What Keeps Space Insurers Up at Night?

By Christopher T. W. Kunstadter

Space insurance—insuring against first-party physical loss and third-party bodily injury and property damage for space activities—has been an enabler of innovation and investment in space since 1965. The pace of change, however, has never been as rapid as in the past several years. With some billionaires riding their rockets to space and others building massive satellite constellations and planning to explore the Moon and Mars in this decade, insurers have many new, challenging risks to consider—collision risk and commercial human spaceflight being just two.

Collision Risk

Constellations of commercial satellites have been around for 25 years or more, and collisions and breakups in orbit have garnered headlines. Since 2018, however, the rapid deployment of over 2,500 satellites in the constellations of OneWeb, Starlink, and others has helped focus the space community on collision risk, particularly in low earth orbit (LEO). The risk of a collision between two derelict rocket bodies could cause the population of tracked objects in orbit to double in a single event. At the same time, lethal nontrackable debris (LNT) (e.g., 2 to 10 centimeters in diameter) poses a very real threat to active satellites.

Space insurance policies are typically "all-risks"—they provide coverage for all losses except those that are specifically excluded, with typical exclusions including war, terrorism, and cyber. Thus, collisions with debris and micrometeoroids are generally covered. Insurers are increasingly including the risk of collision in orbit in their underwriting assessments. Indeed, some insurance companies have curtailed their exposures or even withdrawn from insuring satellites in LEO. As demand for insurance in LEO increases with increasing commercial use, a lack of insurance coverage would have a stifling effect on the space economy.

Nonetheless, we have the tools to address collision risk—to prevent, mitigate, and remediate. The ability to accurately track objects down to 2 centimeters and provide collision warnings in a timely manner is improving with new, globally dispersed radars, inexpensive tracking beacons for satellites, and data sharing. Small, reliable propulsion systems allow satellite operators to perform collision-avoidance maneuvers and post-mission disposal. Active debris removal (ADR), life extension, and other forms of on-orbit servicing (OOS) are revolutionizing satellite end-of-life (EOL) activities.

Meanwhile, policy makers and regulators have come to recognize the growing risk of collision in space. In 2001, NASA and the Department of Defense led efforts to establish the U.S. Government's Orbital Debris Mitigation Standard Practices (ODMSP).[1] Among other provisions, the 2001 ODMSP suggested that satellites should be removed from their operational orbit, either by atmospheric reentry or by maneuvering to a disposal orbit, within 25 years of the end of their operational mission. This guideline has since been adopted worldwide by governments and space agencies as a de facto standard.

Unfortunately, the basis for this guideline is outdated. In 2001, the year the ODMSP was established, just 90 satellites were launched worldwide. There was no hint of the two largest orbital debris-generating events—the 2007 Chinese ASAT test and the 2009 collision of the Iridium 33 and Cosmos 2251 satellites—or of the deployment of vast numbers of satellites in the past several years. In the Chinese ASAT test, a Chinese missile intentionally destroyed a derelict Chinese meteorological satellite, creating over 3,300 new tracked fragments. The Iridium-Cosmos collision—between an active U.S. communications satellite and a derelict Russian satellite—created over 2,200 tracked fragments. In addition, these two events created many thousands of LNTs. Most of these fragments—trackable and nontrackable—remain in orbit, presenting serious hazards to operational satellites and even to humans on board the International Space Station (ISS). Indeed, a Russian ASAT test on November 15, 2021, destroyed a derelict Russian satellite and created over 1,000 trackable fragments and likely many thousands more LNTs, causing the crew of the ISS to seek shelter in crew capsules as the ISS passed through the cloud of debris. In addition, since construction of the ISS in orbit began in 2008, crews have had to perform dozens of evasive maneuvers due to collision risk.[2]

There is currently no requirement to remove

Christopher T. W. Kunstadter (chris.kunstadter@axaxl.com) is Global Head of Space at AXA XL and manages AXA XL's space insurance activities. He works closely with the space industry and policy makers on emerging risk management issues, including on-orbit servicing and space traffic management.

