
# STEM ROLES IN **MOTORSPORT**

Race day. It's high pressure, high adrenaline and high stakes. But success at the track is the product of the year-round work of a fascinating and varied community of motorsport professionals who share the goal of pushing the vehicle, and themselves, to higher levels of performance. Sound interesting? This booklet profiles some key roles, where they fit and the details you need to make an informed decision about getting involved.

# Phases

**Getting the car or bike to the grid is the culmination of a complex, collaborative process involving multiple teams of skilled workers. The process is never entirely sequential, with designs evolving as more testing data becomes available, and exact workflows vary by branch of motorsport and team, but the below is illustrative of the key phases of vehicle development.**

## Design Phase Page 3

It all begins with creating a concept. Design teams with expertise in aerodynamics, composite materials and engineering principles use computer-aided design (CAD) software to create a 3-D model and conduct preliminary testing before the physical prototype is built. It might seem a long way from here to the racetrack, but the decisions made in this phase can make all the difference to the finished product.

## Manufacturing Phase Page 4

A racing vehicle contains thousands of parts, each made and fitted with the ultimate precision using computerised systems and highly skilled manual labour. At the highest levels, teams manufacture and construct in house, with hundreds of employees in temperature-controlled clean rooms ensuring that any imperfections are avoided. Other teams outsource the manufacturing process to suppliers with specific expertise.

## Testing Phase Page 5

Before the vehicle even turns a wheel, it undergoes rounds of rigorous testing. Each component is thoroughly inspected one-by-one before being stress-tested on dynamic test rigs that simulate race conditions. After the vehicle is “fired up” for the first time, teams conduct a “shakedown” test to check that everything has been assembled correctly. In-depth data analysis at every stage ensures that the vehicle is set up for optimal safety and performance.

## Race Phase Page 6

The driver or rider may be the pilot, but they couldn’t do it without the race day team servicing the vehicle, analysing the data and devising the strategy. Performing in this high-pressure environment requires advanced technical expertise and a deep understanding of the vehicle in question, combined with outstanding communication and teamwork skills.

## Glossary & further inspiration Page 7

# DESIGN ENGINEER

Average salary (entry level) **£25-40K**

Average salary (experienced) **£45-65K**

**Responsibilities**

- Use computer-aided design (CAD) software to design composite components for optimal performance within budget and regulations.
- Produce technical drawings, 3-D models and conduct early simulation testing of safety and performance with clear documentation.
- Communication with colleagues and, for suppliers, customers is key.
- Roles are often highly specialised on certain areas of the vehicle, both within in-house teams and specialist suppliers.

**Post-16**
A-Level/Highers in Maths, Physics and another STEM subject. Science and engineering T-Levels/BTECs also an option, although check which unis accept these for relevant courses.

**Higher education**
Mechanical Engineering degree is most requested, also Aeronautical/Aerospace Engineering, Materials Science, Electrical Engineering

**Apprenticeships**
Sporadically advertised with larger motorsport teams and in adjacent areas at Level 6 with training providers (e.g. Electro-Mechanical Engineer apprenticeship)

**Skills**
Competency and experience in the use of CAD software highly requested

**Entry-level roles**
Junior Design Engineer roles or technical-focused graduate schemes at constructors or suppliers

**Primary employers**
In-house at constructors (e.g. Mercedes F1), which tend to be based in Oxfordshire and the West Midlands, and suppliers (e.g. Cosworth for engines, Xtrac for gearboxes), who operate nationwide.

# AERODYNAMICIST

Average salary (entry level) **£30-40K**

Average salary (experienced) **£50-70K**

**Responsibilities**

- Responsible for optimising airflow around the vehicle, a pivotal contributor to vehicle performance.
- Use Computational Fluid Dynamics (CFD) software, a tool that allows for analysis of numerous variables that impact downforce and drag.
- Analysing this data allows them to iterate new designs of key components such as wings, diffusers and bodywork.
- Often split their time between an office and a wind tunnel.

**Post-16**
A-Level/Highers in Maths, Physics and another STEM subject. Science and engineering T-Levels/BTECs also an option, although check which unis accept these for relevant courses.

**Higher education**
Mechanical and Aerospace Engineering most requested, but most Engineering degrees will be considered. Specialist postgraduate courses (e.g. MSc Race Car Dynamics) can be beneficial, but not required.

**Apprenticeships**
Rarely titled specific to Aerodynamics, there are nevertheless technical schemes advertised with larger motorsport teams that are applicable

**Skills**
Competency and experience in the use of CFD and CAD software highly requested

**Entry-level roles**
Junior Aerodynamicist, sometimes specifically Wind Tunnel Technician, or technical-focused graduate schemes at constructors

**Primary employers**
Largely in-house at constructors (e.g. Red Bull Racing), which tend to be based in Oxfordshire and the West Midlands.

