobody, a Subaru WRX; Letty, a Rally Fighter, and Roman, a spectacular orange Lamborghini. But the most daring decision came when it was decided to give Tej Parker a tank to drive. And to achieve this, the movie's producers got in touch with the United States Army and asked to borrow a Ripsaw.

"The famous Ripsaw," says Geoff Howe, of Howe & Howe Technologies, "is the fastest, most powerful lightweight super tank in the world. Bringing it to Iceland was really exciting because it meant we had an incredible machine weighing 4,500 kilos and producing 800hp, capable of reaching a speed of 100 km/h, sliding over the ice. It was epic."

The backdrop to the exciting chase scene between the cars and a submarine is the frozen surface of the volcanic lake Myvatn, in the north of Iceland.

ANTHONY LIBERATORE

In order to design action scenes in detail, like the chase over the ice in *The Fate of the Furious*, it is essential to have a good storyboard, a sort of comic strip in which all the shots in the sequence are drawn. Some first-rate artists have done them, like for instance Anthony Liberatore. He has been connected with the franchise for quite some time, because after designing the opening sequence of *Mission: Impossible III* (2006), he was put in charge of the storyboard for *Fast Five*, and ever since then he has been an indispensable member of the team. His great talent for highlighting the importance of the action in the drawings led Marvel studios to hire him for *Captain America: the Winter Soldier* (2014) and its follow-up *Captain America: Civil War* (2016). After that, Liberatore took part in the production of *Monster Trucks* (2016) and *Kong: Skull Island* (2017), before returning to Marvel to draw the storyboards for *Black Panther* (2018) and *Captain Marvel* (2019). Among his most recent contributions are the storyboards for *21 Bridges* (2019), *Bad Boys for Life* (2020) and *Extraction* (2020).

This small, agile, very fast vehicle caught the eye of everyone taking part in the filming when it first appeared.

"We had never seen anything like the Ripsaw," Jack Gill admits. "The first time they brought it onto the ice we thought it would be a problem. But we made it jump on the ice, brake suddenly so that it almost stood upright, make 360 degree turns … it was indestructible."

"We worked with some great people from the Defense Department," adds vehicle supervisor Dennis McCarthy. "The US government pulled out all the stops so that we could have our Ripsaw. It can be manoeuvred by remote control; you can do a mission with it without the driver being in danger. It's a great military vehicle that works perfectly in the movie."

PERFECT CHOREOGRAPHY

As if it was an artistic skating exercise, the whole sequence had to be choreographed on the ice down to the last detail. With the aid of cranes, launch platforms and cables, the crew managed to create the effect of seeing the vehicles trapped in a white inferno, pursued relentlessly, first by the Russian military forces, and then by that awesome submarine controlled as she pleases by Cipher.

When the presence of the submarine was digitally added, the sequence, which also brought about a huge plot twist by finally reuniting Toretto with his family, looked absolutely spectacular. Fans could not help whooping and yelling in excitement at the results and everyone agreed that it was one of the greatest chases ever filmed in the *Fast & Furious* franchise.





DODGE SIERRA

Between 1955 and 1959 the Dodge brand gave the name "Sierra" to a series of station wagon models. Based on the Dodge Coronet, Royal and Custom Royal, they offered spectacular bodywork, with a rear door and room for six to eight passengers, and with the same 8-cylinder engines as those mounted in their predecessors.

An elegant 1957 Dodge Custom Royal Sierra, with two-tone bodywork and spectacular tailfins. This model was manufactured until 1959.

In 1955 the Dodge range comprised the Dodge Coronet, the Royal and the Custom Royal. In reality they were the same models (the bodywork was identical) but with a different level of finish and equipment. The Coronet was the basic model and the Custom Royal the most deluxe. Dodge sold them with different two or four-door bodywork.

