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Establishing Liability For Falling Space Debris

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Commentary

Establishing Liability For Falling Space Debris

By
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Have you noticed the uptick in reports of human-made objects falling to Earth from space lately? For example:

- In May 2025, Soviet space probe Kosmos 482 fell back to Earth in the Indian Ocean 53 years after commencing its mission for Venus.¹
- In February 2025, a SpaceX Falcon 9 rocket experienced an uncontrolled re-entry over England and parts of Scandinavia before ultimately crashing in Poland.²
- In December 2024, a 500-kilogram (1,102-pound) metallic ring measuring approximately 2.5 metres (8.2 feet) in diameter landed in Kenya.³
- In March 2024, a battery that NASA released from the International Space Station crashed through the roof of a home in Naples, Florida.⁴

Falling space objects is not a new phenomenon—the dinosaurs and a cow named Ruhina⁵ could attest to that. Indeed, the *New York Times* reported that by 1979 there had already been 6,811 known instances of whole or fragmented pieces of human-made space objects falling back to earth.⁶ That number has undoubtably significantly increased. According to NASA, an average of one catalogued piece of debris has fallen back to Earth each day during the past 50 years.⁷ In its Annual Space Environment Report, the European Space Agency reported that in 2024, 1,200 intact objects and millions of debris fragments had re-entered Earth's atmosphere.⁸

More broadly, the European Space Agency estimates that there are currently 141 million pieces of space debris in orbit around the Earth, including 54,000 objects larger than 10 centimeters (3.9 inches).⁹ The larger a piece of debris is, the more likely it is to reach the Earth's surface rather than burning up in the atmosphere after re-entry. Moreover, a 10-centimetre piece of debris impacting a satellite would likely catastrophically damage that satellite, causing its fragmentation and the creation of further debris.

In the longer term, scientists have expressed concern about a phenomenon called the Kessler Syndrome,¹⁰ a situation in which the primary source of new space debris is no longer new material launched into space, but rather collisions between existing space debris, resulting in a chain-reaction of ongoing collisions and ultimately a “debris belt” around the Earth. In turn, this debris belt would substantially increase the risk

of further collisions, both between pieces of existing debris and between debris and active satellites and rockets, those collisions adding yet more debris to the “belt”—including debris large enough to survive re-entry and reach the Earth’s surface.

In short, the problem of space debris impacting the Earth is not only not going away, but it will worsen in the coming years.

International Space Law And Space Debris

The foundational document for all international law relating to space is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.¹¹ Commonly known as the Outer Space Treaty, it entered into force on October 10, 1967, and is currently binding on 116 countries. However, the Outer Space Treaty says very little about space debris, stating in Article IX only that “State Parties to the Treaty shall pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose.”¹²

There is, however, a second important treaty, which more directly engages with the issue of space debris. Under the Convention on International Liability for Damage Caused by Space Objects, commonly known as the Liability Convention,¹³ which entered into force on September 1, 1972, and is currently binding on 98 countries, strict liability is applied to damage caused by space debris impacting the Earth or aircraft. That is, there is no need to prove negligence or any other form of fault. As soon as damage occurs, the affected country has the right to claim compensation from either the country that launched or arranged the launching of the object that impacted the Earth, or from the country from whose territory or facility it was launched.

One important point about both the Outer Space Treaty and the Liability Convention is that international space treaties do not apply everywhere and to everyone. In order for a country to have any rights or obligations under the Treaty or the Convention, it must have agreed to be bound by that agreement.

And as just noted, while 116 countries have agreed to be bound by the Outer Space Treaty, only 98 have agreed to be bound by the Liability Convention. The consequence of this is that if damage is caused by space debris from a satellite launched by a country that hasn’t agreed to be bound by the Treaty or the Convention, then neither is applicable. If the country in question has agreed to be bound by the Treaty but not the Convention, then only the Treaty is applicable. And vice versa.

To be clear, that doesn’t mean that no rules at all exist for countries unless they have agreed to be bound by a relevant treaty, but those rules will have to come from international customary law, something that is much vaguer and much harder to establish than the contents of a treaty. While there have been arguments made that principles of customary international law have developed with respect to at least some space debris, that position is far from universally agreed.

Private Actors And The International Law On Space Debris

The focus so far has been entirely on countries, not on private actors. At the time when the Outer Space Treaty and Liability Convention were adopted governments were the main entities launching objects into space. Today, private actors increasingly dominate the field. Nonetheless, under international law, those private actors are fundamentally just stand-ins for countries.

Under Article VI of the Outer Space Treaty, for example, each country is responsible for “national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.”¹⁴ For example, if a Polish factory is hit by debris from a satellite launched from the U.S. by a U.S. company, international law treats that as damage to Poland caused by the U.S., with any compensation owed to Poland, not to the factory owner. Poland might (or might not) decide to give the compensation to the factory owner once it is paid, but that is an issue of Polish law and politics. From the perspective of international law, the Polish government has no obligation to do so.

But Article VI refers to “national activities in outer space.”¹⁵ What is a “national activity”? Unfortunately, the Outer Space Treaty doesn’t define “national activity”, and to put it bluntly, no one knows for sure what it means. However, the most widely accepted interpretation is that it refers to the jurisdiction of a country. In essence, if a country has the legal right to regulate regarding a space-related activity, then that activity constitutes a “national activity” of that country under the Outer Space Treaty.

