

Aerospace Engineer

Natalie Panek

Mission Systems Engineer, MDA Space Missions, Canada

Natalie Panek thrives on adventure. As an engineering undergrad, she helped build a solar-powered car for the North American Solar Challenge and helped drive her team's car from Texas to Alberta, Canada. She earned her private pilot's license around the same time, but her sights have always been set even higher: on outer space. Panek completed two internships at NASA; now, in her work at MDA, she helps build robots that will perform complex servicing missions in orbit and others that may go to the Moon. Until she can go to space herself, Panek says, building robots that go there is the next best thing.



When did you become interested in engineering?

I've always dreamed of becoming an astronaut—a dream I'm still pursuing—and thought engineering would help me achieve that goal. The cool thing about engineering is that there are so many different disciplines within it. It's a gateway to many opportunities.

In the U.S., many schools offer aerospace engineering, but only a few in Canada do. I learned from talking with people and from reading on the Internet that mechanical engineering is a bridge to aerospace engineering, so I decided to stay in Calgary, where I lived, to do my mechanical engineering undergraduate degree. Then I earned my master's in aerospace engineering at University of Toronto.

How did you land your first internship at NASA?

The Canadian Space Agency sponsors one Canadian student per year to intern at a NASA Academy. I applied for that four years in a row, and I was rejected four years in a row. After the fourth rejection, I called the director of higher education at NASA Goddard, and within a couple of minutes he offered me an internship position.

In the past, I didn't tell the story of how I got to Goddard very often because I was a little embarrassed. Now I realize that there's no point in being ashamed of failure. You just have to keep persevering and make your own path.

What was your first job after you finished your master's program?

First I did another internship, this one focusing on Mars,

Interview by Melissa Hartman

at NASA Ames. Then, because there are so many more aerospace opportunities in the U.S. than in Canada, I started applying for jobs in the States. But I soon realized that U.S. laws make it very difficult for foreign nationals to work on aerospace or defense projects. I looked for jobs back in Canada and was hired by MDA, the company that built the Canadarms (Canadarm2 is on the International Space Station). I was hired for a program called The Next Generation Canadarm, a project focusing on on-orbit satellite servicing.

Why did that job appeal to you?

It was an opportunity to work on space robots, and the idea of satellite servicing is really cool. Many people don't realize how many satellites are orbiting the earth right now—and how many of those satellites aren't even operational. The idea is to use a robotic arm to repair broken satellites so that we can start reusing them instead of launching a new one into orbit and making the space around Earth even more cluttered.

We are so reliant today on satellite technology for everything from cell phones and TV to GPS and weather, and the more reliant we become, the more satellites will be launched. We need to take care of the environment not only on Earth, but also around Earth and in space.

Satellites have been serviced since the '80s. The Hubble Space Telescope was serviced five times by astronauts. The Dextre robot—the robot that looks like it has two arms—on the ISS replaces components on the space station and just recently fixed itself. This kind of servicing is being done more and more, and it's something that needs to be built into the business culture of the satellite market. We need to help satellite providers understand the benefits of fixing and maintaining their satellites.

What are you working on now?

One project I'm working on is the DARPA Phoenix Program, which is similar to satellite servicing in that it promotes sustainability in space by repurposing satellites. Essentially, we will take working pieces off broken-down satellites and use them to build another satellite system. On another project, I'm evaluating the effects of simulated lunar conditions on hardware that could be used on future Moon missions and help-

ing develop technologies to mitigate the impact of lunar dust on this hardware.

What is a typical day like for you?

For robotic projects, I divide my time between computer modeling and working with hardware in our clean room. Any time a robot has to do something on a space mission, you have to plan what it's going to do ahead of time. I get 3D models from our mechanical engineers and designers, and then I basically build the entire environment that the robot will be in—both on the computer and in the clean room—to make sure it can do all of its tasks.

For the DARPA project, my work is more systems engineering. Any project we're working on has precise specifications according to which it must be built. As a systems engineer, I verify that we have met these requirements. I make sure the project adheres to what our customer—in this case, DARPA—wants and needs.

What is the most challenging part of your job?

The most challenging part of being a systems engineer is that I need a good working knowledge of all kinds of engineering—including electrical, software, structural, thermal, and mechanical engineering. It's hard to learn and keep up with all this; it takes practice and experience and the ability to work with and learn from mentors. It is challenging always to be learning something new and to be comfortable in unfamiliar situations.

What skills and qualities do you think it takes to be successful in your career?

You need to embrace lifelong learning. You need to be able to maintain perspective when you're working in a team. You need to be persistent and fearless—especially when it comes to failure.

I think grades in school can make kids afraid to fail, but once you get out of school, you're going to fail sometimes. It's just part of life. The more you



BETTINA BOGAR

realize that failure isn't really a bad thing, the more you can learn from it.

Some of our readers might be entering your field in another 10 years or so. How might things be different then?

Space exploration is changing so much right now. From its beginnings in the 1960s, this field was heavily dominated by the government and NASA, which is a government agency. Now it's shifting toward private companies, and agencies like NASA are contracting out to companies like SpaceX, who are really revolutionizing space travel. I think missions to Mars will probably be a big focus in the next decade.

What advice do you have for students who might be considering a career like yours?

To the young women out there, I'd say don't be afraid of going into careers that are male dominated. Most of the time you'll find people are very helpful and want to help you learn. And don't look just for female mentors. You can learn from both men and women.

And for everyone reading this, I would say to dive head-on into challenge. I love adventure, I love exploring, and I've had so many cool experiences by just embracing that attitude. I guarantee you'll fail, just as I've failed along the way. But as long as you're having fun and learning, you'll have no regrets. ■

What aerospace engineers do

Aerospace engineers design, test, and build vehicles and systems for flight and space environments, such as aircraft, spacecraft, missiles, and satellites.

Where they work

Aerospace engineers work both in industry (well-known companies include Ball Aerospace, Boeing, and Lockheed Martin) and for the government, including NASA, Sandia National Laboratories, and the military.

Education required

A bachelor's degree in engineering is the minimum requirement for entry-level jobs in this field.

Salary range

In May 2012, the median annual wage for aerospace engineers was \$103,720 (source: www.bls.gov).

For more information

American Institute of Aeronautics and Astronautics (AIAA) Careers in Aerospace
<http://bit.ly/1mFC9NL>

Engineer Your Life

www.engineeryourlife.org/cms/Careers/Descriptions/aerospace.aspx

NASA Careers in Aerospace Technology

www.nasa.gov/centers/langley/news/factsheets/FS-2001-09-68-LaRC.html

Read about Natalie's adventures—engineering and otherwise—at www.thepanekroom.com.