Virgil Exner was responsible for the striking redesign in 1955, the year when the station wagon bodywork with four side doors first appeared, named the Sierra regardless of which model it was. Sierra bodywork was very elegant, with large fins (especially from 1957 onwards). At the back the tailgate folded down (like in a pick-up) once the small window in it was concealed. This made it possible to either gain access to the boot or to a third row of double seats, designed for children. These were set facing backwards and made it possible to increase the number of authorised seats from six to eight. These cars were fitted with V8 engines of between 5.2 and 6.4 litres, with four-speed manual or automatic gearboxes.



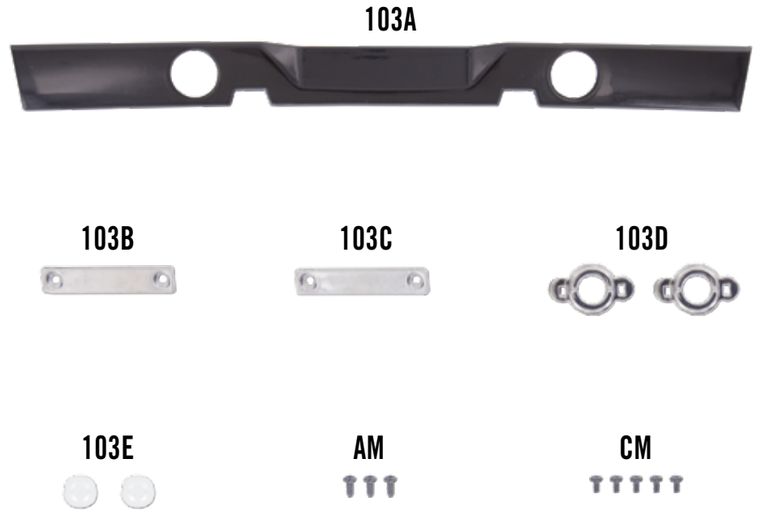
A third row of seats for children was available in the back.



THE REVERSE LIGHTS AND THE REAR VALENCE

In this assembly session you will take be working on the rear section of the car body, attaching the rear valence and installing the reverse lights. Follow our instructions carefully.

PIECES FOR THIS STAGE



103A Rear valence
103B Left reverse light
103C Right reverse light
103D Reverse light trims (× 2)
103E Reverse light lenses (× 2)
AM Screws 2 × 4mm (× 3)*
CM Screws 1.7 × 3mm (× 5)*

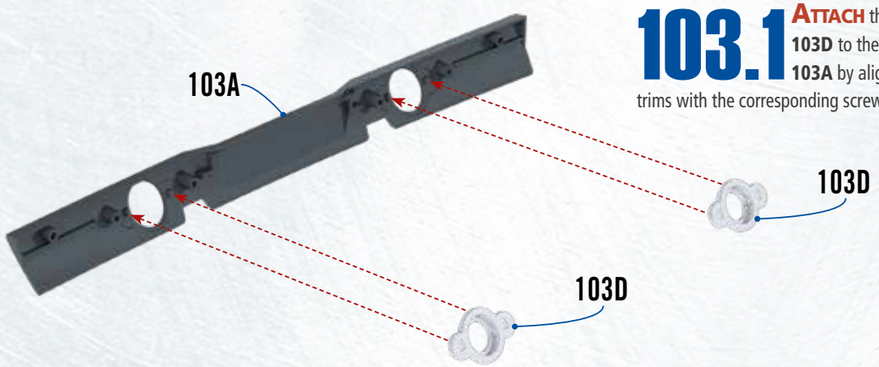
* Some of the parts are spares.

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.

