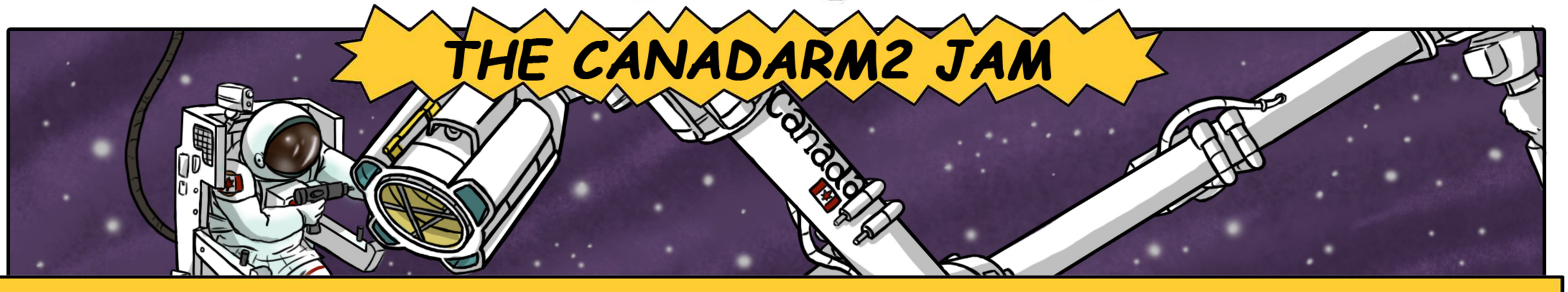
Mission 002: The Jam

Physical Sciences: Forces and Simple Machines. Forces Acting on Structures.
5BC, 5SK, 5ON, 5QC, 5YK, 5NWT, 6QC

StarAcer™ ACADEMY

Welcome Stellar Teacher! Let's Grow Some Astronauts.



Astronaut training is going to challenge your scientific and creative skills. It is also going to test your resiliency, your ability to complete a task when faced with many obstacles. Stay focused and work together with your fellow StarAcers. You will need each others support through these missions. Success in astronaut training will lead to success in your space voyages.

MISSION CONTROL COMMENTS (TEACHERS CORNER)

CURRICULUM OUTCOMES

Simple Machines	Students will be able to identify the parts and mechanical advantage of a class 1 lever.
Space Exploration	Students will be able to identify technologies used in space exploration.
Processes of Science	Students can identify variables in an experiment.
	Students can identify the steps in the Scientific Method.

TIME FLOW

A Make a Guess	20 minutes
B Test Your Lever	45 minutes
C The Big Bang - Making Connections	45 minutes

EXTRA RESOURCES

- StarAcers.com has links for your mission!
- A scientific report outline in the Common Documents
- Student and teacher rubrics

EXPERIMENT EQUIPMENT

SUGGESTED MATERIALS (TEACHER DISCRETION BASED ON AVAILABLE RESOURCES)

Levers - popsicle sticks, rulers, meter sticks, dimensional lumber
Fulcrums - erasers, textbooks, binders, dimensional lumber, bricks

CONDUCTING THE EXPERIMENT

- make sure students have access to pocket guide materials
- have effort lever arm off the edge of table/desk to allow use of spring scale
- have students follow the scientific report outline

