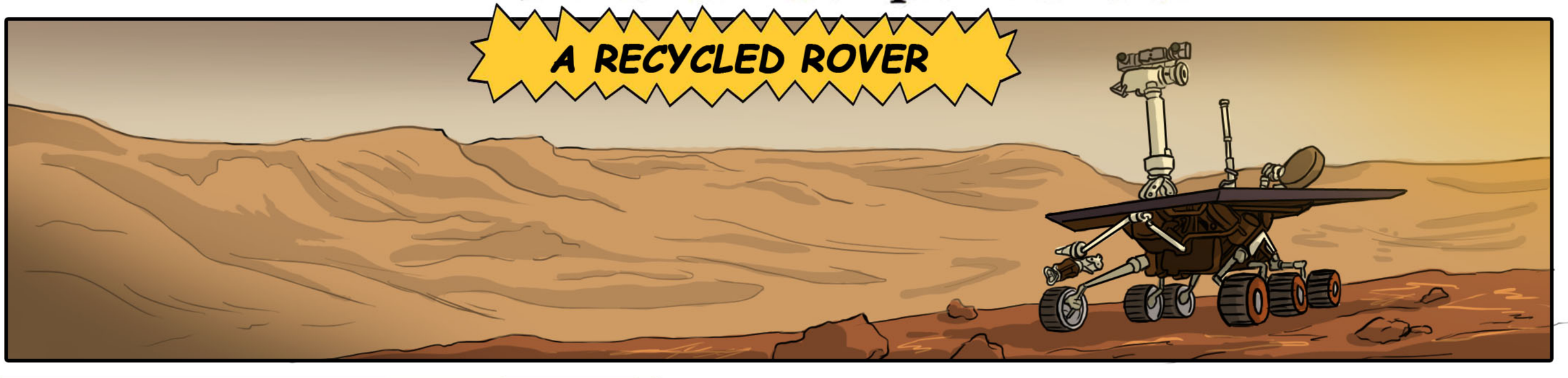
Mission 008: A Recycled Rover

Physical Sciences: Wheels and Levels, Building Vehicles that Move. Properties and Characteristics of Matter. Forces and Simple Machines.
4AB, 4QC, 4NU, 5BC, 5SK, 5MB, 5NB, 5NS, 5PEI, 5NFLD, 5NWT

StarAcer™ ACADEMY

Welcome Stellar Teacher! Let's Grow Some Astronauts.



MISSION CONTROL COMMENTS (TEACHERS CORNER)

CURRICULUM OUTCOMES

Renewable/Non-renewable Resources	Students will be able to explain the difference between renewable and non-renewable resources.
Structures	Students will be able to identify the importance of sustainability.
	Students will demonstrate an understanding of key engineering principles.
	Students will make predictions while also using data from experiments to draw conclusions.

TIME FLOW

A Make a Plan	20 minutes lesson (discussion to understand problem)
B Know Your Engineering Principles	minimum 1 x 45 minute lesson (set up the experiment and record the observations)
C Design Your Craft	minimum 1 x 45 minute lesson
D Raid the Blue Box	minimum 2 x 45 minute lessons
E Get it Done (Conduct your Experiment)	minimum 1 x 45 minute lesson
F The Big Bang - Making Connections	minimum 1 x 45 minute lesson

EXTRA RESOURCES

StarAcers.com has links for your mission!

