

International Space Law: A New Frontier of Risk

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The global space industry is projected to generate over \$1 trillion in revenue over the next two decades, including revenue from the development, launch and operation of satellites.¹ Increased activity in recent years, including more launches of satellites by a larger number of operators, has both reflected and attracted substantial new investment. The increased volume of launches, however, also brings increased risks of damage to spacecraft, both during launch and while in orbit.

The opportunity for profit in the “new space race” will be shaped by the industry’s ability to manage these risks. Given the number and amount of recent losses, the insurance market may not be fully able to absorb space risk and protect investors. The current international legal regime, which was adopted in the early 1970s before the proliferation of privately launched satellites, also provides no certainty. Updated national laws can help clarify and limit risks, but their usefulness is limited by the multinational character of the space industry and the absence of national boundaries in space. Ultimately, cooperation among states to develop new international law rules governing responsibility for incidents in space will be important to provide certainty and clarity to the space industry and its investors.

Crowded Skies

The increase of activity in Low Earth Orbit (LEO)—defined as an altitude of 2,000 km or less—has led to an increased risk of collisions between space vehicles. The growth in activity is due both to increased investment and to technological developments that allow companies to launch “constellations” of satellites at relatively low cost. As a result of these developments, the number of satellites in orbit is projected to jump from 1,200 to 27,000 by 2040²—more than ten times the total number of satellites launched in the

¹ Morgan Stanley, *Space: Investing in the Final Frontier* (July 2, 2019), <https://www.morganstanley.com/ideas/investing-in-space>.

² Paul B. Larson, *Commercial Operator Liability in the New Space Era*, 113 AJIL UNBOUND 109, 113 (2019), <https://doi.org/10.1017/aju.2019.18>.

60 years after Sputnik first reached orbit in 1957.³ The actual numbers may prove to be even higher; SpaceX alone has applied for frequency spectrum rights for up to 30,000 satellites.⁴ Collisions and near misses will undoubtedly become more common as more satellites are launched.

Already, satellite operators have been forced to engage in costly maneuvers to avoid mishaps. For example, the European Space Agency (ESA) had to maneuver its *Aeolus* satellite to avoid collision with a SpaceX satellite as the two hurtled towards each other in September, with no clear rule for who should yield to whom.⁵ Following that incident, the CEO of satellite constellation operator Iridium tweeted that his company frequently has had to undertake comparable satellite maneuvers in similar situations.⁶

Space debris presents another problem. The U.S. National Aeronautics and Space Administration (NASA) currently tracks over 23,000 objects larger than 10 cm orbiting the Earth.⁷ On November 19, ESA Director General Jan Woerner called on states to take immediate action to combat the problems posed by space debris, arguing that more satellite launches will lead to more satellite failures.⁸ Satellites that fail in orbit obviously become hazardous projectiles, but even perfectly executed launches create debris: disposable cargo fairings and upper stages of rockets are separated from their payload in LEO, sometimes remaining in orbit and sometimes falling back to the Earth.

Uncertainties in the Insurance Market

The insurance industry has had difficulty absorbing this new volume of risk. For example, China Satcom's recent \$250 million claim for the power failure of its *ChinaSat 18* satellite in orbit, combined with the \$415 million payout for the launch failure of the *Falcon Eye 1* satellite in July 2019,⁹ will "likely exceed total insurance premiums for 2019"

³ *Orbital Objects*, NATIONAL GEOGRAPHIC (January 5, 2017),

<https://www.nationalgeographic.com/science/space/solar-system/orbital-objects/>.

⁴ Caleb Henry, *SpaceX submits paperwork for 30,000 more Starlink satellites*, SPACENEWS (October 15, 2019)

<https://spacenews.com/spacex-submits-paperwork-for-30000-more-starlink-satellites/>.

⁵ Jeff Foust, *ESA spacecraft dodges potential collision with Starlink satellite*, SPACENEWS (Sept. 2, 2019)

<https://spacenews.com/esa-spacecraft-dodges-potential-collision-with-starlink-satellite/>.

⁶ Matt Desch, @IridiumBoss, TWITTER (Sept. 2, 2019 10:51AM),

<https://twitter.com/iridiumboss/status/1168582141128650753> (noting that commercial satellite operator Iridium maneuvers its satellites to avoid collisions "on average once a week.").

⁷ Maya Wei-Haas, *Space junk is a huge problem – and it's only getting bigger*, NATIONAL GEOGRAPHIC (April 25,

2019), <https://www.nationalgeographic.com/science/space/reference/space-junk/>.

⁸ Debra Warner, *ESA Director General calls for aggressive action on space debris*, SPACENEWS (November 19, 2019)

<https://spacenews.com/woerner-debris-regulation/>.