Published in *The Air & Space Lawyer*, Volume 34, Number 3, 2022.

objects from orbit, and there is no legal foundation for an entity from a country that is not the State of registry to remove an object from orbit. A State could remove its own object (bearing responsibility and liability) or could allow another State's entity to do so. However, if there were a collision of the client object with the servicing vehicle, then, under the Liability Convention,[3] the launching States of both the original object and the retrieval object could bear joint and several liability.

Thus, while there is little incentive for States to create additional hazard and take on additional liability by performing active debris removal, governments have a responsibility to lead efforts at debris remediation. A recent study demonstrated that while the greatest debris-generating potential is from spent Russian rocket bodies in LEO, the most likely collisions among these objects are with U.S. and Chinese debris objects.[4] Collaboration on an ADR demonstration by the responsible space agencies—NASA, Roscosmos, and the Chinese National Space Administration (CNSA)—would kick-start the ADR industry and build confidence that viable, affordable solutions exist.

The world has changed, and the 25-year guideline is obsolete. Responsible behavior is the baseline, not the aspiration. Only compliance with new, strict, internationally agreed-upon rules will help to avoid a significant debris-generating collision in space.

Commercial Human Spaceflight

Space travelers are acutely aware of the risks of spaceflight. Of the 600 or so people who have ventured into space, 19 have died during flight, and another 11 have been killed during training or tests. Nonetheless, the fascination with spaceflight has attracted many private citizens to ride to orbit or to the boundary of space. In 2021 alone, 20 adventurers have ridden vehicles that didn't exist a decade ago, and many more will follow.

While insurance for human spaceflight has been provided for over 20 years, the jurisdictional regime under which an individual spaceflight falls is unclear: Is it the country of residence of the astronaut? The State from which the flight lifts off? The municipality that owns the spaceport? This ambiguity makes individual insurance policies challenging to underwrite.

Furthermore, cross-waivers, informed consent, and other contractual vehicles may specify the legal regime, but the heirs and estates of the victim of a spaceflight accident may have access to a broad range of venues and jurisdictions. At the same time, government agencies may have regulatory authority over only a portion of a spaceflight. For example, in the U.S., the Federal Aviation Administration (FAA) licenses launches and reentries but not on-orbit activity.

Nonetheless, this FAA licensing is a good model for a unified approach to liability allocation for human spaceflight. Rather than relying on differing contract wordings among the various operators and on differing jurisdictional regimes under which activities are conducted, a single, uniform liability scheme will allow spaceflight participants to feel comfortable that their interests are protected in the event of a mishap.

Conclusion

Space is exciting and important, but also challenging and risky. Insurance for space activity protects innovators and investors while providing important public policy tools and incentives. Risk transfer is one of the ways in which enterprises manage risk, along with avoidance, reduction, and retention.

Insurers take risks—indeed, they embrace risk. But a significant insurance loss due to a collision in orbit will have an immediate, dramatic, and chilling effect on the space insurance market, and thus on the whole space industry. Likewise, ambiguous legal regimes threaten the viability of a robust commercial human spaceflight market. Collaboration among operators, policy makers, insurers, and others with interests in space safety will enhance the expansion of new applications and new adventures in space.

While the greatest debris-generating potential is from spent Russian rocket bodies in LEO, the most likely collisions are with U.S. and Chinese debris objects.

Many innovations have developed into stable, safe, responsible industries through attention to collaboration and the recognition of their role in society. We all have a part to play in making space safer, and insurance companies are helping to lead the way.

Endnotes

1. U.S. Gov't, Orbital Debris Mitigation Standard Practices (Washington, D.C. 2001) (updated version), https://orbitaldebris.jsc.nasa.gov/library/usg_orbital_debris_mitigation_standard_practices_november_2019.pdf.

2. Joey Roulette, *The Space Station Just Dodged Debris from a 2007 Chinese Weapons Test*, N.Y. Times (Nov. 10, 2021), https://www.nytimes.com/2021/11/10/science/china-debris-space-station.html.

3. Convention on International Liability for Damage Caused by Space Objects, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html.

4. D. McKnight et al., 72d Int'l Astronautical Cong., IAC-21,A6,2,4,x64012, LEO Risk Continuum—Providing Context to Current and Future Collision Risk (19th IAA Symp. on Space Debris, 2021).