ASSEMBLY AREA

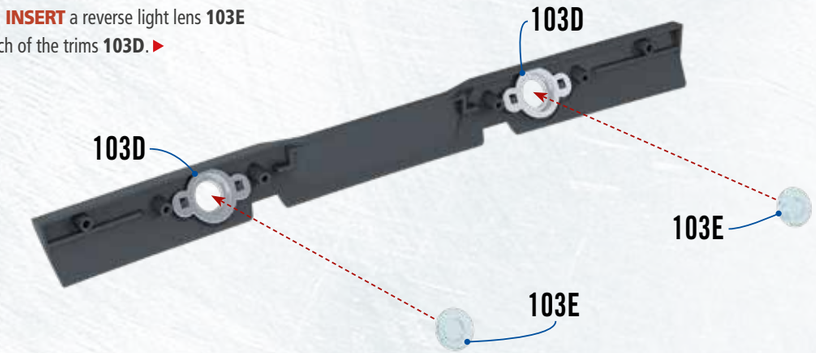


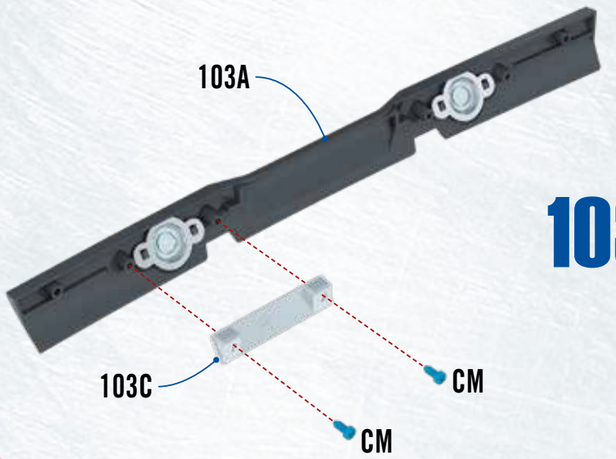
The reverse lights and the rear valence



103.1 **ATTACH** the two reverse light trims **103D** to the inside of the rear valence **103A** by aligning the two holes in the trims with the corresponding screw posts. ◄

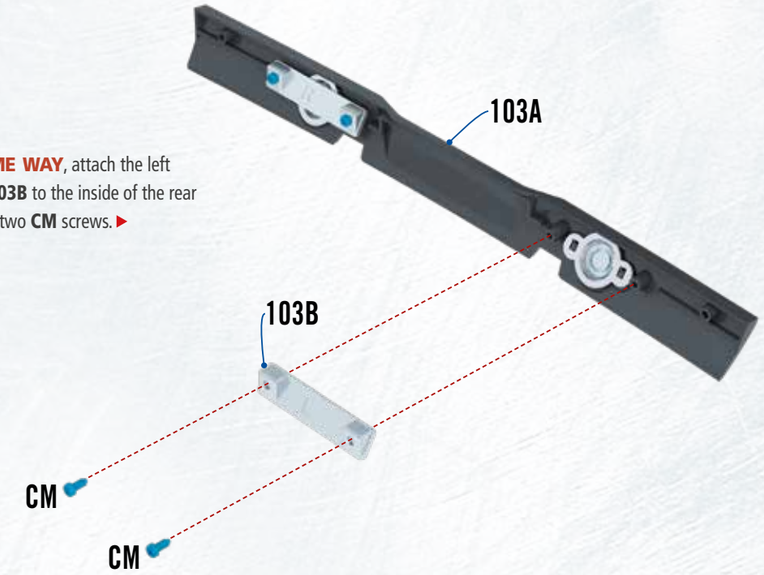
103.2 **NOW INSERT** a reverse light lens **103E** into each of the trims **103D**. ►

