

THE OFFICIAL F1® IN SCHOOLS EQUIPMENT



# *Race* *equipment*

POWERED BY  DENFORD®





## As Proud Founder and Sponsor of F1® in Schools, Denford is delighted to be the official supplier of F1 in Schools Equipment & Consumables

**“F1 in Schools Race Equipment – designed and manufactured in the UK by Denford.”**

“We have developed a complete range of cutting-edge equipment to support the F1 in Schools Challenge, including the lightweight, portable Race Track and Start Gate with clear display and data storage.

The Air Trace Visualisation System is also a valuable asset for analysing aerodynamic capability and for demonstrating this in the classroom.

Denford continues to enhance and develop this equipment to meet the technological demands of competing teams.”

**Steve Oddy**  
Managing Director  
Denford Limited

**“We need high-quality equipment to future-proof the F1 in Schools STEM Challenge.”**

“F1 in Schools has seen exponential growth since its launch in 2000 and in today’s technology driven world, it is as important as ever to deliver cutting-edge equipment to future-proof the success of the Challenge.

F1 in Schools Equipment designed and made by Denford combines the highest standards of manufacture with the advanced technology required by the F1 in Schools teams.

Accuracy and precision are vital when cars are being raced side by side down the F1 Race Track and breaking world records - whether it be at regional events or at national and world final level!”

**Andrew Denford**  
Founder and Chairman  
F1 in Schools



# in Schools STEM Challenge

F1 in Schools Limited is a not-for-profit company, established with committed partners, to provide an exciting, yet challenging, educational experience through the magnetic appeal of Formula 1. It was launched in the UK in 2000 in 8 schools and now operates in over 26,000 schools across 54 countries worldwide.

The F1 in Schools STEM Challenge aims to raise standards across schools, promoting student achievement in STEM related subjects and beyond, developing the next generation of engineers, technicians, scientists, and entrepreneurs.

By adopting a grassroots approach, we actively encourage students from all backgrounds and of all abilities to take part in the Challenge, setting realistic performance goals and offering a variety of different entry levels, which helps students to develop their skills as they progress from one level to the next. As students progress through the competition, standards and expectations rise, in preparation for the opportunities and challenges which will await them in their future careers.

New for 2022 is the F1 in Schools Primary Class, which introduces Primary pupils to the exciting world of F1 in Schools!



# THE PROCESS



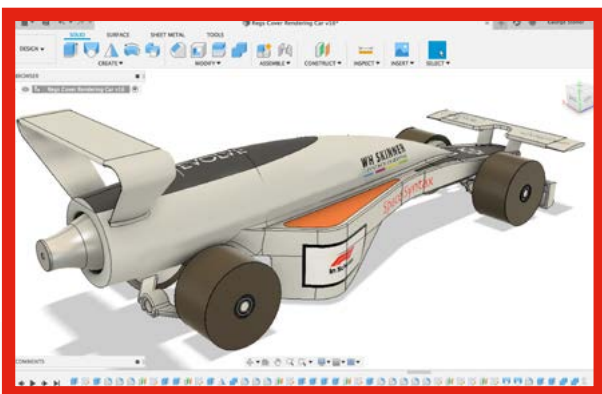
## Form an F1® in Schools Team

A team is formed of 3 - 6 students, who decide on a team name and job roles, and then follow a systematic engineering design process to manufacture and race their cars, making sure that they comply with a comprehensive set of technical regulations. Teams then register for regional final events.