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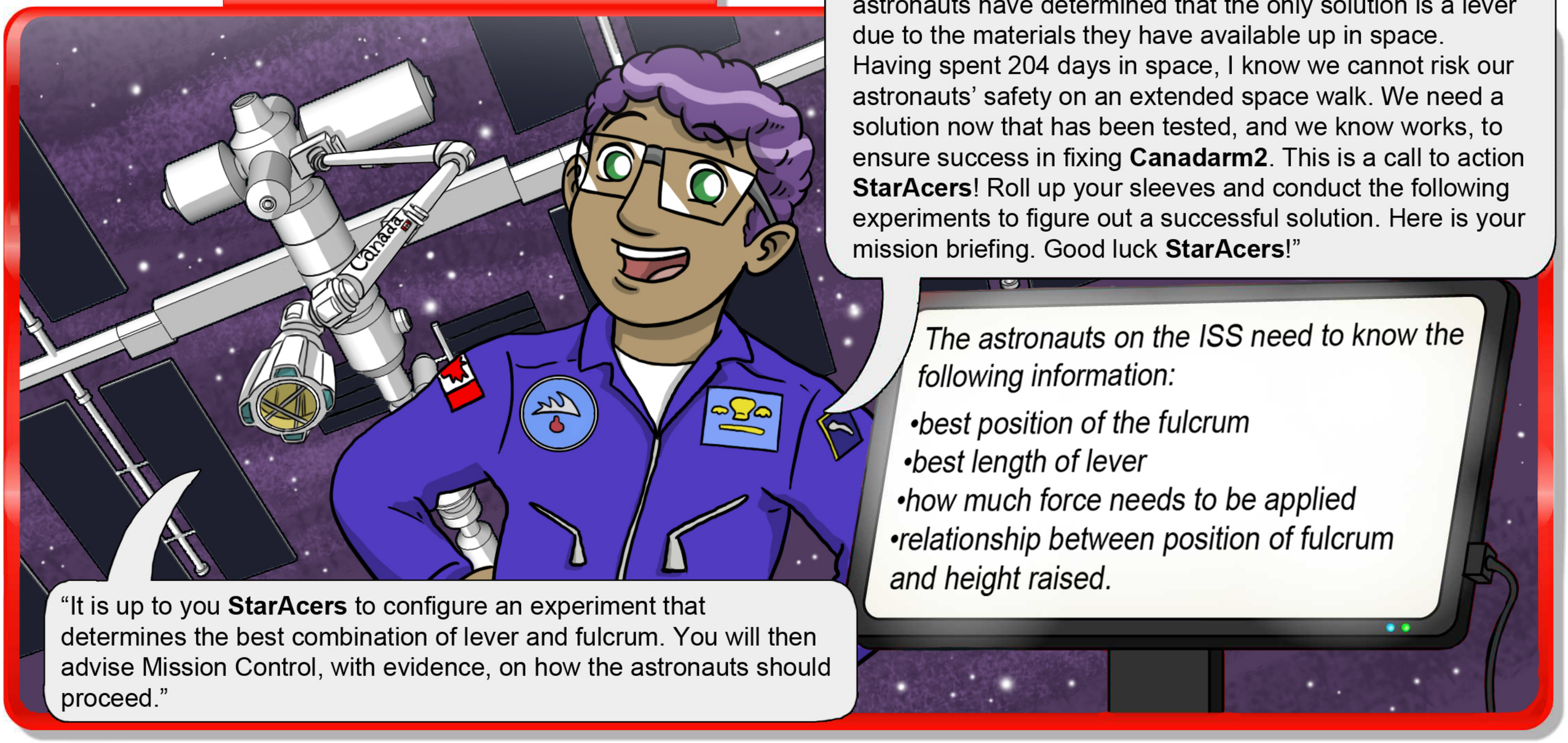
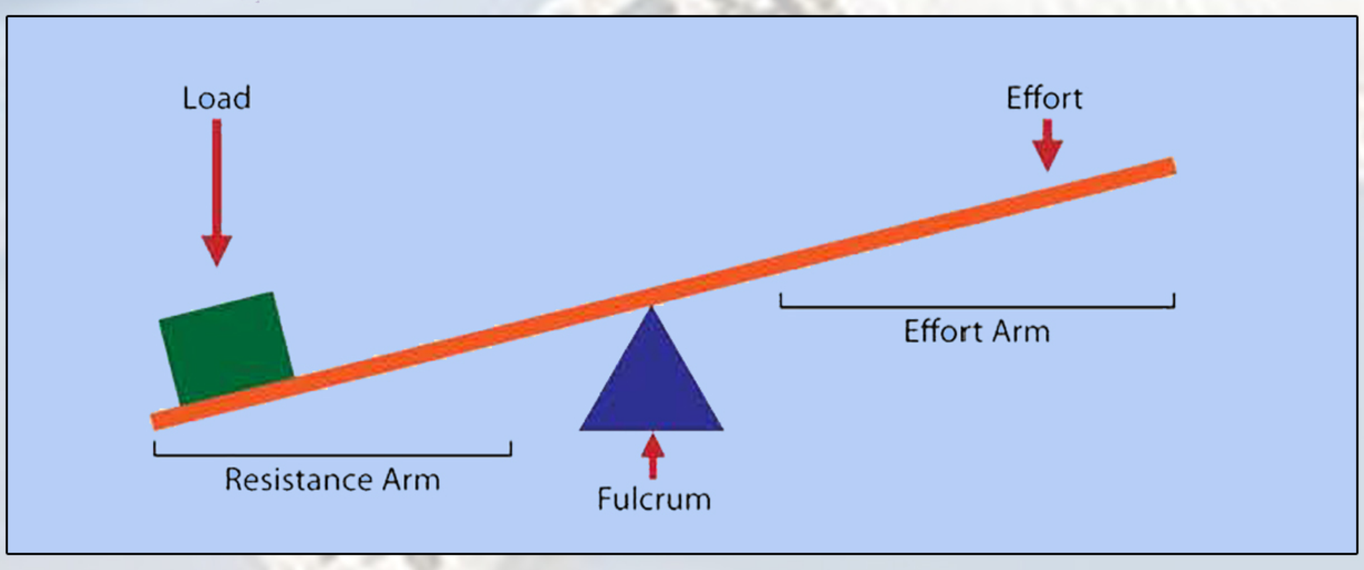
THE CANADARM2 JAM