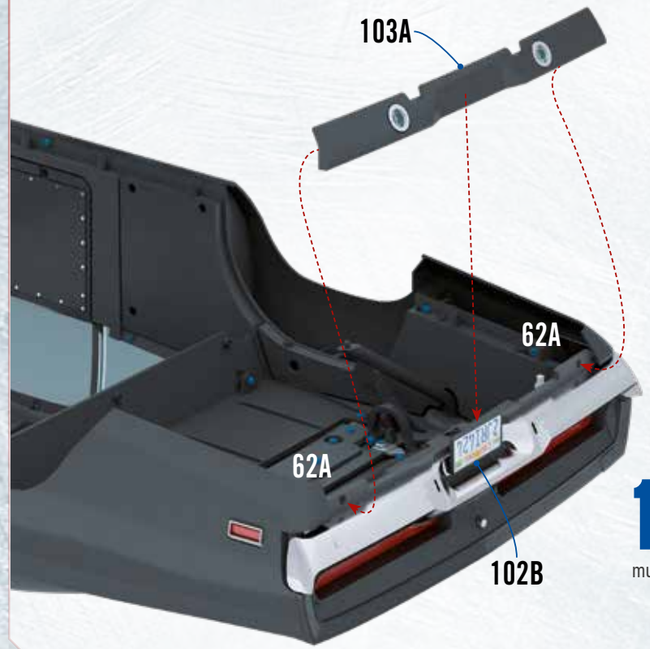




103.3 **ATTACH** the right reverse light **103C** using the two small screw posts on the right side of the rear valence **103A**. Secure with two **CM** screws. ◄

103.4 **IN THE SAME WAY**, attach the left reverse light **103B** to the inside of the rear valence, using two **CM** screws. ►

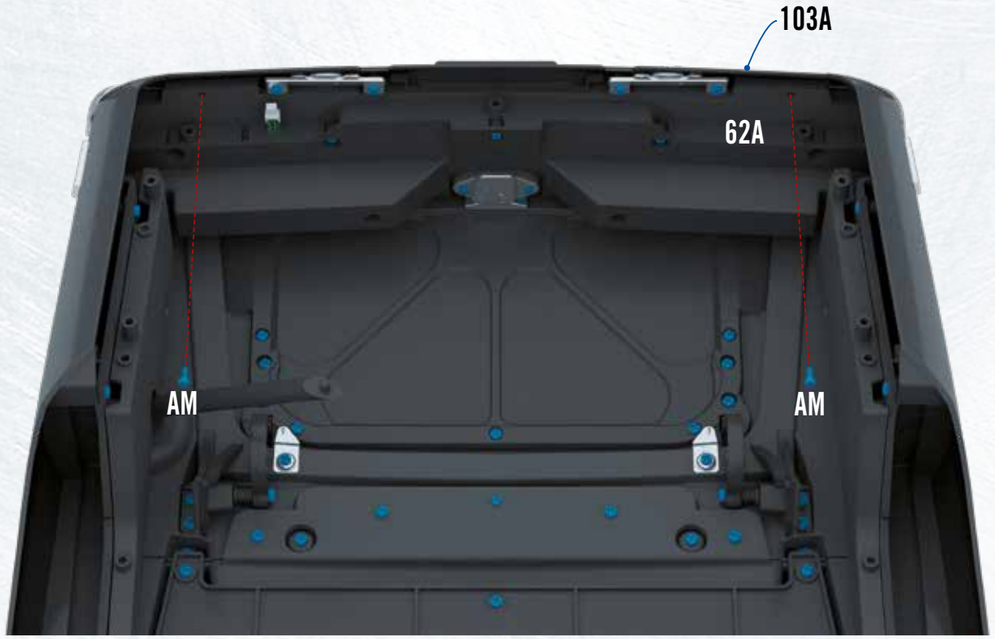






103.5 **TURN** the car body over and attach the rear valence **103A** to the rear section of the body. The central part of the valence must be between the car body and the rear number plate **102B**. ◄

103.6 **SECURE** the valence by inserting and fully tightening two **AM** screws in the holes indicated in the illustration. ▼

