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Aviation

The introduction of a regulatory framework for the operation of Unmanned Aircraft Systems (UAS) and aircraft with Vertical Take-Off and Landing (VTOL) capability p. 4

Francesca Melega

The protection of the environment in the course of air and space activities: legal dimensions p.10

Aikaterini Vakaki

Space

The NewSpace role in the insurance market: profitability goals and its regulatory framework challenges p.25

Sara Dalledonne and Maria Vittoria Prest

ESA accelerators: challenges and opportunities p.38

Maria Vittoria Prest

Space to Africa p.41

Luisa Santoro

Events

International Academy of Comparative Law (IACL) p.53

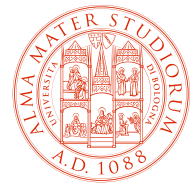
General Congress, Asunción, 23-28 October 2022

International Bar Association (IBA) Aviation Law Committee p.54

Annual Conference, Miami, 30 October - 4 November 2022

European Air Law Association (EALA) p.55

32nd Annual Conference, Athens, 3-4 November 2022



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The NewSpace role in the insurance market: profitability goals and its regulatory framework challenges*

Sara Dalledonne** and Maria Vittoria Prest***

1. Introduction

Space activities are characterised by an inherently high level of risk, both because space is per se a risk environment (several circumstances such as technical failures of the launch vehicle, failure to reach a proper orbit, operational failure of the satellite itself, as well as delays can be mentioned) and in relation to damages that can be caused to third parties as a consequence of those operations. The intrinsic nature of these operations, frequently dealing with the use of unproven technologies, can indeed lead to significant losses in revenue.

In this sense, the insurance market can offset hazardous activities by reducing the magnitude of exposure of the actors involved (mainly satellite operators and launch operators) and providing reliable protection against the risk of financial loss. As a consequence, the predictable and reliable manner of dealing with risks (responsible operations) incrementally gains the interest of investors.

This insurance market is experiencing several challenges, with claims exceeding premiums for three consequent years (from 2018 to 2020). In this sense, an encouragement to revert to profitability might be provided by the continuing growth of NewSpace. Even though there is **not a common definition of this concept**, NewSpace Global has defended NewSpace as “A global industry of private companies and entrepreneurs who primarily target commercial customers, are backed by risk capital seeking a return, and seek to profit from innovative products or services developed in or for space”¹.

The upswing of private, commercial space activities undertaken with a different approach from the traditional direct involvement and oversight by government or intergovernmental organisations is relatively recent. In a comparison with traditional space (or OldSpace), where the space domain was only reserved to governments, which invested in public programmes through public funds, operating under a traditional procurement system, what identifies this NewSpace ecosystem?

It is significant to mention features such as²:

- the increasing participation of private firms, start-ups, and new business ventures in satellite and launch operations;
- extensive range of services (including finance for manufacturing and data analysis) that are used or offered, usually in correlation with new technologies (e.g., Big Data, AI applications and so on), and new space markets;
- proposition of disruptive market solutions (e.g., integrated service, higher performance, lower price) An increasing number of launch of satellites, usually smallsats, and the rise in number of satellite constellations;
- enough large demand for smallsats to provide a commercial basis for the potential viability of small launchers market;
- new industrial and procurement approaches, mainly based on PPP or service procurement approach;

* Source: 72nd International Astronautical Congress (IAC) – n, 25-29 October 2021. IAC-21,E7,7,7,x66863.

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1 *NewSpace Global*, “LLOYD’S Emerging risk report 2019 – New Space bringing the new frontier close to home”, 2019, at 9.

2 A. Vernile, “The rise of private actors in the space sector”, 2018, at 12.



- smaller budget in comparison to traditional space industry;
- massive private investment provided through different funding mechanisms: venture capital or high net worth (HNW) individuals;
- market demand, access, and distribution of data worldwide; and
- Increasing contribution in space-related matters by several space-faring nations.

This change in paradigm in the way of conducting space activities is leading to a new space sector dimension, in particular in the sense of democratisation of outer space. However, NewSpace also requires a new dimension for old issues and concerns, among them the need for sustainable and responsible behaviour in space operations.

