CHALLENGE GUIDE

Elementary School

CHALLENGE OVERVIEW

Astronauts need clean air to stay healthy in space. When people breathe, they let out a gas called carbon dioxide (CO_2). If too much CO_2 builds up, it can make people sick in space — just like too much pollution can hurt our planet here on Earth.

Imagine waking up on the International Space Station and seeing a message that says: "Warning! CO_2 levels are rising!" Astronauts need a safe and easy way to take extra CO_2 out of the air quickly, without using big machines or lots of power.

NASA has tried many different ways to clean the air in space. But for longer trips to the Moon or Mars, astronauts will need new and better ideas. That's where you come in!

Your mission in The Carbon Capture Challenge is to design and share your idea for a carbon dioxide recapture device that could be used on the ISS, Lunar Gateway, or Artemis habitats. Your idea should show how it would work in real life, using pictures, words, or models.

ELIGIBILITY

Who Can Enter:

Students in **K–12** who **live in or attend school in the Greater Houston Area** (public, charter, private, homeschool, and community-based programs are all welcome).

Entry Type

Solo or **team** entry.

Team size: **2–5 students**.

Grade Divisions

K–5, 6–8, 9–12.

Entry Limits

One submission per student (either solo or on one team). **One slide deck per team.**

Location Requirement

Participants must **reside in or attend school/programs within the Greater Houston Area**. (Multi-school teams are allowed if all members meet the location requirement)

Original Work

Entries must be the team's **own original work**. Properly **credit all sources** and images used.

PRIZES

Every scholar who submits an entry for the STEM Innovation in Schools Challenge will receive a free ticket to Space Center Houston and a free invitation to our Awards Ceremony. Additional prizes include:

- ES/MS/HS Solo Division Prize: Explorer Camp or Space U Scholarship
- ES/MS/HS Team Division Prize: Family Membership to Space Center Houston

Space Center Houston also provides webinars, and individual support for teachers to make the implementation of this challenge as easy as possible in your classroom. Teachers with the highest participation levels will be invited to participate in professional development with our incredible instructors to gain skills that will help you further develop your classroom into an engaging, exploratory experience for your students.

OBJECTIVE

Design and share an idea for a CO_2 cleaning system that astronauts could use on the ISS, Gateway, or Moon habitats.

Your project should:

- **Explain the problem and who will use your idea.**
- **Show how your idea will clean the air.**
- **Include a picture or drawing of how it works.**
- **Tell why your idea is important and how it helps the astronauts.**

DELIVERABLES (ONE SLIDE DECK PER TEAM)

Acceptable presentation formats include:

- Microsoft PowerPoint
- Google Slides
- PDF (Word or Google Document)

Acceptable video formats include (video can be included in your presentation):

- MP4
- MOV
- AVI

Maximum Slide Deck Count: 8 slides

Required Sections (use these as slide titles)

1. TITLE & TEAM
    - What is the name of your idea?
    - Who is on your team?
    - What grade and school are you from?
2. MISSION CONTEXT & USERS
    - What problem are you solving?
    - Where will this be used (ISS, Gateway, Moon, Mars)?
    - Why is it important to solve this problem?
3. CRITERIA & CONSTRAINTS
    - What must your idea do to work well?
    - What limits do you have (size, weight, power, safety, crew time)?
    - Which limit is the hardest to solve?
4. CONCEPT OVERVIEW & VISUAL — HOW IT WORKS
    - How does your idea work, step by step?
    - What makes it special or different?
    - What materials would it need?
    - Include a drawing or diagram.
5. IMPACT & WHY THIS DESIGN
    - How will this help astronauts and/or crew?

- What trade-offs did you think about (e.g., smaller but slower)?
- If you had more time, how would you make it even better?

6. REFERENCES & CREDITS
   - What sources helped you?
   - Who created each image or drawing?
   - Who helped you (teachers, parents, friends)?

SUBMISSION

Submissions will be collected through a Microsoft Form. You can access the submission form with the following web address:

https://forms.office.com/r/7yYnTRy1qy

KEY VOCABULARY

- **CO_2 (Carbon Dioxide):** A gas we breathe out; too much is unsafe.
- **Carbon Capture/Removal:** Taking CO_2 out of the air to keep it safe to breathe.
- **Life Support System:** Tools that keep astronauts alive (air, water, temperature).
- **Habitat:** A place where astronauts live and work in space.
- **Criteria (Must-Haves):** What your idea must do to be a success.
- **Constraints (Limits):** Rules or limits like size, weight, or power.
- **Mass:** How heavy something is.
- **Volume:** How much space something takes up.
- **Power:** Energy needed to run a device.
- **Crew Time:** How much astronaut time it takes to use or fix something.
- **Maintainability:** How easy it is to keep something working.
- **Trade-Off:** Choosing one good thing even if it means another thing isn't as good.
- Artemis / Gateway / ISS: Current NASA programs with habitats/stations where your idea could be used.