



كمنترين فنديدن
نكارا بروني دارالسلام
KEMENTERIAN PENDIDIKAN
NEGARA BRUNEI DARUSSALAM



3RD NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGE (NSIDC) NATIONAL FINAL

2018 COMPETITION REGULATIONS

National STEM and Innovative Design Challenge (NSIDC) 2018 adapted from F1 in Schools Rules & Regulation.

This is accessible via f1inschools.moe.gov.bn at the rules and regulations notices and downloads page

Front Cover – NSIDC Challenge Trophy

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WHAT IS THE NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGES?

NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGES (NSIDC), adapted from F1 in Schools™, is a multi-disciplinary challenge open to Secondary schools, Colleges, Institute of Brunei Technical Education (IBTE) institutions and Higher Institutions where teams of students aged 9 to 19 deploy CAD/CAM software to collaborate, design, analyse, manufacture, test, and then race miniature compressed air powered balsa wood F1 cars Teams of 3 – 6 students are judged on car speed, as well as supporting evidence of their design, verbal presentation and marketing display stand in “the pits”.

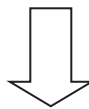
The NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGES: F1 in Schools Brunei Darussalam will be held in Brunei Darussalam where student teams will compete against each other.

GETTING STARTED

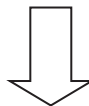
2018 Flowchart

NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGES (NSIDC): F1 IN SCHOOLS BRUNEI DARUSSALAM

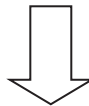
Rules and Regulations
Registration Forms



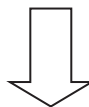
Teachers and students to read the
COMPETITION AND TECHNICAL REGULATIONS
documents



Teacher to enroll and to register team in 2018 season on-line
<http://f1inschools.moe.gov.bn>



NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGE
to confirm school attendance



NATIONAL STEM AND INNOVATIVE DESIGN CHALLENGE
November 2018

Getting Started Continued...

Software, hardware and consumables required

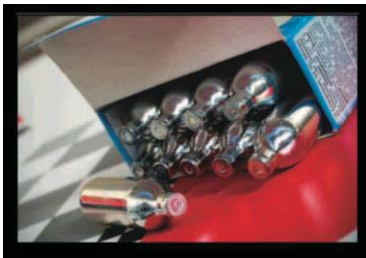


Formula One Car kit



Racing Management System

- Balsa Wood Block
- A set of 4 wheels
- 2 axles (Same Length)
- 4 Washers
- 2 Tether Guides
- 3 pieces coarse sandpaper
- 3 pieces fine sandpaper



CO2 Cartridges (Per Dozen)



Elevated Racing Tracks



CNC Router Milling Machine



3D Printer

THE CHALLENGE

You are the Design Team commissioned to design, construct and race the fastest Formula 1 car on the planet driven by compact compressed air power plants.

In order to enter the Championship, you must allocate job roles to the members of your group. Ideally, one role should be allocated to each person. However, you may have to double up on your role and responsibilities, depending on the number of people you have available. The following job roles are examples of what could be covered by the members of your team:

- **Team Manager** (maximum 1 person).
This person could be responsible for managing the team, ensuring that the primary and backup cars are ready for the finals. The team manager works closely with all members of the team, offering assistance where necessary.
- **Resources Manager**
This person organises time, materials and equipment for design and making the cars. They could be responsible for developing ideas regarding team marketing (presentation). The resources manager will need to liaise with all members to check tasks are progressing on time and offer additional help, if needed.
- **Manufacturing Engineer**
These people could be responsible for advising team members on the manufacture of the car and the constraints of the machining process. Manufacturing engineers will need to liaise with the design engineers to report and help solve any problems with construction of the car.
- **Design Engineer**
This role could be responsible for the styling and aerodynamic performance of the car design. Design engineers will need to liaise with the manufacturing engineers to ensure their ideas can be realised.
- **Graphic Designer**
This person could be responsible for producing the colour schemes applied to the vehicle, including any special sponsorship decals, together with the final graphic renderings and any additional team marketing materials. The graphic designer will need to liaise with the design engineer to ensure any schemes will fit the shape of the vehicle and the resources manager for additional marketing development.

There are so many tasks that must be mastered, in order to design, manufacture, prepare and finally enter a car for racing, that teamwork will be vital to your success.

Remember, no one person is more important than other members in the team.

DESIGN CONSIDERATIONS

Design Preparation

Before beginning to design your car, you will need:

- A 3D CAD solid modelling software package at your school/college such as Autodesk Inventor.
- A design template suitable for the balsa wood blank.
- Hopefully, an endless supply of ideas!

Training

Autodesk CAD packages will help you draw and develop your ideas in 3D. Of course, as with most drawing packages, it takes time to learn how to use them. Your teacher should be able to show you how the software works, but members of your team will need to spend some time exploring the software, so you can see what it can do and how it can help you design your F1 car.

Research

Investigate existing land speed record car designs. Your teacher may be able to help you use the internet to find out the latest F1 designs developments. Concentrate your research on areas that could help your team, for example, aerodynamics and car body designs, and then try to apply the principles to your own ideas.

Testing

Your team may want to consider testing a variety of car designs, or car parts, in a wind and/or smoke tunnel to evaluate their aerodynamic performance.

MANUFACTURING CONSIDERATIONS

- A. The Formula One Class Car Kit will receive a balsa wood block, a set of 4 wheels, 2 axles and some sandpaper, which is the minimum that you need to enter the challenge.
- B. **Note that your car design template must be at least 10mm shorter at one end**, compared to the actual balsa wood block. You will not be able to machine to the extreme ends of the balsa wood block, since they are sometimes used for attaching the CNC machine fixtures. Damage could occur if the cutting tool hits any of these fixtures.
- C. The fixture is used to stop the balsa wood block moving whilst being machined. It also allows the block to be accurately repositioned. Please note however that some machines will process with only one cut, others may require two or more cuts, and therefore you will need to take this into account when you are designing the car.
- D. Once machined, you can smooth down the balsa wood design and finish with primer and paint. Note that only a limited amount of hand finishing to the body is allowed. You could also decorate the car body with any sponsorship stickers, advertising or colour schemes.

