FAST & FURIOUS™

77

Build the Legendary DODGE CHARGER R/T



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FAST & FURIOUS

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HAND-TO-HAND FIGHTING

To counterbalance the amazing action scenes in *Fast & Furious 6*, like the frenetic tank chase on a Spanish highway, the director Justin Lin decided to include another kind of sequence, featuring physical combat. This is why, in this movie especially, hand-to-hand fighting between the characters took on a new meaning.

All through his many years of experience at the helm of *Fast & Furious* movies, director Justin Lin was certain that virtually nothing was impossible for Dom Toretto and his team. In fact, when preparations for the sixth film began, the director coined a significant phrase that became very popular with the crew: "Think big or go home". However, as the scenes that were planned for the film got more and more spectacular, they found it necessary to include another kind of scene to keep the action more rooted in reality.

SCENES OF CONTACT

Justin Lin was worried that, with so many explosions and chases, audiences would get the feeling that the heroes of the series were almost invulnerable. More physical contact was needed. The big fight between Toretto and Hobbs in *Fast Five* had caused an absolute sensation among the fans of the franchise, so now was the time to take it even farther.

The director first met with stunt coordinator Greg Powell, used to always preparing scenes that pushed back all the limits. Greg recommended the participation in the movie of fight choreographer Olivier Schneider, who he had met while working on the action thriller *Safe House* (2012). The three of them came to the conclusion that a physical confrontation between Toretto and Shaw would not arouse as much interest among audiences as the one in the previous movie. So, what were they to do? They decided to focus on two different characters: Letty Ortiz and Riley Hicks, choreographing a fight between these two authentic gladiators.

READY TO FIGHT

For Greg Powell and Olivier Schneider the main objective was to surpass the epic clash between Hobbs and Dom in

↑ The fight between Riley Hicks and Letty Ortiz became one of the main attractions in the sixth edition of the *Fast & Furious* saga. The two protagonists prepared diligently and did the fight stunts themselves.

Hand-to-hand fighting



Actor Joe Taslim, a specialist in fast-paced movies like *The Raid* (2011), played the role of Jah.

the previous film. But their task was not just to design this fight, since as many as 16 awesome confrontations were featured in the script, involving almost every member of the cast. With Justin Lin they agreed that these fights would not occur just for the sake of it: every movement had to have a purpose.

"The fight between Dom and Hobbs in *Fast Five* was in a class of its own," says Justin Lin. "But this time I felt that we could go one better by allowing the other characters to have their moment. With this, audiences would be able to see different styles of fighting, all of them very specifically designed."

The whole cast was in fairly good shape and, of course, they showed an absolute readiness to train under Schneider's orders. The fight choreographer gradually adapted himself to everyone's situation in order to give each of them a well-marked personality when it came to fighting.

A DIFFERENT STYLE

Justin Lin and Olivier Schneider agreed that the latter would visit each set where a fight was scheduled. This was not just simple curiosity. He was interested to see the sets in situ and to have the possibility of incorporating small practical elements that might help to make the action easier. For example, placing a railing in the subway corridors to improve an acrobatic kick, or putting a load-bearing strap inside the Antonov airplane to cushion an opponent's blow.

In the meantime, Schneider was working with each of the actors to find a definitive fighting style for each character. With professional fighters like Joe Taslim, Gina Carano and Dwayne Johnson there was not much to do. While maintaining their individual styles, he still challenged them to try new moves.

For all the characters who were supposed to have had military training, from Hobbs to Shaw, the choreographer familiarised them with disciplines that were usual in any army, like Krav Maga, Wing Chun king fu and Kali Eskrima. The group made up of Dom Toretto, Brian, Letty, Roman and Han, on the other hand, were street fighters who do not have such formal training.

THE BIG FIGHT

The first of the fights between Letty Ortiz and Riley Hicks was filmed in the heart of London, in Aldwych underground station, now disused. Although the plan was for the most controversial moments in the fight to be filmed using stunt performers, Olivier choreographed each and every detail of the fight with Michelle Rodriguez and Gina Carano. When both stars turned up on set, something unusual happened.

"For Gina and Michelle to turn up, and their doubles to be told to take the day off because they're going to try to do it all by themselves, is clear evidence of how hard they work," says Justin Lin. "That makes everything worthwhile."