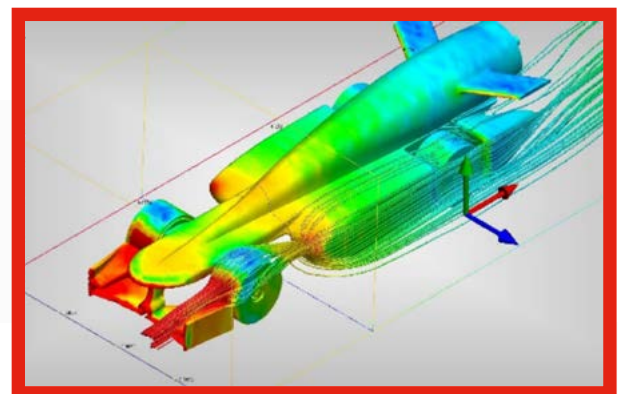
## Project Management & Enterprise

The teams prepare a **project management** and **business plan**, develop a budget and raise sponsorship. Teams are encouraged to collaborate with industry and create business links.



## Design

Using 3D CAD (Computer Aided Design) software, the team **designs** an F1 car of the future to the specification set by the International Rules Committee, just like in Formula 1.



## Analyse

Aerodynamics are **analysed** for drag coefficient in a Virtual Reality Wind Tunnel using Computational Fluid Dynamics (CFD) software.



# in Schools



## Make

Using 3D CAM (Computer Aided Manufacture) software, the team evaluates the most efficient machining strategy to **make** their car on a CNC machine such as the Denford F1 Router.



## Test

Aerodynamics are **tested** in Air Trace Visualisation Tunnels. Aerodynamics is a major focus for all teams involved in the world of Formula 1 and can make the difference to a winning team. Students can fine tune designs to optimise speed and drag coefficient.



## Race

Teams are judged on car speed, as well as supporting evidence of their design, verbal presentation and marketing display stand in "the pits".

Teams put the cars to their ultimate test by **racing** them over a measured 20m distance with the F1 Race Track and F1 Race Control System.

# DESIGN

## Software



### QuickCAM 2D Design



This is an advanced, yet simple to use, wizard-based 2D CAD/CAM package, which allows you to create designs quickly and accurately, then run the CAM wizard to create CNC machine toolpaths.

It is possible to import designs and images from other CAD packages, which can be manufactured on a CNC Router or Laser Cutter.

QuickCAM 2D includes Advanced V-Carve Extension as standard.



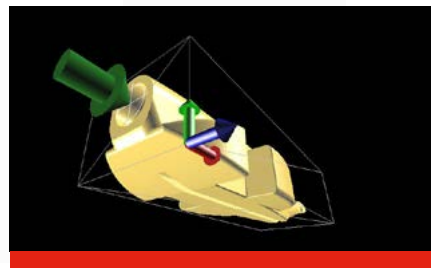
### QuickCAM Pro



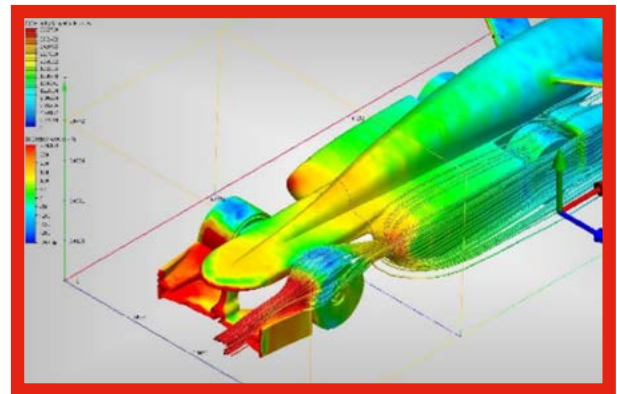
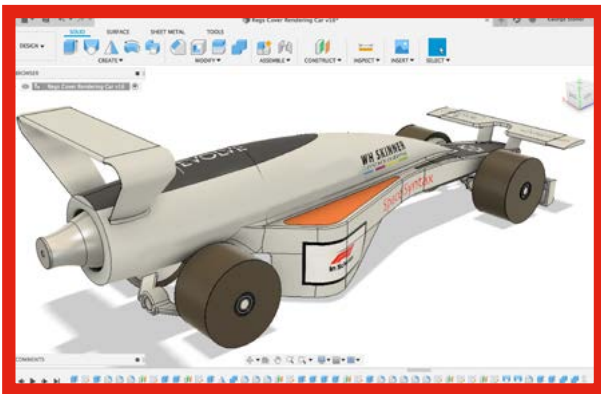
QuickCAM Pro provides the link between your 3D design software and the Denford range of CNC Routers. It's a simple wizard-based CAM package which creates cutter paths from .STL files and image files for the machining of F1 in Schools cars or any 3D parts on a Denford CNC Router or Milling machine.

