National Aeronautics and Space Administration

2025 Drop Tower Challenge

Paddle Wheel

https://www1.grc.nasa.gov/space/education-outreach/drop-tower-competition/

WHAT? Teams of grade 8-12 students are challenged to design and build paddle wheels that will turn in water because of the wetting properties of their surfaces when they experience apparent weightlessness, i.e., microgravity, in NASA's 2.2 Second Drop Tower (shown below). To be clear, the rotation of the paddle wheels must result from the hydrophilic or hydrophobic ('water loving' or 'water fearing') surface(s) of the paddle wheel and not because of mechanical means.

Teams are only responsible for their paddle wheels; NASA will provide the rest of the experimental hardware. After developing their concepts, the youth prepare their proposal, consisting of conceptual drawings and a short entry form, which is e-mailed to Ed-DropTower@lists.nasa.gov.

If selected, the youth prepare their paddle wheels based on provided guidance. The devices are then sent to NASA where they will fall 24 meters (79 feet). Video results of the microgravity testing is provided for student analysis and reporting.

For inspiration, check out the video examples of microgravity motion in Liquid Ping Pong in Space, International Toys in Space, Toys in Space, and/or Toys in Space II.

WHO? This design challenge is for students in grades 8-12 from U.S. schools, including the fifty states (and the tribal nations within them), District of Columbia, Puerto Rico, American Samoa, Guam, the Northern Mariana Islands, the U.S. Virgin Islands, and all DoDEA schools (which are for children of U.S. military personnel). Except for the DoDEA schools, this challenge is not open to participants outside of the United States regardless of citizenship.

Teams will be favored over individuals in selection. Youth are expected to do most of the work, but may get help from adults, for example in building their paddle wheels. Furthermore:

1. Teams may be of any size, but a maximum of four students per team will be invited to the 2025 ASGSR meeting; see the next section.
2. Each student may belong to no more than one team.
3. Each team may submit no more than one proposal.
4. An organization (e.g., school, science center, 4-H club, Scout troop) may have many teams, but it may submit no more than two proposals to NASA. It is envisioned that no more than one proposal will be selected per organization.

SELECTION? NASA anticipates selecting up to 30 teams to build paddle wheels to be tested at the Glenn Research Center in Cleveland, Ohio. After evaluation of the experimental results and teams' reports, a small number of top-performing teams will be invited to present their results in a student poster session at the 2025 meeting of the American Society for Gravitational and Space Research (ASGSR).

WHERE? Participation is remote, where participants do not travel to NASA for the testing. An exception is for those teams invited to present their results at the 2025 ASGSR meeting, but its location will not be announced until Dec. 2024.

Testing in the 2.2 Second Drop Tower

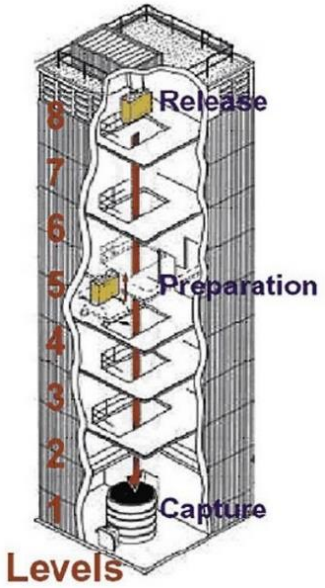
COST? There is no cost to participate in the challenge other than for the (1) preparation of the paddle wheels, (2) shipment of the paddle wheels to NASA, and (3) travel costs for those invited to present their results at the ASGSR meeting. Regarding the latter, the ASGSR has typically provided travel support of $500 each for invited non-local students who present their results at the conference.

WHEN?

2024	Oct. 31	proposal deadline
	Late November	NASA announces teams selected for testing
	Mid-December	NASA provides proposal feedback
2025	Jan.-February	teams prepare paddle wheels
	Feb. 14	deadline for arrival of paddle wheels at NASA
	Feb.-March	tests conducted in NASA's 2.2 Second Drop Tower
	April	analysis and report writing
	May 1	deadline for written report
	Mid-May	NASA announces teams selected for ASGSR participation
	Fall	annual ASGSR meeting (typically in early November)

WHY?

Participation in a nation-wide NASA design challenge could be good to include in college applications. And it is likely that your team will be selected for testing. Thus far, nearly 100% of the proposing teams have been selected for participation in this annual series of problem-based drop tower challenges.



HINTS

- Design and build multiple test paddle wheels so that you can compare their results in your report and poster too if invited to present at the ASGSR meeting.
- Conduct your own microgravity trials. For inspiration, check out the Fire in Free Fall video by Dianna Cowern. The challenge staff can provide additional guidance.

QUESTIONS?

Please review the information at https://www1.grc.nasa.gov/space/education-outreach/drop-tower-competition/current-drop-tower-challenges/2025-drop-tower-challenge/, although the detailed guide and entry form won't be available until mid-2024. You may also email the challenge staff at Ed-DropTower@lists.nasa.gov.