Both actresses prepared diligently to do the scene. The actress who plays Letty found the perfect way to approach it, knowing that she would be facing a highly experienced

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OLIVIER SCHNEIDER

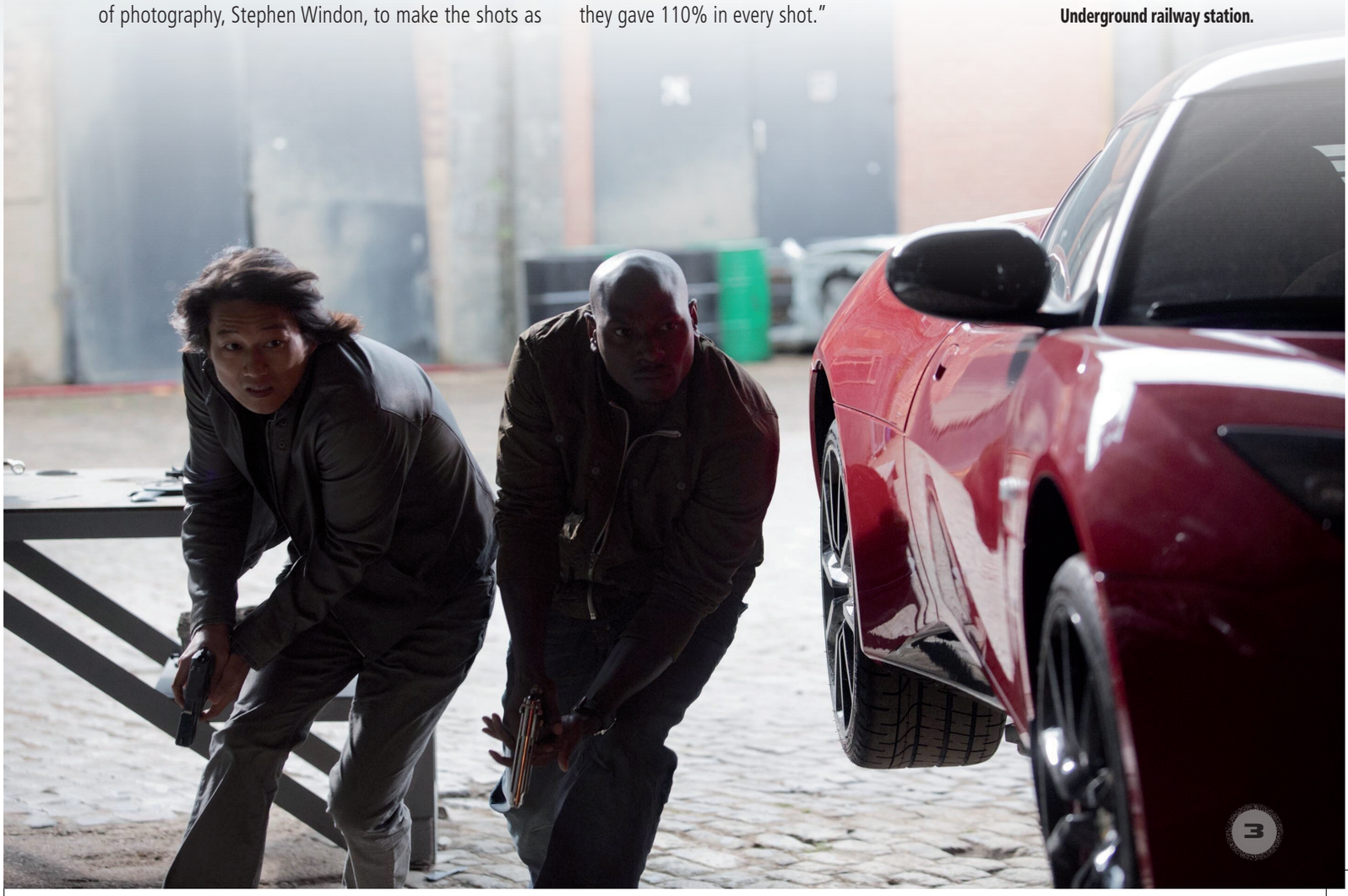
Born in France, Olivier began his career as a stunt performer in movies like *Brotherhood of the Wolf* (2001), *The Musketeer* (2001), and *The Transporter* (2002). Then, in 2008 director Pierre Morel put him in charge of choreographing the action scenes in the movie *Taken*, starring Liam Neeson. The spectacular results led him on to other interesting projects, like the prison drama *A Prophet* (2009), the thriller *Safe House* (2012), and the spectacular sixth movie in the *Fast & Furious* franchise. Having gained international recognition in the industry, he would go on to direct the second unit of *Child 44* (2015), before once again coordinating the stunt performers in two ambitious French films, *The Sisters Brothers* (2018) and *The Emperor of Paris* (2018). He has also gone on to take charge of coordinating the frenetic fights in the two most recent James Bond movies, *Spectre* (2015) and *No Time to Die* (2020).

opponent. While Riley is a woman with military discipline who masters the techniques of fighting, Letty is a woman in crisis who is fighting to survive. And that is what would enable her to connect with the audience.