NewSpace might represent the trigger to bring the space insurance market to the next level, taking advantage of the complementary between insurance and mission assurance. Novel insurance formulas, embedding a new level of flexibility on defining terms of the products and services, as well as on conducting the evaluation risk phase, would create additional opportunities for the market. Finally, this change in paradigm will also result in series of legal challenges, the necessity for standardisation and best practices in the field for instance.

2. Current regulatory framework

The insurance market comprises two types of insurance: **Asset & Property insurance** (or property damage insurance) and **third-party liability insurance**. While third-party liability insurance is typically offered by the aviation insurance industry, Asset & Property insurance is usually offered by space insurers.

2.1. Asset & Property Insurance

Asset & Property insurance protects the owner or operator of a space object from the loss or damage of that space object. There are three kinds of Asset & Property insurance: pre-launch insurance, launch insurance, and in-orbit insurance. As they follow in a consequential order, it is important that one ceases to produce effects when the other begins in order to avoid overlapping or lack of guarantees. Particularly:

- The pre-launch insurance phase begins with *“the signing of the satellite procurement contract and ends when the launch of the launcher becomes irreversible”*³. This phase covers three periods of time: the assembling, integration and testing phase; the transportation of the payloads and launcher to the launch site; and the launch campaign. It is usually offered by **maritime cargo insurers**.
- The launch insurance phase starts when the launch becomes irreversible (based on the launch services agreement and depending on technical aspects specific for that type of launcher), and it can end a few days or more often one year after the launch. Some insurers have multi-annual policies. It is usually offered by **space insurers**, and it covers the payloads but not the launcher *per se*, which can be included as an additional cost factor. Different solutions will have to be shaped due to the increased interest in reusable launchers.
- The in-orbit insurance (spacecraft or individual transponders) phase starts whenever the launch insurance ends and could potentially last until the end of the life of the satellite in space. It is usually offered by **space insurers**.

The decision to contract insurance for a space object is free. No insurance obligation is placed on the manufacturer, the operator, their clients or financial institutions. Institutional satellites are for the large majority not insured, especially due

³ C. Gaubert, “Insurance in the context of space activities”, in: F. von der Dunk, F. Tronchetti (Eds.), Handbook of Space Law, Edward Elgar Publishing Limited, Cheltenham, 2015, at 910–948.



to the fact that government turns to the private sector for satellite services and launch. Besides, only 30% of commercial satellites are usually insured for **Asset & Property** insurance⁴.

2.2. Asset & Property insurance Policy

Insurance policies have their own specific set of terms, conditions, and exclusions.

Asset & Property insurance (for launch and in-orbit services) is the result of a risk mapping analysis of launch service providers or satellite operators. It covers the loss or damage suffered by the insured to its space object regardless of the cause ("*all risks policies except*"⁵) unless it is specifically excluded by the policy. As a result, if the insurer does not want to cover the damage or loss, they will need to prove the applicability of an exclusion, while the insureds will only have to prove they suffered damage or loss⁶. Asset & Property insurance usually covers external causes of damage (e.g., falls, collisions, etc.), internal causes of damage (e.g., electrical short-circuit, fire, etc.) and human error, unlike a conscious misconduct "*of directors or officers of the insured*"⁷. It excludes any future revenue losses.

Regarding the insurance amount (insurance premium), the insurance policy usually mentions an "*agreed value*" as a pre-determined value that cannot be modified after the inception of the policy. The amount changes on the basis of the policy, the insurance phase, and the insured's selections. It is indeed the insured who decides the amount of the insurance based on the satellite's value, on its replacement costs, or – when the space object is financed by financial institutions – on the amount of the loan. Insured usually ask for the possible "*maximum amount*" (insurance coverage limit) which is measured on the space object's manufacturing costs, the launch services costs (unless the launch services agreement includes a "*launch risk guarantee*" -LRG), the insurance premium, or the in-orbit positioning costs. The contractual operations aiming to determine the terms of the insurance contract are conducted by brokers who act as moderator and impartial party. Space insurers have no or limited direct contact with the client.