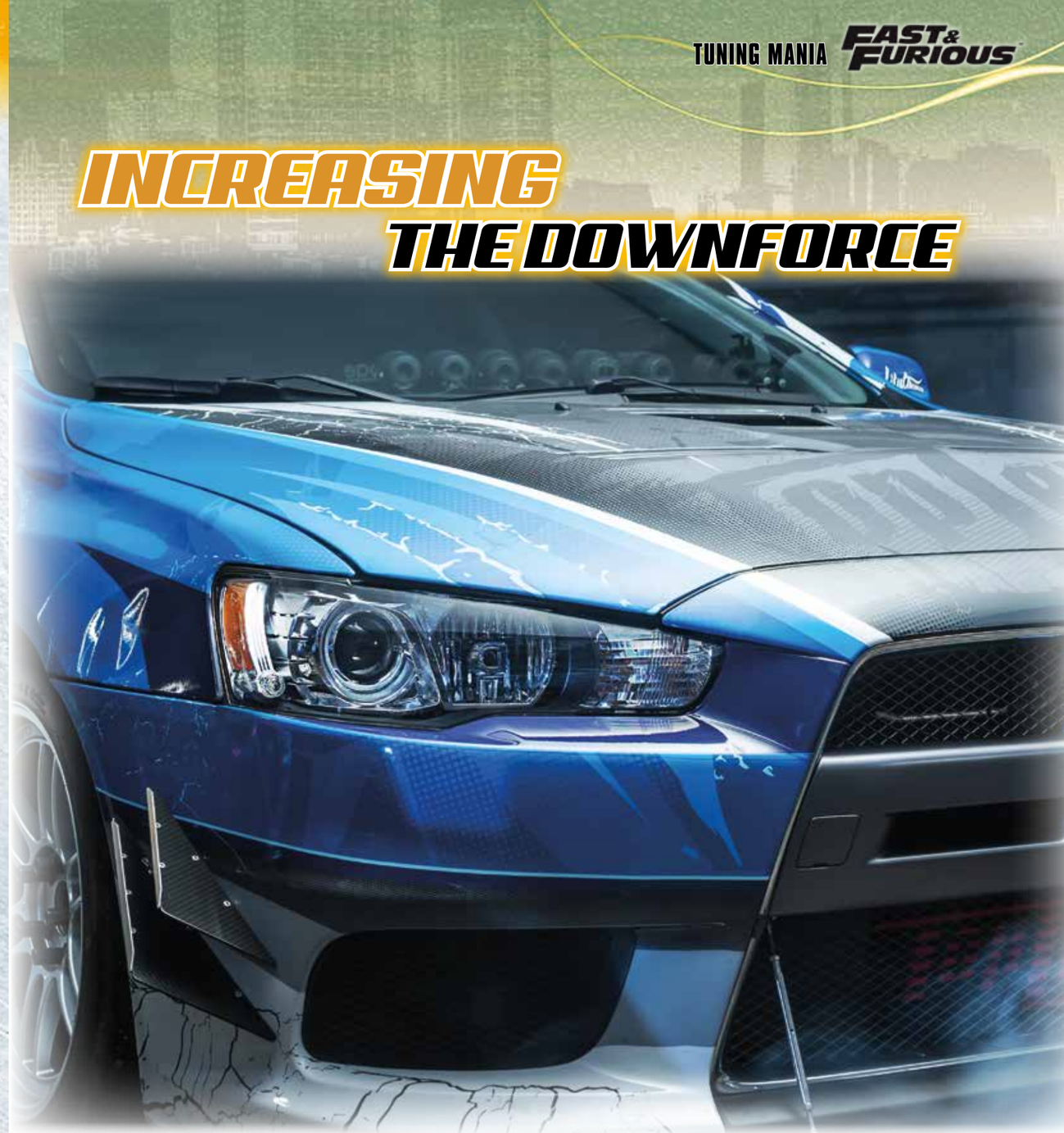


RESULTS OF STAGE 103

You have now attached the rear valence and the reverse lights to the body of your model car.



INCREASING THE DOWNFORCE



In addition to wings and splitters, in a car designed for the track there are other aerodynamic components such as canards installed on the front bumper or a diffuser integrated into the rear bumper. These are fundamental elements designed to increase downforce and grip when cornering. In this edition, we shall look at the details.

Begin with the premise that slow and very turbulent air moves around the rear of a car. With the car in motion, the airflow generated by the bodywork inevitably ends up colliding with itself, creating unwanted turbulence that interrupts the airflow and increases the drag. The greater the difference in air velocity, the greater the turbulence that will be generated.

For this reason, engineers developed an effective solution to the problem of achieving smooth airflow under a racing car: the air extractor, commonly known as the diffuser in motor racing parlance. It is a specially shaped part that is integrated into the rear bumper. It has an upward inclination and a series of vertical fins perpendicular to the ground. The diffuser reduces turbulence and increases downforce.