A scientific report outline in the Common Documents

Student and teacher rubrics

SUGGESTED RESOURCES

- Engineering Principles
- Recycled Material background information

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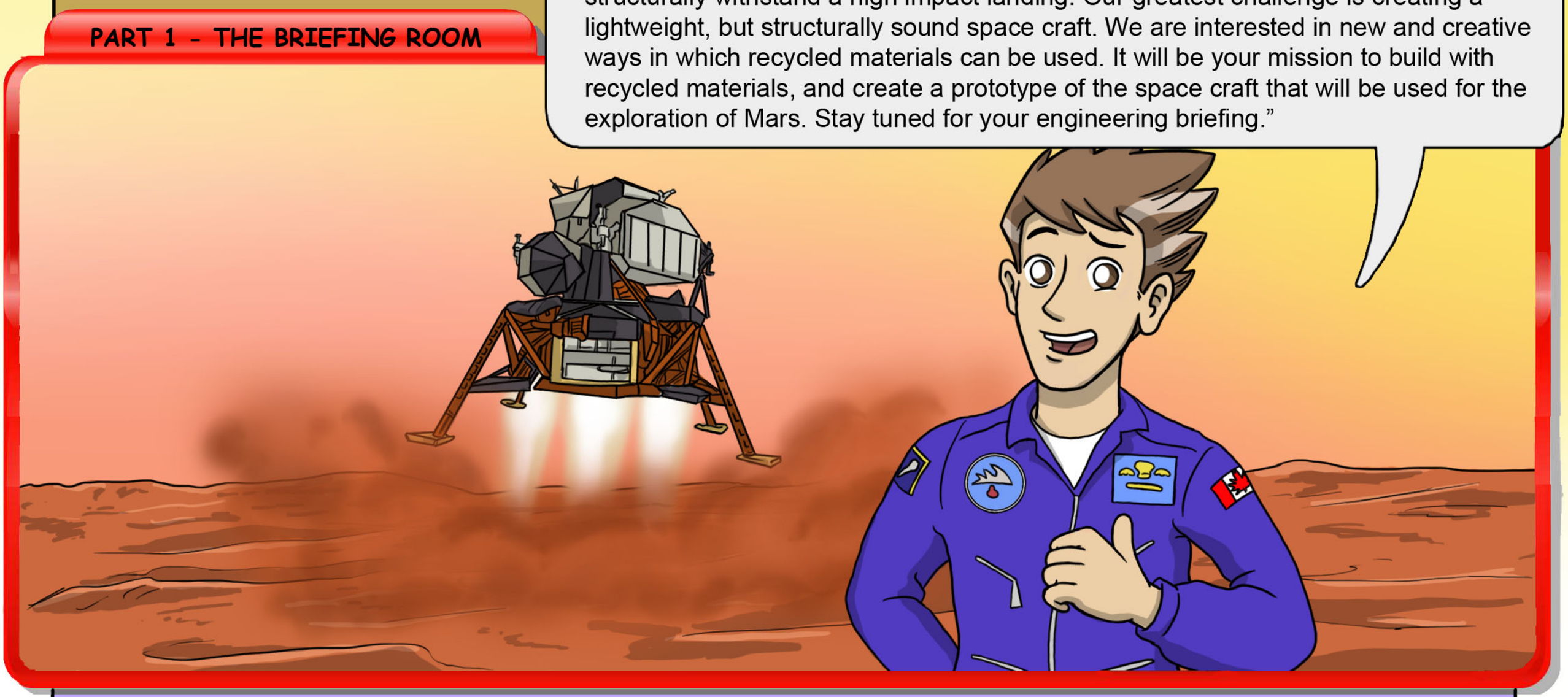
A RECYCLED ROVER

Ingenuity is a key character trait of our space explorers. Using what materials you have, and repurposing objects for other uses can be a very useful skill when faced with a challenging engineering situation. Reusing materials can be sustainable, cost-effective, and stronger than traditional building materials.

PART 1 - THE BRIEFING ROOM



PART 2 - THE POCKET GUIDE

Vocabulary

- Dome
- Sustainable
- Compression
- Corrugation
- Recycle
- Tension
- Renewable
- Non-Renewable
- Folding
- Arch
- Bracing
- Repurpose
- Structural Integrity
- Triangle
- Beam
- Rolling
- Re-enforcing

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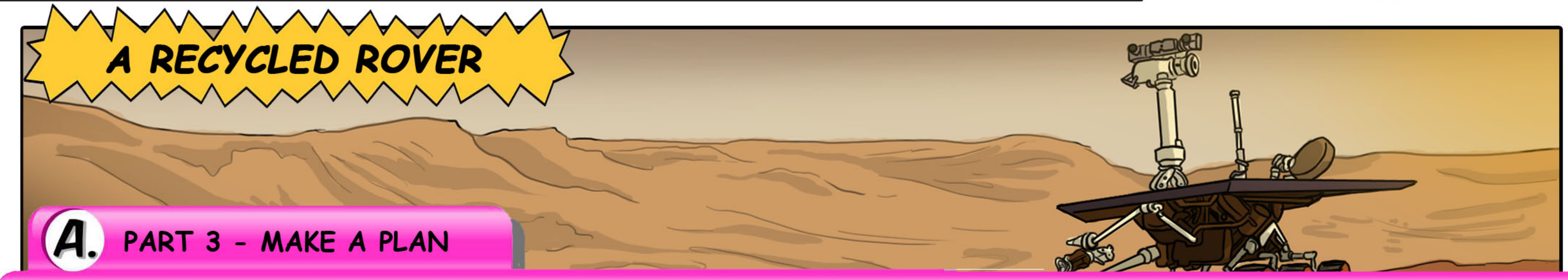

A. PART 3 - MAKE A PLAN

Your mission will be to design and build a space craft for landing on Mars. Two eggs will simulate the astronauts travelling in your spacecraft, and the eggs must arrive safely to the ground from a height determined by Mission Control. Creative solutions will be highly valued.

