

# Managing space debris through space law

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Credit: NASA

It's becoming increasingly crowded in the orbits around Earth that are popular for space travel. And that's not just due to satellites—there's also more waste material, which is compromising safety. Ph.D. candidate Zhuang Tian is conducting research into the legal aspects of discarded space equipment. Whoever leaves debris behind should take responsibility and clean it up.

In the near future, probes with robotic arms will be hovering in orbit. The arms will have four metal tentacles spread out like a spider's legs, ready to catch a discarded satellite where the probes maneuver minutely. It's one of the techniques the company ClearSpace is currently simulating—only on Earth for the time being.

## Active debris removal

With his specialization in [space law](#), legal expert Zhuang Tian is following these developments closely. He will shortly be defending his Ph.D. thesis on the legal aspects of [space debris](#) disposal. The specific focus of his research is how companies like ClearSpace and the Japanese company Astroscale are planning on actively removing debris, because there is another option: space equipment that removes itself after use by burning into the atmosphere. But as Tian explains, current satellites can't yet do that, hence the need for a collection service provided by private companies.

"Space agencies such as ESA could encourage the development of active debris removal (ADR) missions and their exploitation," he says.

## Antisocial campers

As Tian explains following his Ph.D. research, space law is lagging behind, and so it's essential that clear rules and [international agreements](#) are put in place. He compares the behavior of countries that are the registered owners of discarded satellites with that of antisocial campers.

"You can compare it to a campsite littered with cans and plastic bottles. Of course, you could solve the problem technically by constantly removing the waste. But what works better is putting rules in place that inform campers about responsible behavior. I started investigating how space law encourages the countries and space agencies in question to clean up their space debris. Because even now, it's not clear to the states concerned that they're obliged to do this."

## An international mechanism

Tian has encountered legal hurdles along the way. From a legal perspective, it appears to be risky for a state to clean up another state's scrap. Space equipment is the property of the state of registration, even if it has since been discarded. Those who start the cleanup process run the risk of a country, company or government organization holding the cleaner liable for damage to property.

"So currently, cleanup missions only focus on waste that is owned—or is at least allowed to be owned—by the cleaner," explains Tian. "There needs to be an international mechanism that makes it easier for countries and space agencies to request and grant permission."

## **A double-edged sword**

Tian explains that another factor at play is that removal technology—such as the ClearSpace tentacles—have a dual-use nature. Every part of a spacecraft could potentially be used as a weapon in space, even if that was never the intention when it was designed. A peaceful clean-up process could cause misunderstandings.

Tian adds, "If you're able to grab space debris, you're also able to grab another vehicle or deliberately collide with it. If a country removes a discarded object that belongs to another state, that state might perceive it as a hostile act—even if the intentions were good."

## **Transparency surrounding missions**

Tian examined the rules, guidelines and laws for responsible behavior that would prevent space debris removal from being perceived as a threat. He says, "Addressing concerns is more effective than setting technical requirements dictating that objects may not be used for war purposes. After all, in space you could use any piece of equipment for

military purposes. That's why I also recommend transparency surrounding [space missions](#)."

## **An international hotline**

He is pinning his hopes on soft law—instruments that are not legally binding and yet serve as guidelines for behavior and practices in space. While they are voluntary, they can make up for the gaps in the prescriptive articles found in space treaties. He advocates international guidelines for active space debris removal. He also says that countries could increase their commitment to multilateral and unilateral agreements. This would put pressure on commitments made by states to do something about the debris. The United Nations could make a more active effort to agree on rules for clarity and safety in the event of dual use.

It's also important that countries coordinate with each other on this—perhaps by setting up an international hotline that countries can use to register spacecraft in the event of imminent collisions.

## **Future generations**

Tian wants to expand the law governing space debris removal, and in the future hopes to get a ticket for a trip into space if it's affordable. By then, the chance of collisions with space debris should have decreased.

"I'm positive about that—there's a strong common awareness about sustainable use of space in the future. That will also benefit [future generations](#), as [space travel](#) is becoming increasingly important in our daily lives."

Provided by Leiden University

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