HOW DOES IT WORK?

In reality, the diffuser alone cannot actually create downforce; its effectiveness depends on the fact that it works in synergy with other aerodynamic components. Its special shape, with the rear part inclined upwards at an acute angle to the ground, makes the rapidly moving underbody air expand and slow down. As the air becomes slower, turbulence at the rear is reduced. The vertical fins on the sides and along the surface allow the airflow to be channelled, thus avoiding turbulence under the car.

As a general guideline, the rear diffuser must be tilted upwards by at least 10 degrees. For a rear diffuser to be effective, the air travelling under the car from the front must be as fast and linear as possible. Turbulent, slow air will not help a diffuser do its job. To obtain the type of air that the diffuser needs, theoretically the car should have a flat underbody, covering most of the uneven surfaces and components present under the car. However, road cars rarely have a perfectly flat underbody, and the same can be said for many super sports cars.

WHAT ARE CANARDS?

You may have seen canards on the bumpers of DTM Touring cars. Also known as dive plates, they are small triangular fins (usually in carbon fibre) that perform a double function: they generate a small downforce at the front to improve manoeuvrability and limit turbulence towards the underbody. First, the canard redirects the oncoming air's momentum upwards, which causes a downward force on the canard. Because of their small surface area, canards cannot generate a significant amount of downforce; instead, they must be considered as tools to fine-tune small details of the aerodynamic balance.

In addition, canards, together with vortex generators, generate strong vortices that travel down the sides of the car and act as a barrier. If the canards are positioned correctly, these strong vortices act to keep high-pressure air around the car from entering the low-pressure underbody region, thus maintaining more downforce. If air were allowed to enter the underside, the pressure would inevitably rise, reducing downforce. Therefore, these



The rear diffuser has the task of slowing down the air exiting the underbody and avoiding the formation of turbulence at the rear. Ideally, it should have an inclination of 10 degrees.

strong vortices act as a virtual curtain or dam, restricting higher-pressure air around the car's sides from entering the underbody region. Vortices are created when pressure differences are created at the wing tip. As high pressure builds above the wing, low pressure is created beneath and near ambient pressure to the side of the end plate. When these three flows meet, the higher-pressure flow naturally moves towards the low-pressure areas. This sets up a tumbling motion, and a spiralling flow structure is created. The greater the pressure differential, the greater the vortex created. However, these vortices must not adversely affect the operation of the rear wing by generating too much turbulence: this is why CFD (Computational Fluid Dynamics) is essential in the study of the aerodynamic components of a car.

THE SECRETS OF CFD

Computational Fluid Dynamics (CFD) is a method that uses numerical analysis and specific computer algorithms to solve and analyse fluid dynamics problems. CFD was first used in the 1960s in the aerospace industry. NASA, Boeing and Lockheed developed their own CFD software to perform the necessary analyses for their projects. With the introduction of ever-more powerful computers, CFD has been implemented in various industrial sectors. As a result, the transition to motorsport evolved quickly. Nowadays, it is a fundamental tool for the design of racing cars.

Of course, production cars have also been able to take advantage of this system for the aerodynamic design of their bodywork. When using a wind tunnel, experiments are performed by blowing air over a real object in a controlled environment and measuring in real-time the aerodynamic forces that occur.

Using CFD, the same experiment can instead be conducted in the form of a computer simulation, allowing engineers to quickly vary the parameters on the virtual model repeatedly, with a net saving on costs and time. Thanks to the continuous evolution of the computer industry and the arrival on the market of increasingly powerful microprocessors, engineers are able to perform complex calculations in a matter of seconds.

