FAST & FURIOUS™

97

Build the Legendary

DODGE CHARGER R/T



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DODGE CHARGER R/T



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IT'S SOMETHING PERSONAL

Fans demonstrated their unconditional love for the *Fast & Furious* franchise once again when the seventh movie was released – it became one of the biggest box-office smashes of all time. Determined not to let the fans down, the production team prepared to give their all in *Fate of the Furious*.

With the heroes of the series we had shared many incredible experiences, like jumping from a plane or a skyscraper in a car. However, at the core of the franchise is one guiding principle that never changes: the family. But what would happen if one day the cornerstone of that family seemed to turn against them? That was the explosive approach that screenwriter Chris Morgan took for the eighth movie in the *Fast & Furious* franchise.

TORETTO'S DARK SIDE

After the thrilling adventures they've had, Toretto and his group seem to have taken a well-earned break. Dom and Letty are still enjoying the races, Brian and Mia have settled down to bring up their children, and the rest are enjoying their new freedom. But the calm doesn't last long. An enigmatic woman crosses Dom's path. She is Cipher, the most dangerous cyber-terrorist in the world, and she begins to manipulate him.

After the enormous success they achieved with the seventh episode of the saga, the production team for *Fast & Furious 8* wanted to surprise the audience by showing Dominic Toretto's dark side.

"In actual fact, *Fate of the Furious* is about the consequences of one hugely important moment that changes everything you believe in," says the scriptwriter Chris Morgan. "What happens when the patriarch, the man who staunchly defends the family, turns his back on them? What happens if he goes over to the other side? How can a family rise up against a brother? It was a single, rather terrifying theme. The dramatic quality is tremendous and it gave us the reason we were looking for to carry on."

From the beaches of Cuba to the streets of New York, the team again joins forces in a desperate attempt to stop some anarchists who are attempting to plunge the world into chaos, and, above all, to bring the man who made them a real family back to his senses. This is not just another mission: it's something personal.

GOOD GUYS AND BAD GUYS

Of course, Letty, Tej and Roman return to lead the team, trying to understand Dom's strange attitude. But they are not alone. Old acquaintances like DSS agent Hobbs, the intrepid hacker Ramsey, the ever-surprising Mr. Nobody, and even the cold implacable Deckard Shaw join the cause. Characters that in previous movies were adversaries have now become allies, a hallmark of the franchise.

"It always amazes me that we are able to develop and maintain that hazy line between good and bad in the series," says producer Neal H. Moritz. "All the characters, old or new, have chosen different paths. We never begin a movie with preconceived ideas about what they should do or what they should be like, and this is why they grow organically in each new movie. It gives us great satisfaction to discover the number of places they can go. And this is part of what the fans like: they love the characters, but they never really know how they are going to react."

A CHALLENGE FOR NEWCOMERS

The familiar stars of the franchise were joined by many well-known faces in the cast of *Fate of the Furious*. Two extraordinary actresses, Charlize Theron and Helen Mirren, joined to play, respectively, the enigmatic Cipher and the surprising Magdalene Shaw. Likewise, Scott Eastwood, the son of the famous actor and director Clint Eastwood, took on the role of Little Nobody, Mr. Nobody's likeable assistant.

There were some important changes behind the cameras too, especially F. Gary Gray, who joined the franchise to direct this new film, a big responsibility for any director.

"An artist will always go further when he is presented with a challenge, and this movie represented a big challenge for me. From the start I wanted to bring something new to the series," Gray says, before referring to what fascinated him the most about the project. "Dom Toretto has always defended the concept of the family, but in this case he does exactly the opposite of what is expected. Not only did I want to be part of a story that was completely different to the previous ones, but also of performances never before seen from Vin Diesel and the rest of the cast. The fact that Dom is pitted against his family allows us to explore totally different emotions."

