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Field notes Spaceport America, New Mexico

Boldly going where no one has gone before

SpinLaunch has an audacious plan to launch satellites with a giant centrifuge, and it might change the future of space flight, reports **Leah Crane**

BUMPING along a dirt track in New Mexico, something alien rises above the expanse of brush. It looks like a flying saucer on its side, a huge circle 4 metres taller than the Statue of Liberty. This is SpinLaunch's suborbital accelerator, a colossal centrifuge built to practice throwing satellites into space. It seems like a wild idea, but it just might work, as I saw when I watched the company's ninth test flight.

SpinLaunch started in California in 2014 with the goal of making it cheaper and easier to launch satellites while reducing dependency on traditional rockets. In 2017, the company completed its first prototype centrifuge and began using it to test satellite parts, spinning them to extraordinary speeds to see if they could withstand the g-forces.

It went well, and the firm was starting to build the suborbital accelerator at Spaceport America when the covid-19 pandemic hit. Most of the construction and engineering crew moved into storage containers at the site, retrofitting them into living spaces and creating a small, isolated community in the desert where they holed up for two years.

On sunny days, people worked on the centrifuge, which was mostly made from off-the-shelf industrial equipment, some bought second-hand, rather than costly aerospace parts. On rainy days, they found other ways to keep busy – renovating the homemade village, exercising to stay fit for the gruelling work in extreme heat or tending their five chickens and two dogs. Every night there was music and a campfire. After more than two years, the hulking launch facility was ready.

The first test flight was conducted on 22 October 2021 and demonstrated a step towards a new idea: chucking things into space. This type of space flight would use mostly electricity rather than rocket fuel and could cost less than $500,000 per launch instead of upwards of $50 million. "The most complex, expensive and polluting part of space launch is the rocket," says Mark Sipperley at SpinLaunch.

SPINLAUNCH

The SpinLaunch centrifuge at Spaceport America in New Mexico

Inside the SpinLaunch centrifuge, the payload is enclosed within a carbon-fibre capsule, which is in turn attached to the end of a carbon-fibre tether. Almost all the air inside is pumped out to avoid aerodynamic friction and unnecessary heating. At the other end of the tether is a counterweight that keeps the whole system balanced while the tether whirls around, bringing the capsule up to speeds of thousands of kilometres per hour.

Then, all of a sudden, the tether releases the projectile and the counterweight. The projectile pierces the plastic sheet that is maintaining the centrifuge's near-vacuum and flies out of a chute pointed upwards. The counterweight is released into a canister of dirt, where it is vaporised nearly instantly.

When I visited SpinLaunch, I asked – only half joking – if I could get into the capsule and be flung to space. They said no. This system is for satellites only, because the g-forces from being spun around that fast would be fatal. Instead, I watched from a distance as the centrifuge flung its 3-metre-long projectile into the air at more than 1600 kilometres per hour. The process was eerily quiet – none of the usual rumbling of a traditional rocket launch – and after a few seconds, the projectile vanished into the sky. It flew more than 8000 metres up before crashing back down to the ground.

This system is only one-third of the size of SpinLaunch's planned orbital accelerator, which the firm aims to begin building later this year and finish in 2025. If all goes well, the orbital system will use 10-metre projectiles to send payloads of up to 200 kilograms into low Earth orbit – that is about eight cubesats or one satellite about the size of a washing machine.

1600

Speed in kilometres per hour that SpinLaunch's projectile travelled

And that is only the beginning. "Ideally, rather than building one orbital system, we would build them in farms... so we could pass power between the systems," says Sipperley. "Through regenerative braking we can capture back more than 80 per cent of the power of a launch [and feed it to a neighbouring system]."

SpinLaunch has contracts with NASA and the Pentagon, and the hope is to eventually perform five to 10 launches a day using the orbital system, all powered by renewable energy.

"The market expands when launch becomes cheaper – people that never thought they could send something to space will now be able to do it," says Christine Lawson at SpinLaunch. After seeing the suborbital accelerator in action, I believe it. It may not be able to throw me into space, but this little start-up might just revolutionise satellite launches. ▮

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