ARTICLE C1 – DEFINITION

A number of terminology and phrases will be used in all documentation and during National Stem and Innovative Design Challenge (NSIDC): F1 in Schools event. This article will give a definition for each one:

C1.1 Article

Each section in all documentation will be referred to as an Article which brings F1 in Schools Ltd documents in line with the Fédération Internationale de l'Automobile (FIA) documentation.

C1.2 Parc Fermé

A secure area where all race cars (Car A & B) are held to prevent unauthorised handling, but to allow technical inspections to be conducted by the Judges. (Literal meaning in French of 'closed park').

C1.3 Competition Programme

The competition programme will detail the schedule of judging activities for all teams.

C1.4 Key performance indicators (KPI's)

These are portions of text that feature on the scorecards within a corresponding points range. The KPI's describe the type of evidence the Judges will be looking for in order to score the team appropriately.

C1.5 Car race time value

A 'car race time' value is the actual time taken for a F1 in Schools™ car to travel the track from start to finish, measured from the instant the launch pod fires to when the car breaks the finish line timing beam. In the case of reaction races, the 'car race time' value is calculated as the 'total race time' value displayed on the electronic start gate minus the 'reaction time' value displayed for that race.

C1.6 Total race time value

The 'total race time' value is displayed in the total time field on the electronic start gate at the conclusion of every race. This time is the sum of the 'car race time' value and any 'reaction time' value displayed on the electronic start gate. During time trial races where the automatic launch mode is used, the 'reaction time' value is displayed as 0.

C1.7 Reaction time value

A 'reaction time' value is the time recorded from the instant the five (5) start lights extinguish to the instant the start trigger is activated by the driver. This value is displayed in the reaction time field on the electronic start gate.

C1.8 Project elements

These are any materials and resources that the team presents as part of its entry for any judging activity.

C1.9 Race event

The World Finals competition includes two separate race events. These are: Reaction Racing and Knock-out Racing.

C1.10 Engineering Drawings

CAD produced drawings which should be such that, along with relevant CAM programs, could theoretically be used to manufacture the fully assembled car by a third party. Such drawings include all relevant dimensions, tolerances and material information. F1 in Schools engineering drawings include detail to specifically identify and prove compliance for the virtual cargo and wing surfaces.

C1.11 Renderings

Renderings are images intended to illustrate the three dimensional form of an object. These can be generated in isometric projection, oblique projection or perspective.

ARTICLE C2 – GENERAL INFORMATION

C2.1 Competing teams

C2.1.1 Each team must consist of a minimum of 3 students to a maximum of 6.

C2.1.2 Each team member must be between the ages of the category. The age of each team member will be taken at the time of the national final.

Category	Age as on 1st Jan 2018
Formula One Class – Junior (Secondary School)	12 – 17 years old
Formula One Class – Senior Sixth Form & Higher institution	17 – 21 years old

Note: Each school can submit maximum of **two** teams.

C2.1.3 ONLY MEMBERS OF THE OFFICIAL COMPETING TEAM MEMBERS (maximum 6) are permitted to wear the team's uniform.

C2.1.4 Team affiliated students (supporters), supervising adults / teachers must adhere to C2.1.3. If a uniform is to be worn, it **MUST BE SIGNIFICANTLY DIFFERENT** to the official core team. This is to assist the Judges in recognizing the official core students.

C2.1.5 During the competition, only the official core team members (maximum of 6) can represent the team at registration, Pit Display set up, Scrutineering review, Verbal Presentation and Design & Engineering judging, critical rule fix, racing, on-stage presentations and any direct communication with the Chair of Judges or Event/Competition Directors.

C2.1.6 Each team must use **Autodesk Inventor 3D CAD** (Computer Aided Design) software to produce their ideas and model them in 3D. Each team should use a CNC machine such as a Denford CNC Router to produce the car body.

C2.1.7 Each team should manufacture their car body at their school/college/institution.

C2.2 Team responsibilities

C2.2.1 Teams **MUST** read the **NSIDC Technical Regulations** carefully to ensure their cars comply with those regulations.

C2.2.2 Teams **MUST** read the **NSIDC Competition Regulations (this document)** carefully to ensure that all project elements satisfy these regulations and that they understand the requirements and procedures for all aspects of the competition and judging.

C2.2.3 During competition it is the team's responsibility to ensure that team members are present at the correct time and location for all scheduled activities.

C2.2.4 Security of the pit display and its elements is the team's responsibility during competition.

C2.3 Role and responsibility of supervising teacher / adult

C2.3.1 All supervising teachers / adults should carefully read and understand the terms and conditions for entry into NSIDC: F1 in Schools Brunei Darussalam event and must have explained all relevant information to their students.

C2.3.2 It is the primary responsibility of the supervising teacher/adult to ensure duty of care / well-being for all their student team members. Any concerns arising during the event in relation to this should be brought to the attention of the Event Directors immediately.

C2.3.3 The supervising teacher / adult are **NOT** permitted to be present during all judging activities with their team.

C2.4 Regulations documents

C2.4.1 NSIDC: F1 in Schools Brunei Darussalam issues the rules and regulations, all revisions and amendments made.

C2.4.2 Competition Regulations (this document) is mainly concerned with regulations and procedures directly related to judging, the competition event. Competition Regulation articles have a 'C' prefix.

C.2.4.3 Technical Regulations – a separate document to this one, which is mainly concerned with those regulations that are directly relates to NSIDC: F1 in Schools Brunei Darussalam car design/ manufacture. Technical Regulation articles have a ‘T’ prefix.

C2.5 Interpretation of the regulations

C2.5.1 The final text of these regulations is in English, should any dispute arise over their interpretation. The regulation text, diagrams and any related definitions should be considered together for the purpose of interpretation.

C2.5.2 Text clarification - Any frequently asked questions that are deemed by NSIDC: F1 in Schools Brunei Darussalam to be related to text needing clarification will be answered. The question and the clarification will be published to all teams at the same time.

C2.6 Changes to regulations

In the event of any changes to the regulations or event logistics, teams will be contacted by F1 in Schools with further information. Any supplementary regulations will be issued to all teachers and team managers, where the team manager has supplied F1 in Schools with a contact email address.