ACTION APLENTY

Despite so many new developments, the makers of the series did not forget two essential elements of the franchise: action and speed. The action was taken care of by large team of stunt performers, who made it possible to shoot some high-risk scenes live and direct. The speed was once again placed in the capable hands of Dennis McCarthy, the franchise's vehicle guru since *The Fast and the Furious: Tokyo Drift*.

Once again, McCarthy and his crew worked non-stop to surprise the audience with ideas as exciting as the Dodge "Ice" Charger that Dom Toretto drives over ice and snow, to unforgettable classics, like the 1956 Ford Fairlane. Moreover, on this occasion, McCarthy had to prepare the vehicles so that they would deliver their full potential in extreme locations like Cuba or Iceland, where some of the most explosive scenes in movie were filmed. Filming in Iceland was really tough due to the severe weather conditions. On the contrary, the weather could not have been more pleasant in Cuba, although McCarthy found it very complicated due to the difficulty of getting spare parts. "It was impossible to get hold of anything there," the vehicle coordinator recalls. "We took all kinds of stuff to Cuba, from a crane truck to a huge amount of spares and replacements, absolutely everything."

In its desire to surprise the followers of the franchise and offer something "even more difficult", the crew of *Fate of the Furious* agreed to give greater prominence to digital technology this time, as it was essential to resort to computer generated visual effects to obtain scenes as amazing as vehicles raining down on the streets of New York, and others, no less electrifying, that would make this movie a new beginning, a chapter that would mark the start of a new direction for the franchise.

F. GARY GRAY

Hollywood unanimously describes him as a truly versatile director, capable of overcoming any challenge, the man responsible for the discovery of many new talented actors. Born in New York City on 17th July, 1969, Felix Gary Gray began to get noticed for his work as a director of music videos for artists as important as Ice Cube, Whitney Houston, Will Smith and Babyface. The winner in 1995 of the MTV Music Video Awards for his video *Waterfalls*, for the girl group TLC, he crossed over to the cinema that same year with the comedy *Friday*. His debut in the thriller genre with *The Negotiator* (1998) received very good reviews, although his true acknowledgement came in 2003 with the release of two massive box-office hits, *A Man Apart*, starring Vin Diesel, and *The Italian Job*, a remake of the classic bank heist film, now starring Charlize Theron. Gray surprisingly rang the changes again, paying his personal tribute to Hip Hop culture with *Straight Outta Compton* (2015). Now on a roll, he felt ready to take the helm of *Fate of the Furious* and achieve one of the most explosive movies in the series. After that, and in equally spectacular fashion, he swapped franchises to direct *Men in Black: International* (2019).



In the eighth edition of the franchise, there was once more an astonishing collection of incredible vehicles. Shown here is the Dodge "Ice" Charger that Toretto used in the snows of Iceland.



DODGE DURANGO SRT

In recent years the Dodge Durango SUV, a family vehicle available with V6 and V8 engines, has been joined by sports versions, designed by the Chrysler Group, which thanks to their power and excellent performance have proved themselves worthy of bearing the legendary initials SRT.

The Dodge Durango SRT Hellcat, with its 720hp engine, is the most powerful petrol-driven sports SUV in the world.

The proliferation of high-performance SUVs, developed above all by German brands, with a notable presence on the American luxury car market, led the Chrysler Group to develop versions of the Dodge Durango capable of confronting this growing competition. And so, in 2018 it launched the first version of the Dodge Durango SRT. Its 6.4-litre HEMI® V8 engine, delivering 637Nm of torque, notably achieved 482hp. This model offered features that were far superior to those of the Dodge Durango R/T, the version with the highest performance in the range from 2011 onwards, capable of developing 360hp.

The brand, however, decided to go one step farther. As with its ranges of saloon and sports cars, from 2021 it will have the most powerful SUV in the world fitted with a gasoline engine: the Dodge Durango SRT Hellcat. This version will have beneath the bonnet a 6.2-litre V8 HEMI® engine with a screw compressor, giving 720hp. This will make its performance truly impressive: acceleration from 0 to 100km/h in 3.6 seconds, even though it weighs over two tons, and a top speed of 290km/h. Suspension, brakes and steering have all been adapted to handle this power, transmitted to the road via an 8-speed automatic gearbox.