QuickCAM Pro also includes the F1 Car Wizard, which simplifies the process of creating the CNC file to cut both sides of an F1 car.

Simply progressing through the pages of the Wizard allows the program for both the left and right hand side of the car to be created in one easy operation.



# DESIGN / ANALYSE



## Autodesk Fusion 360

As F1 in Schools' Premium Global CAD/CFD Software Partner, Autodesk provides schools and teams participating in the Challenge with free access to an extensive portfolio of Autodesk 3D Design & Analyse software - the same professional software used by industry leaders today. Provide your team with professional design software from Autodesk and watch the magic unfold before your eyes!

Using 3D CAD software, teams design their own unique model F1 cars, in line with the F1 in Schools Technical Rules & Regulations, then to analyse their car designs, they have access to Autodesk's CFD (Computational Fluid Dynamics) software. This provides a virtual wind tunnel, which models airflow around the F1 car design concept, testing aerodynamics early in the design process.

To register for Autodesk Software visit:  
[f1inschools.co.uk/autodesk-software](http://f1inschools.co.uk/autodesk-software)



# MAKE

## Denford CNC Routers



**NEW**

### F1 Router

Designed exclusively for the manufacture of F1 in Schools cars, the F1 Router is an easy to use, low-cost machine, which has been developed to make F1 in Schools more affordable and accessible to schools worldwide.

The F1 Router comes complete with workholding for F1 Model Blocks.



### Compact 1000 / Pro

This versatile Router is perfect for cutting F1 in Schools Car designs, as well as a range of resistant materials such as hard and soft wood, plastic, modelling foam, acrylic and prototyping materials.

The Compact 1000 Pro can also cut non-ferrous metals.

Visit [denford.co.uk](http://denford.co.uk) for full product specifications





## Router 2600 / Pro

Denford's most popular CNC Routers offer a larger capacity and high-speed, precision cutting for a range of resistant materials, and come complete with an enclosed interlocking guard.

Additionally, the Router 2600 Pro has a metal cutting spindle motor for non-ferrous metals.



## Router 6600 / Pro

Denford's largest Routers (table size 1080 x 640mm) – designed exclusively for education and training. These Routers come complete with built-in machine bench and are perfect for cutting a range of resistant materials such as hard and soft wood, plastic, modelling foam, acrylic and prototyping material.

The Router 6600 Pro can also cut non-ferrous metals.

### Choose from these optional extras to create the Denford Router that's right for you:

- F1 in Schools Car Manufacturing Fixture\*
- 4th Axis Programmable Fixture\*
- 3D Scanning Attachment\*
- Machine Bench with PC Arm
- Dust Extraction Unit

\*Not available for F1 Router

All Denford CNC Routers are supplied with Denford's VR5 CNC machine operating software.



# TEST

## Air Trace Visualisation Tunnel

The Air Trace Visualisation Tunnel is an essential part of the design, test and remake process.

Featuring variable wind speeds, it's simple to use, compact in design, and easy to set up. Use it with the Air Trace Smoke Generator to run a steady stream of harmless, smoke-like vapour over your F1 in Schools car to demonstrate its aerodynamic capabilities.



## Air Trace Smoke Generator



This will produce a steady stream of smoke-like vapour for up to ten minutes from a fully charged battery, or continuously when connected to a mains adapter.

Vapour will disperse quickly, so you can clearly see the air flow pattern without flooding the Air Trace Visualisation Tunnel with thick fog.

