

Image ©Surrey Space Centre

# The big spring cleaning in space

**They are used in communications, weather forecasting, or research: Satellites improve our quality of life. However, there will soon be too many of them, and disposal is difficult. In the future they might simply sail away.**

Space is getting crowded. An ever increasing number of satellites are in near-Earth orbits, accompanied by thousands of fragments of their older predecessors, as well as that of rockets. The risk of collision, and damage going into the millions, is rapidly increasing. At a conference about space debris, the European Space Agency (ESA) set itself the goal of clearing the skies and to support research on the deorbiting of satellites.

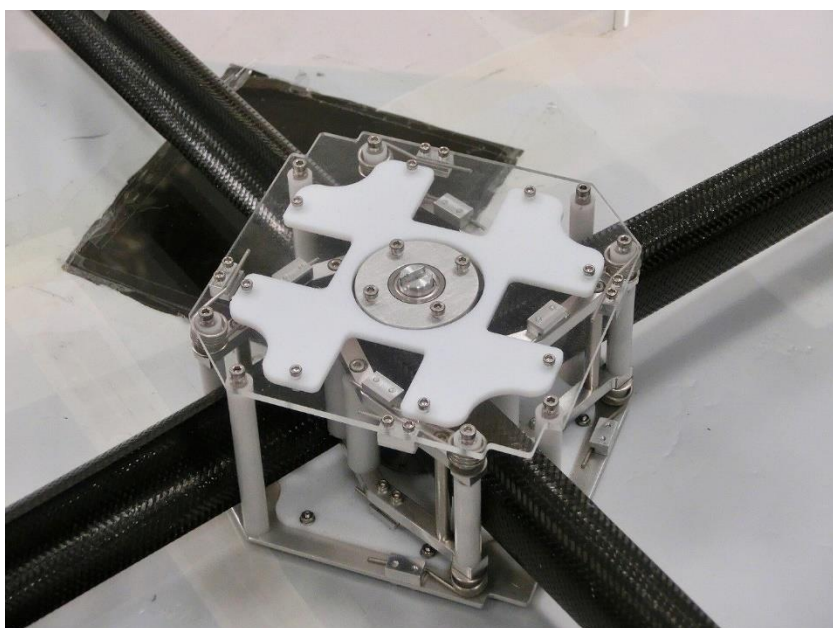
A possible solution was conceived at the Surrey Space Centre (SCC) at the University of Surrey, England. The idea is simple: Future satellites will be equipped with large sails. Within 25 years after the end of a satellite's mission, the sail will pull it down to burn up in the Earth's atmosphere. The sail utilizes the resistance of the residual atmosphere, which exists in altitudes of up to 600 kilometers.

### Carbon outriggers stabilize the sail

The sail developed in Surrey is called Inflatesail. It measures five by five meters and consists of a high-performance plastic foil. The sail module is smaller than a shoebox and weighs only two kilograms. However, the technology has to be not only lightweight, but also robust – and inexpensive. After all, it is not a part of the satellite's main mission objective. The Inflatesail won't be used before the satellite's service life has expired, i.e. after ten to twenty years. Then the following happens: First a small, inflatable mast folds out. Then the sail is extended by means of four carbon outriggers that provide stability. Once it has expanded, the sail slowly drags the satellite closer and closer to Earth, until it crashes and burns up in the atmosphere. Engineers believe this technology to be capable of bringing objects with a weight of up to 700 kilograms down from the skies.

### Long years of experience in space

The sail is unfolded by a brushless EC-max motor by maxon. The motor is combined with a GP 16 planetary gearhead, equipped with ceramic components for a long life span and to protect against corrosion. The drive has a diameter of 16 millimeters. It is built according to extremely high standards and works even in space. maxon motor is using its long years of experience in the aerospace industry, for example in the Mars missions or the SpaceX program.



A prototype of a deployer for the sail support booms. The motor sits in a shaft underneath the deployer. Image ©Surrey Space Centre

Andrew Viquerat, Research Fellow at SCC: “We have been working with maxon motor for years and will continue to do so – because of the reliability of their products if nothing else. The folks at maxon have always shown interest and been really helpful, even when our wishes were slightly unusual.”

### First test next year

Very soon it will be seen whether the Inflatesail stands up to practical testing. Next year, it will be fired into space as a part of the QB50 nanosatellite project. There it will first serve to propel the satellite, using the solar winds. After one year, a maneuver will be initiated that is intended to result in a safe crash and burn-up in the atmosphere. The mission's success could soon lead to a commercial application of the development and help to keep the skies above us clean.

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## maxon products in this article



**maxon EC-max 16 motor**  
With the EC-max 16, maxon motor offers a high-quality brushless drive at an excellent value. The motor comes with a robust steel housing and, like the majority of brushless motors in the maxon portfolio, a rotating permanent magnet made of neodymium.



**maxon GP 16 gearhead**  
maxon's compact planetary GP 16 gearhead is especially suitable for transmitting high torque. With its ceramic components, this gearhead offers an especially long service life.

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