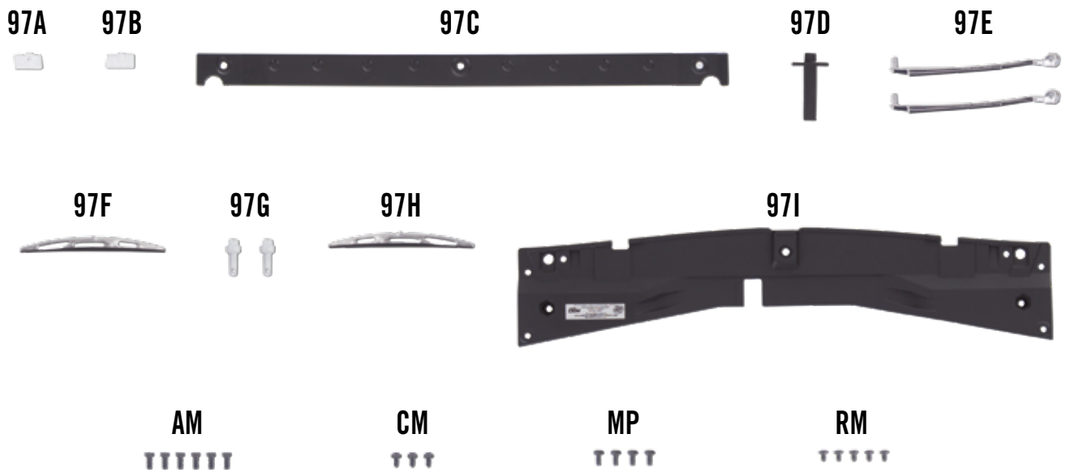
The Dodge Durango SRT joins the Dodge Charger (right) and the Dodge Challenger (left) in the brand's high-performance range.



THE FRONT WINDSCREEN WIPERS

In this assembly session you will be working on the bonnet. Please follow our instructions and the explanatory illustrations very carefully.

PIECES FOR THIS STAGE



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.

97A Front left indicator
97B Front right indicator
97C Bonnet reinforcement crossmember
97D Bonnet lock hook
97E Windscreen wiper arms (× 2)
97F Left windscreen wiper blade
97G Bonnet safety latches (× 2)
97H Right windscreen wiper blade
97I Front panel engine housing
AM Screws 2 × 4mm (× 6)*
CM Screws 2 × 4mm (× 3)*
MP Screws 1.7 × 3.5mm (× 4)*
RM Screws 1.7 × 3mm (× 5)*

* Some of the parts are spares.

