BUILD AYRTON SENNA'S

LOTUS RENAULT 97T

Ayrton Senna

2





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customer.service@deagostini.co.uk

USA
support@usa.deagostini.com

Germany
kunden.service@deagostini.de

España
atencionclientes@planetadeagostini.es

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Ayrton Senna Institute

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Formula 1 chronicles

British engineer Colin Chapman founded Lotus, and his revolutionary ideas transformed Formula 1

Life of an idol

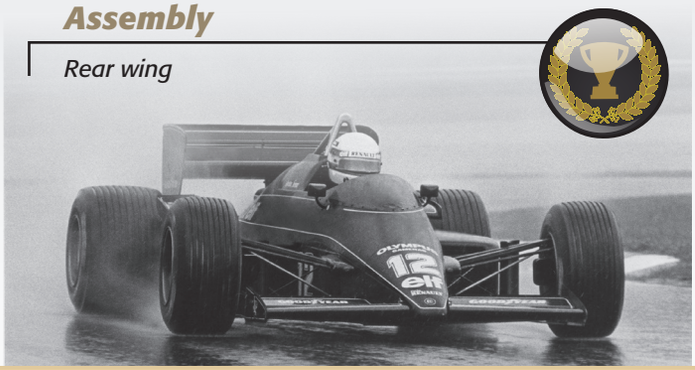
The yellow helmet used by Senna became a trademark of the three-time World Champion

Driver's universe

The Renault EF15 was the engine used by Ayrton in races in 1985

Assembly

Rear wing



COLIN CHAPMAN

A motorsport visionary

Designer, team manager, and businessman, the British engineer who created Lotus changed Formula 1 with his revolutionary ideas



National Archives of the Netherlands

In the seventy-plus-year history of Formula 1, there have been many individuals who have contributed to making this the most electrifying and popular form of motor racing on the planet. Some of them played a crucial role in technological advances, creating lighter and faster cars; others left their legacy in the business side of F1, making it a multi-million-dollar product.

However, few have managed to make an impact in both areas. Undoubtedly among them is the genius that is Colin Chapman, founder of Lotus. One of the most creative and daring motorsports engineers, the Brit designed and built cars that won seven Constructors' World Championships and six Drivers' World Championships, immortalizing famous names such as Graham Hill, Jim Clark, and Emerson Fittipaldi. Off the track, Chapman played a masterstroke: the negotiation of sponsorships for the teams and cars, which included changing the paintwork according to the colors of the companies. Sponsors' capital injection would take Formula 1 to another level.

Flying low: *Colin Chapman took aeronautical engineering concepts to racetracks, making racing cars even lighter and faster*

02 Lotus_Senna_UK_v11.indd 1 20/4/23 16:07



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LIGHTER EQUALS FASTER

Born in 1928, Chapman graduated as an engineer and became interested in aeronautics, joining the Royal Air Force in 1948. Yet, he changed his mind and, in 1952, he decided to invest in what used to be just a hobby; it led him to found Lotus Engineering Limited, a sports car constructor. Two years later, Team Lotus was born, with the aim of participating in motorsport competition. After achieving several notable results in the intermediate categories, the team joined Formula 1. Team Lotus' debut was at the 1958 Monaco Grand Prix, with Graham Hill and Cliff Allison driving the Lotus 12.

It is worth pointing out that Chapman, unlike many constructors, did not have a successful career as a driver. He had tried – in 1956, he enrolled for the French F1 GP with the Vanwall team. However, during the qualifying session, he crashed his car into that of his teammate Mike Hawthorn, and decided to hang up his gloves once and for all.

Hands on: *whether on the track or in the office, the Lotus creator was a ubiquitous presence*

Under Chapman's control, Team Lotus won six Drivers' World Titles and seven Constructors' World Titles

It was lucky for Formula 1: with his focus entirely aimed at designing and constructing cars, especially racing cars, Colin Chapman would revolutionize the top categories of motor racing with a series of cutting-edge innovations. He was obsessed with a car's simplicity of design and reducing weight, which he considered far more important than its horsepower. It gave birth to Chapman's motto, which is now more relevant than ever: "Adding power makes you faster on the stretches. Removing weight makes you faster everywhere."

02 Lotus_Senna_UK_v11.indd 2 20/4/23 16:07

LOTUS DYNASTY

The first time a Lotus race car won in Formula 1 was in 1960 at the Monaco Grand Prix, with Stirling Moss driving a Lotus 18. However, it would be the Lotus 25 – a model that introduced the monocoque chassis to F1 – that would secure the first title for Team Lotus. Launched in 1962, the car took Jim Clark to the 1963 Drivers' World Championship. It was also the base model for the versions that would win two more World Titles in 1965 and 1968, respectively, with Clark (Lotus 33) and Graham Hill (Lotus 49). This, by the way, was the first Formula 1 race car to have the engine as a structural component and to use wings, further pioneering features introduced by Chapman.