⁹ Gavin Bradshaw, *Vega launch failure is \$400mn+ loss*, INSIDE FAC (Jul. 12, 2019),

<https://www.insidefac.com/articles/127506/vega-launch-failure-is-400mn-loss>; see also Marcus Alcock, *Space*

for the entire space industry combined.¹⁰ This would make 2019 the second year in a row in which payouts outpaced premiums across the market.¹¹ The *ChinaSat 18* claim may not even be the last large claim of 2019, as it came on the heels of Eutelsat's October 2019 report of a malfunctioning solar array on its 5 West B satellite, which could lead to a €170 million loss.¹²

Difficulties in anticipating and pricing for these risks may limit the supply and affordability of insurance for space activities. Swiss Re, the leading space reinsurer, announced it was leaving the market in August 2019, citing "bad results of recent years and unsustainable premium rates."¹³

Increasing Investment

Despite these difficulties, investment in the satellite sector shows no signs of slacking. In early 2019, a private equity consortium purchased satellite operator Inmarsat for \$6 billion, stating: "the satellite sector is attractive, with unique characteristics, including long lead times and the need for deep technical expertise, while operators in the sector require strategic management and a long investment horizon."¹⁴ This investment has not slowed, with recent multimillion dollar funding rounds for satellite service startups.¹⁵ Technological advances have lowered satellite launch costs, facilitating smaller, cheaper satellites for a range of applications. Satellite telecommunication has always received the largest share of investment, but now funds are pouring into

market confronts \$310mn Viasat loss, INSIDE FAC (May 14, 2018),

<https://www.insidefac.com/articles/119363/space-market-confronts-310mn-viasat-loss> (potential \$310 million insurance claim in 2018 would have effectively wiped out the industry's gross written premium of \$550-600 million).

¹⁰ Caleb Henry, *\$250 million ChinaSat-18 loss looming over insurers*, SPACENEWS (August 29, 2019)

<https://spaceneews.com/250-million-chinasat-18-loss-looming-over-insurers/>.

¹¹ Carolyn Cohn et al., *Space insurance costs to rocket after satellite crash*, REUTERS (July 31, 2019),

<https://www.reuters.com/article/us-space-insurance/space-insurance-costs-to-rocket-after-satellite-crash-idUSKCN1UQ1SK>.

¹² Steve Evans, *Insurance market could face \$192m+ Eutelsat 5 West B satellite loss*, REINSURANCE NEWS (October 28, 2019), <https://www.reinsurancene.ws/insurance-market-could-face-192m-eutelsat-5-west-b-satellite-loss/>;

Caleb Henry, *Solar array issue jeopardizes new Eutelsat satellite*, SPACE NEWS (October 24, 2019), <https://spaceneews.com/solar-array-issue-jeopardizes-new-eutelsat-satellite/>.

¹³ Caleb Henry, *Space insurer Swiss Re leaves market*, SPACE NEWS (Aug. 1, 2019), <https://spaceneews.com/space-insurer-swiss-re-leaves-market/>.

¹⁴ Javier Espinoza, *Private equity consortium to buy Inmarsat in \$6bn deal*, FINANCIAL TIMES (March 25, 2019)

<https://www.ft.com/content/818699be-4ecf-11e9-9c76-bf4a0ce37d49>.

¹⁵ Alex Knapp, *This Startup Just Raised \$13 Million To Build Satellites-As-A-Service*, FORBES (Nov. 13, 2019),

<https://www.forbes.com/sites/alexknapp/2019/11/13/this-startup-just-raised-13-million-to-build-satellites-as-a-service/> (Loft Orbital); Alan Boyle, *Spaceflight Industries is raising more cash as satellite deals heat up on the final frontier*, GEEKWIRE (Nov. 15, 2019), <https://www.geekwire.com/2019/spaceflight-industries-raising-cash-satellite-deals-heat-final-frontier/>.

satellites used for “everything from weather monitoring, to ship and aircraft tracking” and more.¹⁶

The Outdated Space Liability Regime

The absence of an international legal regime that takes account of the involvement of non-state actors in the space industry exacerbates the uncertainty. The current regime, established by a treaty known as the Space Liability Convention,¹⁷ was developed in an era when states were the primary actors in space. Before an object reaches outer space, the Convention imposes on the “launching state” absolute liability for damage.¹⁸ When a collision occurs in orbit between objects from two different launching states, liability is determined based on which state is “at fault.”¹⁹ The Convention, however, does not establish any rules defining what constitutes “fault,” nor does it clearly regulate liability for private activity in space.

ChinaSat-18 may provide a test of this regime. Because of the shape of its orbit, the satellite will likely become a five-ton projectile orbiting the Earth for the next several months before burning up in the atmosphere, possibly crossing paths with other satellites but unable to maneuver. Should the failed satellite collide with other space vehicles during this time, questions of liability may become hotly contested issues.