## COMPUTER NUMERICAL CONTROL (CNC) MACHINIST

Average salary (entry level) **£25-35K**

Average salary (experienced) **£40-50K**

**Responsibilities**

- Work from drawings and 3-D models of vehicle parts produced by the design team.
- Formulate plans for how the part will be made and programme, set and operate one more CNC machines to manufacture it.
- An extremely high level of precision and attention to detail is required, as any imperfection in the component could have serious safety and performance implications.

**Post-16**
Emphasis on practical experience and knowledge, so worth considering Engineering BTECs, T-Levels or Diplomas over A-Levels/Highers

**Higher education**
Not required - most job descriptions only specify Level 3 qualifications that provide relevant experience of working with CNC machines

**Apprenticeships**
Level 3 Machining Technician apprenticeship has most direct relevance, but consider other Manufacturing-related apprenticeships too

**Other routes**
CNC work in manufacturing roles of other industries e.g. transport, energy, defence

**Entry-level roles**
CNC Operator roles often require less programming knowledge and more manual tasks

**Primary employers**
Some roles in-house at constructors, with many more at specialist suppliers

## ASSEMBLY TECHNICIAN

Average salary (entry level) **£25-35K**

Average salary (experienced) **£40-55K**

**Responsibilities**

- Take parts that have been designed and made and assemble them with painstaking accuracy and attention to detail to ensure optimum safety and performance.
- Quality assure, install, and maintain components in their assigned area of the vehicle (e.g. powertrain, suspension).
- Work largely in the factory and occasionally in direct support of the race team during events.

**Post-16**
Emphasis on practical experience and knowledge, so worth considering Engineering BTECs, T-Levels or Diplomas over A-Levels/Highers

**Higher education**
Not required

**Apprenticeships**
Level 2 Motorsport Engineering specific apprenticeships here and here, and at Level 3 here, but also consider broader Engineering apprenticeship roles

**Other routes**
Assembly roles in other manufacturing industries

**Entry-level roles**
Junior Assembly Technician, or the apprenticeships mentioned above

**Primary employers**
Largely in-house at constructors, using parts that may have been manufactured at suppliers

# SIMULATION ENGINEER

Average salary (entry level) **£30-45K**

Average salary (experienced) **£50-70K**

**Responsibilities**

- Ensure that teams can gather huge amounts of data, long before the vehicle leaves the factory and public testing begins.
- Develop, monitor and refine computerised models and simulation tools that replicate a wide range of race conditions.
- Generate data that informs design and manufacturing decisions to optimise vehicle performance and reliability.

**Post-16**
A-Levels or Highers in Maths, Physics and one or more other STEM subject(s). Science and engineering T-Levels and BTECs also an option, although check which unis accept these for relevant courses.

**Higher education**
Undergraduate degree in Maths, Physics, or Engineering-related disciplines

**Apprenticeships**
Undergraduate degrees are more requested in job specifications, but there are some technical schemes advertised with larger motorsport teams that are applicable, if combined with the relevant data skills

**Skills**
Handling large datasets is key, so experience of data analysis tools and programming language is advantageous

**Entry-level roles**
Junior Simulation Engineer. Specific simulation-related student placements for undergraduates are advertised.

**Primary employers**
Most roles are in-house at constructors

# DATA ENGINEER

Average salary (entry level) **£35-45K**

Average salary (experienced) **£50-80K**

**Responsibilities**

- Turn the sheer volume of data from the hundreds of sensors on the vehicle into intelligible outputs that inform key decisions.
- Curate and explore complex datasets and develop models and processing algorithms.
- Produce insights that shape race strategy but also input into further iteration of components during design and testing.

**Post-16**
A-Levels/Highers in Maths and Computer Science (if offered), with one or more additional STEM subject(s). Science and engineering T-Levels and BTECs also an option, although check which unis accept these for relevant courses.

**Higher education**
A degree in Computer Science, Maths (with high Applied/Stats content) or Engineering or Physics (with high Maths content) is most requested

**Apprenticeships**
Technical schemes advertised with larger motorsport teams are applicable, if combined with the relevant data skills

**Skills**
Proficiency with programming languages, data analysis tools and/or machine learning is key, as is being able to demonstrate that you have applied them practically

**Entry-level roles**
Graduate-level Data Engineer roles are common

**Primary employers**
In-house at constructors and, occasionally, at sport governing bodies e.g. F1

# RACE MECHANIC

Average salary (entry level) **£30-40K**

Average salary (experienced) **£50-70K+**

**Responsibilities**

- Assemble, maintain and repair the car trackside and in the workshop, combining deep mechanical and technical expertise alongside problem-solving and communication skills under intense pressure.
- Adhere meticulously to specifications and regulations.
- Undertake demanding physical work with unsociable hours and a heavy travel schedule.