Light and practical, the generator comes in its own robust carry case with a battery and charger (mains adapter kit available separately).



### PACKAGE

## Air Trace Visualisation System

Includes everything you need to test your car designs:

- Air Trace Visualisation Tunnel
- Air Trace Smoke Generator with Air Trace Fluid



# RACE

## F1<sup>®</sup> in Schools Race Track

**The F1 Elevated Race Track is designed and manufactured in the UK.**

Designed to be durable and moisture resistant, its light aluminium construction makes it easy to assemble, break down and store. It measures 23.65 metres in length, comprising 11 track sections and 12 support legs, incorporating cable management, and has screen printed start and finish sections. Timing sensors are built into the finish section of the track for accurate and consistent finishing times.

A flight storage case is available separately (see page 21).





**OPTIONAL**

## Car Deceleration System

F1 in Schools cars are becoming faster and more sophisticated, so the Car Deceleration System is an important way to slow cars down safely once they have crossed the finish line. Using a tapered brush system, the unit comes in two pieces designed to stop cars effectively on each side of the track.



# RACE

## F1<sup>®</sup> in Schools Race Control System

The ultimate Race Control Package, with F1 branded wraps, designed for the F1 Elevated Race Track.

### What's included:

- Start Gate
- Finish Gate
- 2 Start Boxes
- 2 F1 Start Triggers

### Available optional upgrades:

- Optional Sector Gate Timing System
- Race Triggers (see page 16)
- Flight Storage Case (see page 21)

### Features:

- The display screen background can be customised - for example to create an event-specific screensaver
- Reaction time leader board program, which updates in real time

**Note:** The Race Control System is also available as a stand-alone system (see page 18), which can be floor mounted or used on the new Roll Out Race Track.



Finish Gate indicators to show that power is applied and that both lanes are clear.

Shown with optional Race Triggers

### OPTIONAL

#### F1<sup>®</sup> in Schools Sector Gate Timing System

Additional Timing Gate for use with F1 Race Control System (not Stand Alone). The Sector time is recorded by the Race System and will allow car acceleration and deceleration graphs to be calculated.

Can only be used with the F1 Elevated Race Track.



**The Start Gate features a high resolution 9" anti-glare screen displaying multiple modes:**

- Auto Mode (Race Time)
- Manual Mode (Reaction Time, Race Time and Combined Time)
- Reaction Time Mode (Reaction Time)

The Start Gate is fully programmable, allowing team names to be input and results to be viewed live.



Multi voltage power supply and WiFi data transmission as standard.  
Rugged start triggers and cables are supplied with 90 degree connectors.  
Cable management included.

Finish Gate incorporates a blue spotlight indicator to show when the finish line is crossed.



Reverse view of Start Gate



Reverse view of Finish Gate



# RACE

## Start Boxes

**Start Boxes are included with the F1 Race Control System and are designed for reliability and durability, featuring:**

- Silver steel firing pins for extended life
- Torsion spring, which is latched under pressure for consistent release
- Steel latch mechanism to provide consistent release and to prevent wear
- Latch release lever to allow the spring to be un-cocked, and a substantial base to reduce recoil

The Start Boxes are designed with safety in mind and are fully guarded.



Standard Start Triggers



**OPTIONAL**

## Race Triggers

Race Triggers are available on request. The Race Triggers are machined from high grade aluminium alloy, and are larger than standard Start Triggers (shown above left). Race Triggers are used at all of the UK Regional and National Finals, and at the World Finals.



**PACKAGE**

# F1® in Schools Race System Package

Includes everything you'll need to get racing

- F1 Race Track
- F1 Race Control System comprising:
  - Start and Finish Gates
  - Start Boxes and
  - F1 Start Triggers

This Official F1 in Schools Race System Package is authorised for Regional and National Competition Events



# RACE

## F1<sup>®</sup> in Schools Race Control System (Stand Alone)

The Stand Alone Race System comes complete with additional Finish Sensor Gate and cables to mount the timing sensors, and with F1 Branded Wraps.