Clearly, a traditional NASA-managed launch of a U.S. government-owned satellite will be a “national activity” of the U.S. And so will the launch of a private satellite in cooperation with NASA. Moreover, a government-authorized launch of a private satellite from U.S. soil, but without any active governmental involvement, will also be a “national activity” under the Treaty, given the official authorisation. More notably, even an unauthorised launch by a private party from a Texas farm will be a “national activity,” creating international liability for the U.S., as the U.S. government has the legal right to regulate launches taking place on its soil (whether it chooses to do so or not).

But what about the launch of a private satellite owned by a U.S. company but launched in a foreign country with the cooperation and approval of that foreign country and no involvement of the U.S. government? Well, that is certainly a “national activity” of the foreign country, but there is a strong argument that it is also a “national activity” of the U.S. because the U.S. company is under U.S. jurisdiction.

In short, the international legal framework relating to space debris may explicitly address only countries, not private actors, but that doesn’t mean that private actors are excluded. Even if undertaken illegally, the actions of a private actor will create an international legal obligation for at least one country and liability for that country if those actions result in space debris impacting the Earth.

Private Claims For Impacts Of Space Debris On Earth

However, there is also a flipside to the place of private actors in space debris disputes, as it might be a private individual or company that suffers damage when space debris reaches Earth. As already discussed, under international law, that damage is treated as

damage suffered by the injured actor’s country, and any attempt to secure compensation has to be pursued by that actor’s government, not the by actor themself.

However, there is an important limitation on this description: Article VII of the Outer Space Treaty limits the liability of a country that launches or procures the launch of an object into space to “another State Party to the Treaty or to its natural or juridical persons”;¹⁶ similarly, Article VII of the Liability Convention expressly states that the Convention does not apply to “damage caused by a space object of a launching State to ... nationals of that launching State.”¹⁷

That is, if the U.S. launches a satellite that crashes in France, then under international law, the U.S. is strictly liable to France for any damage caused. But if that satellite crashes in the U.S., then international law imposes no liability on the U.S. In effect, from the perspective of international law, the U.S. just hurt itself, so questions of liability and compensation just don’t arise.

So, what legal remedies exist for private individuals who have suffered damage because of the space activities of their country? Only those provided by their country’s domestic law, if it even has provisions that cover damage from space debris.

The situation in the U.S. is illustrated by the aforementioned March 2024 impact on a home in Florida. From the perspective of international law, this was damage done by the U.S. to itself, so there is no liability attached. The U.S. has no international responsibility to compensate the homeowner, Mr. Otero for the damage that NASA has acknowledged was caused by its debris.

But in June 2024, Mr. Otero’s attorney announced that an administrative claim had been filed against NASA under the Federal Tort Claims Act (FTCA), the domestic legislation most applicable in this context.¹⁸ This was not a lawsuit, as under the FTCA, a claimant must first present their claim to the federal agency allegedly responsible for the damage they have suffered.¹⁹ Upon receiving a claim, that agency then has at least six months to resolve the dispute or issue a “final denial” of the claim. Only at that point does the claimant gain the right to commence litigation.

However, there are other obstacles. While international law imposes strict liability for damage caused by space debris, domestic U.S. law does not. Rather, any claim under the FTCA requires that the claimant demonstrate that the damage was caused by a negligent or wrongful act of a federal government employee acting within the scope of their employment.²⁰ In short, if NASA can establish that it took all reasonable measures to ensure that its battery would burn up on re-entry or safely crash into the ocean but that just didn't happen, then Mr. Otero has no legal claim for compensation, even though it is undisputed that the damage to his house was caused by NASA's battery, and it is undisputed that if the battery had landed in the territory of another country then compensation would be owed.

Unfortunately for Mr. Otero, his claim was not resolved in discussions with NASA, and litigation has since been commenced.

A Path Forward For Space Debris Disputes

The proliferation of space debris and the legal complexities described above present a compelling case for the expanded use of arbitration in resolving space-related disputes. As this article has demonstrated, the current framework relating to space disputes, bifurcated as it is between international treaty obligations and diverse domestic legal regimes, creates significant gaps in liability and compensation mechanisms. These structural inadequacies, exemplified by cases such as Mr. Otero's, suggest that traditional litigation is increasingly ill-suited to address the unique challenges of space debris incidents.

Arbitration has generally played a minor role in resolving space-related disputes, given the traditionally small and cohesive community of actors in the space field and their mutual interest in harmonious dispute resolution to facilitate future interactions. However, the recent expansion of space activities has fundamentally altered the group of possible participants in such disputes, including the likelihood of a shared intention to continue working together. Moreover, while most arbitrations involve a contractual arbitration clause—something very unlikely to exist in the context of a space debris impact—parties have the right to agree to arbitrate their dispute at any time.

Arbitration offers several distinct advantages for resolving space debris disputes. First, it allows parties to select arbitrators with experience in space law and with technical competencies rarely found in traditional judicial settings. Moreover, the confidentiality and procedural flexibility of arbitration can be particularly advantageous given the reputational sensitivities surrounding space activities and the urgent

need for compensation when debris causes damage. In turn, the cross-border nature of space activities meshes well with arbitration's established and well-tested mechanisms for international enforcement. As the space sector continues its rapid commercialisation and the threat of cascading debris events intensifies, arbitration provides a forum uniquely suited for the resolution of space-related disputes.

Endnotes

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