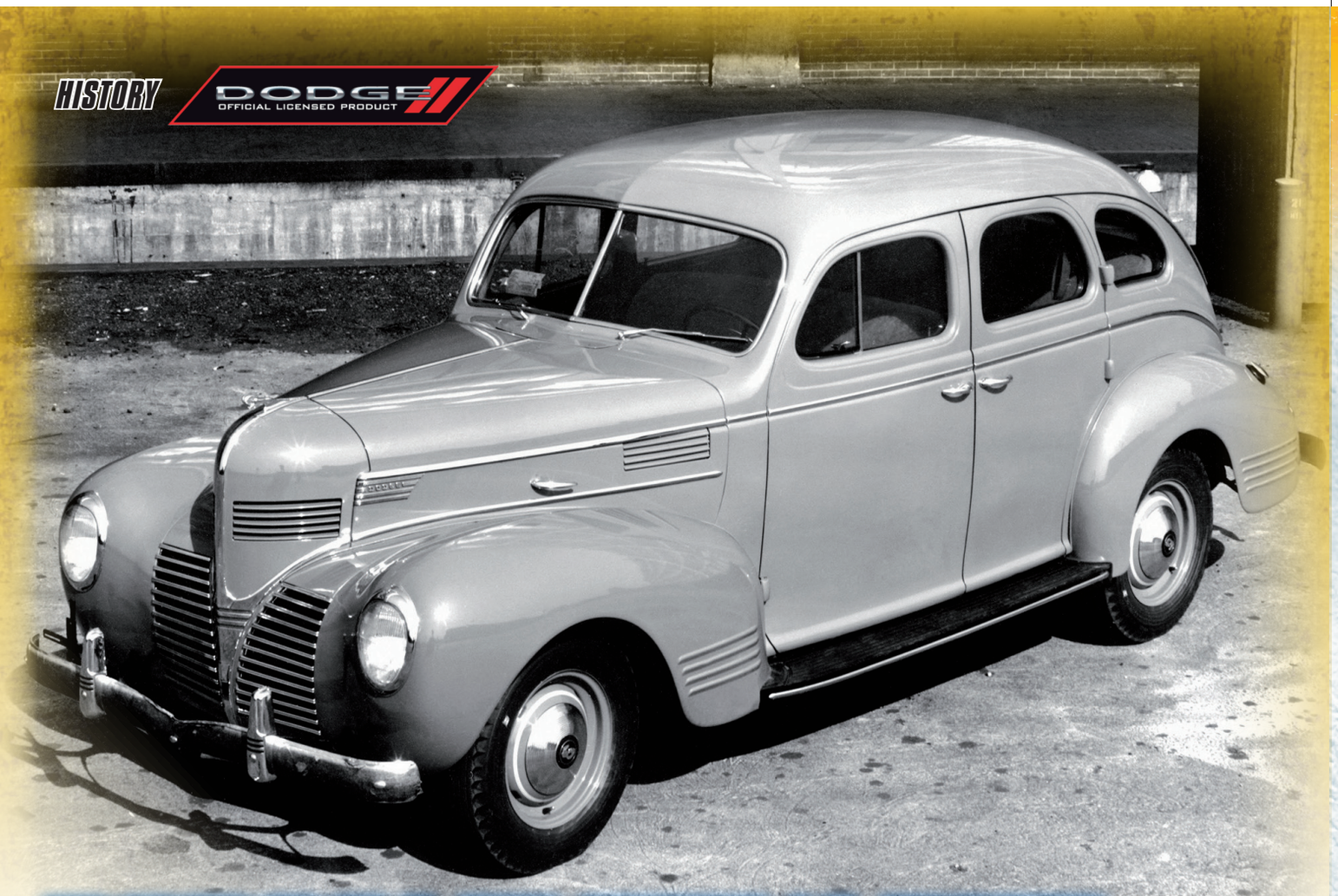
Apart from this exciting fight, another stunning fight was shot in the corridors of Waterloo underground station. Olivier Schneider and Justin Lin agreed with the director of photography, Stephen Windon, to make the shots as wide as possible so that the audience could see every detail of the fight. As many as four cameras were used to film it simultaneously.

"The actors' energy was awesome," Justin Lin concludes. "I didn't have to worry that the characters' faces would not be seen during the fight because they decided to do it all themselves, without the need for doubles. And they gave 110% in every shot."

Han and Roman were also caught up in the breakneck action scenes, like the incredible fight that was filmed in the corridors of London's Waterloo Underground railway station.



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DODGE LUXURY LINER SERIES D

The Dodge brand's Series D cars, named Luxury Liner and which first appeared in 1935, underwent a notable change in 1939, especially in the look. This change prepared these models to face the challenge of ensuring continuity between production prior to World War II and when it was resumed after the end of the war.

A 1939 Dodge D19 with a deluxe finish and four-door saloon bodywork with six side windows.

In 1939 the Chrysler Corporation's models changed completely. Although it may seem minor, that transformation completely altered the appearance of these cars and paved the way for their subsequent stylistic development. In that year, the lights went from being attached to both sides of the front (as remembered in the Citroën 2 CV) to being integrated in the front wings in quite a low position. This change made it possible to enlarge the wings and refine the radiator grille, little by little integrating all these features in a horizontal line.



The same Dodge D19 model, but in its 1948 version, with more integrated wings and a new front grille.