The Lotus 49 was also the first F1 car to be entirely painted in the colors of a sponsor: in this case, white, red, and gold replaced the traditional green used by British racing cars. From then on, competitors would unabashedly copy the idea. Chapman's insight added color to the circuits to make racing more visually appealing, and at the same time it also filled the teams' coffers to allow for greater investment in technology. In 1972, Chapman secured a new sponsorship deal for the team and Lotus would incorporate the renowned black and gold livery that became an instant classic.

On the track, the 1970s witnessed three more Drivers' World Titles, with Jochen Rindt (1970, Lotus 72), Emerson Fittipaldi (1972, still with the 72 model), and Mario Andretti (1978, Lotus 79, with its legendary "ground effect" design).

EARLY DEATH

In the early 1980s, Colin Chapman started to test the active suspension concept, which would be successfully introduced to Formula 1 many years later, especially by Williams in the early 1990s. The Lotus creator, however, would not see the results of his innovation.

In December 1982, at the age of 54, Colin Chapman suffered a massive heart attack and died at his home in Norfolk, England, leaving his wife Hazel a widow, with three children: two daughters, Jane and Sara, and a son, Clive.

"He lived two or three lives simultaneously," Nigel Roebuck, editor of the British magazine *Autosport,* told *The New York Times* on the occasion of Chapman's death. "He was a team chief, a car designer, and a businessman."



National Archives of the Netherlands

Monocoque chassis, wings, ground effect… Colin Chapman's signature innovations helped make drivers like Jim Clark, Graham Hill, and Emerson Fittipaldi famous names in the history of Formula 1

02 Lotus_Senna_UK_v11.indd 3 20/4/23 16:07

THE MYTHICAL YELLOW HELMET

The most famous protective gear in F1

Created by Brazilian Sid Mosca, the design used by Senna all through his career became a trademark of the three-time World Champion



Norio Koike © ASE

What is the most iconic car design in the history of modern Formula 1? Some will say it is the classic full-blooded red Ferrari; others, the elegant Lotus in its black and gold livery; there will also be no shortage of references to the dominant red and white McLaren. The subject is hotly debated, but no consensus is ever reached.

When the topic is the design of the drivers' helmets, however, the discussion

"I hold a special fondness for the helmet, which is the driver's trademark"

Ayrton Senna

02 Lotus_Senna_UK_v11.indd 4 20/4/23 16:07

From his beginnings in kart races to his success in Formula 1, Senna and his yellow helmet were inseparable



Familia ©ASE

is over before it has even begun. It is unanimous – aesthetically perfect, the famous yellow design with Ayrton Senna's green and blue stripes has exceeded its original function and has become a true graphic representation of the Brazilian driver's values, recognized both inside and outside the world of Formula 1.

Credit goes to Sid Mosca, a designer from São Paulo, who in 1979 idealized the design for the then Brazilian kart racer, who was getting ready to compete in the World Karting Championship in Portugal. Back then, the competition's rules demanded that the driver's helmet had to bear the colors of their country's flag. Sid chose the predominance of yellow, which was visually eye-catching; with a master touch, he painted green and blue stripes coming out of the visor, creating a real sense of speed. Sid had hit the jackpot.

Brazilian colors: *World Karting Championship rules required drivers to race with a helmet displaying the colors of their home country's flag*

02 Lotus_Senna_UK_v11.indd 5 20/4/23 16:07

ONLY MINOR CHANGES

The designer talked Ayrton Senna into wearing the helmet design throughout his career from then on. The only changes to the helmet would be carried out due to sponsorship adjustments and the occasional tribute. In the 1987 Australian Grand Prix, for example, the helmet featured the design of two airplanes, to commemorate the episode in which Senna flew in a Brazilian Air Force F5 fighter jet over the Jacarepaguá circuit.

When Senna was introduced by Lotus, it was possible to see a noticeable change – not in the design, but in the shade of yellow on the helmet.

This was also Sid Mosca's work: to provide a greater contrast with the car's black and gold bodywork, the artist replaced the opaque tone with a fluorescent yellow. According to Mosca, this would make the driver stand out, like a "fireball" in the cockpit.

And, of course, the brilliant Senna agreed with the change.

SID MOSCA, THE DESIGNER

Talking drivers into his ideas

Cloacyr Sidney Mosca tried his luck as a driver in the 1970s. Yet he only attracted the public's attention for the extraordinary look of his cars: his driving skills were, let's say, below par.

Thus he began to receive requests for customization from his competitors. One of his first works was the bold blue and orange painting on Ingo Hoffmann's Brasilia, in 1973. In the following year, he also started to design helmets, and soon he was to exchange the tracks for his workshop-atelier in Interlagos, in São Paulo's southern zone.

The artist explained: "The painting of the helmet is the other face of the pilot, which gives him an identification when he is in action on the track, and I am happy to be able to participate in the creation of his image, a valuable and important element in the course of his career."

