

Aiming for the stars



NASA's shuttle program may be defunct, but the next generation of spaceflight is on the horizon – and there will be plenty of jobs to go around. **Becky Oskin** reports

GROWING UP in Costa Rica, Melania Guerra always dreamed of following in the footsteps of NASA astronaut Franklin Chang-Diaz, a national hero. She set her goal, studied mechanical engineering, and then got Chang-Diaz to take her on as an intern at the Johnson Space Center in Houston, Texas.

But Guerra's dream ended in 2004, before she had even finished her internship, when President Bush announced plans to cancel the shuttle program. "I had to look at what my dreams had been, and adapt," she says. Searching for something that could offer a similar sense of adventure and discovery, Guerra turned to oceanography. She now works in extreme environments such as the frigid Chukchi Sea between Alaska and Siberia, gauging the effect of underwater ambient noise on marine mammals.

The shuttle program was canceled this summer, supposedly to free up resources to explore deep space. It was a blow to aspiring astronauts and meant the loss of thousands of jobs. And when NASA needs to send astronauts and cargo to the International Space Station, it must pay to use a Russian Soyuz spacecraft. To ensure that the US has independent access to the ISS, NASA has commissioned private companies to build suborbital and orbital ships, effectively kick-starting a new space race.

"Space is a \$280 billion industry, and NASA is worth approximately \$20 billion, so NASA is small potatoes," says David Whalen, professor of space policy at the University of North Dakota in Grand Forks. "Most of the jobs that are available aren't changed by what NASA does."

Virgin Galactic, Armadillo and Blue Origin are three of the companies competing to

send people into suborbital space (classed as anywhere from 30 to 50 miles up). Southwest Research Institute in San Antonio, Texas, has already bought seats on Virgin Galactic's SpaceShipTwo for two of its scientists at \$200,000 a pop, allowing them to carry out trial experiments in microgravity. Boeing, Sierra Nevada Corporation, SpaceX and Space Adventures are aiming for the ISS and beyond.

Grand plans

Many companies plan to get off the ground by hauling tourists into space, but the big money lies in NASA contracts and space research. Sierra Nevada, one of the frontrunners, aims to ferry astronauts to and from the ISS on NASA's dime. Steve Lindsey, a retired astronaut and director of flight operations for the company,

Private "space taxis" will be ferrying NASA astronauts to the ISS

says he's not after a monopoly. "I want the paradigm to change," he says. "I'm hopeful that more than one company will succeed, and more people will have opportunities to fly into space."

Lindsey is one of many astronauts to retire from NASA in recent years. The astronaut corps now numbers 60 members, down from a high of 150 in 2001. That's not enough to meet obligations aboard the ISS, according to a report published by the National Research Council last year. And so, even with no shuttle, NASA is recruiting a new astronaut class, with

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applications being accepted until the end of January 2012.

Other opportunities for budding astronauts such as Guerra have already sprung up in the private sector. Now a postdoc at Cornell University in Ithaca, New York, she has joined Astronauts4Hire, a non-profit group based in Florida that puts aspiring astronauts through their paces. The organization hopes to match its trained scientists with companies wanting to send experiments, but not employees, into orbit. "I think commercial exploration is going to open a lot of doors," says Guerra. "It's exciting. It's completely new territory."

But before spaceflight can become as commonplace as the commercial CEOs hope,

the industry needs to solve the regulatory problems associated with spaceflight. "The technology has never been the problem," says Mike Gold, director of D.C. operations for Bigelow Aerospace. "The legal, financial and political aspects of space exploration are what has held the industry back."

In 2006, Bigelow launched its first prototype inflatable space station into orbit on a Russian Dnepr rocket. Despite several further launches, Gold quips that export control regulations were second only to gravity at keeping them on the ground. "I would strongly encourage lawyers and policy people with an interest in space to become involved in supporting commercial crew and commercial space activities," he says. "In many ways, that's where the most important battles lie."

George Nield, associate administrator for commercial space transportation at the Federal Aviation Administration, which regulates the industry, predicts a hiring boom once commercial flights begin. The FAA is already recruiting – everyone from engineers to environmental experts – and has proposed opening a new operational base at the Kennedy Space Center, where several companies will launch their vehicles. "In the past, there have been four or five shuttle launches in a good year, but we're going to see hundreds every year," he says. "With all those missions, we'll see a lot of job opportunities." ■

Becky Oskin is a science writer based in California.

More earthly pursuits

Space science isn't the only option for adventure seeking scientists. Here are a few projects to whet the appetite

Thanks to the Apollo missions, 12 humans have walked on the moon's surface, but only two people have explored the deepest depths of our oceans.

Come next year, we will be able to add one more to that tally. Serial entrepreneur Richard Branson (CEO of Virgin Galactic, no less) is developing a one-person submarine – Virgin Oceanic – to visit the deepest parts of the

Earth's five oceans. First to be explored is the deepest of the deep, the Mariana Trench, next year. Researchers from the Scripps Institute of Oceanography in La Jolla, California, and the universities of Southern California and Hawaii, among others, are on the scientific operations team.

Another grand project under way is the Ocean Observatories Initiative, which aims to wire up the ocean with a network of sensors strung from the surface to the ocean floor. The scientific and video data that the sensors, and the accompanying autonomous vehicles, will stream

back to labs will be far superior to that which is currently gathered by research satellites and research vessels on the surface.

The project involves researchers from the Woods Hole Oceanographic Institution in Massachusetts; the universities of Washington and California, San Diego; and Rutgers, the State University of New Jersey. It will consist of sensor arrays anchored in coastal ecosystems, polar regions and around the entire Juan de Fuca tectonic plate in the Pacific Northwest of the US, allowing scientists to observe volcanic activity and earthquakes as they happen.

How about monitoring the seismic heartbeat of the US? This is what the USArray project has been doing with its set of 400 transportable seismographs. It began in 2004 with California and will end in 2013, having swept through 48 states, with each "seismic station" taking measurements for two years before being moved further eastward.

The stations are monitoring the vertical and horizontal vibrations of the Earth more comprehensively than ever before, building up a 3D picture of the ground, right down to where the mantle touches the core some 2,900 kilometers below the surface. **Jessica Griggs**