Asset & Property insurance is usually purchased by the owner or operator of the satellite (insured). Insured purchase Asset & Property insurance to protect their investment against launch failures, but not on-orbit insurance, while other purchase launch insurance in conjunction with in-orbit insurance as a combined policy.

The period of insurance is variable but today the most common insurance offered by the insurance market is of one year and then renewed on an annual-based or extended under specific requirements. Longer period insurance can also be acquired, even though are less common. For instance, larger satellite operators usually purchase for one year following the successful flight (self-insure the in-orbit phase), while longer insurances are usually contracted with for space debris collision concerns in mind. Indeed, while the insurance market has usually considered the debris risk low in terms of profitability of collision between satellite and piece of debris, SSA has reversed this underestimation by reassessing this part of the coverage.

In the case of longer insurance, the insured usually needs to provide space insurers "*with a health status report of the insured satellite*" on which basis the insurers will decide whether they want to renew the insurance policy and under which terms and conditions⁸. The amount of the insurance usually decreases as the years of life of the satellite increase or towards the end of the financial agreement.

The insurance can claim damages for:

- "*Total loss*" of the space object allows the insured to obtain the total value of the insurance amount⁹.
- "*Constructive total loss*" which also allows for the full insurance coverage, but "*upon receipt of the full indemni-*

⁴ Space Foundation, "The Space Report 2020 (Q3)", October 2020.

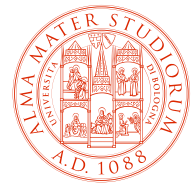
⁵ L. de Gouyon Matignon, "Space Insurance & Space Law", August 2019. Link: <https://www.spacelegalissues.com/space-insurance-space-law/>.

⁶ *Supra* note 5.

⁷ The insurance that only covers damages or losses due to specific causes listed in the insurance policy is named "*named perils*". *Supra* note 3.

⁸ *Supra* note 3.

⁹ *Supra* note 3.



fication of its loss, the insured undertakes to use its best efforts to save the satellite” and “the insurers will then be entitled to have the sole right to the maximum benefit of salvage” (best effort clause)¹⁰.

- “Partial loss” of the space object allows the insured to obtain coverage calculated on the “actual loss of capacity or lifetime” of the space object¹¹.

Finally, a “salvage clause” can be added to the insurance policy stating that “after a claim payment, the insured agrees to do all things reasonably practicable to maximise salvage opportunities for the affected part of the satellite” and “in such a case, the amount of salvage received by the insurers shall be limited to the indemnification paid by the insurers”¹².

2.3. Third-party liability insurance

Third-party liability insurance is insurance against damage caused to a third-party, and addresses “a launching agency, a satellite operator or owner whose launcher, satellite or part thereof is considered accountable for damages caused to third parties during the space operation”¹³. It covers the indemnification of all sums that the insured shall become legally obligated to pay for bodily injury and/or property damage to third parties. It can be divided into two subcategories:

- Liability insurance for space operators, which covers the damage caused to third parties during insured launches and in-orbit operations of spacecraft.
- Space product liability insurance, which covers manufacturers, subcontractors, and service providers when damage to a third or contractual party is caused “due to a defect of the product after its delivery” or due to a service default¹⁴. These individuals may also be liable on the basis of the general rules applicable to product liability beyond space activities¹⁵. It usually provides financial coverage for 1 year. Space risks in case of damages caused by satellites’ failures are addressed in Europe under the European Space Products Liability Scheme (ESPLS)¹⁶.

In contrast with Asset & Property insurance, the 1969 Outer Space Treaty (OST) and the 1972 Liability Convention (LB) outlined a particular legal regime governing space-related liabilities of States party to the Treaty at the international level. Particularly:

- governance of national activities carried out by governmental and non-governmental entities (authorisation and supervision) (Article VI OST);
- liability for damage to other states party to the Treaty caused by launch or procurement of the launching of an object in space (Article VII OST).

Subsequently, the Liability convention expands on the liability rules of the OST to elaborate on efficient liability regimes, rules, and procedures for prompt and equitable compensation in case of liability. On the other hand, the third-party liability insurance’s regulatory framework consists mainly of national disciplines (e.g., US Commercial Space Launch Act) since neither the OST nor the Liability Convention imposes an insurance obligation. In any case, liability insurance policies have legal consequences both under international and national laws¹⁷.