In his extensive and starry resume are the helmets of Senna, Emerson Fittipaldi, Nelson Piquet, Rubens Barrichello, and Maurício Gugelmin, among others. Mosca was also responsible for the look of the Copersucar cars.

Sid died in São Paulo in 2011, but his studio remains active due to the work of his son, Alan, his granddaughter, Stella, and the many hundreds of drivers who proudly race, on circuits around the world, with his helmets. All bear the unmistakable inscription: "SID – painted in Brazil".

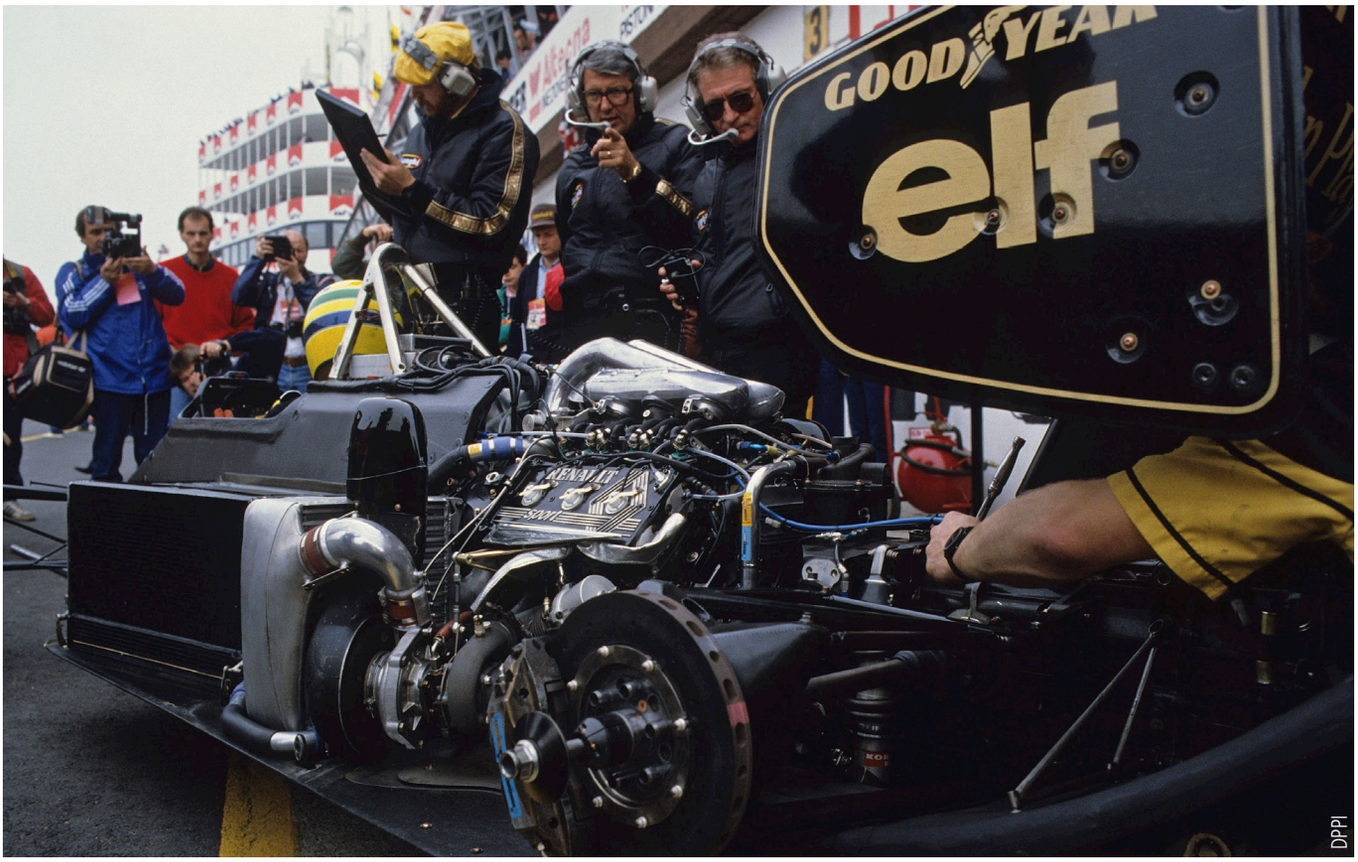


02 Lotus_Senna_UK_v11.indd 6 20/4/23 16:07

THE ENGINE USED IN THE EARLY WINS

The machine behind the machine

In 1985, Ayrton Senna chose different engines for qualifying sessions and for races; the Renault EF15 was the unit used for races



When Ayrton Senna changed the Hart-engined Toleman for the Renault-engined Lotus 97T, the Brazilian hoped that the engine specialists at Mecachrome – a company based in Bourges and contracted by Renault to manufacture its engines – had got it just right. This time, the driver was seeking an engine with the power and efficiency to help him secure his first Grand Prix victory… and perhaps more.