Dodge vehicles, despite sharing many of their mechanical features with other Chrysler models, retained their personality thanks to a specific grille of horizontal lines that included the wings, a wheelbase longer than that of the Plymouth models, and an engine, prepared by the brand's technicians, with six cylinders in line delivering 87hp. A two-door saloon, another with four doors, a family car, a coupé and a convertible were offered on the same chassis, all with the same engine and two levels of finish. The front of the Series D was modified each year. Production ceased in 1942 because of the war and was resumed in 1945, after it was over.

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ASSEMBLING THE FUEL CAP

In this assembly session you will be working on the fuel cap. Please follow our instructions and the accompanying illustrations very carefully.

PIECES FOR THIS STAGE

77A



77B



77C



77D



77E



77F



RP



77A Rear left parking light mount plate
77B Rear left parking light frame
77C Rear left parking light lens
77D Fuel cap
77E Fuel cap base
77F Fuel cap ring
RP Screws 1.2 x 5 mm (x 2)*

* 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

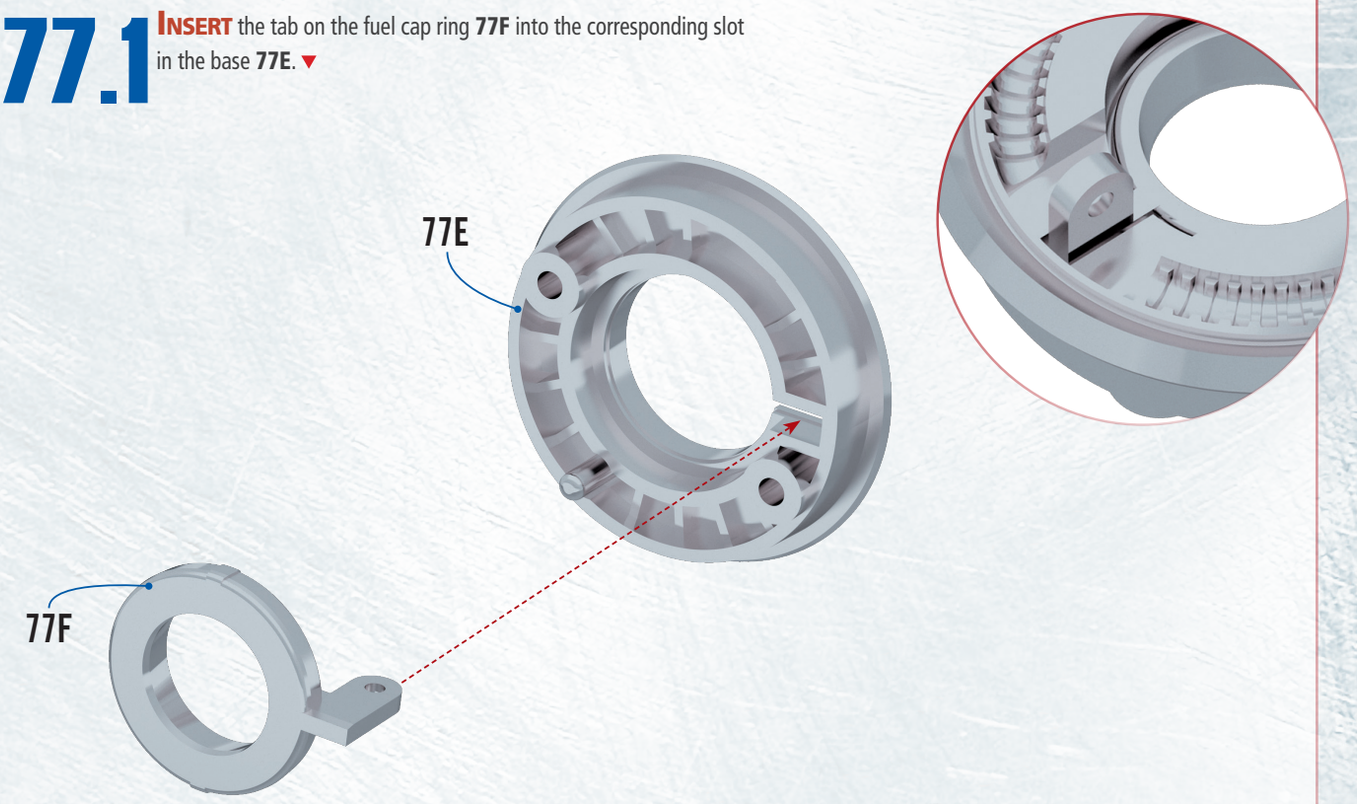


CAR BODY

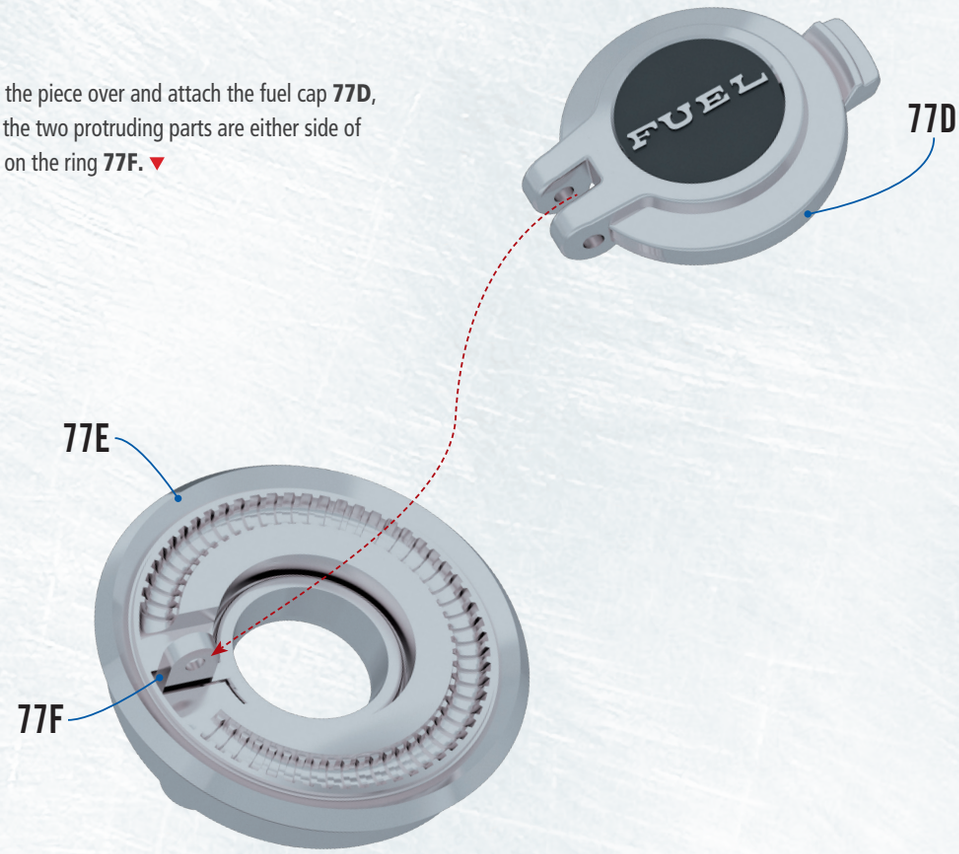
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Assembling the fuel cap

77.1 **INSERT** the tab on the fuel cap ring **77F** into the corresponding slot in the base **77E**. ▼



