

MISSION BRIEFING

Activity: Design a Crew Module

Prep Time:  15 min

Activity Length:  60 min

Task: Participants will design, build, and test a crew module that will secure two astronaut figurines (2 cm tall) during a drop test.



By the end of this activity participants will

- Know that crew modules must be tested for safety, impact force, and potential damage.
- Understand that the quantitative and qualitative data collected is used to make improvements.
- Be able to use data to improve crew module design.

Materials

- 2-cm plastic figurines, 2 per team
- Tape (tape cannot be used to keep the astronaut in place)
- Scissors
- Metric scale
- Meterstick
- Graph paper and pencil for brainstorming
- Mailing tube, oatmeal canister, or small coffee can (used as a size constraint)
- Paper or foam cups
- Paper or foam plates
- Index card
- Aluminum foil or plastic wrap

Preparation

1. Gather and prepare all supplies listed on the materials list.
2. Divide the participants into teams (three to five participants per team).

Procedure

1. Provide each group with sheets of graph paper.
2. Participants should sketch their crew module designs and then agree on a design.
3. AFTER participants agree on a design, one participant should gather desired materials.
4. Participants construct and improve their crew capsules. (Participants should be able to test crew capsules as they build.)
5. Gather ALL participants in one area for the drop test. (Height = 1 m)

NASA's Orion spacecraft will serve as the exploration vehicle that will carry the crew to space, provide emergency abort capability, sustain astronauts during their missions, and provide safe reentry from deep space return velocities. To learn more about Orion visit www.nasa.gov/exploration/systems/orion/index.html.

MISSION GUIDANCE...

DO

- Set up a “testing site” for participants to use as they build.
- Encourage groups to sketch crew designs before building.

MAYBE

- Conduct a “building brainstorm” time.
- Show a video of Orion drop tests.

DON'T

- Make unrequested suggestions.
- Provide step-by-step instructions.

Crew Module Constraints

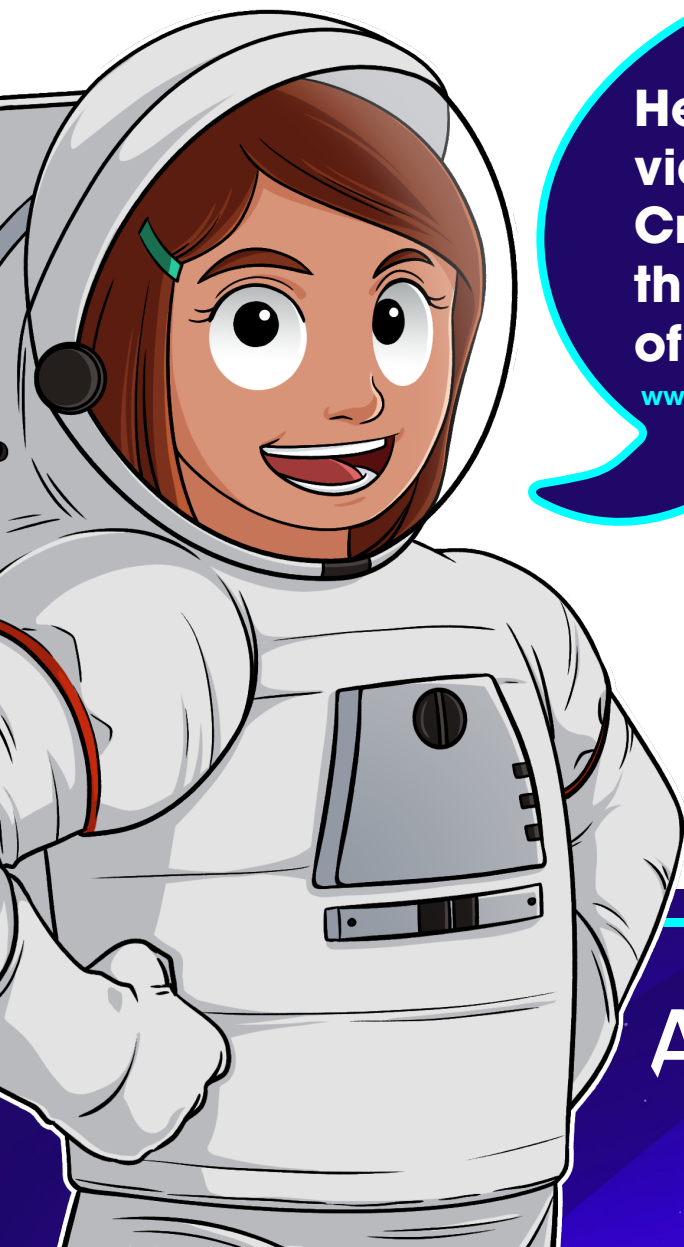
- The crew module must safely carry two astronauts. Each team must design and build secure seats for the astronauts without gluing or taping the astronauts in place. The astronauts must stay in their seats during each drop test.
- The crew module must fit into the size-constraint container provided. This item is simply a size constraint; the crew module will not be dropped while inside the container.
- The crew module must have at least one hatch that opens and closes easily. The hatch must remain closed during all drop tests.

Extension

- Ask participants to calculate the area of their self-designed crew module by identifying smaller shapes and calculating the area of each shape.
- Provide participants a “budget” to maintain.
- Provide size and mass constraints.

Challenge Questions

- How can the force of impact on the crew module and astronauts be reduced?
- What are some safety devices used to protect passengers on or near Earth? Will these devices be useful in space?
- What design features will allow a hatch that can open and close after splashdown?



Here's a handy instructional video, “Design Your Own Crew Module,” that walks through the entire process of this activity.

www.youtube.com/watch?v=5L5Yj6m85SI&t=3s

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