ASSEMBLY AREA

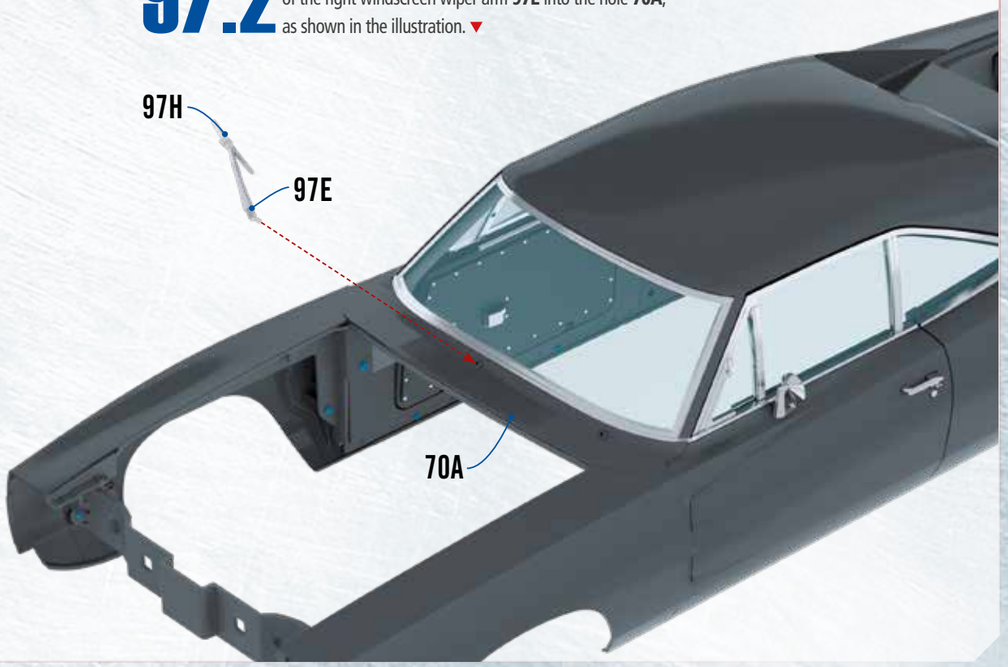


FRONT WINDSCREEN

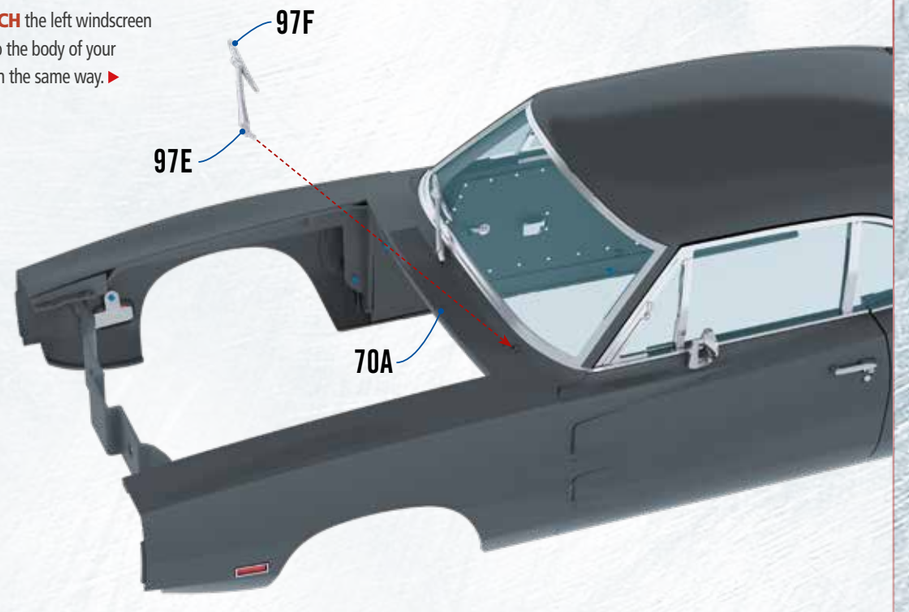


97.1 **ATTACH** the two windscreen wiper arms **97E** to the two blades **97H** and **97F**. The blades have two pins which must be inserted into the holes in the ends of the arms. ◀

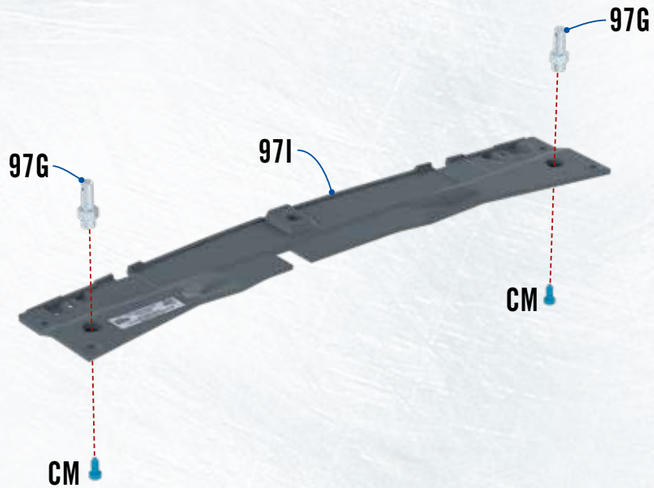
97.2 **CAREFULLY INSERT** the pin on the free end of the right windscreen wiper arm **97E** into the hole **70A**, as shown in the illustration. ▼