77.2 **TURN** the piece over and attach the fuel cap **77D**, so that the two protruding parts are either side of the tab on the ring **77F.** ▼



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MAXIMUM ATTENTION TO DETAILS

Every single detail on the 1970 Dodge Charger R/T, the model Dominic Toretto drove in Fast and Furious, is a tiny work of art, for example this shiny fuel cap on the left side of the car.

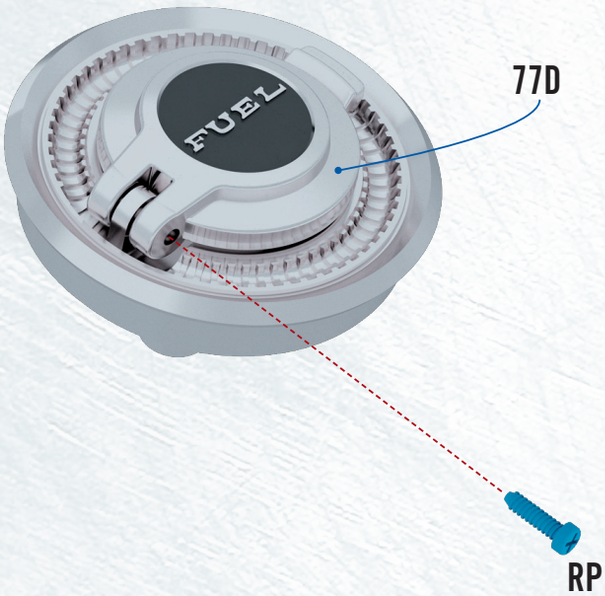




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Assembling the fuel cap

77.3 **FINALLY,** secure the fuel cap **77D** to the completed base with an **RP** screw. ▼



A USEFUL TIP

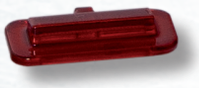
Once you have finished this assembly session, check that the fuel cap's hinge has the same resistance when opening and closing.

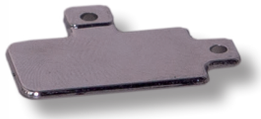


RESULTS OF STAGE 77



You have now assembled the fuel cap. Keep it in a safe place together with the pieces you haven't used yet.







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THE ENGINE CURVES



To understand the performance that engines can provide and the details of the delivery of that performance, we can get a good approximation by analysing the characteristic curves that are obtainable through instrumental analysis on a test bench. In this edition, we learn what they can tell us about performance.

