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Focus on Founders: Nobu Okada takes on the threat of space junk with Astroscale

As a child growing up in Japan, Nobu Okada (TOK 00-04) harbored dreams of becoming an astronaut. In high school, he was serious enough about it to attend NASA's space camp. While there, he met Mamori Mohri, a Japanese astronaut and a national hero in that country. Mohri gave Nobu a hand-written message, part of which read, "Space is a place where your generation shines."

Nearly 30 years later, Nobu is still taking this message to heart. While he didn't become an astronaut, he is tackling the complex threat of space debris with his Singapore- and Tokyo-based company Astroscale, which has developed a practical solution to capture orbiting objects.

The space-debris issue

According to the European Space Agency's Space Debris Office, a cherry-sized piece of debris traveling at normal orbital speed – 7 kilometers a second – has the collision force of a grenade exploding.

Given that there are half a million pieces of debris in space of at least that size – and, of course, many thousands that are much larger (and smaller: there are an estimated 100 million particles of 1 centimeter or smaller) – the odds are pretty good that, sooner or later, things are going to collide.

It's already been occurring: in one instance in 2009, a U.S. communications satellite ran into a defunct Russian satellite, exploding on impact – creating yet more debris. And last year, astronauts on board the International Space Station were forced to evacuate to an escape capsule when a piece of debris was observed hurtling toward its safety zone at nearly 30,000 mph.

The worst-case scenario is known as the Kessler Syndrome, named for NASA scientist Donald Kessler, who in 1978 warned of a domino effect of ever-increasing collisions between debris and satellites, which in turn would create more debris and more collisions – finally reaching a tipping point where no satellites could survive. (If you've seen the 2013 movie "Gravity," you've witnessed a dramatic representation of the Kessler Syndrome.) That same year, Kessler told *The Guardian* that we're already at the tipping point: "The cascade is happening right now – the [2009] collision was the start of the process," he said. "It has already begun." However, he added, we have time to correct the problem – provided that we start actively removing debris.

Mid-life crisis = space debris removal startup

Nobu took a variety of paths before founding Astroscale. He followed a degree in agricultural science from the University of Tokyo with a stint in Japan's Ministry of Finance, and then

received his MBA from Purdue University. He worked in McKinsey's Tokyo Office for several years, and then joined a software company as CFO, helping lead it to a successful IPO. He then set up an IT company, later selling the technology and patent rights.

But as he neared his 40s, Nobu began soul-searching. "I was having a mid-life crisis," he says. He reflected that many of the people he admired had followed a similar pattern: "absorb knowledge and develop skills in their 20s, clarify their mission in the 30s, and start implementing their mission in their 40s," he says. It was time for him to follow his passion, and become a "space entrepreneur."

Tackling the issue

Nobu became aware that of the growing threat of space when attending space conferences. He was told, he says, that there was "no proven technology, no viable business model and no enforceable regulation." He saw his opportunity. "Since there was a consensus among the space community that space debris is an issue that needs to be tackled, I realized I could be the first one to provide the solution, and take the lead in shaping the market," he says. "I found the blue ocean."

He is blunt about what the dangers of inaction are. "Under Kessler conditions, the runaway cascade of collisions continues until all satellites in an orbit have been destroyed," he says. "That would dramatically impact our way of life back on Earth – no mobile phones, no GPS, no accurate weather forecasting, no satellite broadcasting."

Raising capital

Nobu's approach to funding his planned venture was a creative one: he first won a contract to design a time capsule, containing messages from one million children, to be sent to the moon. "Having a solid and confirmed project enabled me to develop good relationships and increase credibility," he says.

It worked: by February of last year, Nobu had raised nearly $8 million in Series A funding, allowing him to build a manufacturing facility in Tokyo. He also hired a team of 20 engineers, researchers, and physicists – "Space Sweepers," as he calls them – who are based in Singapore (the company's headquarters) and Tokyo.

By March this year, Astroscale secured $35 million in Series B funding, which enables him to accelerate the development of debris removal satellites and purchase rockets for technology demonstrations.

"There is a huge gap between a good idea and marketable product," Nobu says. "I came up with a hypothesis on how to remove space debris after extensive discussions with industry and academic experts, but it was just the beginning. Our engineering team has been working zealously to convert this hypothesis into reality."