The first part was successfully achieved. At the end of 1985 season, Ayrton was fourth in the championship, with two wins, at the Estoril and Spa-Francorchamps circuits. Clearly, there was great harmony between Lotus and Renault. However, although Senna and his teammate Elio de Angelis had seven pole positions, they only won three races. It was evident that their car performed better in qualifying than during a race – their

Power and efficiency: *the Renault engine's strength helped Ayrton triumph in Portugal and Belgium*

02 Lotus_Senna_UK_v11.indd 7 20/4/23 16:07



Fuel economy at high rpm was the number one requirement when building the Lotus engine for 1985

***New step up:** the transition from Toleman to Lotus allowed Ayrton Senna to fulfill his goal*

season was hampered by a dozen pit stops due to mechanical problems across the 16 Grands Prix.

A look at the differences in results in qualifying sessions and in races reveals an unusual procedure: Lotus would use a Renault engine of a different specification during qualifying from that used in a race.

The new EF15 V6 turbo engines built for the 1985 F1 World Championship were saved mainly for races, while the team would choose to use cars with an updated version of the previous year's Renault EF4 for qualifying sessions. Few rival teams could afford two different engines, and Lotus took advantage of this opportunity more than the Renault factory team, finishing the season more than 55 points ahead of the French outfit. Renault then withdrew its F1 team and in 1986 focused on supplying engines to Lotus, Ligier, and Tyrrell.

LIGHTWEIGHT, BUT FRAGILE

The EF15 engine was built with fuel economy at high rpm as its basic requirement. The engine designers were able to achieve this by making the V6 turbo engine less square, decreasing the cylinder bore from 86 to 80.1 mm, and increasing the stroke from 42.8 to 49.4 mm. Another change was the replacement of the KKK turbochargers with a pair of Garrett AiResearch units.

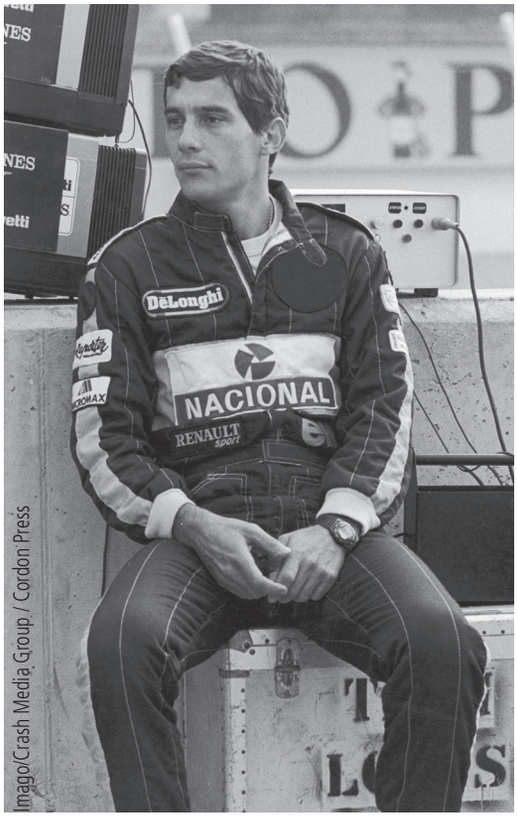
The engineers' calculations showed that the EF15 engine would be more powerful, pushing out up to 810 hp, compared to

02 Lotus_Senna_UK_v11.indd 8 20/4/23 16:07

1985 RENAULT EF15 ENGINE SPECIFICATIONS

TECHNICAL SHEET

Configuration:	V6
Displacement:	1,492 cc
Bore x Stroke:	80.1 x 49.4 mm
Compression ratio:	7.0:1
Weight:	302 lb (137 kg)
Fuel system:	Renix/Weber electronic fuel injection
Ignition system:	Marelli
Turbocharger:	Two Garrett AiResearch
Maximum power:	810 hp
Maximum RPM:	11,500
Power per liter:	543 hp



Imago/Crash Media Group / Cordon Press

A tight-knit team: *Lotus finished the 1985 season 55 points ahead of the Renault factory team*

the EF4's racing output of 760 hp. Simply, that suggested that the new EF15 engine would be a more powerful tool for qualifying; however, the truth is that an enhanced version of the EF4, the EF4B, proved better for the task.

This engine was more successful in handling the high levels of turbo pressure needed to provide power during a few laps in qualifying sessions, when short peaks of over 1,000 hp could be reached. The mechanics would then use the EF15 engines – along with a new transmission and rear wings – for warm-up laps and the actual race. This way they could ensure that they did not use any component that could have been compromised by the high pressure required in the qualifying sessions.

FUEL ECONOMY WAS MANDATORY

The EF15 engine offered lower fuel consumption than the EF4B because it worked at a higher compression ratio, so it was therefore preferred for racing. However, both drivers had to learn exactly when and how much they could push harder in races to make the permitted 58 gallons (220 liters) of fuel last the entire race – especially on circuits like Imola and Montreal, with long stretches where the cars would go at full throttle.

