
Directions for your two page spread in your Reader’s Notebook:

1. Read and jot on one page in your Reader’s Notebook. Keep track of thinking as you read.
Non-fiction jot ideas:

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|------------|---------|------------|------------|-------------------|-----------|
| *key ideas | *quotes | *questions | *key vocab | *important people | *sketches |
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2. Write a full page response to ONE of the prompts at the end of the article or an idea of your choice on the next page in your reader’s notebook. This is your chance to communicate your thinking about one idea.

How will astronauts poop on the moon? NASA challenge aims to flush this mystery

By Chelsea Gohd, Live Science on 07.17.20

It's no secret that humans poop — even in space.

But the actual, physical act of going to the bathroom while floating in space can be tricky, to say the least. In a new contest, NASA is calling on innovators from around the world to develop a new space toilet that would work not just in microgravity such as aboard the International Space Station, but also in lunar gravity aboard a future lunar lander as part of NASA's Artemis program which aims to return humans to the moon by 2024. The contest has a total prize purse of \$35,000 to be shared by winning teams.

"This challenge hopes to attract radically new and different approaches to the problem of human waste capture and containment," NASA wrote in an overview of the challenge, titled "NASA's Lunar Loo Challenge."

The challenge is being overseen by the NASA Tournament Lab and organized on the HeroX crowdsourcing site.

Anyone can apply to this challenge and the winning design will receive a \$20,000 prize, the second-place design will win \$10,000 and the third-place winner will win \$5,000. The contest even includes a "junior" category in which children (anyone under the age of 18) can apply with their innovative space toilet idea. Children in the junior category can win "public recognition and an item of official NASA-logoed merchandise," according to the challenge overview.

Specifically, the contest calls for designs that work in lunar gravity, which is about one-sixth Earth's gravity and microgravity. Designs should also take up no more than 4.2 cubic feet (0.12 cubic meters) of space and shouldn't be louder than 60 decibels (that's about the same volume as a bathroom fan on Earth, according to the same statement).

The space toilet will have to be able to collect both urine and feces at the same time and hold at least a quarter gallon (1 liter) of liquid waste and 17.6 ounces (500 grams) of solid waste.

The final requirements are that the system must be able to store or get rid of waste and should be able to be cleaned and maintained "with 5 minute turnaround time or less between uses," the statement reads.

Hopefully, this next-gen space toilet will be a major step up from some of the more challenging waste removal systems that have been used in space throughout human spaceflight history.

During NASA's Apollo program in the 1960s and early 1970s, astronauts would urinate into a "relief tube" (designed only for male astronauts, since women were not yet allowed in NASA's astronaut corps) after which they would dispose of urine into space where the urine would freeze. Apollo astronauts would also have to figure out how to get their solid waste into plastic bags which they had to bring back to Earth to be studied.

The space shuttle had toilets known as the Waste Collection System, which emptied waste out into the vacuum of space. But it didn't always work perfectly. The International Space Station improved on the space toilet with a new design, and NASA is working on a new space toilet known as the Universal Waste Management System (UWMS).

To learn more about NASA's Lunar Loo challenge, including rules and registration requirements, visit the contest website.

<https://www.nasa.gov/solve/nasas-lunar-loo-challenge/>

Possible Response Ideas (see the directions at the top of the article):

- What are your thoughts about possible solutions to the Lunar Loo problem? Explain.
- Pick a word/line/passage from the article and respond to it.
- Discuss a writing technique or strategy used by the writer in this piece that you think is good/interesting. Explain.