Understanding the absolute values of torque and power allows us to understand a car's behaviour. However, analysing the curves as a function of the engine speed can only help us understand the performance based on the revolutions per minute. To get this data in a more usable format, we need to put the engine on a special tool known as a test bench. Of course, these curves do not tell us everything, but knowing how to interpret them is very useful. Not only do they describe the nature of the engine, but they also allow us to evaluate the effect of any changes we make. This plays a fundamental role in performance tuning. The test bench is not to be con-

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The engine curves



The concept of torque, i.e. a twisting force, is very simple. To create it, apply force at a certain distance from an axis of rotation. A cyclist, for example, generates torque by pushing his feet on the pedals.

fused with a rolling-road dynamometer, or "dyno" for short. The dyno acts as a variable load that the engine drives. It works by soaking up or absorbing the power that the engine produces, so it is called an absorption dynamometer. A simple test bench consists of a base, known as a seismic base, where the motor to be tested is mounted. A dynamometric braking device is connected to its shaft, the point from which it transmits motion. While the test bench is often used in the automotive field to design production engines and especially in the world of competition, the use of the dyno is preferred in the field of tuning. Here, data is acquired not just from the engine but also from the whole vehicle that is positioned on rollers. More and more tuners make extensive use of this type of equipment, especially to demonstrate to customers the results of their work. They start with a rolling test of the production car and then compare the torque and power curve of the vehicle after tuning it.

UNDERSTANDING TORQUE

Before examining the characteristic curves of an engine in more detail, it is a good idea to dedicate a few words to the concept of torque. Torque is the rotational equivalent of linear force. Think of it as the force applied to a ratchet or spanner arm. For example, we apply torque when we tighten or loosen a threaded bolt with a spanner or a socket wrench. Torque can be transmitted by gears, belts and chains and can be increased, but always at the expense of rotation speed. For example, when a cyclist encounters a hill, he engages a lower gear. The forward speed decreases without changing the pedalling frequency, but the torque sent to the rear wheel increases. As a result, the wheel turns more slowly but transmits a greater driving force to the road, while the work being done remains unchanged. A car's gearbox is nothing more than a torque multiplier: a low gear corresponds to the reduced speed of the wheels (and therefore of the vehicle) and higher torque. In contrast, the opposite occurs when a high gear is engaged.

The greater the torque that reaches the drive wheels, the steeper the climb that can be overcome.

CYLINDER TO WHEEL

The torque delivered by the engine depends on what happens inside the cylinders and the size and number of

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cylinders. In technical terms, it is the product of the mean effective pressure (MEP) times the engine displacement. To increase it, either the displacement must be increased, the mean effective pressure (MEP) must be increased, or both. Torque is expressed in Newton metres (Nm). The torque that the engine produces varies with the speed of rotation, and the curve that we obtain on the test bench indicates how this variation occurs.

As it is easy to suppose, the torque that reaches the wheels is different from that produced by the engine. The first change takes place inside the gearbox, while another takes place due to the gear pairing of the final reduction. We must also take into account the size of the driving wheels. A reduction in the diameter of the drive wheels is the same as a reduction in the transmission ratio. The driving force transmitted to the road is higher, but the vehicle's forward speed, for the same rotation speed, decreases. The power delivered by the engine is therefore given as the product of the torque and the speed of rotation. In turn, the torque is made up of the product of the displacement and the MEP. The latter is directly proportional to the volumetric, thermal and mechanical efficiency. Therefore, the link with the breathing of the engine becomes fundamental. It varies significantly with the rotation speed (and in Otto cycle engines, with the load, or rather, with the opening of the exhaust valve). Even the thermal efficiency, i.e. the efficiency of the motor as an energy transformer (from thermal to mechanical), varies with the speed, but to a much lesser extent. As for mechanical efficiency, it gets worse and worse as the speed of rotation increases.

Do not confuse the engine test bench with a dynamometer. In the first case, the engine itself is directly connected to the instruments, while in the second, the car's behaviour on the road is "simulated" on rollers.

BEAUTIFUL CURVES

There is a very close relationship between power and torque, although they are two very different things. The two curves have different trends, but if the torque output from the engine is changed, the power output inevitably changes, too. As seen, torque increases with the engine speed (as the engine's breathing gradually improves) up to a certain point at which the curve reaches its maximum value. Then the torque curve gradually begins to decline as the volumetric efficiency worsens. However, the power curve continues to rise because the torque/speed product continues to increase. In other words, the reduction in

torque is more than compensated by the increase in rotational speed. At a certain point, at a given speed, the power curve reaches its peak, after which it falls off quite rapidly. From this point on, the speed with which the torque decreases is such that it cannot be compensated for by a further increase in the speed of rotation.