C2.7 Design ideas and regulation compliance queries.

Teams are not permitted to seek a ruling from F1 in Schools or any competition official or judge before the event as to whether a design idea complies with the regulations. Rulings will only be made by the Judges at the F1 in Schools event. Design compliance to the regulations forms part of the competition. As in Formula 1™, innovation is encouraged, and F1 in Schools teams may also find, sometimes controversial ways, of creating design features by pushing the boundaries in order to get an extra competitive edge.

C2.8 Team partnerships

C2.8.1 F1 in Schools teams are encouraged to develop mentoring partnerships with businesses, industry or higher education organisations throughout their project.

C2.8.2 All design work, text and scripting for all project elements presented for assessment must be wholly undertaken and created by the team. This includes all CAD and CAM data, electronic portfolio and graphic content.

C2.8.3 All aspects of any partnerships should also be represented in the team’s portfolio. For any project element produced utilising some outside assistance, teams should be able to demonstrate to the Judges a high level of understanding and justification for any of the processes used.

C2.8.4 ‘Common sense’ will prevail for project elements or components that a team has purchased from a supplier e.g. bearings, screw eye, electricity power board. Teams should be able to explain and justify why a specific component was selected / purchased over other similar available components.

C2.9 Mandatory project elements required for National Competition entry

Following is a summary of the mandatory elements to be submitted for judging:

- Two (2) complete and identical F1 in Schools™ Class Cars
- Two (2) Design & Engineering Portfolio
- An Orthographic drawing and 3D render included in design portfolio
- A Pit Display
- An 8 minute Verbal Presentation
- An electronic copy of all specified project data
- Project Elements Submission Checklist

The above list is detailed in the remainder of ARTICLE C2.

C2.9.1 Cars

Each team must produce **two (2) complete and identical race car** and to submit the two (2) cars for judging and racing. Teams can produce a third identical car for display during the F1 in Schools Final.

C2.9.2 Portfolio

Each team must produce **two (2) identical** 'hard copy' of maximum 10 pages Design & Engineering portfolio, presented in an **A4** sized format for exhibition within the teams' pit display. Refer to ARTICLE C6 of these regulations along with the Design & Engineering judging scorecard for portfolio specification and content requirements.

C2.9.3 Orthographic drawing

A 3rd angle orthographic projection, including plan, side and end elevations of the fully assembled car must be included in the design portfolio. A 3D rendering of the final car design must also be included. These elements must be produced using CAD.

The orthographic technical drawing should include dimensions and corresponding regulation numbers in order to illustrate regulation compliance.

C2.9.4 Pit display

Each team will need to provide their own table and display booth for set-up of their pit display elements. Refer to ARTICLE C6 for further pit display specification and content requirements.

C2.9.5 Verbal presentation

Teams will be required to deliver a verbal presentation in relation to their project to the Judges. The presentation must not last longer than 8 minutes at national. Teams should save their presentation on USB or storage device and submit it on the verbal presentation judging day.

C2.9.6 Electronic Data

Teams must submit all Engineering and other data specified below on a storage device compatible with the windows operating system e.g. USB memory stick. F1 in Schools will copy the files during judging day.

Data submitted must include:

- All CAD parts and assembly files
- Hi-res realistic renders
- Full Design & Engineering portfolios
- All additional Engineering drawings and Renderings submitted for judging
- Any pit display multimedia files

C2.9.7 Project Element Submission Checklist

Teams must complete the checklist or submission at the event.

C2.10 Team registration at the event

Teams will be required to register with F1 in Schools once arriving for the event. At this registration teams will be issued Name Tag and event programs. The student team manager and supervising teacher for each team should make themselves known to F1 in Schools upon arrival.

C2.11 Submission of F1 in Schools™ cars

Teams will submit their cars one week before the competition for Scrutinizing. Once cars have been submitted, they are considered as being in parc fermé. All cars submitted must be race ready.

C2.12 Project elements to be retained by F1 in Schools

It is a condition of the NSIDC: F1 in Schools Final entry that each team permits NSIDC: F1 in Schools to retain 1 x race car, usually the nominated backup car, the 10-page Design & Engineering portfolio and the electronic copy of all specified project data submitted.

ARTICLE C3 – COMPETITION AND JUDGING FORMAT

C3.1 Competition program

C3.1.1 Each team will be judged as per the competition program. The competition program will be formulated by F1 in Schools to best and fairly accommodate all judging and other competition activities.

C3.1.2 Judging Streams – The competition program will normally be divided into two parallel judging streams to ensure quality judging time intervals within the event time constraints. A number of

strategies are implemented within the judging process, including Judge Briefings and Judge reviews for cross moderation to ensure there is consistency across the judging streams.

C3.2 Judging categories

There are five (5) main judging categories, each with its own team of judges and specified judging activities as detailed in further articles.

- Specification & Scrutineering Judging
- Design & Engineering Judging
- Portfolio and Display Judging
- Verbal Presentation Judging
- Racing

C3.3 Judging score cards

The F1 in Schools judging score cards provide detailed information in relation to what the Judges will be looking for. The key performance indicators are used by the judges in awarding points during the judging activities. The 2018 F1 in Schools judging score cards can be found in the appendix of this document. **READING THE SCORE CARDS CAREFULLY IS IMPORTANT. THEY PROVIDE CRITICAL INFORMATION FOR TEAMS AS TO WHAT NEEDS TO BE PRESENTED FOR EACH JUDGING CATEGORY.**

C3.4 Point allocations

Points will be awarded to teams across five (5) categories with maximum possible scores as detailed in the following table.

Specification & Scrutineering Judging	
Specifications	80 points
Design & Engineering Judging	
CAD CAM and Analysis	80 points
Manufacturing	60 points
Portfolio and Pit Display Judging	
Portfolio	80 points
Enterprise	80 points
Pit Display	40 points
Verbal Presentation Judging	
Technique	80 points
Composition	40 points
Subject Matter	60 points
Racing	
Time Trials	110 points
Reaction Racing	110 points
TOTAL	820 points

C3.5 Critical regulations

C3.5.1 Some of the Technical Regulations have been identified as being **critical regulations**. If a team's Car A or B is judged as being NON-COMPLIANT with any critical technical regulation, they will be INELIGIBLE for the following awards:

- Overall Champion
- Fastest Car
- Best Engineered Car

C3.5.2 If the back-up race car is used for any races, it must also comply with all critical Technical Regulations for the team to be eligible for these awards.