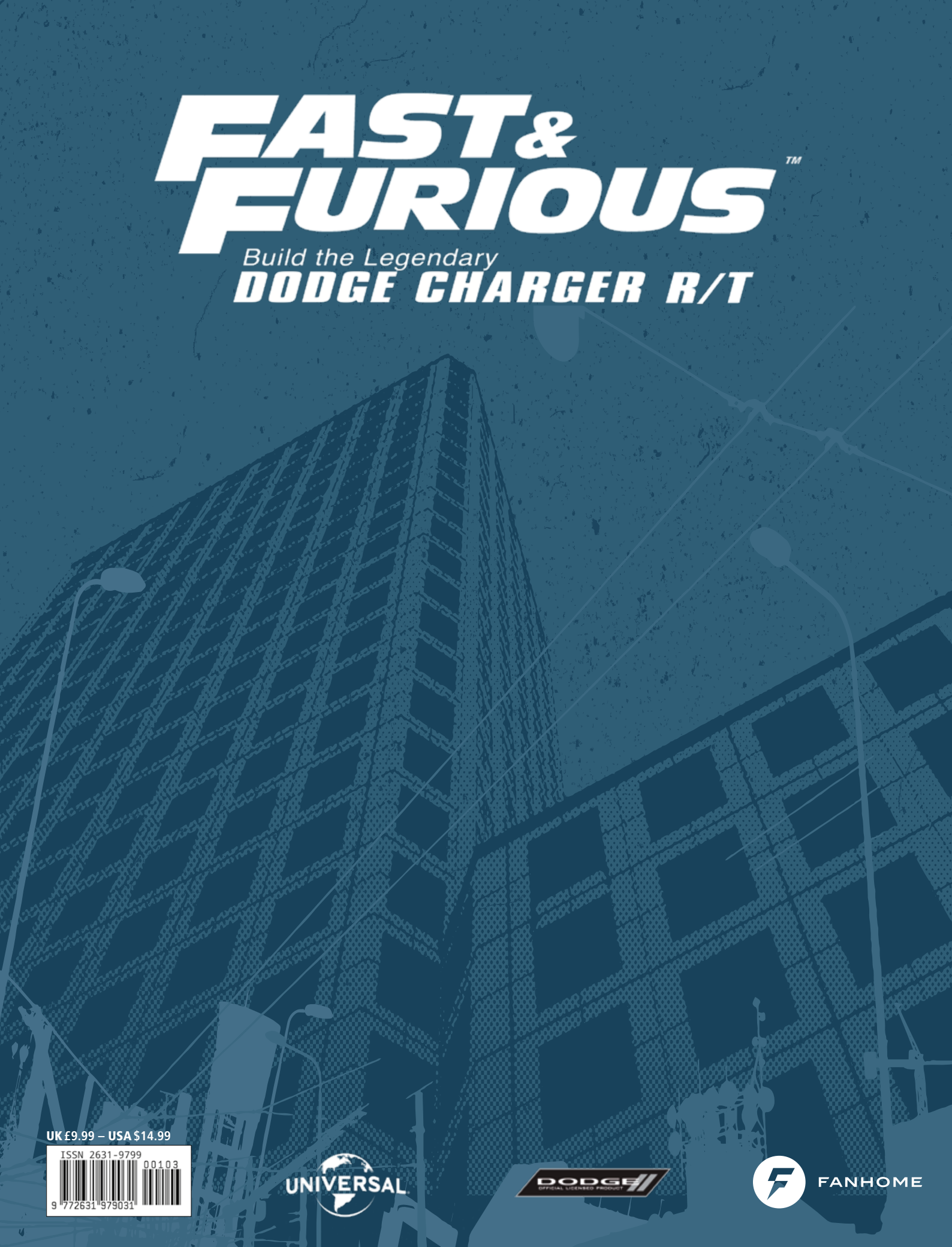
However, CFD is not infallible. There are many factors that can influence the accuracy of CFD simulations, including the degree of accuracy of the mathematical models used, the limitations of the computing power and the ability to interpret the data generated by the computer.

The wind tunnel is a structure used to study the interaction between solid bodies and air currents. Inside, the interaction is simulated by producing high-speed airflows over the model being tested. The model is fastened in place within the test area of the tunnel so that the lift and drag forces on it can be obtained by measuring the stresses on the fastening structure.



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