Criteria for Space Vehicle:

- size is not critical
- must be lightweight
- eggs must be fully enclosed to simulate a space capsule
- one or more well established engineering principles must used which may include: domes, arches, triangles, corrugation, rolling, folding.
- use recycled materials (materials that have already been used for their intended purpose, and are now going to be reused/repurposed for this mission)
- Only the following supplementary materials can be used to help with construction: 30 cm of masking tape and/or 30 cm of string, glue

Procedure:

- Explore engineering techniques
- Design space vehicle based on your engineering explorations
- Create a list of recycled materials needed
- Build your spacecraft
- Submit your spacecraft to Mission Control for testing

The success of this mission is determined by the two following criteria:

- survival of the eggs
- the weight of the space craft as compared to other StarAcer designs

B. PART 4 - KNOW YOUR ENGINEERING PRINCIPLES

Using a piece of recycled paper, explore the following concepts:

Put the piece of paper, elevated flat between two books as shown below:

How many pencils can it support? Take a look at the chart provided by mission control and predict how many pencils can be supported when the paper is modified.

Now take a piece of paper and try the following: corrugating, folding, rolling, triangulating, and two other techniques of your choice. See how the number of pencils supported varies with each different technique. Fill in the chart provided by mission control with the number of pencils supported by each modification to the paper.

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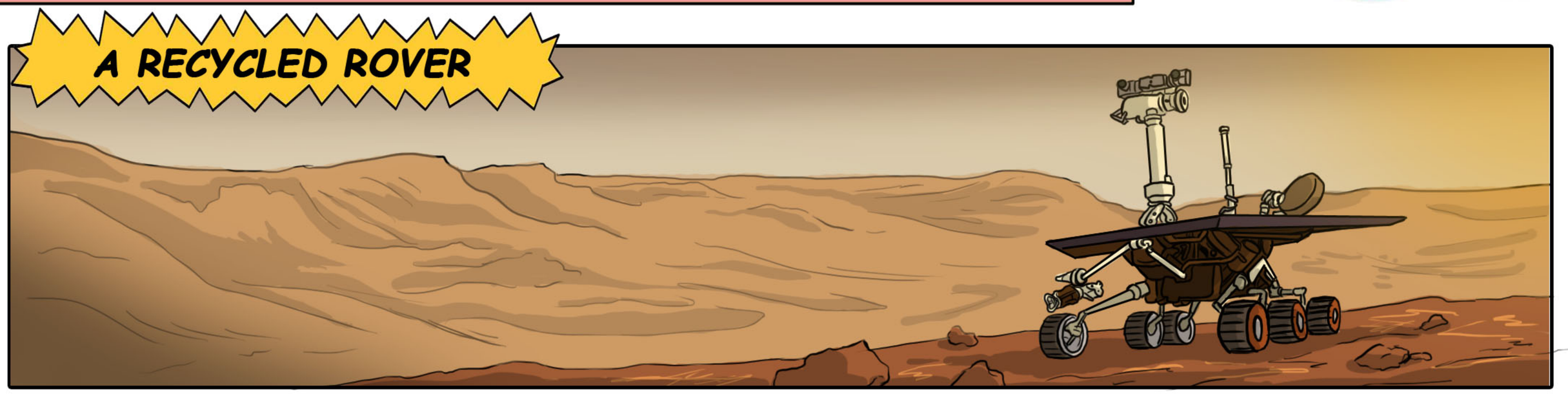


C. PART 5 - DESIGN YOUR CRAFT

Using the principles discovered in Part 4 or through your own research, design your spacecraft. Keep in mind the following:

- capsule for two eggs
- strength
- weight
- recycled materials

D. PART 6- RAID THE BLUE BOX

Using your diagram and list of materials, raid your local blue box, and build your spacecraft. Don't forget you have your 30 cm of tape and/or string as well as glue to help you. Hand in your completed diagram and prototype to Mission Control for inspection.

E. PART 7 GET IT DONE (CONDUCT YOUR EXPERIMENT)

Mission Control has inspected the spacecraft and has established the testing site. Grab a Results Sheet to record the data (name of space ship, weight, survival of eggs).

- First up is the weight in.
- Drop each space craft and inspect eggs for breakage.
- Record data.