IMPORTANT: Article numbers are from the 2018 NSIDC Technical Regulations. Please take extra time to check your cars don't break any of the above critical Technical Regulations.

ARTICLE C4 – SPECIFICATIONS JUDGING (80 points)

C4.1 What will be judged?

Specification judging is a detailed inspection process where BOTH race cars are assessed for compliance with the NSIDC Technical Regulations. Refer to the specification and scrutineering judging scorecard for scoring details.

C4.2 Team preparation

Teams must ensure that their race cars (Car A & Car B) are ready for specification judging before they are submitted.

C4.3 Who needs to attend?

Specification & Scrutineering judging is a closed activity that no team member or supervising teacher may attend.

C4.4 Judging process / procedure

Teams begin specification judging with a full allocation of 80 points. Any infringements of the Technical Regulation articles, on either car, will result in point's being deducted as detailed in the Technical Regulations. Scrutineering will be conducted within the confines of parc fermé, where the specification Judges will scrutinise cars for compliance to the Technical Regulations. A series of specially manufactured gauges will be used to broadly check compliance. Accurate measuring tools, such as vernier callipers will then be used to closely inspect any dimensions found to be near to dimensional limits per the initial gauge inspection.

ARTICLE C5 – DESIGN & ENGINEERING JUDGING (105 points)

C5.1 What will be judged?

The engineering Judges will assess the teams' use of CAD/CAM technologies along with the quality of manufacture of both cars submitted. The specific areas to be assessed are:

- ✓ Application of CAD CAM
- ✓ Analysis
- ✓ Organisation of CAD data
- ✓ Orthographic drawing and 3D rendering
- ✓ Quality of manufacture and assembly of the two submitted cars
- ✓ Manufacturing process discussed in the portfolio
- ✓ Use of CNC machining and/or 3D Printing

C5.2 Team preparation

The team is allowed to bring along their design portfolio. Other items may also be taken to help the team explain any engineering or manufacturing concepts. The engineering judges will not have access to the team pit display for judging purposes. Preparation should include careful reading of the scorecard, the key performance indicators for the application of CAD CAM analysis and associated data organisation, describe what the judges will be looking for.

C5.3 Who needs to attend?

This judging session must be attended by the team manager and team design and manufacturing engineers as a minimum.

C5.4 Judging process / procedure

Teams will be awarded points as per the key performance indicators shown on the engineering scorecard. The scheduled engineering judging interview session will focus on the application of CAD CAM, analysis, CAD data organisation, orthographic drawing, 3D render and use of CNC machining and/or 3D printing. This is an informal interview where Judges will ask the team to demonstrate their CAD / CAM work and query teams on what they have done. The quality of car manufacture and car assembly will be judged during a separate 'closed to teams' session.

ARTICLE C6 – PORTFOLIO AND PIT DISPLAY JUDGING (210 points)

C6.1 What will be judged?

The portfolio and pit display judges will examine each team's 10 pages (maximum) design portfolio and pit display so that they can assess the following specific areas.

- ✓ Project management
- ✓ Team work
- ✓ Portfolio for clarity and quality
- ✓ Team identity
- ✓ Marketing
- ✓ Pit display for clarity and quality
- ✓ F1 car design process
 - Idea
 - Development and testing
 - Evaluation

Refer to the portfolio and display judging scorecard for detailed point scoring and key performance indicator information.

C6.2 Team preparation

Most importantly, teams need to read the portfolio and display judging score card carefully to ensure that all areas to be assessed are included within the context of their design portfolio and pit display. It is each team's decision how and where each area is presented. Teams should be mindful of the time constraints of judging when making these decisions.

C6.3 Who needs to attend?

All team members must be present during the portfolio and display judging session.

C6.4 Judging process / procedure

Portfolio and display judging will take place at each teams' pit display. The Judges will usually introduce themselves then ask the team to stand clear of their display so the Judges can conduct assessments. Team members may be asked.

C6.5 Design Portfolio requirements

The design portfolio must be in a printed '**hard copy**' format of **A4 size**. The portfolio is limited to 10 pages which include the front and back covers. This can be **10 single sided or 5 double sided sheets**. If a portfolio comprises more than 10 pages, the Judges will only review the first 10 pages for assessment purposes.

This is a general guideline of what should be included in the portfolio

- | | |
|-------------------------|--------------------------------------|
| ✓ Cover Page | ✓ Car Specifications |
| ✓ Research | ✓ Manufacturing Process |
| ✓ Development of Ideas | ✓ Testing of Car(s) |
| ✓ Design Concept | ✓ Team Identity |
| ✓ Computer Aided Design | ✓ Marketing & Sponsorship (Optional) |

This only serves as a guide. All other components are up to the discretion and creativity of the participants. There **MUST** be content related to the use of CAM and CNC manufacturing included in the portfolio as this will be referenced by the engineering Judges. An orthographic drawing and 3D render must also be included in the portfolio. Content related to project management, the team, design ideas, design development, research, testing and evaluation are commonly presented within the portfolio.

C6.6 Pit display setup and parameters

C6.6.1 Teams will provide **THEIR OWN PANEL** for their display booth according to NSIDC: F1 in Schools dimension, **(2 meter height by 1 meter width)**

C6.6.2 Teams need to supply any power adaptors they may require. The precise booth and table dimensions for the National Final will be announced closer to the event.

C6.6.3 You are given an area of 1.5 meter and 1.5 meter.

C6.6.4 All teams will be able to set-up their pit displays on arrival prior to the judging and welcome brief commencing. Participants are given **90 minutes** to set up the whole booth, after which no further set up is allowed. Violation would result in **10 points deductions**.

C6.6.5 No part of the teams completed pit display is allowed to protrude beyond the physical dimensions of their allocated pit booth. This includes anything that might protrude above the pit booth highest point e.g. flags.

