Air-Buoyant Solids

Internet for Everyone with Floating WiFi Hotspots

BACKGROUND & MOTIVATION

Over half the people living on Earth have no access to internet.

WiFi hotspots suspended from helium weather balloons have been proposed, BUT:

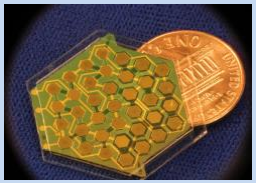
- Helium is becoming more expensive/rare.
- Long term deployment of balloons has proven difficult.

http://asd.gsfc.nasa.gov/

INNOVATION

Ultra-low density solid supports displacing an evacuated volume

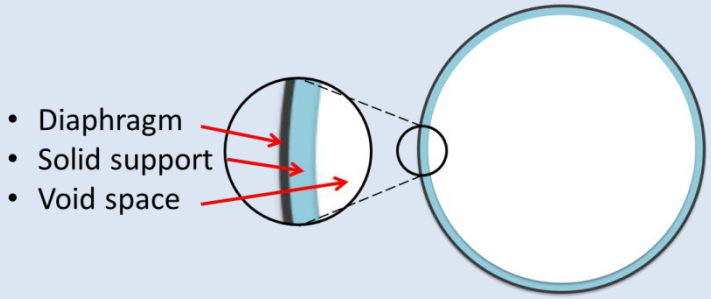
- Advancements in the strength of ultra-low density solid materials developed at LANL enables the design of air buoyant solids.
- Hollow geometries that minimize surface area to volume ratio.
- DARPA has developed miniature roughing pumps that can evacuate these "vacuum balloons".



http://newatlas.com/darpa-mems-smallest-vacuum-pumps/27883/

DESCRIPTION

Basically a "Vacuum Balloon", i.e. like a helium weather balloon (or blimp) but requires no gas.



- Instead of filling the balloon with helium, the balloon is instead filled with "nothing".
- Geometry is chosen to minimize surface area to volume ratio, which enables a minimum amount of material to displace a maximum volume of air, thus optimizing buoyancy under evacuation.
- Buoyancy is achieved by pumping air out of the void space inside the solid support shell.
- The solid support shell must withstand atmospheric pressure under evacuation, but be thin enough to achieve buoyancy.

Current Technology Readiness Level (TRL) 3

- Solid support materials have been tested for compression, flow, and vacuum integrity.
- Molds have been produced for making small-scale sub-buoyant prototypes for TRL 4 level testing.
- Provisional Patent Pending.

ANTICIPATED IMPACT

Reduce cost and increase reliability associated with long duration sub-orbital scientific ballooning

- Reduces much of the expense associated with preventing balloon rupture at altitude.
- More permanent deployment can be achieved.
- Ability to regulate altitude by varying vacuum pressure within structure.

PATH FORWARD

Provide proof of concept demonstration with prototype

- Small scale sub-buoyant prototype to determine thickness requirements of solid support.
- Larger scale air-buoyant prototype for proof of concept and demonstration of increased performance with scale up.
- Cost model for mass production.
- TRL increase to level 4; air-buoyant prototype

Potential End Users:

- NASA, Amazon, Project Loon, academic and private scientific ballooning programs, and other industrial ballooning applications.

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