**Post-16**
Practical experience is key, so consider BTEC courses in Automotive/Motorsport Engineering certified by the Institute of the Motor Industry or Level 2/3 Motorsport Engineering Diplomas

**Higher education**
Not required

**Apprenticeships**
Level 2 Motorsport Engineering specific apprenticeships here and here, and at Level 3 here, but also consider broader Engineering apprenticeship roles

**Other routes**
Volunteering or working with local or junior racing teams in series like karting, club racing, or junior single-seaters give experience and helps networking

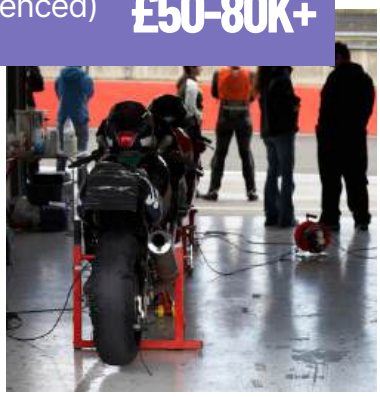
**Entry-level roles**
There are specific trainee roles advertised or though specific apprenticeship schemes with constructors.

**Primary employers**
Largely direct with constructors

# RACE ENGINEER

Average salary (entry level) **£35-45K**

Average salary (experienced) **£50-80K+**



**Responsibilities**

- Develop a strategy that gives their team the best chance of success, while being ready to adapt this strategy as circumstances change.
- Oversee a vast range of topics, from the financial ramifications of research and development decisions to the psychology of the driver, vehicle set-up and tyre strategy under heavy scrutiny.
- Data analysis skills, quick thinking and a resilient personality are vital.

**Post-16**
A-Levels/Highers in Physics, Maths and Computing/Computer Science and/or other STEM subjects if no Computer Science offered

**Higher education**
Bachelor's in Mechanical or Electrical Engineering, or Maths or Physics. Postgraduate study combining the above with data analysis or specialising in motorsport, features more commonly than with other roles

**Apprenticeships**
Less common entry route than other roles

**Skills**
Extra-curricular activities where you can demonstrate leadership and communication skills would be very beneficial. Also, familiarity and experience with programming languages is key.

**Entry-level roles**
Race Engineers progress through the ranks with other Engineer roles at lower formulas

**Primary employers**
In-house at constructors

# GLOSSARY

**Aerodynamics -** The study of the movement of air and the way that vehicles or vehicle components move through it.
**Clean room -** A space kept as free as possible from dust and other contaminants.
**Composite materials -** Materials produced from two or more component materials.
**Computer Aided Design -** The process by which computers are used to create, modify, analyse and optimise a design.
**Computer Numerical Control -** The use of a computer programme to control tools.
**Diffuser -** A shaped section of the vehicle that increases the velocity of airflow underneath the car.
**Downforce -** Airflow that pushes the vehicle into the race track, increasing grip.
**Drag -** The resistance encountered as the vehicle moves through the air.
**Iteration -** A new version of a design, component or piece of software.
**Level (qualifications) -** A standardised system to compare the difficulty of different qualifications e.g. A-Levels, T-Levels and Advanced Apprenticeship are all level 3.
**Powertrain -** The components of the vehicle that generate and deliver the vehicle's power (e.g. engine, energy storage units).
**Prototype -** A first or preliminary version of the vehicle or component.
**Stress test -** Intense testing under race conditions to determine the stability, durability and safety of the components.
**Test rig -** Equipment designed to enable testing that replicates race conditions.

# FURTHER INSPIRATION

Black Women in Science Network - Tackles the underrepresentation of Black women in Science through their mission to serve as a supportive space, platform and movement for a community of black women in science at all career stages.
Driven By Us - Empowering aspiring motorsport leaders from ethnic minorities and underrepresented groups through mentoring and support in a safe space, facilitated by relatable role models with first-hand success stories.
Females in Motorsport - Sharing the stories and celebrating the talent of female motorsport professionals via social media, podcasts and more.
Girls on Track - A joint initiative between FIA and Motorsport UK offering exciting free events to girls aged 8-18 and an online community for women of all ages interested in motorsport careers.
My Job in F1 YouTube playlist - Interviews with Mercedes F1 team members across a wide range of departments explaining what roles they do and how their experience got them into motorsport.
Race for Diversity - A Motorsport UK programme for those aged 14-24 offering school and community events, with a supportive online space that helps aspiring motorsport professionals develop their networks.
Racing Pride ambassadors - Profiles of LGBTQ+ individuals working in across disciplines and roles within motorsport and associated industries, sharing their lived experience across various media.