C6.6.6 **ONLY** student team members are permitted to set-up their pit displays. There must be **no supervising teacher/adult or other outside assistance**, unless deemed to be a health and safety issue.

C6.6.7 NSIDC: F1 in Schools and / or the Chair of Judges may instruct a team to take actions required to reduce or remove noise or the impact of any other physical or visual display inclusions deemed to be inappropriate. NSIDC will instruct teams to remove or alter any display inclusions considered to be a safety hazard.

C6.6.8 Any electrical appliance connected to the power supply must be electrically sound.

ARTICLE C7 – VERBAL PRESENTATION JUDGING (180 points)

C7.1 What will be judged?

The verbal presentation Judges will assess each team 8 minutes verbal presentation across the following specific areas:

- Presentation technique
 - Use of visual aids – effective use of multimedia and / or other ‘props’.
 - Team contribution – effective participation by all team members
 - Dynamic – levels of enthusiasm and energy.
 - Engagement – audience interest and excitement
- Presentation composition
 - Concepts clarification – clear and concise explanations where required.
 - Use of time – how effectively was the 8 minutes used.
 - Presentation structure – overview explained and connection between topics.
- Subject Matter (the topics which need to be talked about)
 - Innovation – detail key innovations related to car design, project management, marketing or any other aspect of the team’s project.
 - Collaboration – detail and justify any partnerships or mentoring from outside the team in terms of improving project outcomes.
 - Learning experiences – explain how the F1 in Schools™ project has benefited team members.

Refer to the Verbal Presentation judging scorecard for detailed point scoring and key performance indicator information

C7.2 Team preparation

Each team is required to prepare a Verbal Presentation as per the requirements as ARTICLE C2.9. Multimedia content, slides etc must be saved on USB or storage device and submit it during registration on the first day of the competition. Teams need to have all presentation resources tested and ready with them for Verbal Presentation judging. Most importantly, teams should read the verbal presentation judging scorecard carefully to ensure their verbal presentation features all elements and content that the verbal presentation judges will be looking for.

C7.3 Who needs to attend?

All team members must be present during the Verbal Presentation judging session.

C7.4 Judging process / procedure

Teams will be given an opportunity at the start of their time to set-up and any other presentation technologies and resources. The team will inform the Judges when they are ready to begin. The Judges start timing the 8 minute duration and will provide a discreet time warning signal when one minute of presentation time remains. The team will be asked to cease presenting when the time limit has been reached. At the conclusion of the team’s presentation time, the Judges may choose to provide some

feedback and / or ask any clarifying questions they feel necessary. Verbal presentations may be video recorded for Judges review or promotional and future resource purposes.

C7.5 Verbal presentation judging provisions

NSIDC will provide a dedicated private space, such as a small meeting room, where each team will deliver their presentation to the Judges. This space will include a data projector and screen or LCD Screen and VGA cable to connect the laptop. These will be in fixed positions but usually with sufficient cable length to allow teams some freedom for choosing where they wish to locate their laptop. A single table will also be made available with its use and location in the presentation space being optional.

C7.6 Verbal presentation video recordings

The Verbal Presentations of all teams may be video recorded by NSIDC: F1 in Schools for the purpose of judging review and/or post event publicity and promotional purposes by NSIDC: F1 in Schools.

ARTICLE 8 – RACING (220 points)

C8.1 What races will be conducted?

The NSIDC racing points will be awarded through the staging of one (1) type of race event:

- **Reaction Racing** - Manual / driver launch mode, commonly referred to as ‘reaction racing’ consisting of two races in each lane. ‘Drivers’ will not be permitted to practise during the official race time.

Single fastest ‘car race time’ value from reaction races will determine the Fastest Car Award.

An additional **Knockout Racing** is the last of the scheduled races, however no points will be awarded for this. Refer to ARTICLE C3.4 and further information following for details on how points are calculated and awarded.

C8.2 Team preparation

C8.2.1 Teams should be familiar with the operation of the F1 in Schools™ Race System. Race officials will give instructions prior to their scheduled races.

C8.2.2 Manual / driver starts - one or more team members (driver/s) must be nominated for launching of the teams’ car using the manual launch method.

C8.2.3 Finish line management - at least one member of the team must be nominated as responsible for managing the finish line deceleration system (i.e. deceleration towels) and return of team car along the track to the start area.

C8.2.4 Start line car staging – one team member may be nominated as being responsible for ‘staging’ the car. This team member is permitted to set the alignment of the car with respect to the launch pod and track under close supervision from the race track Judges. Nomination of this team member is optional.

C8.3 Who needs to attend?

All team members must be present during their scheduled racing sessions and should assemble at the track start for briefing by the race track Judges at their scheduled time.

C8.4 Reaction race procedure

Cars are launched in manual / driver reaction mode with four (4) races total per team, two (2) races in each lane. The TOTAL RACE TIME displayed and the REACTION TIME displayed for each race is recorded. The reaction race events will be conducted using the following procedure:

- Teams race in order as shown in the competition program.
- Driver and team stands trackside with corresponding lane start trigger.
- One team member to track finish for deceleration system control.
- Both Car A & B WILL be used for Reaction Racing.
- Race 1 (Car A) - team member sets cars on track / tether line and inserts CO₂ canister.
- Judge arms launch pod - SAFETY ON – makes initial launch pod adjustments.
- A team member is then allowed to ‘fine tune’ the staging of their car.
- Judge switches launch pod - SAFETY OFF – checks track is clear for racing.
- Judge presses the start system reset button – car is launched by driver pressing start trigger.

- j) Judge records TOTAL RACE TIME AND REACTION TIME displayed on start gate.
- k) Team member at finish control returns car and canister along track to the start.
- l) Race 2 (CAR B) conducted in same lane as above using same process as e – j. Driver can be inter-changed.
- m) Team member remove cars from tether line and change lanes.
- n) Race 3 (CAR A) and Race 4 (CAR B) conducted as per above, driver can be inter-changed.
- o) Team members remove cars from track and returned to Parc Ferme.

