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Space Research Projects for the International Space Station

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SIDES

Space Italian Dressing Experimental Setup

SIDES examines the dynamics of fluid segregation between fluids of differing densities. While in space the fluids will not undergo buoyant or convective forces, thus isolating the affects of separation due to density and molecular forces.

The experiment will serve as an outreach experiment in addition to gleaning scientific data; mixtures are a topic of study in the 5th grade curriculum.

The experiment is a sealed container holding mineral oil, water, and gaseous nitrogen. As the two liquids do not mix well together, shaking will result in something similar to a bottle of salad dressing. When first shaken on Earth, the substances will form globules that do not mix with each other, but over time the two liquids will reach an equilibrium state that is identical to the starting state. The fluid interaction in space is unknown.

The "salad dressing" will be taken to the ISS by a space flight participant who will do the shaking, re-shaking, and recording. Since there is no "up" in space, it will not be the case that the less dense fluid rises to the "top." This experiment is to analyze the behavior of the two fluids when under these conditions; what happens when there is no "top" for the fluid to float toward?

This data could be used to characterize the behavior of fluid interaction while in microgravity environments. This research would be the first of its kind and may lead to insights on how to store liquid fuel for future deep-space missions.

IPAS

International Paper Airplanes in Space

The objective of IPAS is to excite children about space research by giving them a chance to take part in it.

IPAS includes collecting paper airplanes made by elementary-school students from around the world. The airplanes will be sent to the ISS to determine the effects of microgravity on paper airplane flight. The data will be recorded, collected, and then disseminated.

This outreach project will mainly target the 16 countries building the ISS; Russia, Canada, Japan, Brazil, the United States, and 11 member nations of the European Space Agency (Belgium, Denmark, France, Germany, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.) The goal is to use the USU international students from those nations as ambassadors to their home countries. It will be their responsibility to contact the elementary schools near their homes, collect the airplanes, and return them to USU. The airplanes will then be sent to the ISS care of Space Adventures and the Russian Space Agency.

The final project will only include two airplanes from each participating country that will be sent to the ISS. The airplanes will be flown and recorded by a space participant. The video and space weathered planes will then be returned to the several countries.

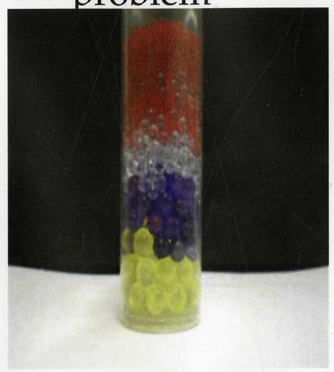
Though not garnishing any scientific findings, IPAS will provide elementary students with exposure to space research and fuel the growth of scientific interest in the future leaders of this earth.

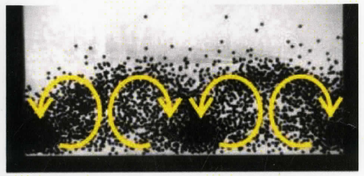
Experimental Parameters

The experiment will include letter or A4-size paper, colored pencils, markers, etc. The students will be allowed to decorate their airplane however they would like. The only rule is the finished airplane cannot be glued, it must be only one piece of paper, and it must be able to fold flat.

REMBRANT

Research on the Effects of Microgravity on the BRAzil NuT problem





REMBRANT examines the affects of inertia on granular separation. The experiment includes two to four different bead sizes in one container that will be shaken and recorded to evaluate the ensuing collisions. Because of minimized gravitational effects, the granules will not be subject to buoyant or convective forces.

On earth, it is a common phenomenon that when shaking a container of mixed nuts, the larger nuts end up on top while the smaller nuts "sink" to the bottom. This is the case with any container holding multiple objects with differing densities and sizes. Within the container there arises a convection cycle in the middle that drops off in thin streams along the walls of the container.

Along with granular separation under microgravity conditions, analysis of the video could help determine if "granular gas" occurs in space. Granular gas is the solid state equivalent of the Leidenfrost effect. That is, just before reaching the convection stage there is a thin layer of granules that will "float" on the surface of a higher energy layer of granules.

By conducting this experiment in space it will be seen just how much inertia plays in granular separation and could lead to possible solutions for packaging and transporting materials that act like fluids.

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University of Twente (2008, February 22). Granular Matter On The Boil Behaves Like Fluids. *ScienceDaily*.