

# Apollo Rescue Mission (ARM)

## CHALLENGE:

Working as a team, **design and engineer** a **space bridge** that will get the three astronauts from Apollo 13 (ping-pong balls) from space safely through reentry and splash down back on earth using only the materials provided. The Apollo 13 mission is best known for all the “challenges” that occurred on the mission and how NASA used **science and engineering practices** to solve these challenges. This is your opportunity to show that the Apollo 13 mission would have been a success if you and your team were part of NASA and Mission Control.

## YOUR MISSION:

1. Make a **group of 2 or 3**.
2. **Read the directions** and the information on this paper.
3. Do background research (gravity, forces, physics, stable structure engineering, Apollo Missions)
4. Get your **supplies** and **label** your Zip-lock bag with (Names and Per. #).
5. **Sketch/Draw/Create** a blueprint or model (one per person that is unique) of a possible design concept. Include **measurements** for **height** and **length** (include **units**).
6. In your digital notebook complete the **Apollo Rescue Mission Report** by the due date.

## DESIGN AND PROJECT GUIDELINES:

1. Only the materials provided may be used.
2. You **many not use** the actual Zip-Lock plastic bag in your design.
3. All construction of the project will be done **in class**.
4. The only **tools** you have are: **rulers, scissors, and writing utensils**.
5. You **can** cut or **use** the materials as you want, but **cannot** get more if you change your mind.
6. Start planning, discussing, and building your design. **Keep notes in your notebook or digital notebook** on what worked, didn't work and design improvements and prototypes.
7. You can use the 3 pieces of color paper **in your design** or as a “**model**” of the wooden platform.
8. YOU ARE NOT BUILDING THE PLATFORM, only a “space bridge” from space to reentry.
9. If you leave any of these materials on your desk after class, they will float off into space and you won't ever see them again. Protect your materials and **do not pollute space**.
10. **Cleanup** at the end of each period and **Enjoy...**

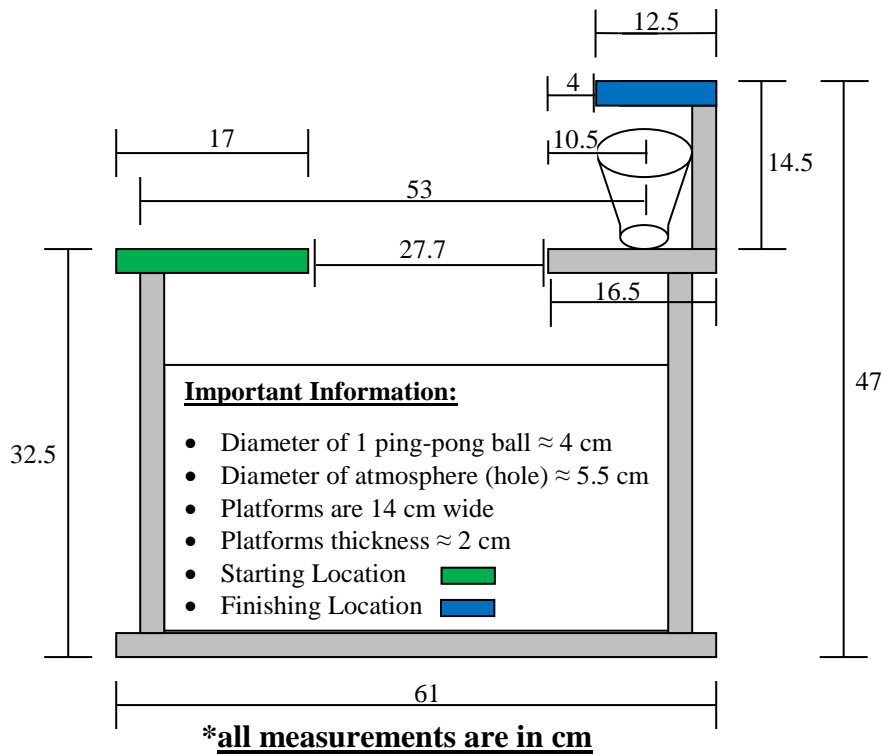
## ENGINEERING CONSIDERATIONS:

1. All parts must be connected together (**no** free-standing parts).
2. You **do not** need to use all the supplies, only what you need for your design to work.
3. John said, “*Power is everything*”. That translates into, “**Stability is everything**” for your bridge.
4. Gene Krantz says, “*We can only give our guys 45 hours. That is **not** acceptable. We need to get them home with time to spare. Failure is **not** an option.*” What he was saying is make sure you design your bridge **past the minimum length** so they can make it across safely to reentry.

Measure carefully and accurately. Be a problem solver, a team player and use the **science and engineering practices** to bring back Jim Lovell, Fred Haise and Jack Swigert. *Enjoy.*



CLASS COPY – DO NOT TAKE WITH YOU IN OR OUT OF SPACE



## Materials:

- 8 clear drinking straws- 20 cm
- 6 narrow red stir straws-13 cm
- 5 toothpicks
- 4 flex-straws
- 3 sheets 8 ½ x 11 in paper
- 2 large paperclips
- 2 small paperclips
- 2 rubber bands
- 2 3-oz. cups
- 1 30 cm piece of masking tape \*(Gently stick it to the outside of your bag)

## GRADING:

- Each team will have **one (1) minute** to set up and perform **three successful rescues** (one per astronaut). Your design may **not** be held or touched once the ping-pong ball has been released.
  - You **may not use the tape, rubber bands, or any other supplies to anchor or fasten your design to the platform.** (Tape does **not** work in space, especially if it has nothing to stick to.)
  - The ping-pong ball can **only** be powered by gravity or elastic potential energy from a rubber band.
  - The ping-pong must be **released** above the “**green**” platform, **not** over the gap.
  - The cup (ocean) must stay under the atmospheric opening and cannot be moved.
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- **Save all 3** astronauts in under 15 seconds                      1000 pts
  - **Save all 3** astronauts in under 30 seconds                      900 pts
  - **Save all 3** astronauts in under 45 seconds                      800 pts
  - **Save all 3** astronauts in under 60 seconds                      700 pts
  - At least **1 of the 3** astronauts **hit atmosphere** (platform)      600 pts