97.3 **ATTACH** the left windscreen wiper to the body of your model in the same way. ▶

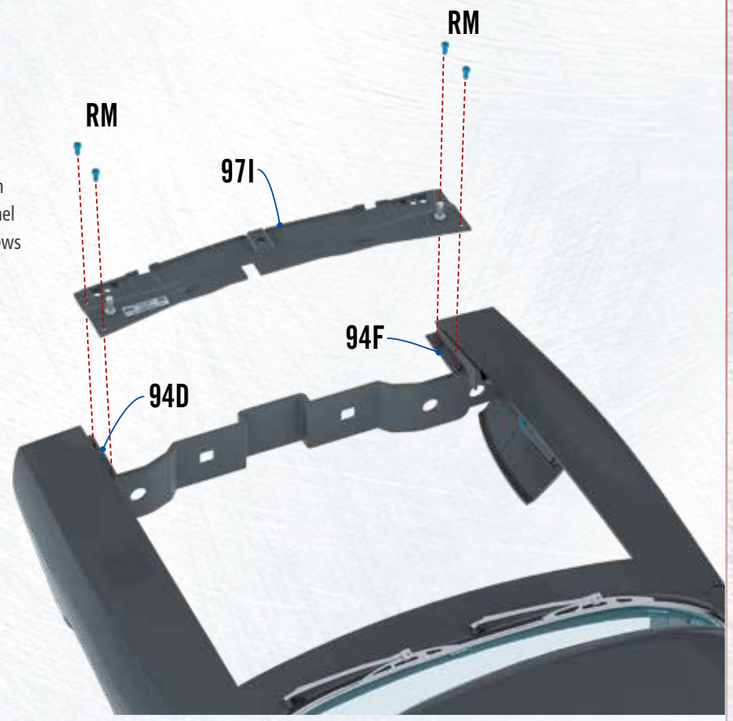


97.4 **INSERT** the two safety latches **97G** into the hexagonal holes at either end of the front panel of the engine housing **97I**. Secure the two components in question with two **CM** screws. ▼



The front windscreen wipers

97.5 **Position** the front panel of the engine housing **97I** as shown in the illustration. Secure the panel with four **RM** screws. Keep the components and screws you haven't used in a safe place. You will need them in the next assembly session. ▶



RESULTS OF STAGE 97



This is the result of this interesting assembly session. Put everything you have built so far in a safe place, ready for the following assembly sessions.

INLET AND EXHAUST VALVES



Valves play a fundamental role inside the engine. They are subjected to enormous stresses and perform an essential task, as well as being a factor in determining performance. In this edition, we shall see how they are made and how they work.

We all understand the operation of the engine in its various phases, just as we are aware that the valves control the flow of the gases entering and leaving the cylinders by opening and closing at the right moments in the cycle. In two-valve cylinders, both valves are fully closed during the compression and expansion phases, after which the exhaust valve opens to allow the exhaust gases to escape. We then move on to the



To protect the peripheral area of the head of the valve from wear and corrosion, a coating of a highly resistant cobalt-chromium alloy, known as "Stellite", is often used. Similarly, the end of the stem must also be hardened or protected.

following phase, during which the inlet (or intake) valve opens, with the exhaust valve remaining closed. The new air-petrol mixture enters the cylinder, sucked in by the vacuum that the piston creates by moving downwards from top dead centre to bottom dead centre. This movement of the valves is controlled by the profile of the camshaft lifters. Very often there are two, one for the inlet valve and the other for the exhaust. When they are not being opened by the camshaft lifters, springs hold them in the closed position. Initially, they may seem like insignificant components, given their simple shape. However, behind their appearance there is much more to learn about them.

