Chris Blackerby, Chief Operating Officer, Astroscale

Satellite Evolution Global

Q&A

Astroscale stays on course for pioneering space sustainability

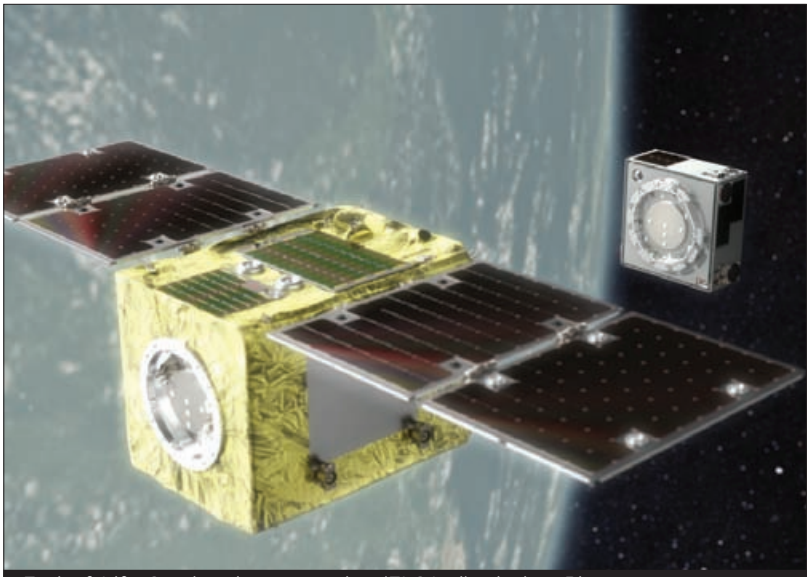
Astroscale is a leading developer of several space sustainability technologies, including the ELSA-d experiment, which illustrated the successful location and de-orbit of a derelict object in Earth's orbit. With expansion in mind, the company has recently obtained several grants from Japan and ESA and is now positioned to be a market leader in the deorbiting economy. Chris Blackerby, Chief Operating Officer, explains the company's progress.

Laurence Russell, Assistant Editor, Satellite Evolution Group

Question: In March you announced that you were selected by ESA to receive an ·800,000 contract to boost collision avoidance on congested orbital highways through the ESA Collision Risk Estimation and Automated Mitigation (CREAM) program. What was it about Astroscale's service offering that made you the clear choice?

Chris Blackerby: Collision avoidance is part of routine satellite operations where a satellite needs to manoeuvre to avoid other satellites or pieces of debris. The risk of collision is continuously monitored and when the risk is above a certain level, mitigation actions are put in place. This is a very resource-intensive process that demands expertise from spacecraft operators and other engineers.

The risk of collisions in space is increasing. Euroconsult recently announced that more than 17,000 satellites are planned to be launched in the next decade. This is leading to many conjunction alerts, currently estimated at one actionable alert and avoidance manoeuvre per satellite, per year on average. With so many large constellations expected to launch, the resources and associated costs will continue to rise exponentially.



