# Need a Snack?

## Try 3-D printing technology

Made in Space CTO Jason Dunn (left) and P.I. of the 3DP Experiment Mike Snyder look to optimize the first 3-D printer for space.

### We're hungry.

Mounting deadlines, trade show planning and Friday afternoon trivia give the Addendum Staff (recently on a brief hiatus) little or no time to enjoy much food outside of a Milky Way and a carbonated beverage. Sure, there's a Subway right down the street and enough soup cans in the office to survive the zombie apocalypse (3x), but some variety is in order.

3-D printing technology (touted heavily during the last couple of IMTS shows) might make lunch a little easier in the future. How valuable would it be to whip up a dozen gear-shaped cookies in the office in less than five minutes?

The Fab@Home project began at the Cornell University Computational Synthesis Laboratory in 2006 (*www.fabathome.org*). It's an open-source mass collaboration aimed at bringing personal fabrication technology to your home and/or office. The community consists of engineers, inventors, artists, students and hobbyists across six continents.

Using personal fabricators made from off-the-shelf components, Fab@Home's Jeffrey Lipton hosted an instructional video (*www.youtube.com/watch?v=1GG4tWhkxcc*) on creating gear-shaped cookies using 3-D printing technology. He explained the fairly simple process in the video, "The tools you're going to need are a 3-D printer and a deep fryer. The ingredients are half a cup of corn dough, three quarters cup of water and then you simply mix it together in a bowl."

That's it? That's all it's going to take to serve up a fresh baker's dozen whenever your sweet tooth needs a fix? Not exactly, you'll also have to assemble the 3-D printer if you're mechanically inclined to do so.

Lipton remarked that putting the printer together isn't a difficult task at all. "It's completely at-home doable—anybody can build it. This one we like to call IKEA-plus level skill, a little more than putting together IKEA furniture. When we release the next model, we hope for it to be right around IKEA level: just screw it together and you're good to go."

With this ever-changing technology, there's absolutely no reason whatsoever to stop at gear cookies. NASA's Small Business Innovation Research (SBIR) department issued a grant in 2012 to research advanced food systems technology for long space missions using similar technology. Here's the Technical Abstract from the project:

"Systems and Materials Research Corporation (SMRC) proposes combining its Manufacturing Technology and Materials Science expertise to address NASA's Advanced Food System Technology needs. Using progressive 3-D printing and inkjet technologies, SMRC will design, build, and test a complete nutritional system for long duration missions beyond low earth orbit. The 3-D printing component will deliver macronutrients (starch, protein, and fat), structure, and texture while the inkjet will deliver micronutrients, flavor, and smell. SMRC will team with the food science program at North Carolina State University and International Flavors and Fragrances to ensure the production of nutritious and flavorful mission supplies. SMRC proposes producing synthetic food which meets the nutritional needs of each and every mission specialist and astronaut. Using unflavored macronutrients, such as protein, starch and fat, the sustenance portion of the diet can be rapidly produced in a variety of shapes and textures directly from the 3-D printer (already warm). Since basic sustenance will not ensure the long-term physical and mental health of the crew, this is where the microjetting will add value."

In a separate project, NASA is planning to launch a 3-D printer to the International Space Station to test space manufacturing technology for long-duration missions. The 3-D Printing Zero G Experiment, a partnership between the company Made in Space and NASA's Marshall Space Flight Center in Huntsville, Alabama, will send a Made in Space 3-D printer to the space station in 2014 to demonstrate the feasibility of using the technology to construct spare parts and tools from raw materials on a deep-space mission. If they can find a way to combine both projects, we could live in a world where Captain Jean-Luc Picard could eat a Chicago deep dish pizza the size of an aspirin.

Where do we sign up?


The Made in Space team conducts tests during a reduced gravity flight. Made in Space has over 400 parabolas of testing 3-D printing technologies in zero-gravity.

Photos courtesy of Made in Space