Consider the fact that in an engine running at 6,000rpm, each valve opens and closes fifty times per second! Multiply that by the thousands of kilometres - 250,000km is a reasonable engine lifespan these days - and then add the fact that they must be one hundred per cent reliable. By doing a simple calculation, you will quickly realise that at an average rotation of 3,000rpm and mileage of 200,000km, each valve will have opened and closed almost 6 million times.

In the world of motor racing, the numbers triple. In a Formula 1 engine, every valve opens and closes more than 130 times per second.

EXTREME STRESSES

The valves must be durable as well as achieving a perfect seal against the valve seat, even under the most severe working conditions. In high-performance petrol engines, they need to function with pressure peaks of over 80 bar. In simple terms, if a valve has a 36mm diameter face, a force of 800kg will act on it during combustion. In diesel engines, the force can even exceed 1,500kg because the maximum combustion pressures exceed 150 bar.

The valves are also stressed by the enormous acceleration they undergo during the very fast opening and closing phases. Exhaust valves suffer more than inlet valves. They are exposed to greater temperatures because the hot exhaust gases flow around and behind them.

They are constantly in close contact with hot, corrosive exhaust gases and so are made from extra durable, heat and corrosion-resistant materials. Most of the heat is transferred to the valve seat when the valve closes. In tuned engines, temperatures of over 800°C are often reached, and therefore the valves must be made with materials capable of maintaining adequate mechanical characteristics like tensile strength and hardness while resisting corrosion and deformation under such conditions.

Life is easier for the inlet valves, which are effectively cooled by the fuel mixture entering the cylinder. Their temperature generally does not exceed 400°C.

DIFFERENT MATERIALS

Normally the valves of production cars are obtained by forging, using chromium-molybdenum steel - or chromium-silicon - for the inlet valves, and austenitic steels

(i.e. with more than 8% nickel and a cubic crystalline structure) strongly bonded with chromium and manganese for the exhaust valves. Usually, to save money, a hardened, less expensive steel is used for the stem, and austenitic steel, which is more suitable for working at very high temperatures, is used for the mushroom-shaped head. The two parts are joined by friction welding - the so-called bimetallic valves.