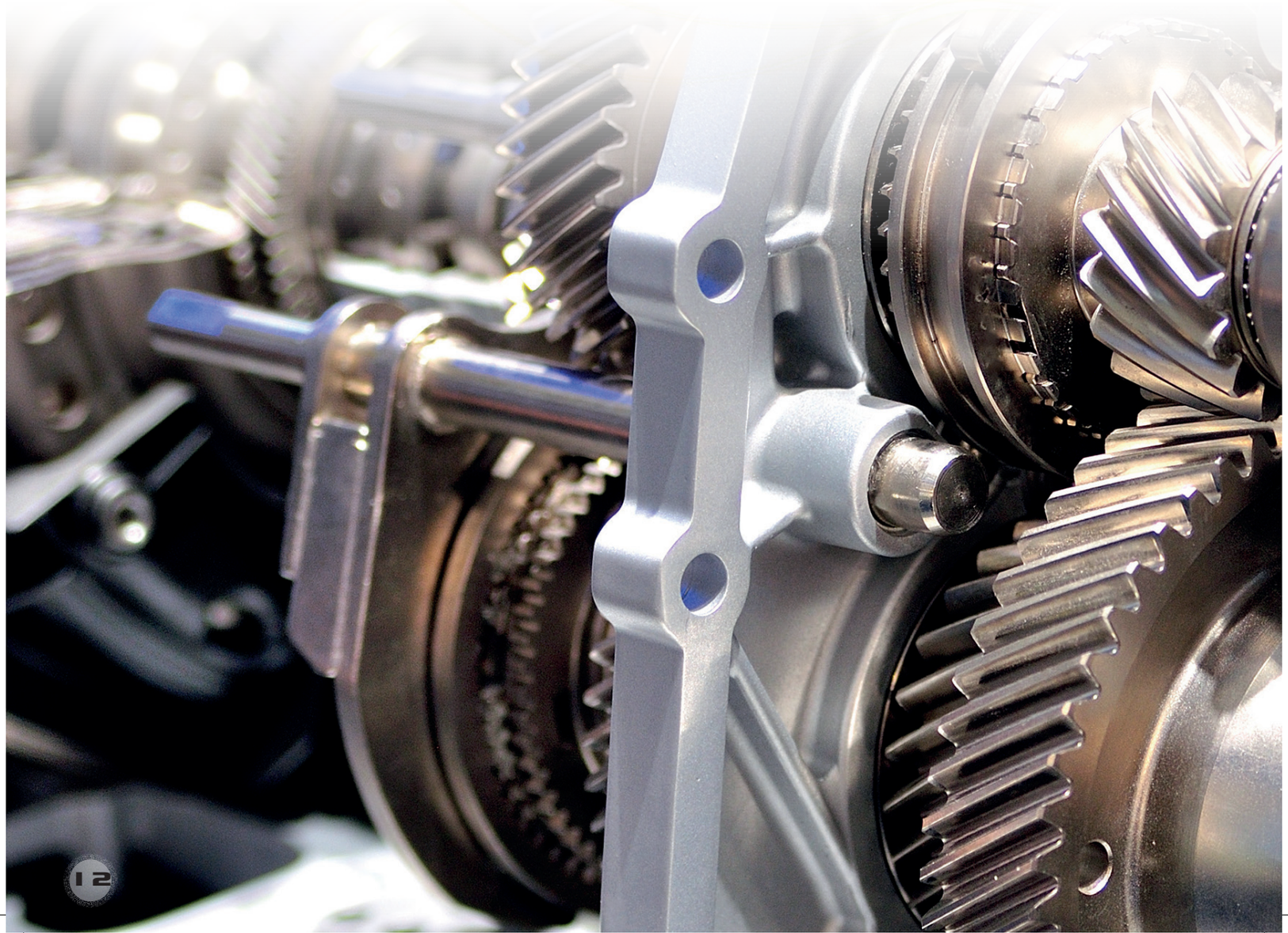
WHAT DO CURVES TELL US?

At this point, it is possible to make some basic observations regarding the information obtained by examining the behaviour of the characteristic curves. Remember that the data is obtained at full load, when the accelerator pedal is fully depressed. Therefore it cannot tell us about the engine's behaviour with the throttle in intermediate positions. If the peaks of the two curves are very far from each other, it means, in broad terms, that the engine is very flexible. In other words, the engine's range of use is very wide. A torque curve that progressively increases from the point at which maximum power occurs as the engine speed decreases is self-compensating. Think of a vehicle running on level ground with the accelerator fully depressed. When it encounters an ascent, its speed decreases as the "resisting" torque increases. With the same gear engaged, the rotation speed decreases progressively, but at the same time, the torque delivered by the engine increases (the curve rises). If at a certain point, the increase in driving torque sent to the wheels equals the resisting torque, the speed stabilises, and the vehicle climbs. Otherwise, it is necessary to shift to a lower gear to increase the torque that the engine sends to the wheels.

MODERN TENDENCIES

In many modern engines, the torque curve has a significantly different pattern to that of engines of just a few years ago. In many cases, a flat curve is favoured, and it is made to remain flat for a wide range of revs. In any case, for production cars, even if the curve is not flat, they try to have at least 80% of the maximum torque

A car gearbox is nothing more than a torque multiplier. Each ratio corresponds to a variation in the rotation speed of the transmitted torque.