¹⁰ D. Philippe, “Best Efforts Clauses: Common Law and Civil Law”, November 2017. Link: <http://www.interleges.com/wp-content/uploads/2018/01/Best-Efforts-Clauses-Common-Law-and-Civil-Law.pdf>.

¹¹ The “partial loss” corresponds to “a partial reduction of the lifetime or operational capacity of the satellite below the threshold used for the determination of the constructive total loss”. The same concept of “loss quantum” used for the latter will also be employed in this case. *Supra* note 3.

¹² *Supra* note 3.

¹³ *Supra* note 3.

¹⁴ *Supra* note 5.

¹⁵ *Supra* note 3, at 29–126.

¹⁶ *Supra* note 3, at 29–126.

¹⁷ *Supra* note 5.



Furthermore, it is common for participants to space operations to try to mitigate - or eliminate whether possible - their liability with clauses in the respective contracts (including manufacturing and launch service contracts), aware of the high risks connected to space activities¹⁸. In terms of insurance, these limitations or exemptions may benefit the insurers if they are stipulated in favour of the insured or penalise them if they are stipulated in favour of the other parties by limiting or eliminating altogether the insured's right to recourse in the event of damage for which they are not responsible. The validity of these clauses however is subjected to national disciplines, provided that the state is responsible at the international level.

2.4. National regulatory framework

Approximately forty countries have laws regulating space activities to a certain extent. National space law includes clarification regarding the risk-sharing between the State and the private entities: in particular, tools to provide indemnification to governments, a ceiling of liability for limiting the exposure of private entities, and licensing control of national space activities. A specified (minimum) amount of insurance is different based on the prescribed applicable legal regime. These frameworks usually aim to facilitate compliance with international obligations.

The majority of national space legislations require the possession of a license or permission to conduct space operations for both their nationals regardless of their location and foreigner conducting space activities within the country on the matter. Many spacefaring nations also require an adequate financial guarantee or insurance. The insurance obligations vary widely, but only a few national laws explicitly require the purchase of insurance coverage. Some national regimes also impose a compulsory requirement upon launch services providers to contract third-party liability insurance as a condition for obtaining a licence. Space liability insurance for in-orbit services is less common as a requirement in national regulations. In other cases, legal requirements of insurance coverage for private participants in space activities might be the result of bilateral agreements in the context of specific planned activities (e.g., common carriage or spacecraft operations) involving the nationals of the relevant states or between different countries.

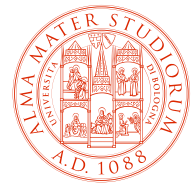
National space laws and related insurance requirements are represented in the following figure:

Table 1 - *Compulsory Indemnification and Insurance Requirements per National Space Law*¹⁹

	Indemnification of State	Third-Party Liability
Insurance Requirement at the discretion of governments	Austria, Belgium, Denmark, Kazakhstan, Norway, Sweden, South Arica, Ukraine	Denmark, Finland, New Zealand, Portugal, South Africa, Ukraine
Greater of Maximum amount		
Or	Australia, China, Hong Kong, Indonesia, Netherlands, South Korea, New Zealand, the U.K.	Australia, Indonesia, Luxemburg, Netherland, the U.K., Japan, Russian Federation
Maximum probable loss		
Up to probable maximum probable loss with cap	France, Finland, Portugal, the U.K., the U.S.	France, the U.S.

¹⁸ Such clauses are the "limitations of liability or waiver of recourse" clause, and the "hold-harmless" clause. Also, a cap on damage type can be used. *Supra* note 3.

¹⁹ J. Suchodolski, "An Overview and Comparison of Aviation and Space Insurance", J. Bus. & Tech. 14, 2019.



In 60-plus years of space activities, launch and on-orbit liability claims have not occurred, so there is no direct precedent for such circumstances. A third-party liability claim could be challenging and even catastrophic for the satellite operators at fault, as well as for the space insurance market²⁰.