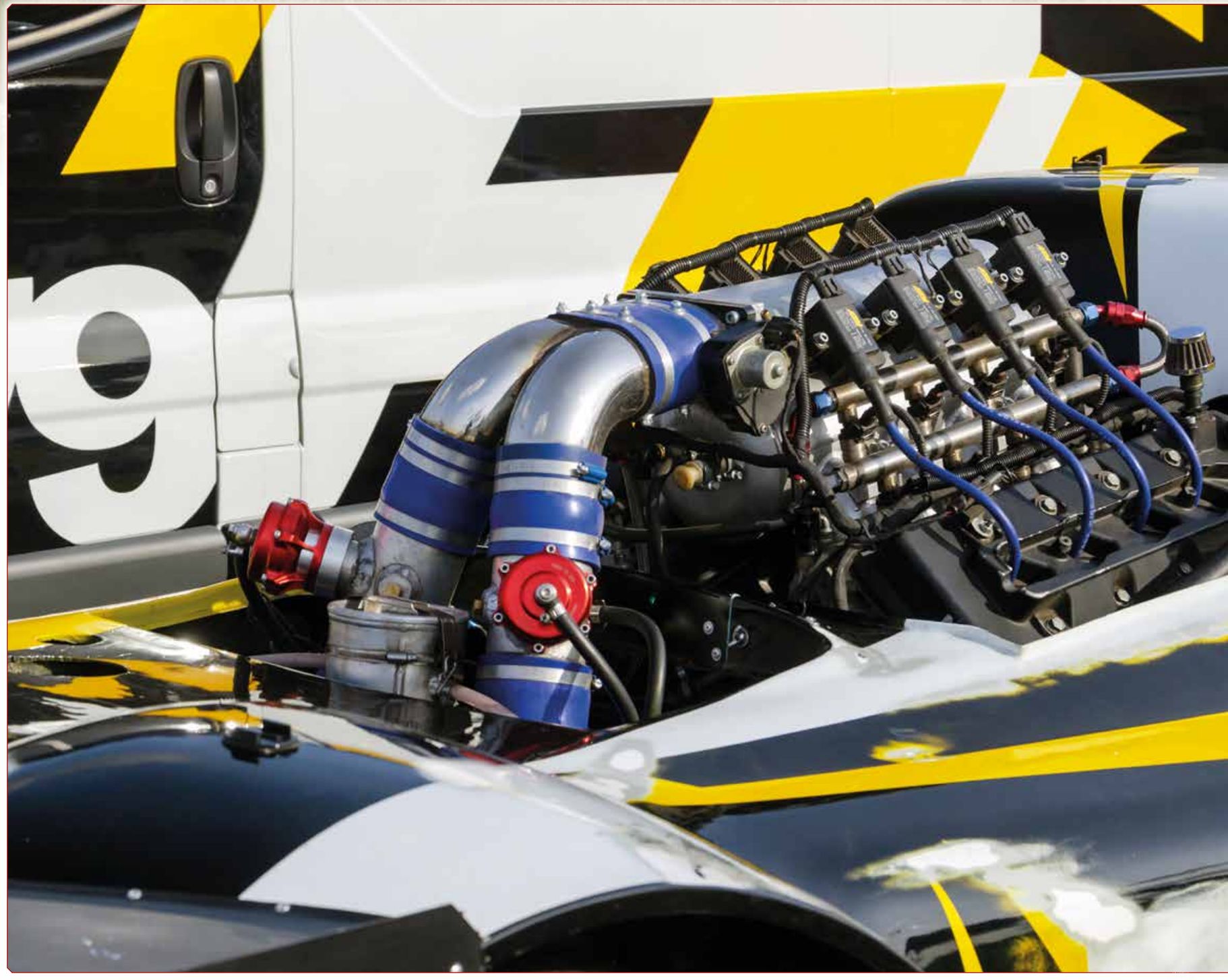
The constant increase in performance of production engines has led to the development of exhaust valves made of nickel-based superalloys with high percentages of chromium, often a considerable amount of cobalt, and practically no iron. The best known of these alloys are INCONEL® and NIMONIC®. Valves made of these alloys offer very high performance and are suitable for racing engines. However, they have two downsides: they are heavy and expensive. The highest-performing valves are those made of titanium alloys. They are used exclusively in racing engines and are super light and extremely expensive.

A NUMBER THAT MAKES A DIFFERENCE

It may seem obvious, but the number of valves per cylinder considerably influences the flow of the gases in the combustion chamber and consequently, the breathing of the engine. A cylinder head with four valves per cylinder has higher "permeability" compared to a two-valve head. In addition, the individual valves are smaller and therefore lighter. An added benefit is that the exhaust systems are less thermally stressed, so there is less risk of deformation.

Theoretically, the ideal shape of the combustion chamber when there are two valves per cylinder is hemispherical. In four-valve heads, a geometric chamber is more efficient, with the spark plug placed in a central position.