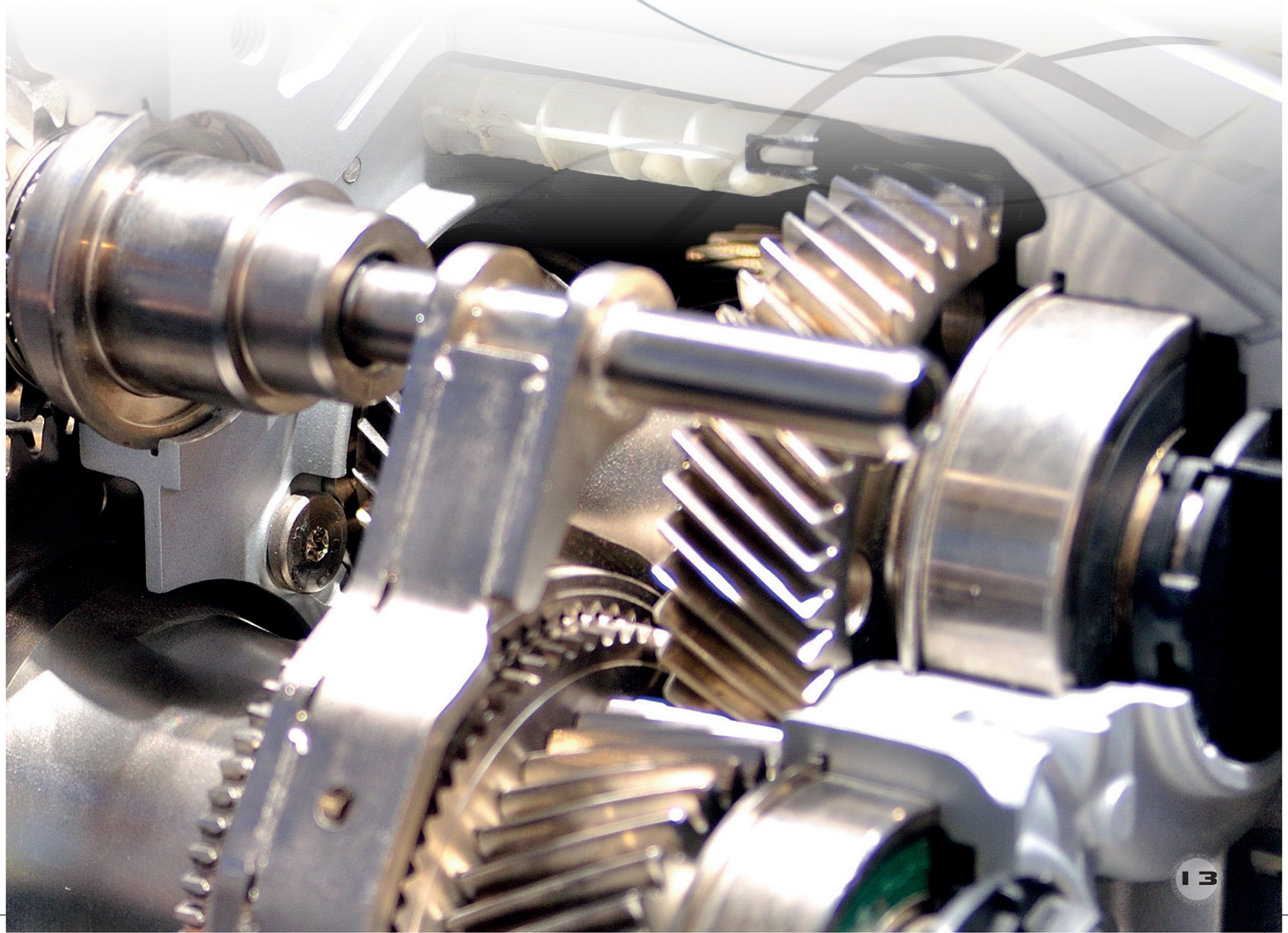


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From Kilowatts to Horsepower

If torque tells us how steep an incline we can climb, power tells us how fast we can get to the top. In fact, it is the speed with which the work is done. Or rather, it is the work done per unit of time (which corresponds to power x speed). The torque multiplied by the rotation speed gives the power. The unit of measurement of power is the watt (W). A multiple of it is used in the automotive industry, the Kilowatt (kW). At this point, it must be said that most mechanics, and nearly all enthusiasts, still express power in "horsepower" (CV). The relationship between this unit of measurement and the Kilowatt is straightforward: 1 kW =1,36hp. Therefore, an engine that delivers 150Kw has 204hp of power. To quickly calculate the figure in your head, remember that the horsepower can be calculated by dividing the kilowatts by three and multiplying the result by four. The error is only about 2%, and it is close enough if you do not have a calculator at hand.

available at all times and to remain above that value most of the time. To achieve this, variable geometry inlet systems, variable timing distribution systems, and in supercharged engines, dual compressor systems, are used. As far as competition engines are concerned, the situation is quite different. Flexibility is not that important and what matters is maximum power. The drivers use the engine in a much narrower range of revs and make intensive use of the gearbox. In these cases, the torque peak may be very close to the power peak.



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