Going into details, the approaches taken by the national space law can be grouped into three main systems:

1) No maximum amount of liability cap (an only requirement for indemnification)

In some cases, namely Norway and Sweden, requirement, and type (insurance or financial guarantee) are under the discretion of the agency on a case-by-case basis, or not required at all as in the case of Kazakhstan. Reimbursement from the entity to whom the law applies to the government for the amounts disbursed in accordance with a claim for damages is envisioned. In addition, there is no limit to liability²¹.

2) Maximum amount

In other countries, such as China, the Netherlands, and South Korea the insurance operates under a maximum available insurance market amount (or capacity), usually diversified based on type and phase of risks (launch or in-orbit). It means space actors are required to acquire a cover-up to the maximum allowable amount which can be obtained on the market²².

3) Maximum probable loss (MPL)

Other countries, such as the U.K. (for certain operations) and Australia provide more specific requirements in regard to the type of indemnification and set up the amount of the maximum probable loss anticipated by the space operation. In 1986, the U.K. released the Outer Space Act requiring a minimum acceptable level of cover per satellite. In 2018, the U.K. passed the Space Industry Act, in which at Section 38 requires holders of on-orbit operations licenses to have third-party liability insurance.

4) Liability cap for indemnification requirement

Finally, the U.S., as well as France and the U.K. (in certain circumstances) require licensees to demonstrate they hold sufficient third-party liability insurance for the activities undertaken. In particular, France and the U.K. set up a limit amount above which the government is responsible to cover the costs instead of the operator.

The U.S. was the first country to enact a national space law expressly governing space launches and liabilities, in compliance with international discipline. Indeed, the **US Commercial Space Launch Act** provides a third-party liability insurance obligation – or financial guarantee in the alternative – on the launch licensee as well as mandatory additional insurance coverage on the U.S. nationals and any other participant in the launch operation. The U.S. set up three Tiers of potential losses which divide the costs between the private stakeholder and the government. Under the first limit amount, the operator is bounded (Tier I), while the country commits itself to pay the amount in case of higher damage top to the third level (Tier II). The operator is again responsible above the third tier (Tier III)²³. In terms of liability limitations, the U.S. has

20 V.A. Samson, J.D. Wolny, I. Christensen, "Can the Space Insurance Industry Help Incentivize the Responsible Use of Space?", IAC-18-E3.4.2, 69th International Astronautical Congress, October 2018.

21 UNOOSA, "National Space Law, Space Law: National Space Law Database". Link: <https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/index.html>.

22 Kongjian Wuti Dengji Guanli Banfa (《卫星轨道空间物体注册管理条例》), "Measures for the Administration of Registration Space Objects", promulgated by PRC Nat'l Def. Sci. & Tech. Indus. Comm. and PRC Ministry of Foreign Affairs, Feb. 8, 2001, effective immediately. "Interim Measures on the Administration of Permits for Civil Space Launch Projects", promulgated by PRC Nat'l Def. Sci. & Tech. Indus. Comm., November 2001, effective December 2002. See also "Interim measures on Administration of Mitigation of and Protection against Space Debris", promulgated by PRC Nat'l Def. Sci. & Tech. Indus. Comm., effective January 2010.

See also, "Minebob [Civil Act], Act on Compensation for Damage Caused by Space Objects", Act. No. 8714, Dec. 21, 2007, amended by Act No. 8852, Feb. 29, 2008, art. 4 (S. Kor.), translated in Korea Legislation Research Institute online database, http://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=17043&type=sogan&key=2.

23 T.J. Brennan, C. Kousky, M. Macauley, "More than a Wing and a Prayer: Government Indemnification of the Commercial Space Launch Industry", September 2009. Link: https://economics.umbc.edu/files/2014/09/wp_09_112.pdf.



been the first country to impose an indemnification cross-waivers of claims between the licensee or transferee and the participant in the launch or re-entry operation, including the customer²⁴. As a result, the parties waive their right to seek recourse for the damage suffered. In turn, the same does the Secretary of Transportation regarding damages sustained by the government or executive agency due to an activity of the licensee or whether a licensee or transferee are facing exclusion from insurance contained in the relative insurance contract²⁵.