End-of-Life-Service demonstration (ELSA-d) mission. Photo courtesy Astroscale

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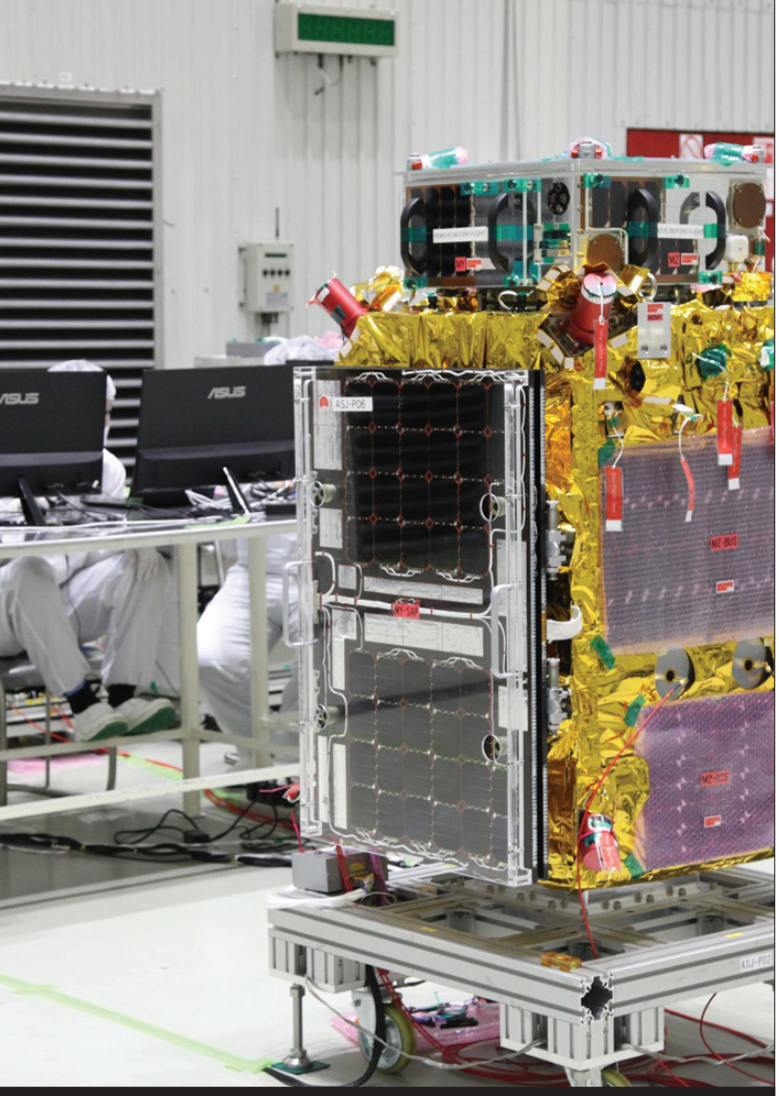


ELSA-d pre launch test. Photo courtesy Astroscale

The CREAM program will explore innovative ways to develop and test concepts for late commanding paths which will allow for late decisions in collision avoidance by looking at different classes of satellite collision avoidance operations, including constellations. Astroscale formed a strong partnership with the UK, Romania, and GMV Portugal to garner their expertise with on ground and onboard collision avoidance processes and information sharing systems. OneWeb is sharing its expertise and insights on the specific methods and challenges in managing collision avoidance for large satellite constellations.

It is expected that Astroscale services will be operating in very busy orbital regimes where efficient collision avoidance strategies will be of importance. We expect that our missions will be prime candidates to test future CREAM algorithms and software.

Question: For those unaware, would you care to detail the emerging conversations around space debris and orbital sustainability?

Chris Blackerby: We are at a critical juncture in our development and utilization of space. Society's use of data and information from satellites is expanding at an ever-increasing rate, and this is driving more companies to launch more satellites to provide that data. These orbital highways are already crowded with objects, 95 percent of which are debris ranging from specks of paint to several ton upper stage rocket bodies.

Over the past few years, the space community and society at large has become aware of the urgency of the issue, and we are seeing a shift toward action, from both government and industry. Governments are funding missions to remove debris, satellite operators are taking more responsible actions in support of orbital sustainability, and a growing number of companies are getting into the satellite servicing business.

This call to action was most significantly seen during the G7 Summit in 2021, when member nations pledged to take action to tackle the hazard of space debris and released a statement that welcomes all efforts, public and commercial, in debris removal and on-orbit servicing activities.

Question: With satellite coverage set to exponentially increase as space law and de-orbiting commitments remain in their infancy, what will it take to assure sustainable orbits in the 21st century?