Making their fuel last was especially more challenging for the drivers, since their cars were not equipped with computerized fuel gauges. Likewise, engineers also had to make accurate calculations before each Grand Prix to adjust the turbo pressure to an optimized level for each particular circuit, giving the drivers as much power as possible without them running out of fuel.

This juggling with turbo pressure became an important factor for all 15 teams before the end of the season, as 1985 marked the discontinuation of all naturally aspirated engines – at least temporarily.

02 Lotus_Senna_UK_v11.indd 9 20/4/23 16:07

DESTINATION: EUROPE

The next level

Senna said goodbye to Brazil in 1981 to pursue his dream of racing Formula 1 cars and winning a World Title



A traveler's life: *Ayrton took up residences in England, Monaco, and Portugal*

Brazil hosted an official Formula 1 Grand Prix for the first time in February 1973. The race at the Interlagos circuit resulted in a win by the then F1 World Champion, Emerson Fittipaldi. Watching in the crowd were Ayrton Senna and his father, Milton.

Eight years later, in 1981, Ayrton Senna would be officially starting out on his journey in the top category of world motorsports. After thriving in Brazilian and international karting series, the young driver moved to England to race in formula cars in Europe. He began in the entry-level category of the British Formula Ford 1600 Championship.

Ayrton resided in a house in the county of Norfolk, England. In his own words, it was there where he could breathe motorsports 24 hours a day, so that he could pursue his dream of becoming an elite motorsports driver.

Ayrton had homes in England, Monaco, and Portugal

In 1984, his dream came true: Senna drove in his first Formula 1 World Championship for Toleman. The following year, he started racing for Lotus, where he stayed until 1987. In 1988, Senna signed a contract with McLaren, the team in which he remained for six years and with whom he won three Formula 1 World Titles.

But before this, in 1986, the driver had already changed his residence in Europe, moving to an apartment in Monaco, on Boulevard Princesse Grace.

In 1991, Senna changed his European base in Europe once more. He bought a beautiful house in the Algarve region of Portugal, as it resembles Brazil for its beautiful beaches and mild temperatures. It was here at Quinta do Lago that the driver would relax between races and training sessions, enjoying his free time. This was his last official residence.

02 Lotus_Senna_UK_v11.indd 10 20/4/23 16:07

REAR WING ASSEMBLY

PARTS

2A



2B



AP

2C



2D



BP

2E



2F



CP (black)

2H

CP (silver)

2I

2G



FM

2A Rear wing main plane top
2B Rear wing flag top
2C Rear wing flag bottom
2D Rear wing top flap
2E Gurney flap
2F Rear wing left endplate "L"
2G Rear wing right endplate "R"
2H Rear wing cross bar mount
2I Water decals kit
AP Screws 1.7 x 4 mm, 13 pcs*
BP Screws 1.2 x 4 mm, 5 pcs*
CP Black screws 1.2 x 3 mm, 7 pcs*
CP Silver screws 1.2 x 3 mm, 3 pcs*
FM Screws and nuts 1.4 x 4 mm, 2 pcs*

* Including spares

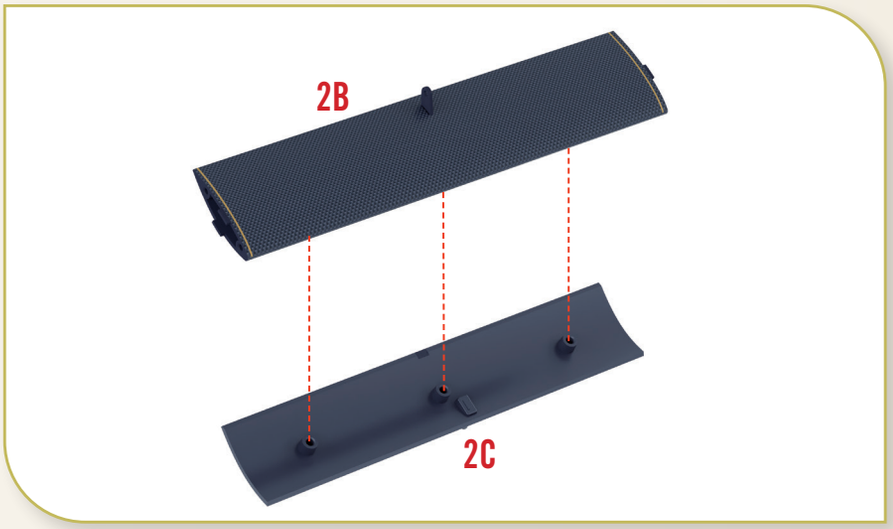
Publisher's note: the finish of the parts in the pictures may differ from the parts enclosed in this issue. This in no way affects either the product quality or the assembly instructions.