Addressing the challenge – going from an "extraordinary outsider" to a "unique insider"

Knowing the problem and having a solution is one thing: threading your way through the complicated tangle of governmental regulations, politics, legal issues, logistics, funding, and new technologies to implement it is another.

“We are tackling a very complex mission, and coordinating all our efforts is the biggest challenge that we face,” Nobu explains. “As a private entity, our company philosophy is focused on discovering and meeting the business needs of our customers through creative thinking.”

He says that Astroscale’s biggest asset is its “disruptive idea,” and that its competitive advantage is the ability to secure the necessary resources, including talent and technology, and to deploy the solution. “We started as an ‘extraordinary outsider’ in the space industry and have been working to gain credibility to be seen as a ‘unique insider,’ by engaging with key influential players and by respecting the regulatory framework,” Nobu says.

How it works

There are three basic technology approaches to capturing space debris: “pull” (ranging from catching debris in nets to harpooning it to remove it from orbit); “push” (using tentacles and robotic arms); and “contact-less” (using plasma beams to slow objects down and smash them into a cloud of particles).

The technology that Nobu has developed is an adhesive-based push approach, which concentrates on light debris in higher orbits and heavier debris in lower orbits. The adhesive approach is cheaper, lighter, and simpler than others, he says, and can be used on a variety of shapes and materials.

The lower cost of the adhesive push technology – Nobu estimates it to be a tenth of the cost of other technologies – is a key element in persuading international organizations to mandate stricter removal regulations.

Partnering with a Japanese chemical company to develop the concept, Nobu plans to launch the first removal demonstration mission in 2018. This is part of his “7-Year Marathon” plan to become the first private company to fund and test a debris-removal technology. Securing a client to partner on a customized space mission allowed Astroscale to become profitable from its first year of business.

Educating the public

Another aspect of Nobu’s work with Astroscale has been to raise public awareness of the problem unfolding many miles above our heads. He feels he’s made some progress. “Initially, I thought that only academics and professionals would be interested,” he says. “However, I soon discovered that even primary schools wanted us to come speak to students about space debris, and we see a growing number of attendees. I believe more and more people feel space sustainability is essential for their lives.”

Inspired by the grass-roots campaign to address climate change that followed the documentary “An Inconvenient Truth,” Nobu has also spoken at conferences and symposiums around the world. (Click here to view his TEDx talk in Tokyo.

[https://www.youtube.com/watch?v=Ngnu8RM6NYI])

Leading a startup: challenges and inspiration

Nobu is honest about the challenges of managing a startup. “I still don’t see myself as a good leader,” he says wryly. But, he says, setting out to solve the space debris problem demanded that he step up. “I had no choice but to become the founder and CEO of Astroscale,” he continues. “When I developed the passion for space sustainability, I looked for a company to join that was working on the issue. I couldn’t find one, so decided to start the company on my own. But I still struggle to be a good leader.”

Daily inspiration comes from his team, though, he says: “Our team is determined to deliver practical solutions to solve the issue of space debris. Watching them working hard every day keeps me motivated.”

And he’s learned, he adds, to always be honest. “Don’t promise your team an easy and smooth ride, because working on a new venture is not easy. Instead, focus on inspiring the team by providing them with a game-changing experience to make a positive difference to the world.”

The McKinsey Alumni network – a supportive community

Nobu explains that he has leveraged the alumni network to assist him in building Astroscale. “I fully harness the extensive reach the McKinsey alumni network offers to engage with potential investors, partners and media,” he says. And he welcomes alumni involvement in helping him keep space sustainable. “We cannot solve this difficult issue by ourselves,” he says. “We need more partners, resources and interests. If any alumni would like to know more about the space debris issue and how Astroscale is working on the challenge, we welcome any opportunity to exchange ideas. We continually seek new and better ways to find novel solutions that are more effective, efficient and sustainable.”

Nobu says the journey so far has been rewarding. “I started the company alone,” he says. “My first day at work, I felt extremely lonely and the office was very quiet. Fast-forward 3 years, and I am surrounded by more than 25 talented individuals and the office is vibrant. Our company also enjoys strong external support to work on the mission together as Space Sweepers. We have faith in a simple dream – to make space sustainable.”

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Click here [https://hbr.org/product/Astroscale--Space-Debris-/an/716037-PDF-ENG] to read a Harvard Business Review case study about Nobu’s work: “Astroscale, Space Debris, and Earth's Orbital Commons.” (purchase required)