Chris Blackerby: There are two key steps that need to be taken to keep space sustainable. First, satellite operators, especially operators that are building out large satellite constellations in low Earth orbit, should prepare satellites to be serviced prior to launch. Astroscale's proposal is to pre-mount a docking plate on all satellites so that if there is a failure in orbit, we can approach, rendezvous, and remove the defunct satellite. Preparation of satellites with a common interface allows us to produce servicing satellites at volume – safely and economically.

Second, those groups that have primarily contributed to the debris in orbit since the start of the space age, should pay for the removal of large objects. Since government missions created most of the existing debris in orbit, they should fund missions to remove critically large pieces such as upper stage rockets and defunct satellites. ESA, JAXA, and the UK Space Agency all have missions in various stages of development that are focused on the removal of orbital debris. Astroscale is currently working with JAXA and the UK Space Agency on their projects and we would like to see more of these missions worldwide.

Like roadside car services on highways terrestrially, servicing of satellites in space will keep our orbital highways safe, reduce the risk to commercial and government satellite operators, and stimulate the entire economy – both in orbit and on Earth.

Question: In April, your contract with the Japanese Ministry of Economy, Trade, and Industry (METI) to research and develop extra-vehicular general-purpose robotic arm and hand technologies was renewed for another year, exemplifying the country's interest in creating disruptive progress in the space market. Do you believe the Western world underestimates the potential for space technology development in Asia?

Chris Blackerby: Japan has a strong history in civil space with its first successful satellite launch in 1970. Over the following decades, Japanese contributions to space grew rapidly, to the point where Japan was a partner in building the ISS and now has one of the most robust space budgets in the world, supporting a wide array of missions.

Japan has also been at the forefront of the growing

commercial development of space. When Nobu Okada founded Astroscale in 2013, there were only a handful of space startups in Japan. However, during the past decade, this number has swelled to more than 40 companies covering services from ground-based communications to lunar exploration, and everything in between.

This growth has been spurred by Japan's goal to double the size of its current $11 billion commercial space industry by the early 2030s. The Japanese government, JAXA, and private investors have cultivated a thriving startup scene, and that investment is paying off in groundbreaking technologies and the creation of new markets.

Question: Following the success of ELSA-D, your ELSA-M multi-client servicer is preparing for an in-orbit demonstration in 2024. Could you outline that experiment?

Chris Blackerby: ELSA-M, the commercial follow-on to our End-of-Life-Service by Astroscale-demonstration (ELSA-d) mission, represents our first full service offering to remove multiple (M) pieces of debris in a single low-Earth orbit mission. The mission will mature Astroscale's integrated end-to-end satellite servicing solution, taking an important step toward the sustainable development of space. Comprising both space and ground segment products, the In-Orbit Demonstration (IOD) will provide the proof of concept of Astroscale's commercial debris removal capability. The mission is planned in partnership with OneWeb, a large constellation operator with nearly 400 satellites in orbit, with whom Astroscale has been working for four years.