Possible Signs of Progress

The international community is showing signs of stirring to adapt the legal framework to suit the needs of the modern space industry. In its 2019 session, the United Nations Committee on the Peaceful Uses of Outer Space provided recommendations on the application of international law to small-satellite activities, space traffic management, and international principles of liability for damage caused by space debris.²⁰ The Legal Subcommittee of that body recently agreed to explore international standards for mitigation of damages from space debris and ways of encouraging states to update their

¹⁶ Joe William, *Billions flow into U.S. space industry, but reckoning looms*, FOX BUSINESS (March 5, 2019) <https://www.foxbusiness.com/technology/billions-flow-into-us-space-industry-but-day-of-reckoning-looming-for-many-startups>.

¹⁷ Convention on International Liability for Damage Caused by Space Objects, 961 U.N.T.S. 188 (opened for signature Mar. 29, 1972).

¹⁸ *Id.* art. II.

¹⁹ *Id.* art. III.

²⁰ Report of the Committee on the Peaceful Uses of Outer Space on its Sixty-Second Session, U.N. Doc. A/74/20, ¶¶ 225-229 (June 12-21, 2019).

domestic legislation,²¹ including a draft questionnaire intended to help states consider changes to their domestic liability laws.²²

A number of jurisdictions have updated their domestic laws to respond to the challenges presented by commercial activities in space. Approximately 40 countries now have laws regulating space activities, but the regulation of liability and insurance differs from country to country.²³ Some countries already have strong regulations requiring satellite operators to carry liability insurance or provide proof of fiscal responsibility. Such requirements, however, may cause difficulty if insurers and reinsurers are unable or unwilling to provide coverage. South Korea, Hong Kong, China, and the Netherlands require insurance coverage up to the maximum amount available in the market,²⁴ but this amount could change rapidly as a result of changes in the market. The United States requires proof of third-party liability insurance or a demonstration of financial responsibility for all licensed launches.²⁵ Australia has a similar requirement.²⁶ The United Kingdom,²⁷ Austria,²⁸ Belgium²⁹ and Denmark³⁰ give the government discretionary power to require insurance for space activities. In addition, the United Kingdom places strict liability on the operator for damage from space activities³¹ and, along with other states such as Norway and Sweden, requires the operator to indemnify the state against claims.³²

²¹ Committee on the Peaceful Uses of Outer Space, Report of the Legal Subcommittee on its fifty-sixth session, UN Doc. A/AC.105/1122, ¶¶ 167-173 (March 27 to April 7, 2017).

²² *Id.* § V, Appxs. I & II.

²³ Jeanne Suchodolski, *An Overview and Comparison of Aviation and Space Insurance*, 14 J. BUS. & TECH. L. 469, 487-88 (2019).

²⁴ *Id.* at 490-91.

²⁵ 51 U.S.C. § 50914(a).

²⁶ Space Activities Amendment (Launches and Returns) Act 2018, No. 92 of 2018, part 4A (Austl.).

²⁷ Space Industry Act 2018, 2018 c. 5, § 38 (U.K.).

²⁸ Bundesgesetz über die Genehmigung von Weltraumaktivitäten und die Einrichtung eines Weltraumregisters (Weltraumgesetz) [Federal Law on the Authorization of Space Activities and the establishment of a National Space Registry (Space Law)], BGBl I No. 132/2011, § 4 (Austria) (listing the conditions for a license to issue); Verordnung der Bundesministerin/des Bundesministers für Verkehr, Innovation und Technologie zur Durchführung des Bundesgesetzes über die Genehmigung von Weltraumaktivitäten und die Einrichtung eines Weltraumregisters (Weltraumverordnung) [Regulation of the Federal Minister for Transport, Innovation and Technology in Implementation of the Federal Law on the Authorization of Space Activities and the establishment of a National Space Registry (Space Regulation)], BGBl II No. 36/2015, § 2(7) (Austria) (requiring evidence of insurance to obtain a license).

²⁹ Loi relative aux activités de lancement, d'opération de vol ou de guidage d'objets spatiaux [Law on the Activities of Launching, Flight Operation or Guidance of Space Objects], Sept. 17, 2005, as amended, art. 5, § 2 (Belg.).

³⁰ Bekendtgørelse om krav ved godkendelse af aktiviteter i det ydre rum m.v. [Executive Order on requirements in connection with approval of activities in outer space, etc.], No. 552, May 31, 2016, as amended, § 13(1) (Den.).

³¹ Space Industry Act 2018, 2018 c. 5, § 34 (UK).

³² *Id.* § 36 (U.K.); Lag om rymdverksamhet [Law on Space Activities], SFS 1982:963 (Swed.); Lov om elektronisk kommunikasjon (Ekomloven) [Electronic Communications Act], 2003 No. 83, § 6-7, as amended (Nor.).

Domestic laws, however, can only go so far. In the absence of clear rules of international law allocating liability between satellite operators of different nations, significant uncertainties will remain. Monitoring developments in national and international law can help investors understand and manage these uncertainties.

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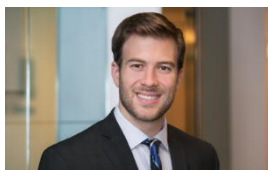
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