C8.5 Reaction race scoring (Maximum possible points - 200)

All two (2) 'total race times' recorded from the reaction races are considered. The points of these two (2) times is used in the following formulae to calculate the points awarded:

- Fastest 'total race time' = 110 pts
- 2nd fastest 'total race time' = 105 pts
- 3rd fastest 'total race time' = 100 pts
- Slowest 'total race time' = 5 pts
- Base Time = 120% of 3rd fastest 'total race time'
- 4th fastest and all other teams score points using the following formula:
 Team Points = $5 + (95 / (\text{Base Time} - \text{fastest 'total race time'})) \times (\text{Base Time} - \text{teams fastest 'total race time'})$
- Any team with a best 'total race time' that is slower than the base time will score 5 points. To further discriminate between any teams scoring 5 points, a deduction of 1 point will be made for any did not finish (DNF) reaction race result.

C8.6 Knock-out race procedure

Only the top 8 seeded teams will participate in the knock-out competition. Teams will be issued the race seeding prior knock-out racing commencing. Cars are launched in manual / driver reaction mode, with two (2) races total, one (1) race in each lane, for each round of the knock-out. The winning team proceeds to the next Knock-Out Round while the losing team is eliminated. Teams race in order of the competition seeded draw.

Sample knockout Draw for a field of 8 in National Final

Round of 8	Semi Final	Final	Winner
Rank 1	Q1	S1	KNOCKOUT CHAMPION
Rank 8			
Rank 5	Q3		
Rank 4			
Rank 6	Q4	S2	
Rank 3			
Rank 7	Q2		
Rank 2			

C8.7 DNF (Did not Finish) race results.

Damage or part separation occurring during a race, before the car crosses the finish line, (e.g. wheel or any other part of the car separating), or car not crossing the finish line at all, effects in a DNF race result. The Judges may refer to video evidence to verify a DNF result.

C8.8 False starts.

C8.8.1 A false start (jump start) occurs when the driver depresses the trigger button before the 5 start gate lights have extinguished. This will be signalled with the outer red light above a lane illuminating. All false starts will incur a **5-point penalty**.

C8.8.2 In the knock-out stage, if one team false starts (jump starts), the other team should continue to race as normal. The team who false started forfeits that race.

C8.9 Track, tether line and timing system information.

C8.9.1 The F1 in Schools™ Elevated Race Track, as manufactured by Pitsco Inc., will be used. The official length of the track, from start line to finish, is 20 metres. A monofilament tether line of diameter

0.6mm, fixed at the start end, passes down the centre of each lane. At the finish end the line passes through 90 degrees over a single pulley then attached to a 1.0kg mass suspended above the floor.

C8.9.2 Launch/ Timing System – The F1 in Schools™ F1 Race System will be used for launching cars and timing races and driver reaction times to 1/1000th of a second.

C8.10 Car Deceleration system.

C8.10.1 The deceleration system acts to bring cars to rest once crossing the finish line. NSIDC will provide a standard race car deceleration system, consisting of two towels positioned behind the finish line of each lane.

C8.10.2 Teams may supply their own deceleration system and the team will be responsible for its management. Any system supplied by a team must be simple to setup and must not impede the opposing track lane, race car or the race schedule in any way. The Judges, at their discretion, can rule any system supplied by a team to be inappropriate and revert to use of the standard deceleration system. Deceleration systems must be located a minimum of 25mm after the finish line.

C8.11 CO₂ Race cylinders.

CO₂ cylinders to be used for all Brunei Darussalam competition races will be supplied by F1 in Schools Brunei Darussalam. Each CO₂ cylinder will be separately weighed before competition to ensure that all CO₂ cylinders used for races are within a weight range of 0.5 grams. All race cylinders will be kept in a temperature-controlled environment of 21 degrees Celsius.

C8.12 Car weight checks

Cars will have their weight checked at the race track prior to commencing a race event. This is done to ensure each car remains at a legal weight during all races. If a car is judged to have gone under weight whilst stored in Parc Fermé, the judges will add ballast to return the car weight to what it was when first submitted to Parc Fermé, without penalty.

C8.13 Judges handling cars.

The race Judges will not be required to comply with any special car handling requests made of them by teams. This includes use of any special gloves or tools.

ARTICLE 9 – CAR REPAIRS AND CAR SERVICING

C9.1 Car repairs

- All damage issues and related repair work during racing is at the Judge's discretion and may be referred to the scrutinizing Judges and/or Chair of Judges for a final decision.
- No items can be removed or added to a car during racing, other than CO₂ cylinders, except in the case of a repair.
- If the primary race car sustains damage during racing and this damage is ruled to be related to engineering deficiencies, the back-up race car will be reverted to *immediately* for races remaining in the current race event. This will incur a single 15-point penalty, applied against the teams score for this race event. The primary race car can later be repaired in any car service time that may follow. If then ruled as safe by the Judges, the team may use the primary race car for further races.
- Team members will be allowed to make 'trackside' repairs to the damaged car as racing continues.
- If the back-up car is damaged the repaired primary car will be reverted to and another 5 pt penalty will be applied.
- The Judges may choose to suspend racing in order that repairs can be made.
- If the Judges rule that damaged sustained was not due to engineering deficiencies, immediate repairs or revert to back-up car will be permitted without penalty.
- No penalty is applied for damage incurred during knock-out racing or a team's final race of any race event.

ARTICLE 10 – PROTESTS

C10.1 Submitting a protest

Any protest issues must be submitted by the team manager to an Event Director, who will register this and immediately lodge it with the Chair of Judges. This must occur by the date and time stated in the event supplementary regulations or during event registration. All protests must be lodged in writing via the official protest form available from the Event Directors. The Chair of Judges decision related to any protest is final.

C10.2 Unsuccessful protests

Teams should carefully consider their grounds for submitting a protest or appeal. Any protest or appeal that is unsuccessful, with the Judges initial decision remaining unchanged, will result in the team having a 15-point penalty applied against their total score.

ARTICLE 11 – JUDGES

C11.1 Chair of Judges

An independent authority appointed by NSIDC to oversees all Judging procedures. The Chair of Judges will determine the final judging decision where a protest has been submitted or other judging issue needs resolution. The Chair of Judges will also preside over a meeting of all lead Judges to ratify the final results along with nominations and winners for relevant awards.