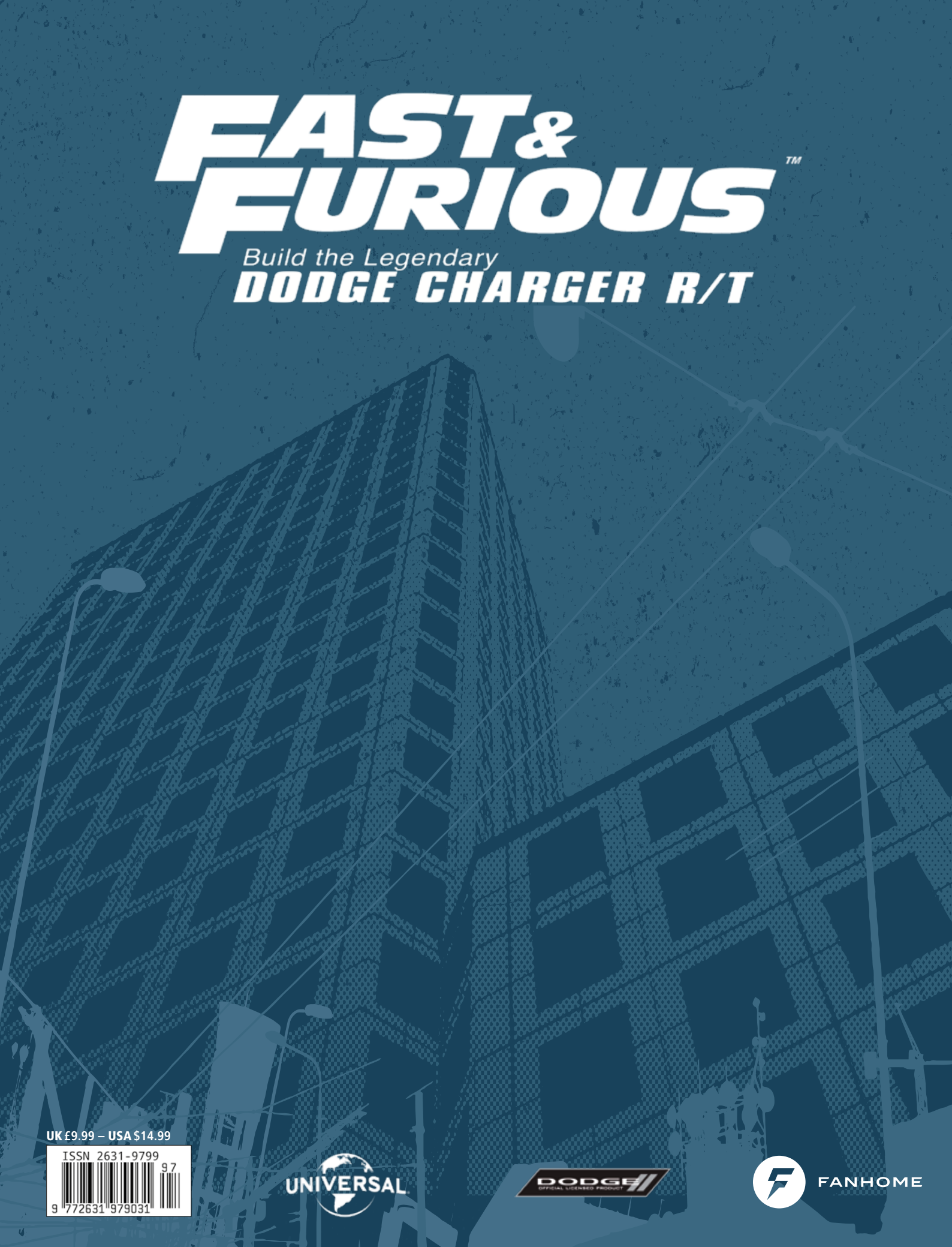
The efficiency of the two chambers is very similar, but the performance changes. Thanks to the larger gas-flow sections and the possibility of higher rotation speeds, engines with four valves per cylinder can achieve a considerably higher power output than two-valve set-ups with the same displacement. There are also engines that use three valves - two for intake and one for exhaust - or even five, with three for intake. In this second case, the passage sections available for fresh intake gases are greater than needed. Compared to four-valve heads, breathing at higher speeds is no better, since the gas flow coming out of the three inlet ducts is too turbulent. As a result, there is no consistent performance advantage. Five-valve heads have been almost universally phased out.



The technology of hollow and sodium-filled exhaust valves is used in motorsport and in high-performance engines. The sodium filling prevents overheating and allows the engine to operate at higher exhaust gas temperatures.

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