This Race Control System can be floor mounted or used on the new Roll Out Race Track.



## F1<sup>®</sup> in Schools Roll Out Race Track

24m Roll Out Race Track, complete with support brackets for the Start & Finish Gates, and a tether line mounting system.

Includes ramp supports which lift the Start & Finish Gates clear of the race surface and angle the screen display upwards.



## PACKAGE

# F1® in Schools Race System Package - Roll Out Race Track

An affordable entry-level race system package, which is easy to set up and doesn't require much storage space - ideal for testing and racing your F1 cars!

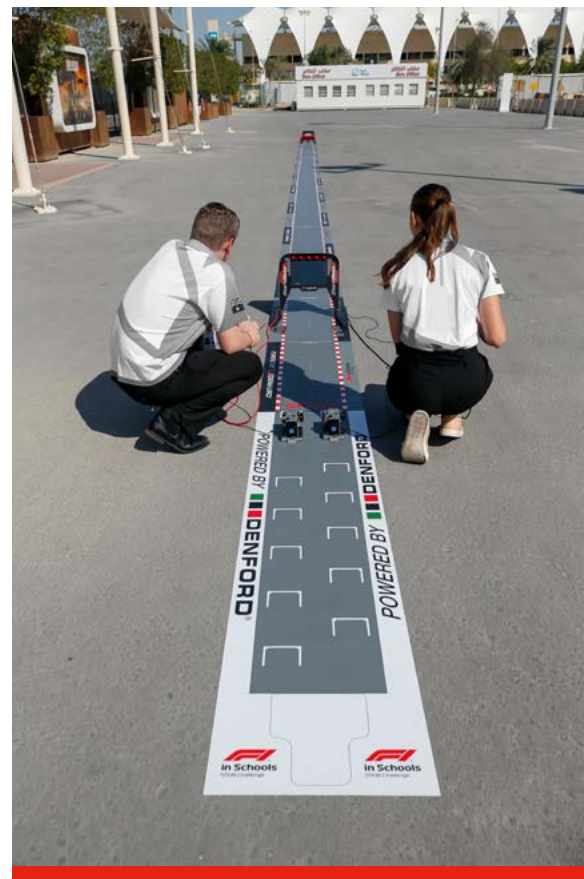
Note: This F1 in Schools Race System Package - Roll Out Race Track - is not for use for Regional and National Competition Events

### Includes

- F1 Race Control System (Stand Alone)
- F1 in Schools Roll Out Race Track System

### Benefits

- Ideal for testing and racing your F1 cars
- Quick and easy to set-up
- Lightweight
- Easily affordable
- Easy to store
- Easy to transport (will fit in a car)
- Ideal for promotional events





# F1® in Schools Race Equipment & Consumables

## MAKE



### F1 in Schools Car Manufacturing Fixture

To enable the manufacture of Formula 1 Class cars. The fixture clamps directly to the T-slotted table on the Compact 1000/Pro, Router 2600/Pro and Router 6600/Pro and is also suitable for use on the VMC 1300 (it is necessary to remove the tool changer to fit the fixture)

NR1/0400UA



### F1 Entry / Development Class Starter Kits

#### SOLO

1 x F1 Model Block Car Kit  
1 x IsoSketch 3D Drawing Tool - single blister pack

F1DKIT01

#### TEAM

5 x F1 Model Block Car Kit  
5 x IsoSketch 3D Drawing Tool - single blister pack

F1DKIT05

#### GROUP

10 x F1 Model Block Car Kit  
1 x IsoSketch 3D Drawing Tool - class pack of 30

F1DKIT30



### F1 Model Block (pack of 10)

This official F1 Model Block measures 223mm x 65mm x 50mm, with a consistent weight and density, and contains a pre-drilled hole for the Power Pack.

