

## **ANNEX 1**

### **Singapore Science and Engineering Challenge 2007**

#### **Brief Description of The Challenge Activities**

##### **1. Engineering Game**

Students are required to design and build a doll's chair. Each group will be "charged" for labour and materials and then given income based on the strength of the chair. The chair with the highest profit will win. Students complete this activity in three phases, prototyping, production and evaluation.

This activity allows students to gain an overall appreciation of engineering particularly that in engineering there is seldom a unique single answer. Solving everyday problems invariably means making compromises.

##### **2. The Great Tea Race**

The activity involves making hulls out of thin plastic and electrician's tape covered with lunch wrap to ensure they are watertight. These hulls are drawn through the water by a simple pulley and the time taken for the hulls to travel a set distance is recorded. There will be two attempts and the hull will be loaded with 75 and 225g.

There are many factors involved in hull design and there is of course the need for the hull to move through the water in as straight a line as possible. If the hull bounces off the sides of the tank, it will be appreciably slow. A design good for 75g may not be good enough if the load is increased to 225g. So students will have to work on having a set of hulls when it comes to final testing.

##### **3. Gold Fever**

This is a bridge building activity that uses a standard test rig to deliver a dynamic load. Construction materials will be supplied and are limited to those materials. The lightest bridge to hold the load wins.

Construction is one activity that requires thinking about forces. This task incorporates dynamic loading and thus adding another dimension to an already complex problem.

#### **4. Leprechaun Cannon**

This is a fascinating use of a smoke ring generator. Essentially a column of air is compressed and released through an orifice. This air then strikes a target.

Students are provided with three different pipe sizes and a number of connectors that they can put together using tape. Variables are the length of the cannon, diameter of the exit muzzle, diameter of the barrel and a combination of diameters if desired. Accuracy of the cannon is a factor that must be determined quickly during initial testing. A consistent and methodical approach is needed for testing.

#### **5. Hover Frenzy**

The students will be given a lift fan and two motorised propulsion unit together with styrofoam, balsa, rubber strip and tape to construct a small hovercraft.

Scoring will be based on several criteria: manoeuvrability, time through a course, and ability to negotiate obstacles.

#### **6. Babe: Home sheep home**

Each team (made up of 2 school groups) has an 11 by 11 mat that represents a sheep-trial field. A number of randomly located 'sheep' and 'home pens' are placed on the mat.

Students then place on the mat their pigs which are used to push the sheep into the pens in the minimum number of moves.

Students are given some time to discuss strategies and assign roles. Play ends once the team has each sheep in a home pen, or trapped and unable to get into a home pen. This activity demonstrates the importance of teamwork, communication and negotiation, but above all planning. The students will have to deal with rule changes, the introduction of obstacles, gates, sequencing, and Babe, the super pig...

## **7. Future Power**

Students will be provided with a simulator which has two input boards. One input board allows students to switch loads in or out of their simulator. The other board has provision for four power stations chosen by the students from a pool of seven different power station options.

Students are required to adjust their supply of power to meet the load. Once the load is balanced and the score is recorded a new load profile is given to the students and they must then switch loads on and off and at the same time continue to balance the supply of power. Failure to keep the supply of power within acceptable limits will cause the system to trip meaning that all loads and power stations need to be zeroed and the system built up again.

## **8. Job Juggle**

Job Juggle presents students with the same sort of scheduling challenges as are faced on a daily basis by project engineers, R&D scientists, and production managers.

Job Juggle requires students to organise the production of hip new CDs for release onto the world market. There are a range of tasks for each CD; each task takes a different period of time to complete. Once a particular task is commenced for a given CD the same task cannot be commenced on another CD until the original task is complete.

The sequencing problems increase in difficulty and the score for the activity is related to the time taken.