PART 1 - THE BRIEFING ROOM



PART 2 - POCKET GUIDE TO LEVERS AND THE SCIENTIFIC METHOD

Diagrams of class one lever, fulcrums, force, load (possible sample below)



Scientific Report Outline (see Mission Control for copies)

THE POCKET GUIDE

Vocabulary

Spring Scale
Fulcrum
Lever
Load
First Class Lever
Force
Load Arm
Effort Arm
Second Class Lever
Third Class Lever

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A. PART 3- MAKE A GUESS (HYPOTHESIS)

Generate a hypothesis for each of the following questions:

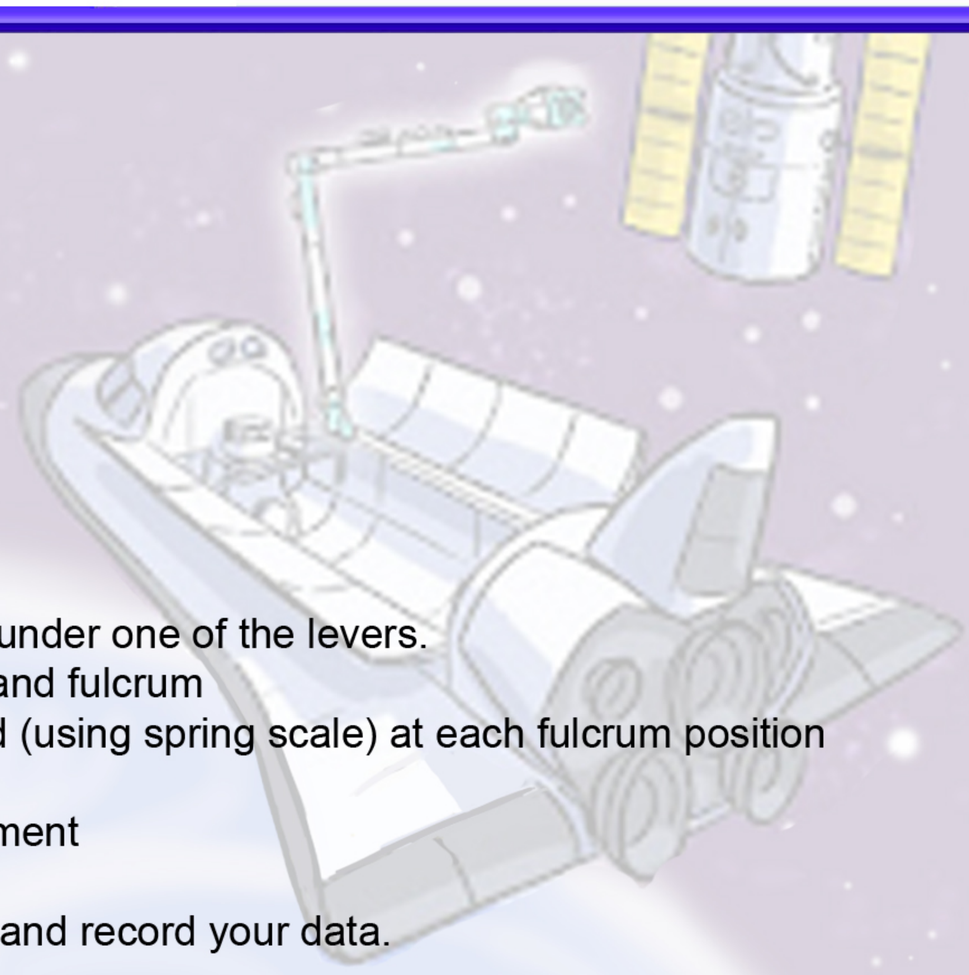
- If you are to change the location of the fulcrum in relation to the load (changing the length of the load arm / effort arm) what effect does it have on the force required to lift?
- If you change the length of the lever, what effect does it have on the force required to lift the load? What effect does it have on the distance the load moves?
- Is there a combination of lever and fulcrum position that provides a balance between force required and distance the load is moved?

