

■ RETURN TO MARS

STUDENT QUICK-START

SCENARIO

Your team has been recruited by an aerospace company aiming to be the first to send humans to Mars. The rocket is ready, but it's not big enough to carry an assembled vehicle (buggy) to explore the Martian surface - which means that your team will have to assemble it on-site.

AIM

The aim of this half-day activity is to build a suspension system for a simple buggy that will allow a number of loads to be safely conveyed across the undulating Mars surface.

WHAT TO DO

Your team needs to design and build a buggy from the materials provided. The suspension system must make the buggy safe, reliable and stable. Consider the number of wheels and where they are positioned. String is used to pull the buggy across the surface.

TERMS

There are some terms used in this activity that you may not be familiar with:

Suspension	A system of springs and other devices that stabilise and insulate the body of a vehicle from the shocks transmitted through the wheels.
Chassis	A vehicle's main support frame onto which the suspension, body and (in a real vehicle) engine and drive train are mounted.

RULES

Teams can only construct one buggy.

Each buggy must include a chassis, and with the plastic arms roll over the test surface on wheels - i.e. no part of it can scrape the test surface.

The buggy must have string attached so it can be pulled over the surface. The string must feed underneath the metal guide at the end of the test surface.

The buggy must not touch the vertical sides of the track.

The distance between the left and right side wheels of the buggy cannot be greater than the length of one threaded rod (axle).

The test load must sit on its end i.e. with its smallest surface sitting on the rubber-faced loading area, on the top of the buggy. The test load must not be held or supported in any way.

SCORING

Teams will have the opportunity to attempt several tests to successfully carry the Small, Medium and Large (Combined) load blocks along the entire length of the surface. The buggies can be trialled throughout the session, but will only be awarded points during an official test.

The first test involves placing the Small load block on the rubber-faced loading area on the buggy. The team's chosen 'navigator' will stand at the guide end of the Mars test surface and while running the string attached to the buggy underneath the metal guide, pull the loaded vehicle along the surface. The distance covered (to the point where the load falls off) within the allotted time is used to determine each team's score.

This process is repeated for the Medium load block, and the Large (Combined) load blocks. There are 20 bonus points available at the end of the session for disassembling the buggy, returning the components, and leaving your area tidy when instructed.

⚠ At the end, ensure your team's score sheet is with the Event Staff

TIPS

Your team must focus on the suspension of the buggy so that the load does not fall off the buggy as it is pulled along the surface.

Changing the length and shape of the plastic arms will affect the stability of the buggy.

Changing the location of the pivot point on the plastic arms that support the wheels will also change the performance of the suspension system, as will the direction and distance the plastic arms move.

The number and position of the wheels affects the buggy's performance.

Springs deform when a force is applied, and then resume their original shape once the force is removed. Rubber bands act in a similar way.

Once satisfied with the suspension configuration, your team should focus on the mechanical tuning of the buggy. The following questions may help:

- How far should moving parts travel? Should they be limited in some way?
- Does the ride height (ground clearance) of the buggy affect its performance?
- How much force is needed to prevent movement or to return the suspension to its original position?