SμGRE-1 Sculpture Design Competition

Schools micro-Gravity Rocket Experiment

Competition proposal:

Educational establishments - schools, colleges and home-schooling households hereafter: "school(s)" – are invited to develop and submit a sculpture which may be included as part of a micro-gravity and 3D-imaging experimental payload to be launched into sub-orbital space on board a NASA Black Brand IX sounding rocket. The rocket will return to Earth where, it is envisaged, the payload will be recovered and the sculptures returned to the schools, along with a 3D video of the sculptures, and a certificate authenticating it has travelled into space*

Rules for entry:

1) The project is open to all school children, including schools for children with special needs. All participants must be under the age of 18 years old.
2) Home-schooled children may form a group and submit a group entry, or may enter one entry as a household if not affiliated to a group.
3) ONE sculpture design entrant only from each school can be put forward for flight.
4) The selection of sculpture entrant for flight from each school is to be governed and decided in-school by whichever means contrived (some ideas are suggested overleaf).
5) The chosen entrant from each school must be sent to us as two physically identical copies (within reason), and to arrive no later than **Friday 2nd of February 2018**. The entrant must be sent along with a pre-paid self-addressed Jiffy bag for return of the sculpture. If you do not include a pre-paid self-addressed Jiffy bag you sculpture will not be returned.

Like all space missions, we are subject to mass and volume constraints and so the number of entrants into the micro-gravity experiment are limited, however we will make best endeavours to ensure all other entrants received will be travel into space. It is anticipated that up to 250 sculptures will be visible during the flight by the cameras, while up to a further 750 will make the journey into space in another compartment.

Requirements for the sculpture:

1) The sculpture must fit within a cuboid of 4 cm^3 e.g. the size of a sugar cube.
2) The sculpture may be made of any material, but suitable for taking on an airplane in hand luggage and remain solid up to a temperature of 100°C.
3) The sculpture may be any mass, but no greater than 4 g.
4) The sculpture must be able to withstand a force of 12-G.
5) The sculpture may be any colour.
6) The sculpture may be any shape.
7) The sculpture may be fabricated in any way, but must be in one piece.
8) Manufacture of the sculptures must be quickly re-producible such that multiple copies can be made if required.

*DISCLAIMER – Pennsylvania State University's Water Recovery X-ray Rocket (WRX-R) is the PRIMARY mission; SμGRE-1 is a passenger on board. For reasons beyond our control permission to fly SμGRE-1 may be withdrawn at any time and if so all sculptures will be returned in the pre-paid self-addressed jiffy bags. In the likely event that the rocket does not survive either launch, the return descent, or recovery from the ocean, all sculptures and video will be lost.

Suggestions for 'in-house' competition/entry selection:

- A single class develop and manufacture their submission on behalf of the school
- All students take part and select a winner by ballot/some other means.
- In class competitions – as a class project, design, develop and manufacture a sculpture then choose the best from all the entrants (whole school).
- Inter-year competition – as individuals or as a class project, design, develop and manufacture a sculpture then choose the best from the entrants to put forward a

sculpture to represent the year groups, then choose the best of those to represent the school.

Consider the design and manufacturing process:

- What shape should it be and why? What does shape do to an object's physical properties and how it interacts with other objects, especially when in micro-gravity?
- What material should it be made of, and why:
  - Resin; Wood; Plastic; Metals (NOT magnesium or any other highly reactive metals – check for stable metals and alloys); Rubber; Glass; Rock or minerals; Paper/card; cork, etc.
- How will you manufacture the sculptures (remember: the manufacture process should be reproducible to provide identical sculptures)
  - 3D printing; carving; moulding, etc.

Other Information:

- We encourage students to document their sculpture design and manufacture as a Vlog. Submissions with report and/or Vlogs allows us to showcase their design and prioritise its participation in the experiment, but are not a requirement for entry.
  - Reports can include the following information:

i. some background information about the experiment and what it hopes to achieve (an introduction),
ii. the reasons (rationale) they chose to develop their sculptures the way they did and how those choices will be advantageous for the experiment,
iii. a methods section (what they did to make the sculpture),
iv. how they might consider improving what they did what they might expect to observe (the summary/discussion) and,
v. A general overview of the whole design and manufacture process, the significance of what they have done and how it might be applied in other experiments, followed by an assessment of how their project fared (the conclusion).

  - Students should try to back up any statements they make, or reasons they give for decisions they made by providing references to books, journals, websites or any other information they have read (try to avoid citing Wikipedia as a primary source of information).
  - Vlog entries will be uploaded to our mission YouTube channel (SuGRE-1). Vlogs should be informative, contain an update of progress and should be as professional as possible – remember, you're space scientists now!

For any queries please contact Sheree Murray: sheree.murray@dynamicimaginganalytics.co.uk

Credit https://sites.wff.nasa.gov/code810/files/SR%20Infographic%20Final.pdf