C11.2 The Judging teams

- a. Specification & Scrutineering Judges - will assess both race cars plus rendered images and engineering drawings as per the Specification & Scrutineering score cards.
- b. Design & Engineering Judges - will be assessing each team as per Design & Engineering score card
- c. Verbal presentation Judges – will assess each team as per the verbal presentation scorecard.
- d. Portfolio and display Judges – will assess each team as per the portfolio and display scorecard.
- e. Race Judges – will oversee and rule on all race events and any incidents.

C11.3 Judging Decisions

THE DECISION OF THE JUDGES IS FINAL.

ARTICLE 12 - AWARDS

C12.1 Awards Celebration

The NSIDC: F1 in Schools Brunei Darussalam National Schools Final awards will be presented at an awards ceremony at the end of each event.

C12.2 List of awards to be presented

Every school will be awarded Gold, Silver and Certificate of Participation according to their overall performance during the race. This list may be amended at the discretion of NSIDC.

- **Overall Champion** -The team which achieves the highest total score in the individual Class.
- **Fastest Car Award** - This will be awarded to the team that achieves the fastest 'car race time' recorded during the time trial and reaction racing events.
- **Best Engineered Car Award** - This will be awarded to the team that scores the highest score from the Engineering judging
- **Best Pit Display** - At the Judge's discretion, this award will be presented to the team that displays the most unique / clever feature or idea aesthetically and informative that impresses the judges.
- **Best Reaction Time** - This will be awarded to the team that has the fastest reaction time.
- **Best Verbal Presentation** - This will be awarded to the team for best verbal presentation

APPENDIX

1. Specifications Score Card
2. Design & Engineering Score Card
3. Portfolio and Pit Display Score Card
4. Verbal Presentation Score Card

<h1>1. Specifications Score Card</h1> <p>For clarification on individual regulations, refer to the NSIDC Technical Regulations</p>	Team Name:	
	School Name:	
	Designed Using (CAD):	
	Manufactured Using (CNC)	

Reg	Regulation Overview	Min/Max Quick Guide	Penalty per Car	Pass or Fail		Remarks
				Car A	Car B	
ARTICLE T3 – FULLY ASSEMBLED CAR						
T3.1.1	Designed and engineered using CAD / CAM		NA			
T3.1.2	Body manufactured using CNC only	Check unfinished body	NA			
T3.1.3	Race cars identical geometry	Visual check	NA			
T3.2.1	Safe Construction – Specification judging	Check T3.2.1	-5			
T3.3	Undefined features	Check T1.1	-6			
T3.4	Total length	Min:170 Max:210	-6			
T3.5	Total width	Max: 85	-6			
T3.6	Total height (CO ₂)	Max: 65	-6			
T3.7	Total weight	Min: 50.0g	-6			
T3.8	Track clearance (CO ₂)	Min: 1.5	-6			
T3.9	Status during racing	Nothing removed	-6			
ARTICLE T4 – BODY						
T4.1	Body construction	Balsa Blank only	-6			
T4.2	Virtual cargo – See T4.2 for dimensions	Between axles	-6			
T4.3	Virtual cargo identification	Check Eng. drawing	-3			
T4.4	Body thickness	No part is less than 3mm thick	-6			
T4.5	F1 in Schools logo decal location	T1.12	-6			
ARTICLE T5 – CO₂ CARTRIDGE CHAMBER						
T5.1	Diameter	Min: 17.8 Max: 19.5	-3			
T5.2	Distance from track surface (CO ₂)	Min: 30 Max: 40	-6			
T5.3	Depth	Min: 45 Max: 58	-6			
T5.4	Max angle of chamber (CO ₂)	Min: -3° Max: 3°	-6			
T5.5	Chamber safety zone (CO ₂)	Min: 3	-3			
T5.6	CO ₂ cartridge visibility (CO ₂)	Min: 5mm top view	-6			
ARTICLE T7 – TETHER LINE GUIDES						
T7.1	Location	2 line guides firmly secured	-6			
T7.2	Guide separation – inside edges	Min: 120	-2			
T7.3	Internal diameter	Min: 3.5 Max: 6	-2			
T7.4	Tether line guide safety	200g test, safe to race	-3			
Assessed by: (Initials)						
Checked by: (Initials)						

<h1>1. Specifications Score Card</h1> <p>For clarification on individual regulations, refer to the NSIDC Technical Regulations</p>	Team Name:	
	School Name:	
	Designed Using (CAD):	
	Manufactured Using (CNC)	

Reg	Regulation Overview	Min/Max Quick Guide	Penalty per Car	Pass or Fail		Remarks
				Car A	Car B	
ARTICLE T8 – WHEELS						
T8.1	Number and location	4, 2 x 2	-6			
T8.2	Distance between opposing wheels	Min: 30	-6			
T8.3	Diameter	Min: 26 Max: 34	-6			
T8.4	Width	Min: 15 Max 19 exc. chamfer/fillet	-6			
T8.5.1	Visibility of wheels	Top & Side views	-6			
T8.6	Race track contact (CO ₂)	All 4 in contact	-2			
T8.7	Rolling surface	Consistent, no tread	-3			
T8.8	Wheel support systems	Cylindrical volume	-6			
T8.9	Rotation	Abs. Min rolling incline: 2°	-6			
ARTICLE T9 – NOSE CONE						
T9.2	Nose cone identification	Check Eng. drawing	-6			
ARTICLE T10 – WINGS AND WING SUPPORT STRUCTURE						
T10.1	Description and placement	F & R & height	-6			
T10.2	Construction and Rigidity	Span constant during racing + rigid	-6			
T10.3	Clear airflow	3 mm clear 'air' space	-6			
T10.4	Rear wing location	Behind CL of rear wheel	-6			
T10.5	Rear wing height (CO ₂)	Min: 34	-6			
T10.6	Front wing location	In front of CL of front wheel	-6			
T10.7	Visibility of front wing	Visible from front	-3			
T10.8	Wing identification	Check Eng drawing	-6			
T10.9.1	Front wing span	Min: 40	-3			
T10.9.2	Rear wing span	Min: 40	-3			
T10.10	Span segment	Min: 20	-3			
T10.11.1	Front wing chord	Min: 15 Max: 25	-2			
T10.11.2	Rear wing chord	Min: 15 Max: 25	-2			
T10.12.1	Front wing thickness	Min: 1.5 Max: 6	-1			
T10.12.2	Rear wing thickness	Min: 1.5 Max: 6	-1			
Assessed by: (Initials)						
Checked by: (Initials)						