B. PART 4 - TEST YOUR LEVER

Get the experiment done by doing the following:

1. Gather materials
   a. Table
   b. Levers- 3 choices
   c. Fulcrum- same
   d. Load
   e. Spring Scale
   f. Pencil
   g. Paper
   h. Positive Attitude!
2. Do your trials:
   a. Place the fulcrum in 5 different locations under one of the levers.
      - Record distance between the load and fulcrum
      - Record force required to lift the load (using spring scale) at each fulcrum position
      - Sample diagram of setup
      - Sample diagram showing measurement
      - Sample Data chart

   b. Repeat Step A with the other two levers, and record your data.



RECORD YOUR OBSERVATIONS:

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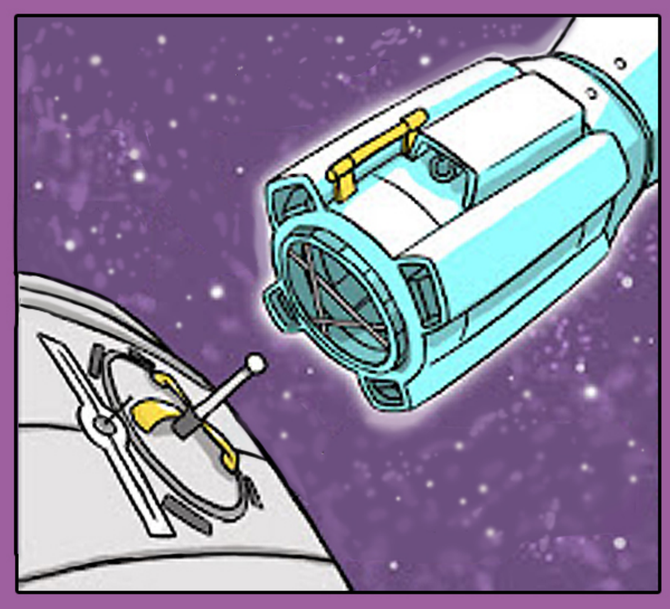
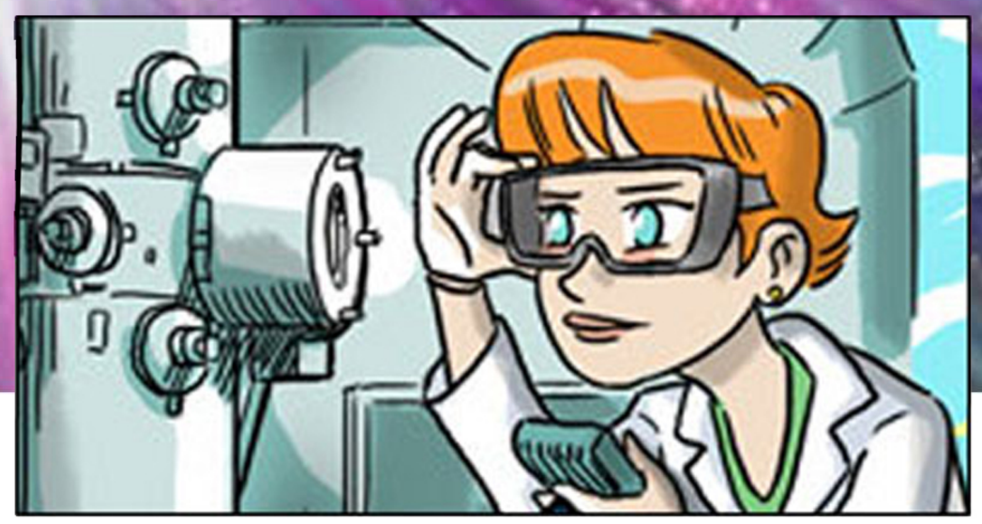
C. THE BIG BANG - MAKING CONNECTIONS

We have a lot of raw data here to process and the astronauts are anxiously awaiting the results of your trials.
You need to use the observations and data from your trials to establish a conclusion.
This will provide the astronauts with clear direction on how to unjam the Canadarm2.
Be sure to have a complete report for presentation to Mission Control.
This is the big leagues- no room for shoddy work.



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 002?



WANT MORE ADVENTURE?

Want a challenge? Try answering these questions:

- Does changing the height of the fulcrum alter the mechanical advantage?
- Do different classes of levers provide different mechanical advantages?
- Put together a report on how Canadarm2 works and its uses.

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Use the observations and data from your trials to establish a suitable conclusion. Write a detailed report to present to Mission Control.