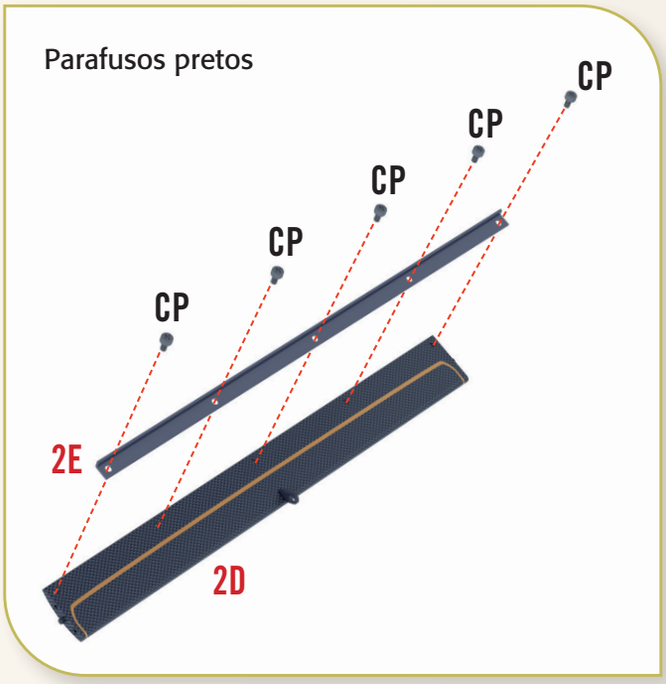
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BEFORE STARTING
Make the necessary checks to identify each of the parts. Read all the steps beforehand to get an idea of what to do during assembly.

STEP 2-1

Place the rear wing flag top **2B** over the rear wing flag bottom **2C**. Press gently to connect the two pieces.





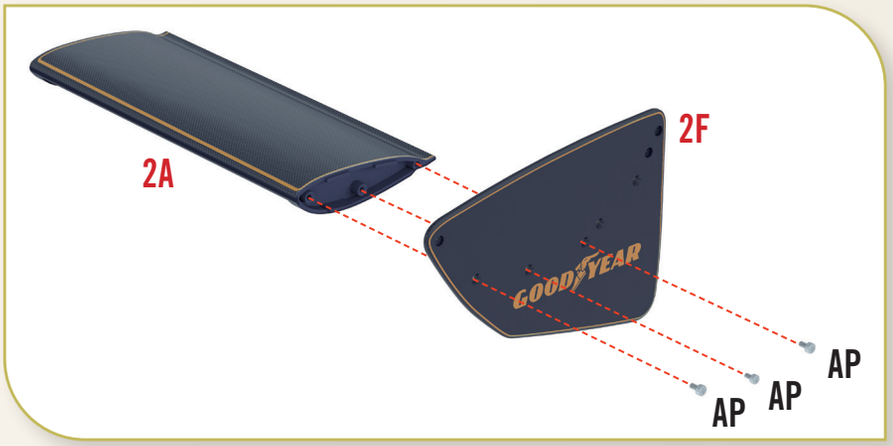
STEP 2-2

Place the gurney flap **2E** over the edge of the upper part of the rear wing top flap **2D**, so that the five holes on the two pieces align with each other. Pay attention to the picture to identify the gurney flap correctly. Join the parts with five black **CP** screws.

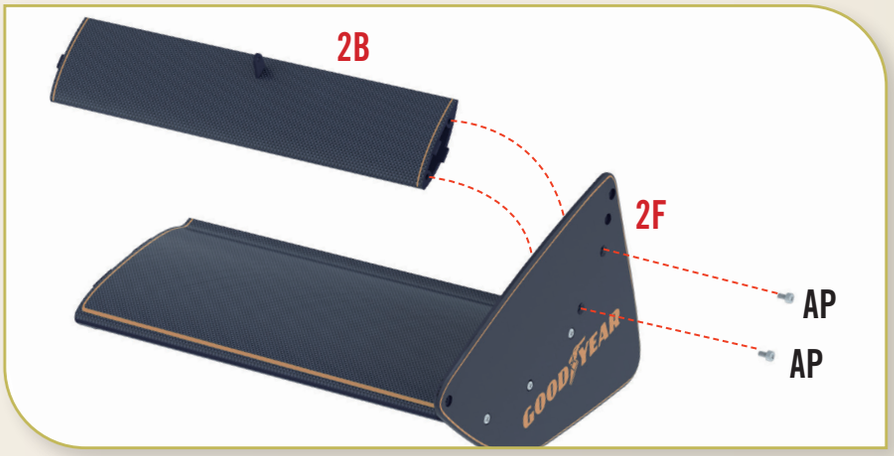
TIPS
With each issue, you will receive small bags with the identification of the type of screws inside. It is normal to receive more screws than necessary. This way, there is a reserve in case the screws break or are lost. It is, therefore, important to keep all screws in the bags they came in. Remember that even if the screws are the same size, they should not be mixed if they are not the same type, because they are designed to join parts made of different materials: if the screw code is "M", it is for joining metal parts; if it is "P", it is for plastic parts.