F1223/10



### F1 Class Wheels

F1 Class Wheels - Black (pack of 100)

NX4531



### F1 Model Block Car Kit

Includes 4 x F1 Class Wheels, 1 x Sandpaper, 2 x Screw Eyes, 2 x F1 Axles, 4 x Axle Bushes, 1 x F1 Model Block

N13226F1M01



### Screw Eyes

Use these screw eyes to keep your car on the track  
Screw Eyes (pack of 100)

N16020





**F1 Axles**

Use the strength of steel to mount your model wheels  
 F1 Axles - 66mm (pack of 100)

N16010



**Axle Bushes**

1/4" OD for use with F1 Axles (pack of 100)

NX4532



**Paint Stand**

Holds your car during the painting process. The car is suspended by the cartridge hole and once in the stand, can be rotated to paint all sides

N54528

## RACE

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**Denford Power Packs - Standard**

Denford Power Packs 8 gms (pack of 360)

F1C02ST

**Denford Power Packs - Race**

Denford Power Packs 8 gms (pack of 360)  
 (separately weighed to guarantee a race weight range of within 0.5 grams)

F1C02CMP



**F1 in Schools Track Banners (for new F1 Race Track)**

Track Banners for use with F1 Race Track, featuring chequered flag borders, F1 in Schools logo and Denford logo

F1RTB



**Flight Case for F1 Race Track**

F1RTFC

**Flight Case for F1 Race Control System**

F1RSFC

**Flight Case for F1 Race Control System & Sector Gate**

F1RSFC-SG

# F1<sup>®</sup> in Schools Primary Class

Placing Primary School Pupils aged 9 -11 on the Starting Grid for STEM Learning!

**NEW**



F1 in Schools has introduced a new Primary Class, which allows Primary pupils to take their first official steps on the F1 in Schools pathway. Using the popularity of Formula 1 motor racing to engage pupils in STEM learning, the competition challenges Primary pupils aged 9-11 to create their own race team and design a miniature compressed air-powered paper F1 car – an ideal introduction to the world of F1 in Schools.



The Primary Class follows exactly the same process as F1 in Schools in Secondary Schools: register, form a team/allocate roles, follow the steps to design, make, assemble, test and then race a unique model F1 car, whilst developing invaluable interpersonal skills and putting teamwork abilities to the test. Teams aim to compete at a Primary Class Regional Final, progressing on to the ultimate challenge: a National Final! Regional and National Finals give a chance to share their experience, showcasing their work with presentations to judges and creating a 'pit garage' display about their team.

The Primary Class is a great opportunity to see ideas and designs come to life in a STEM-related context, cover science links such as friction, air resistance, gravity and air pressure and identify areas for future development and have fun, whilst learning key life skills.

[f1inschools.co.uk/primary](http://f1inschools.co.uk/primary)

 **in Schools**  
Primary Class

# Race Equipment & Consumables



**F1 in Schools Primary Class - Group Starter Pack (Makes 50 Cars)\*** PCCP50

Consists of:  
 50 x Printed Chassis Nets, 50 x Printed Engine Housing Nets,  
 50 x Blank F1 Bodyshell Nets, 200 x F1 Class Wheels, 200 x Axle Bush,  
 50 x Axle Guides, 100 x F1 Axles and 100 x Axle Tether Line Guides

**F1 in Schools Primary Class - Starter Pack (Makes 5 Cars)\*** PCCP05

Consists of:  
 5 x Printed Chassis Nets, 5 x Printed Engine Housing Nets,  
 5 x Blank F1 Bodyshell Nets, 20 x F1 Class Wheels, 20 x Axle Bush,  
 5 x Axle Guides, 10 x F1 Axles and 10 x Axle Tether Line Guides

\*All items are available individually



**F1 Race System Package - Roll Out Race Track** PKFF2B

Ideal for testing cars and is also easy to transport and store.  
 Includes: F1 Roll Out Race Track System &  
 F1 Race Control System (Stand Alone)