2. Design & Engineering Score Card	Team Name:	
	School Name:	

CAD CAM & ANALYSIS				
Application of Computer Aided Analysis	No or minimal analysis shown	Appropriate analysis shown. Results applied to development	Advanced and relevant. Virtual analysis integrated throughout design development.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Use of CAM/CNC	No or minimal evidence of CAM/CNC understanding	Effective use and understanding of CAM/CNC processes used	Evidence of excellent understanding of CAM/CNC technologies. Appropriate techniques and processes used to achieve manufacturing goals	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Testing	No or little evidence of testing	Limited testing. Some evidence of method and outcomes.	Purposeful testing with method and outcomes documented. Evidence of virtual and physical testing on the fully assembled car and individual components.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Design Process Evaluation	No or limited design process evaluation	Ideas or process evaluations at different stages	Excellent ongoing idea evaluations linked to improvement actions	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
CADCAM & Analysis Total =				/80

MANUFACTURING				
Engineering Drawings	Little or no detail, Little or no annotation	Third angle orthographic projection. Excessive or insufficient detail	Third angle orthographic projection and unrendered isometric view or similar. Parts list / bill of materials. Additional views to show sufficient detail. Regulation compliance shown	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Rendering	Poor quality	Different views, some inconsistencies with final car.	Different Views. Perfect match to final car including branding. Environment and lighting High end render technique	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Quality of Finish and Assembly	Reasonable finish with some inconsistencies	Good overall finish quality and assembly with attention to details	'Showcase' finish quality on all components. Exceptional attention to detail across all assembly and finishing. Two cars are identical.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Manufacturing Total =				/60
CADCAM & Analysis + Manufacturing = Design & Engineering Assessment Total =				/140

Notes:

3. Portfolio and Pit Display Score Card	Team Name:	
	School Name:	

PORTFOLIO				
Design Concepts /Design Ideas	Single or basic concepts	Multiple concepts with links to research.	Several technically inspired ideas for different car components	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Research & Development	No or limited evidence of R&D	Some scientific & mathematical theories and principles considered. Logical research based design developments explained.	Relevant R&D throughout the entire product design & development cycle. Design concept developments justified from research & test findings	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Testing	No or little evidence of testing	Limited testing. Some evidence of method and outcomes.	Purposeful testing with method and outcomes documented. Evidence of virtual and physical testing on the fully assembled car and individual components.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Design Process Evaluation	No or limited design process evaluation	Ideas or process evaluations at different stages	Excellent ongoing idea evaluations linked to improvement actions	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Portfolio Total =				/80
ENTERPRISE				
Project Management	No or very limited project management	Simple management and planning used to guide progress. A range of project resources identified. Basic team budget	Comprehensive project management. A range of factors considered; e.g. scope, time, resources and project risks. Plan changes discussed. comprehensive financial management.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Team Work	Limited team work evident	Evidence of effective team work with roles defined	Highly structured team with clear roles. All team members had effective and critical contributions. Role interactions recognised	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Quality & Clarity	Difficult to follow with basic presentation standard.	Clear structure, well organised.	High impact and professional throughout. Consistent and clear organisation.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Overall Team Identity	Inconsistent, limited or obscure identity	Effective team identity consistent through various project components e.g. car matches team uniform	Excellent and highly effective team identity. Team 'brand' consistently applied through all project elements.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Enterprise Total =				/80

3. Portfolio and Pit Display Score Card	Team Name:	
	School Name:	

PIT DISPLAY				
Pit Display Design Process	Limited evidence of design process	Some ideas & justification of design. Some consideration of constraints e.g. freight packing	A range of ideas, clearly justified creative final design. Evidence of development considering factors e.g. team identity, budget, sustainability and time constraints.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Pit Display Content	Repetition of Portfolio contents. Disorganised layout.	Clear and effective presentation and messaging. Multimedia used to enhance display	Clean, well-organised with high impact. Highly professional with attention to detail. Excellent integration of technology and multimedia	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Pit Display Total =				/40
Portfolio + Enterprise + Pit Display Total = Portfolio and Pit Display Total =				/200

Notes:

Participants are given 90 minutes to set up the whole booth, after which no further set up is allowed. Violation would result in 10 points deductions.

4. Verbal Presentation Score Card	Team Name:	
	School Name:	

TECHNIQUE				
Visuals	Little use of aids.	Some aids used effectively	Highly professional aids effectively improve communication	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Team Contribution	Minimal team participation	Good contributions from most team members	Excellent team work with all members participating effectively	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Dynamic/Energy	Artificial and/or low energy	Speakers generally enthusiastic with lively delivery	Passionate with effective and appropriate levels of liveliness	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Engagement	Minimal engagement	Some audience connection at times	Audience fully engaged and excited throughout presentation	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Technique Total =				/80
COMPOSITION				
Concept Clarification	Several concepts lacked clarification	Clear and appropriate concept explanations	Everything presented was understood through excellent explanations	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Time / Presentation	Too fast or ran out of time. No structure presented	Good timing. Balanced topic depth and pace. A basic structure / outline provided and could be followed by audience	Ran on time or under. Excellent balance of depth for each topic. Clear presentation outline / overview. Excellent connections between topics and easy for audience to follow.	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Composition Total =				/40
SUBJECT MATTER				
Innovation	Little project innovation presented	Project innovations described and justified	Originality. Clever innovations with high positive project impact	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Collaboration	Little collaboration discussed	Links with industry or higher education described	Collaborations justified with links to learning and project outcomes	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
F1 in Schools Learning Experiences	No real reflections discussed	Good explanation of some learning outcomes	A range of personal, life-long learning and career skills acquired and identified as project outcomes for a range of team members	
	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20	
Subject Matter Total =				/60
Technique Total + Composition Total + Subject Total = Verbal Presentation Total =				/180
Notes:				