STEP 2-3

Place the left side of the rear wing left endplate **2F**, marked with an "L", over the three holes on the left side of the rear wing main plane top **2A**. Secure the side to the base with three **AP** screws.



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STEP 2-4

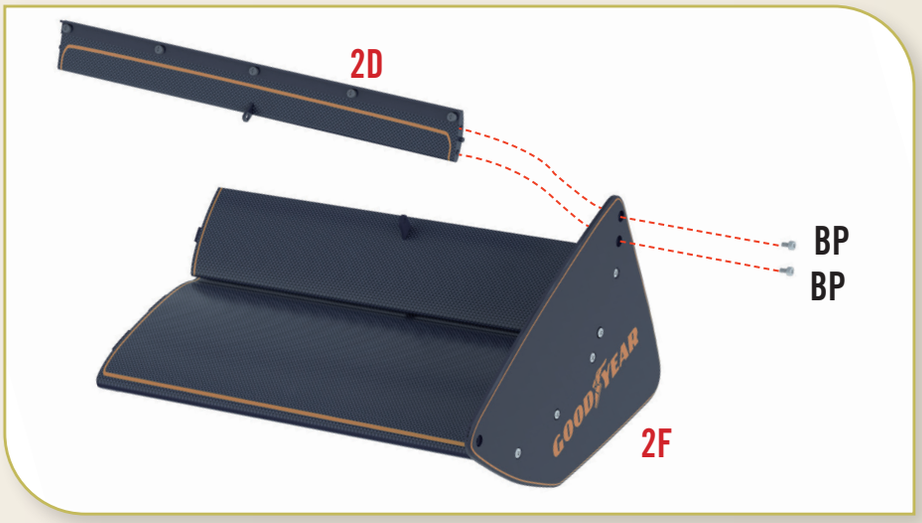
Join the center part of the rear wing flag top **2B** and the left side part of the rear wing left endplate **2F** (marked with an "L"). Align the holes of the two parts, as in the picture, and use two **AP** screws to fix the center and side parts.

WATER DECALS KIT

For legal reasons, we cannot show or mention the brand of one of the historic sponsors of Ayrton Senna's car. However, for those who want their model to have the original decoration, we will offer, along with the first issues, water decals of the logos and signatures of this well-known sponsor. They are very easy to apply.

Please follow the instructions below:

- The area where the decal will be applied needs to be clean and dry
- Cut out the logo you are going to use
- Soak the logo in cold water for approximately 30 seconds
- Use the tweezers to remove the protective film and place the logo in its final location.