Under the **French Law on Space Operations (FSOA)**, adopted in 2008, private space operators can either insure for third-party liability or prove they are able to compensate the eventual victim (Article 6)²⁶. The FSOA set up a limit amount under which the operator is bounded, while the French government commit itself to pay the remained amount in case of higher damage.

The insurance or financial guarantee must cover the French government and public bodies (including CNES), ESA and all the participants in the production of the space object or the space operation, which all benefit from the insurance policy “*subscribed by the launch operator*” (Article 6.3)²⁷. The 2008 French Space Law also regulates waivers of recourse and “*hold-harmless*” clauses for space operations (Article 4). Whenever said law is not applicable though, liability’s limitations or exemptions clauses are invalid “*for professionals that do not have the same business speciality*” and can be rescinded by a judge²⁸.

To conclude, national regulatory frameworks have the potential to be one of the elements under which competition in the space sector is based. The balance of shared risks between private and public actors is indeed a way to attract private companies, including a large number of emerging start-ups.

3. Space-related insurance market

As previously mentioned, insurance coverage for space operations is usually differentiated between the kind of space activity and the type of insurance sectorial companies:

- manufacturing (usually insured by the ground market);
- transit and pre-launch (usually insured by the marine market);
- launch and Commissioning (usually insured by the aviation market or space market);
- in-orbit life (usually insured by the aviation market or space market);
- de-orbit operations (usually insured by the aviation market).

The **global insurance market** represents more than €4.2 trillion per year. The space insurance market on the other hand is quite recent, as it emerged in the early 1980s due to increased demand for such insurance. In 2020, it comprised a market between approximately €500 million and €850 million per year.

Insurance requirements represent a significant additional cost for space companies. Indeed, property insurance is typically the third-largest expenditure behind launch and manufacture, with an average of 10% of the overall cost for private space entities. The vast majority of satellite ventures carry property insurance, and especially launch insurance, which covers the riskiest phase of the satellite’s life cycle (approximately 34% of GEO satellite losses since 2000 occurred during launch.). The market into question has been mainly the one of large satellites in GEO (45% of GEO satellites holding insurance in 2019). However, this market is currently experiencing a downturn, and the focus is switching to large con-

²⁴ *Supra* note 3.

²⁵ *Supra* note 21.

²⁶ *Supra* note 21.

²⁷ *Supra* note 21.

²⁸ *Cour de cassation, civile*, Chambre commerciale, March 2013, 11-26.566. Link: <https://www.legifrance.gouv.fr/juri/id/JURITEXT000027209798>



stellations in LEO (3% of LEO satellite holding insurance in 2019)²⁹. In any case, the cost is substantially contingent on the kind of activity performed (launch activities, satellite operations) and the financial robustness of operators.

The space insurance industry's goal is to receive in premiums more than what it pays out in claims. Meanwhile the economics of space insurance has broadly been successful over the past 20 years, it has been experienced a persistent loss space insurance sector in the last three years (2018, 2019, and 2020) with claims larger than premiums³⁰. While in 2005, the ratio between the premiums received by insurers and the maximum exposure by insurers (for all potential claims of that year) was 3.4., it had reduced to 0.7 by 2018, meaning premiums would not cover the total insured value of space assets in the case of failure³¹, 2018 saw five major failures, resulting in estimated claims of over \$515 million. In 2019, insurance claims were over \$800 million against premiums of \$502 million (two major failures). In 2020, insurance claims were \$500.3 million against premiums of \$460.5 million³². At the same time, the total number of launches has marginally increased.

The current challenge the space insurance market is experiencing is the result of a **confluence of factors**. Among them, an oversupply of (offered) capacity has concurred with changes in demand, resulting in reducing premiums over the past couple of decades. Indeed, space insurers operate in a highly competitive industry, with limited demand for insurance. The competition between them is sometimes based on coverage terms and capacity, but more frequently on premium prices (premium rate), which are the consequence of multiple factors (market conditions, risk assessment, sum insured).