**Denford Power Packs 4gm (Pack of 100)** F1C02/100

**Denford Power Packs 4gm (Pack of 300)** F1C02/300



**Option - Design:**  
 IsoSketch 3D Drawing Tool (Class Pack of 30) ISOCP30



**Option - Make:**  
 Silhouette Cameo 4 12" Cutter - White BI01819SC4



**Option - Test:**  
 Air Trace Visualisation System F1AT001000  
 Includes: Air Trace Visualisation Tunnel, Air Trace Smoke Generator  
 & Air Trace Fluid

# Primary STEM Project

Make STEM learning exciting and fun with this innovative Classroom Resource!



Sow the seeds of STEM learning at an early age with the Primary STEM Project, encouraging Primary pupils to develop knowledge and skills through practical, hands-on activities. An ideal introduction to the F1 in Schools Primary Class.

## What pupils will learn:

- Science applied to the real world
- The process: research, design, make, test, modify, race
- Teamwork and sportsmanship
- How to closely follow instructions
- Speaking and listening skills
- Recognising personal strengths and strengths in others



## Design - Make - Race

Students start the process by folding a pre-stamped chassis net to make a standard 3D racing car with wheels and axles. Following research, they will design and make a body shell to create their own miniature racing car and go on to test its aerodynamic qualities, using the launch system and roll-out race track, then re-evaluate their designs, to produce a winning car!



[primarystemproject.com](http://primarystemproject.com)





# Race Equipment & Consumables



## Primary STEM Project Pack (Makes 50 Cars)\*

ARCP02

Consists of:  
 50 x Printed Chassis Nets, 200 x Primary STEM Project Wheels,  
 50 x Propulsion Tubes, 50 x Propulsion Tube End Caps,  
 50 x Axle Guides, 200 x Axle Bushes, 100 x F1 Axles and  
 50 x Tether Guide Tubes

## Primary STEM Project Pack (Makes 5 Cars)\*

PSCP05

Consists of:  
 5 x Printed Chassis Nets, 20 x Primary STEM Project Wheels,  
 5 x Propulsion Tubes, 5 x Propulsion Tube End Caps,  
 5 x Axle Guides, 20 x Axle Bushes, 10 x F1 Axles and  
 5 x Tether Guide Tubes

\*All items are available individually



## Primary STEM Project Launch System

F1AR001000A

Includes:  
 Air Launch Control Box, Air Launch Pump, Loading Pins,  
 Tether Block Assembly, Tether Guide Line



## Primary STEM Project Roll Out Race Track

F1AR/0900

Roll out race track 10m.

## Upgrade Primary STEM Car Kits to F1 in Schools Primary Class

Students who have taken part in the Primary STEM project can easily modify their 'air-powered' car kits with the addition of a 'Ready to Race Pack', which includes engine housing nets for a 4gm compressed air power pack, along with wider wheels (as used in the F1 in Schools Entry & Development Classes), and tether line guides.