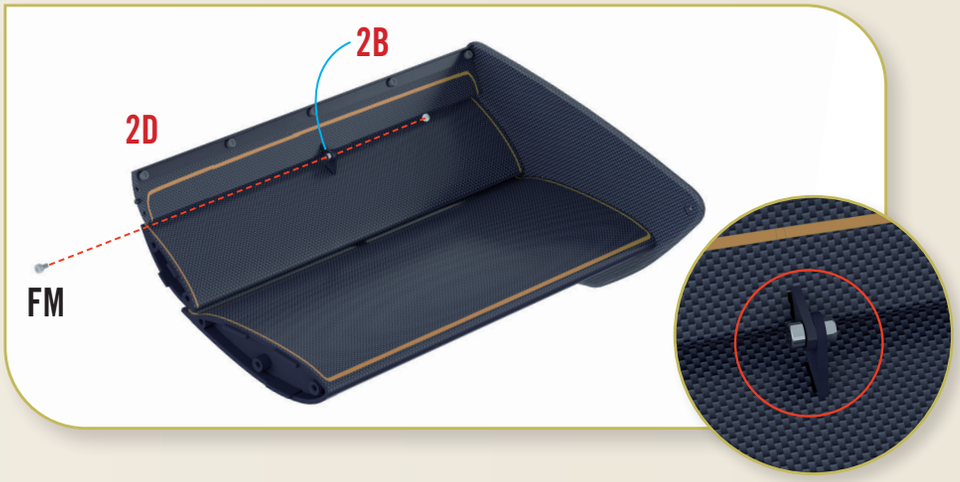


STEP 2-5

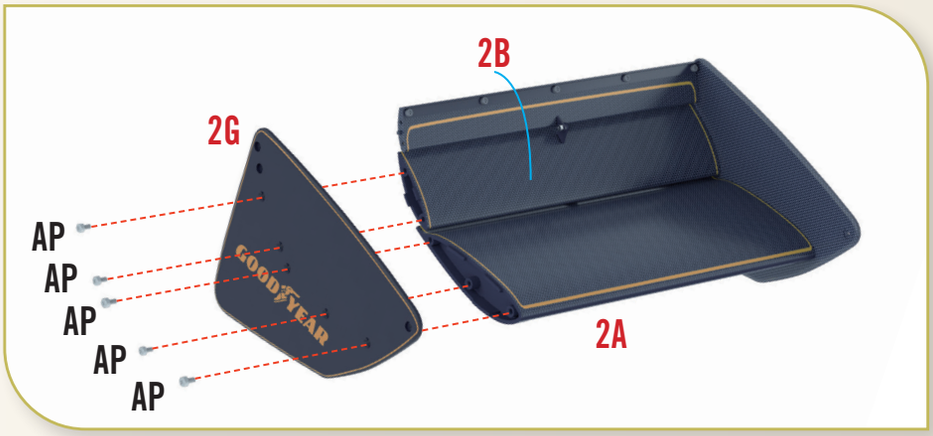
Continue the assembly by attaching the top of the rear wing top flap **2D** to the left side of the rear wing left endplate **2F** (marked with an "L"). The parts should be aligned based on the holes – refer to the image. Join the parts with two **BP** screws.

STEP 2-6

Place an **FM** screw and nut on the connection flaps of the upper part of the rear wing top flap **2D** and the middle part of the rear wing flag top **2B**. Screw in from the side opposite to the head of the **FM** screw.



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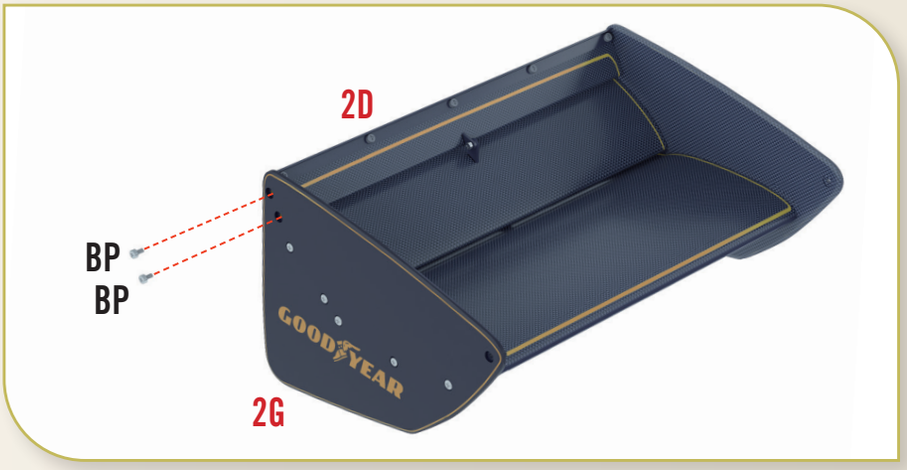


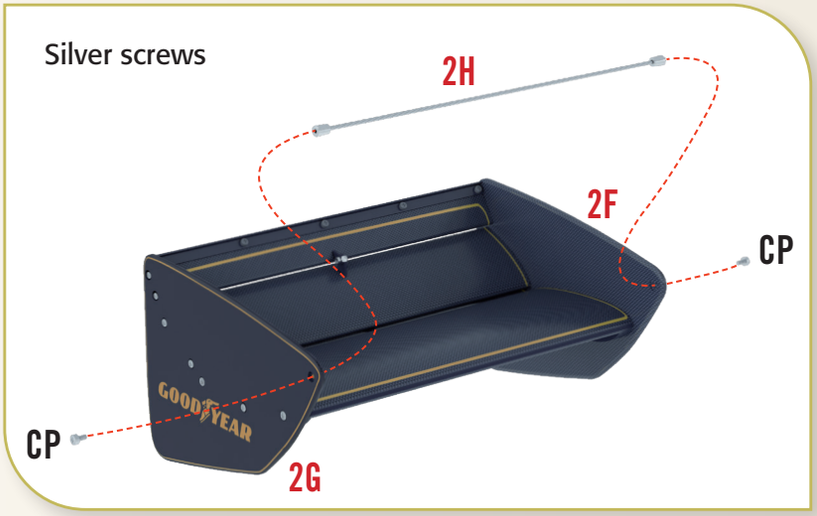
STEP 2-7

Now it is time to place the rear wing right endplate **2G**, by the "R" side, in its place. To do this you first need to join the rear wing main plane top **2A** and rear wing flag top **2B** parts together with five **AP** screws.

STEP 2-8

Afterward, attach the side of the rear wing right endplate **2G** (from the "R" side) to the side of the rear wing top flap **2D** with two **BP** screws.





STEP 2-9

Finally, place the ends of the rear wing cross bar mount **2H** into the corresponding holes on the sides of the rear wing right endplate **2G** and rear wing left endplate **2F**. Attach the tensioning cable to the sides with two silver **CP** screws.

FINAL ASSEMBLY

This is the image of the set of parts that we have assembled in this issue:



02 Lotus_Senna_UK_v11.indd 14 20/4/23 16:08