Table 2 - Major insurance claims in the space sector 2018-2020 (Source: ESPI)³³

2018	Reported claims	Cause
WorldView-4	\$183 million	In-orbit failure
Angosat-1	\$121 million	In-orbit failure
Al Yah 3	\$115 million	Partial launch failure
Soyuz MS-10	\$71 million	Launch failure
Turksat-4b	\$25 to \$60 million	Partial launch failure
2019	Reported claims	Cause
Falcon Eye-1	\$415 million	Launch failure
ChinaSat-18	\$250 million	Post-launch anomaly
Eutelsat 5 West B	\$192 million	Partial failure
2020	Reported claims	Cause
Thaicom 5	\$26 million	On-orbit anomaly
Express AM-6	\$39 million	Payload failure
Palapa-N1	\$252 million	Launch failure

²⁹ *Supra* note 4.

³⁰ *European Space Policy Institute (ESPI)*, "ESPI Yearbook 2020 Space policies, issues and trends", June 2021. Link: <https://espi.or.at/news/espi-yearbook-2020-is-now-available>.

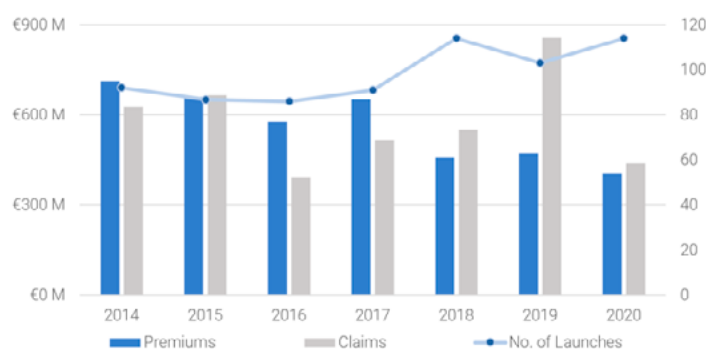
³¹ *P.B. De Selding*, "Space insurers book 3rd straight money-losing year. Market volatility may mean 100% premium hike in 2019 is not enough", December 2020. Link: <https://www.spaceintelreport.com/space-insurers-book-3rd-straight-money-losing-year-market-volatility-may-mean-100-premium-hike-in-2019-is-not-enough/>.

³² *R. Schenone*, "Space Insurance Update", June 2019. Link: file:///Users/mariavittoriaprest/Downloads/2019_Space_Insurance_Update.pdf

³³ *Supra* note 30.

This prolonged unprofitability and unsustainable premiums have led different companies to take some steps back in the area. In 2019, Swiss Re (represented about 5% of the space insurance industry) announced it would no longer offer space insurance, citing poor financial results and unsustainable premiums³⁴. Furthermore, in 2020, American International Group (AIG) also withdrew from the space insurance class industry due to prolonged unprofitability³⁵. Boutique space insurance firm such as Assure Space has decided to minimize its exposure, ceasing to offer policies to LEO satellite operators covering collisions due to the increased risk of such events in March 2020³⁶. Factual factors to consider are the marginal increase of the total number of launches if to even decreased in GEO, the lowering cost of satellites and the proliferation of small satellites. 52% of all launches were uninsured in 2020 (e.g., SpaceX launches of its Starlink low-orbiting broadband satellites)³⁷.

Figure 1 - Insurance Premium and Claim 2014-2020 (Source: Seradata, AXA XL, ESPI)³⁸



Insurance companies are mainly concerned by the volatility of the line of business and the changes in demand. Underwriters and brokers may benefit from the experienced loss of underwriting capacity, as it would likely result in an increase of premium rates in the near term, bringing back the sector to profitability. On the other hand, since spacecraft insurance is not compulsory, competitiveness in the industry will not decrease and an excessive rise in premium may lead additional insurers to go out of the market.

The insurance market of property damage insurance needs to mainly be addressed at the international level considering the elevated costs linked to this type of insurance due to the high risks space objects are submitted to. Space insurance companies are mainly located in the U.S., U.K., Germany, France, Switzerland, Japan and the UAE. Approximately 30 insurers (e.g., Lloyd's, AIG, AXA XL and Allianz, Aesir Space, elseco, Marsh, Munich Re) are the space insurers offering Asset & Property insurance today.

