



## Analysis Space weapons

### Saying no to space wars A proposed ban on testing anti-satellite weapons would be a small step towards solving space junk, says Jonathan O'Callaghan

TODAY there are an estimated 27,000 pieces of trackable space junk in Earth's orbit, which includes anything larger than a tennis ball. The largest group contains pieces of exploded rockets left to drift around our planet. In close second are more than 3000 pieces of debris left over from anti-satellite tests. Now, a group of experts is calling for a ban on such tests, to stop the problem before it has disastrous consequences.

The use of weapons in space has been ever-present, and often shrouded in secrecy, in our short history of space flight. Anti-satellite tests have been more brazenly conducted, however. Both the US and Soviet Union used missiles on several occasions to practise destroying their own satellites in the 20th century, in anticipation of a conflict in space. Hundreds of pieces of dangerous debris remain from these tests, but they are eclipsed by China's infamous destruction of its Fengyun weather satellite in 2007. There are still 2865 pieces of debris from that event orbiting Earth.

"It remains... the single biggest contributor to orbital debris," says

#### An artist's impression of space junk in orbit above Earth

Jonathan McDowell at the Harvard-Smithsonian Center for Astrophysics in Massachusetts.

In a letter to the UN, experts from the Outer Space Institute – including former heads of state, astronauts and industry experts – are calling for a ban on such tests.

They say anti-satellite tests pose a greater danger than ever given the significant orbital debris risks due to the rising number of satellites in orbit, particularly from mega constellations such as SpaceX's Starlink and the UK's OneWeb.

**27,000**  
Estimated pieces of trackable space junk in Earth orbit

"The mega constellations, with tens of thousands of satellites going into orbit, change the risk profile dramatically," says Michael Byers at the University of British Columbia in Canada, the letter's lead signatory. "[Banning anti-satellite tests] is no longer something that can be postponed."

A collision with even a small piece of space junk is enough to destroy a satellite, creating more debris. In turn, this could lead to rapidly rising levels of debris as more subsequent collisions take

place, a cascade known as the Kessler syndrome. In a worst-case scenario, parts of Earth's orbit could be rendered unusable because of space debris. This could affect everything from Earth-imaging satellites involved in global food production to climate satellites that enable rapid responses to major disasters.

The letter comes as the US military is rumoured to be on the cusp of announcing a new space weapon, with speculation ranging from a kinetic anti-satellite vehicle to an electronic interference system. "If we get into a live-fire, open-conflict situation, we're going to accelerate the debris population very, very quickly," says Daniel Porras at US think tank Secure World Foundation, who is a member of the UN Institute for Disarmament Research.

Efforts to halt anti-satellite tests could take years. "The US has always shut down these considerations," says Victoria Samson, also at the Secure World Foundation.

Attempts to conduct anti-satellite tests responsibly have had mixed results. In 2019, India destroyed a satellite at lower altitude than previous tests, hoping the debris would re-enter the atmosphere within 45 days, but dozens of pieces remained after. "There's one piece still in orbit," says McDowell.

Neither China, the US nor Russia have conducted such a test in the past decade, but the danger remains. With the number of satellites in orbit set to increase 10 or even 100 times in the coming years, we must champion a sustainable use of space. Banning anti-satellite tests is the least we could do, says McDowell.

"It's a no-brainer," he says. "Deliberately creating space debris is just egregious." ■

## Human biology

### Diets rich in plants lead to excess emissions in men

Alice Klein

**PLANT-BASED** diets cause men to fart more and have larger stools, but that seems to be a good thing, because it means these foods are promoting healthy gut bacteria.

Anecdotally, it is well-known that eating more plants – including fruit, vegetables, grains and legumes – creates bulkier stools and increases flatulence. Claudia Barber at the Liver and Digestive Diseases Networking Biomedical Research Centre in Barcelona, Spain, and her colleagues compared the effects of a Mediterranean-style diet mostly comprised of plants with a Western-style diet containing fewer fruit and vegetables on the guts of 18 healthy men aged between 18 and 38. Each participant was randomly assigned to follow one of the diets for two weeks, then after a break, they switched to the other diet for two weeks.

The men did a similar number of poos per day on the two diets, but each one was about double the size on the plant diet. The men produced about 200 grams per day on the plant diet, compared with 100 grams on the Western diet. They also farted more frequently and produced more gas on the plant diet (*Nutrients*, doi.org/gt89).

Both increases are down to certain types of gut bacteria that feed by fermenting plant fibre, says Rosemary Stanton at the University of New South Wales in Australia. The added stool weight is made up of the spent bodies of these extra bacteria plus water and some undigested plant fibre, she says.

These fibre-fermenting bacteria are known as "good" bacteria because they release short-chain fatty acids. These chemicals keep the large intestine healthy and protect against bowel cancer. Short-chain fatty acids can also be absorbed into the bloodstream where they protect against heart disease and diabetes. ■



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