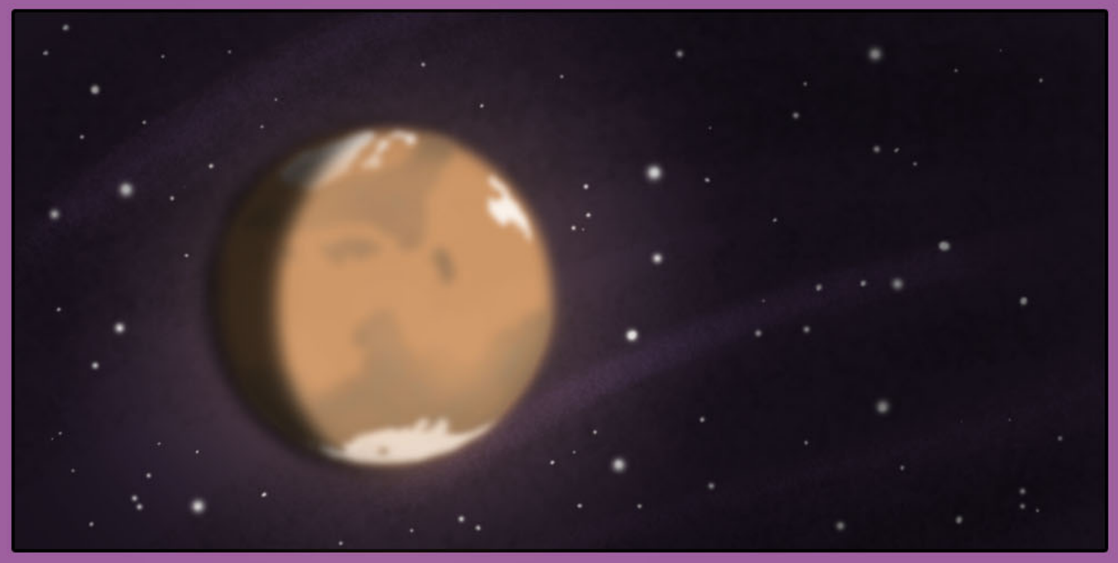
A RECYCLED ROVER

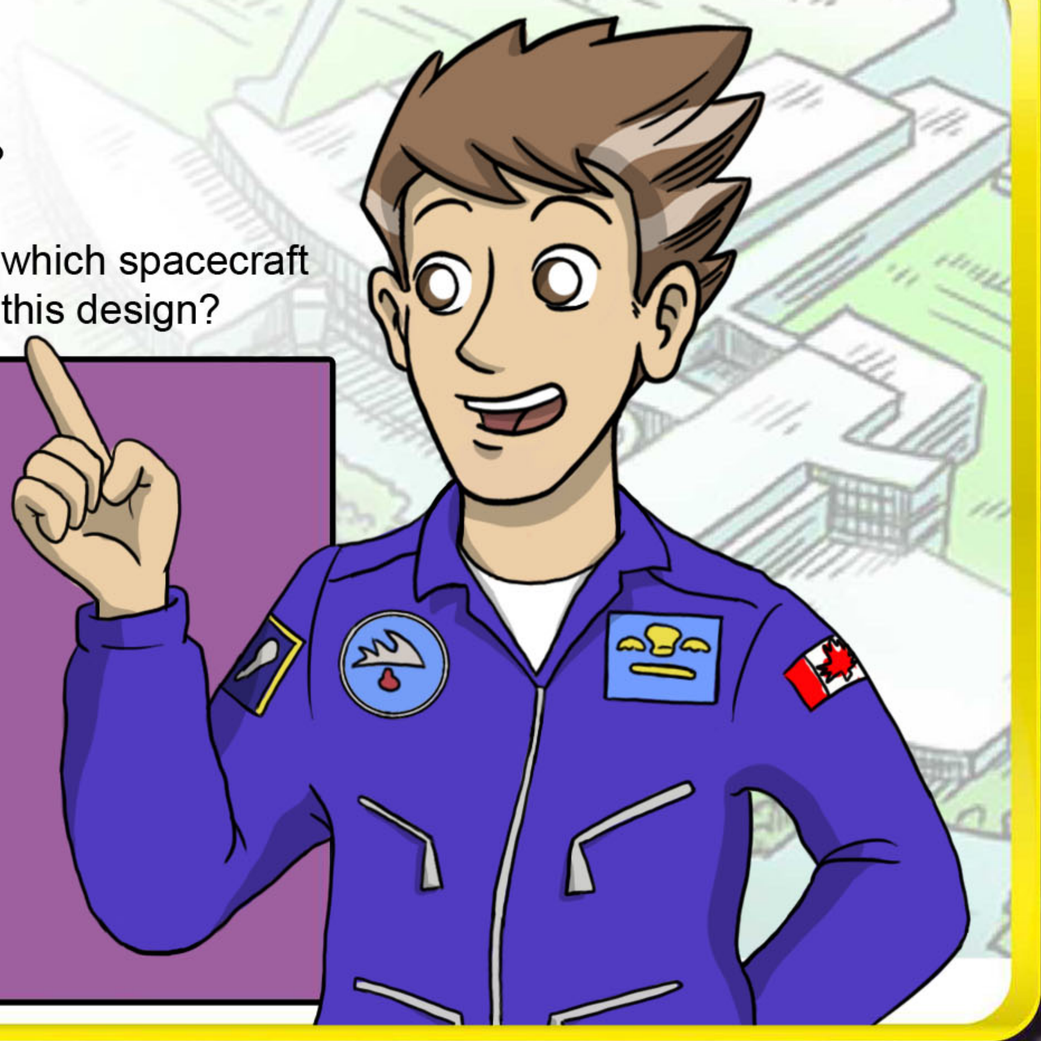
F. THE BIG BANG - MAKING CONNECTIONS

Having now reviewed the data, can you determine the following:

- What design features worked/didn't work?
- What materials worked/didn't work?
- Did the weight of the spacecraft affect the success of the design?

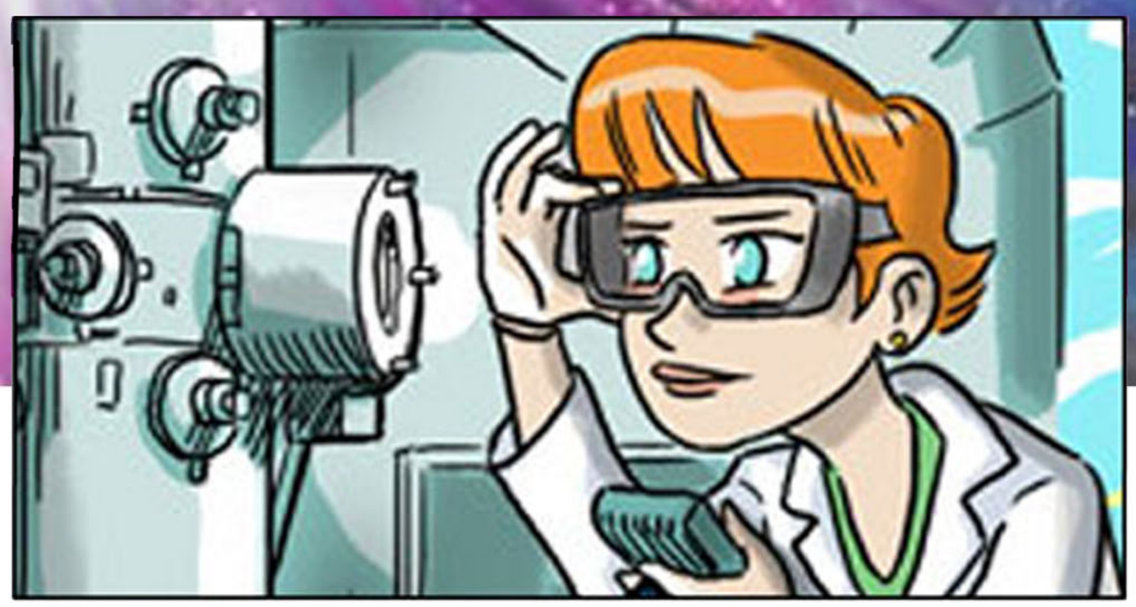
Given the results of the experiment and the conclusions you have made, which spacecraft design was the most successful? Would you recommend that NASA use this design?





DO YOU MEASURE UP?

Get a rubric from Mission Control. How do you measure up based on the work that you have just completed in Mission 008?



WANT MORE ADVENTURE?

Want a challenge? Try answering these questions:

- Can you increase the height of the drop?
- Can you create other experiments to test the strength of other engineering principles and/or recycled materials?
- Can you research recycled materials which are currently used in space exploration?

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Know Your Engineering Principles Trials

Engineering Principle	Number of Pencils

Record Your Observations

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Sample Data Recording Sheet- Space Ship Trials

Student Name	Spacecraft Name	Weight	Did Eggs Survive?

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Review your data and determine what did, and did not work in your design and materials, and whether the weight of your craft affected the design.