

Compact Transformer

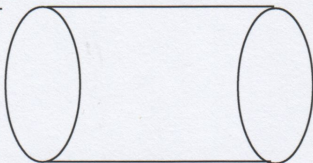
Small Volume to Large Area Transformation

Art 5

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Background

NASA is always trying to fit as much into as little space as possible on spacecraft. Small and unusual spaces present interesting design problems. In addition NASA needs large surface area devices to collect the Sun's energy to power spacecraft. Solar panels can be folded up and bent easily now for storage. In addition solar panels are deployed in zero gravity freeing up weight constraints when opened.



Goal

Creating small volume devices which will open up into large area devices is our goal with this project. But not only should the functional limit be met, **how it opens should be interesting** as well. How it opens is the aesthetic limitation and will be equally rewarded.

$$\begin{aligned}\text{Vol.} &= \text{Pi} * r^2 * h \\ \text{Vol.} &= 3.14 * 0.66 * 4.5 \\ \text{Vol.} &= 9.3 \text{ cubic inches } \pm\end{aligned}$$

Limits

We will **start with a very small volume**, the inside of a standard toilet paper roll. Surprisingly it contains over 9 cubic inches of volume. Fitting inside this roll will be a device you create, constructed primarily of paper, which, when pulled out or otherwise opened up, will **achieve the largest surface area possible**. It need only perform this once opening operation (it can take a long time to reload) and it need not be self supporting when opened (zero G's). Other materials can be used but paper must be the primary material.

ref:

<http://mathforum.org/dr.math/faq/formulas/>

Process

You have never done this project before, so give yourself a break! **Make some mistakes** and don't try to plan it out in your head. Make mistakes with paper and the roll and be humble (sketch in 3D). From many mistakes good ideas or even parts of idea will come. **Quantity is important at this stage of design!**

Due Date: _____