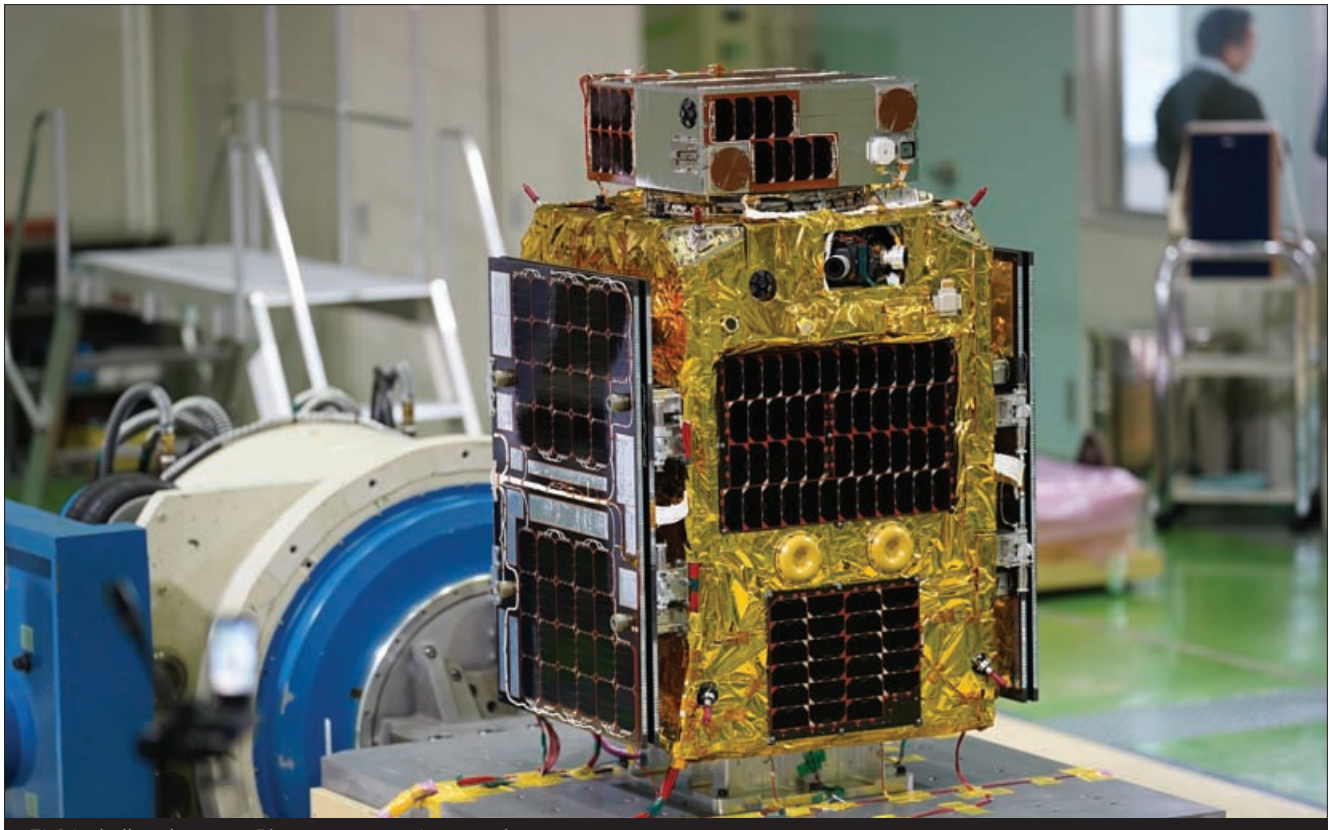
The IOD, which is expected to launch in the 2024 timeframe, will demonstrate the ELSA-M servicer docking with a client asset in space. It will include demonstrations of repeated docking and un-docking to further mature our capability after the ELSA-d demonstration mission. The ELSA-M servicer is being developed to service a range of future constellation customers.

Question: What will Astroscale's service model look like in ten- or twenty-years' time, when we can expect the orbital servicing market to have matured beyond its experimental stages?

Chris Blackerby: In ten years, we would like to see on-orbit servicing activities become routine work in space, much like waste management on the ground. We want it to be so routine that we eventually don't make headlines for simply taking out the trash. To achieve this, satellite operators have to future-proof their satellites and their operations before launch so that when they fail or malfunction, we can go up and service or remove them.

Governments will need to regularly budget to remove their large pieces of debris and set regulatory expectations for responsible practices in the commercial sector. When these become the norm, our vision of securing safe and sustainable orbits for generations to come will become a reality.

Overall, we expect that Astroscale will become a critical service provider for safely removing defunct objects from space and pioneering new ways to service, upgrade, and transport spacecraft to maintain and grow the viability of Earth's orbits.



ELSA-d vibration test. Photo courtesy Astroscale