## Primary Class Ready to Race Pack (For 5 Cars)

PCRR05

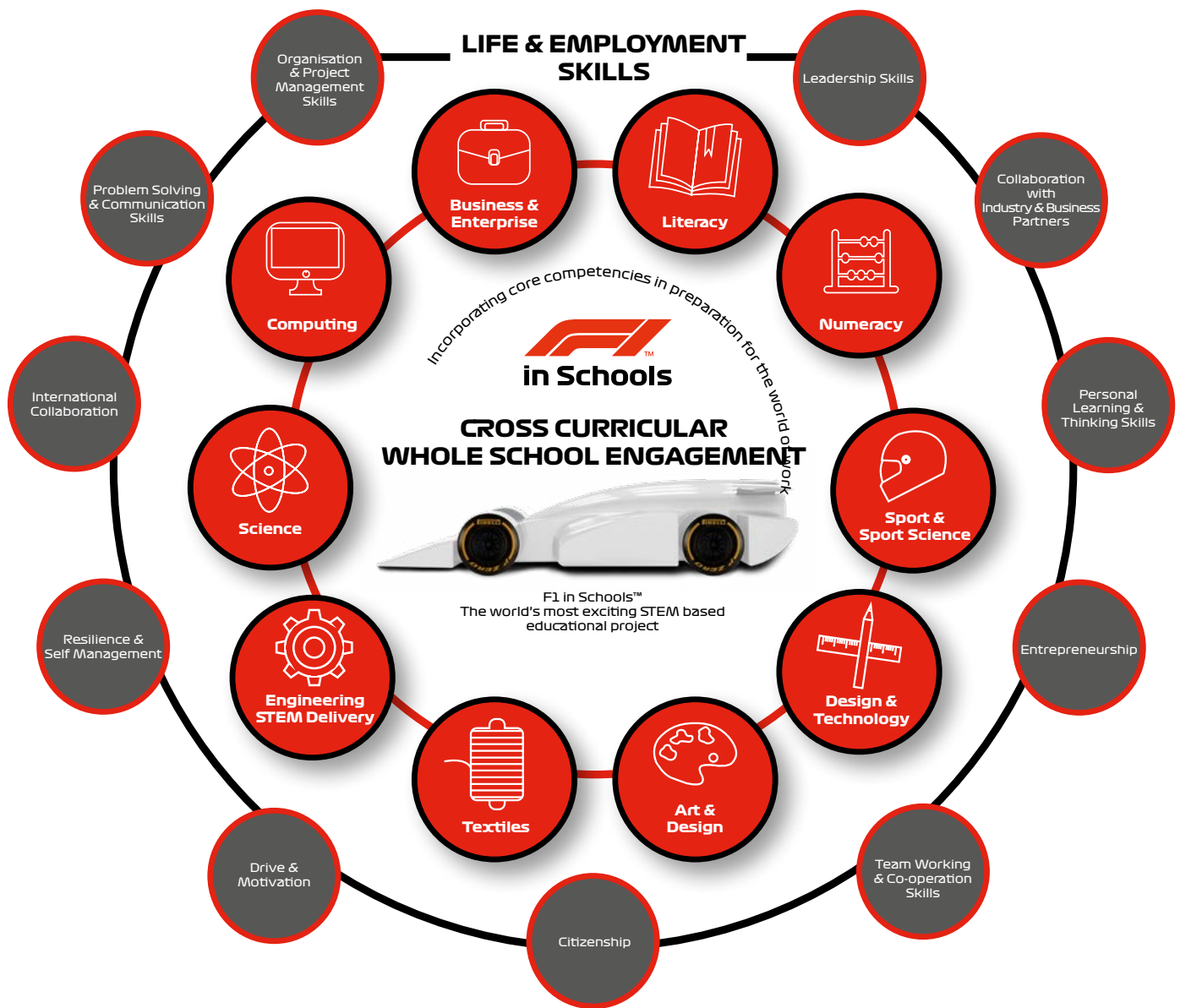
Consists of:  
 5 x Printed Engine Housing Nets, 20 x F1 Class Wheels and  
 10 x Axle Tether Line Guides





# Building Life Skills

Not just STEM



EDUCATE | MOTIVATE | INSPIRE

# Want to know more?

To register for the F1 in Schools Challenge and for "all things F1 in Schools"

visit [www.f1inschools.co.uk](http://www.f1inschools.co.uk)

For more information on F1 in Schools Race Systems and Denford equipment

visit [www.denford.co.uk](http://www.denford.co.uk)



**in Schools**

*Race*  
**equipment**  
POWERED BY  **DENFORD®**

Tel: +44(0)1484 728000

[denford.co.uk](http://denford.co.uk)

Denford Limited Armytage Road Brighouse West Yorkshire HD6 1QF England