4. How can insurance benefit from NewSpace?

In recent years, NewSpace has changed the way we “do” space, also consequently leading to a paradigm shift which is heavily affecting the space-related insurance market in different ways. It is not only impacting insurance premiums and policies, but it is also affecting it at the provider and customer levels.

34 J. Foust, “Space insurers hoping to break even after recent losses”, November 2020. Link: <https://spacenews.com/space-insurers-hoping-to-break-even-after-recent-losses/>.

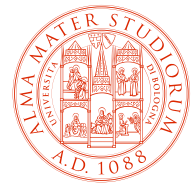
See also, C. Henry, “Big claims, record-low rates: Reshaping the space insurance game”, September 2019. Link: <https://spacenews.com/big-claims-record-low-rates-reshaping-the-space-insurance-game/>.

35 *Supra* note 34, C. Henry. See also, A. McNestrie, J.H. Jones, “AIG withdraws from loss-hit space insurance market”, November 2020. Link: <https://www.insuranceinsider.com/article/2876nupqiql67n4bf7r40/aig-withdraws-from-loss-hit-space-insurance-market>.

36 *Supra* note 35, A. McNestrie, J.H. Jones.

37 D. Werner, “Assure Space won’t cover collision risk in low Earth orbit”, March 2020. Link: <https://spacenews.com/assure-space-leaves-leo/>.

38 *Supra* note 30.



The first point of discussion regards the **necessity for NewSpace to contract insurance**. From this perspective, and in particular, as a consequence of multiple factors such as the ongoing democratisation of outer space opening the market to start-ups, the speedier development of new technologies, the high severity of loss, higher launch rates, new architectures for satellite, and increasing orbit hazard, NewSpace companies need the insurance market to absorb their risks and attract investment. Indeed, they have smaller and more unique businesses, backed by a reduced and more vulnerable financial commitment, and loss might likely lead to the end of their business. Furthermore, contracting insurance represents an added value for investors who are then more incentivised to take the risk of getting into NewSpace. Under this perspective, NewSpace might represent a new class of insurance industry participants, to which the space insurance market should find a way to adjust while remaining viable and benefitting from. Nevertheless, the development costs of small satellites are lower than those for traditional satellites. As a result, it is more advantageous for NewSpace companies to manufacture or buy a backup satellite to launch in case of a failure rather than insure one. Even though privates still need to ensure their launches, it is possible that the increasing volume of spacecraft will decrease the amount of in-orbit satellite insurances. It is thus still unclear whether underwriters will benefit from NewSpace as new customers.³⁹

4.1. Market perspectives: how can the insurance companies adapt their policies to the very different needs and characteristics the NewSpace market has?

In a highly technological age like the one we are currently living in, innovation moves fast. As a result, the insurance market policies should continuously be adapted in order to be up-to-date and meet the quick-changing sectors' requirements. No difference should there be for the space sector. As previously mentioned, fast evolutions characterising the space sector - further boosted by the advent of the private sector - is mostly a consequence of NewSpace. NewSpace's phenomena are both challenging and beneficial for the space-related insurance market under different perspectives. In comparison with traditional risks that insurers are usually underpinning, space insurers dealing with NewSpace are mostly challenged by the necessity to build new reliable rating models for the assessment of new risks. The development of parameters for a new module based on trustworthy risk analysis is difficult, especially because new players not always have experience in dealing with high-risk space environment. This demanded new approach shall deal with novel emerging risks (e.g., untested space technologies, increased space debris-related concerns) as well as new specific needs of the space sector (e.g., insurance of large satellites constellations, reusable launchers).

Among them, the advent of **small satellites** has been a game-changer in many ways. Smallsats - and even more CubeSats - production costs are lower than bigger satellites, they are starting to be mass-produced, and as previously mentioned the insurance costs occupy the third place on the "*cost podium*". As a result, those few times when smallsats are insured, the insurance premium is minimal. This phenomenon is one of the contributing causes to the exit of big insurance companies from the market. A market which, if it is to survive the advent of NewSpace, must necessarily create the conditions for its companies to attract clients as well as be competitive and efficient. Space insurance companies are facing new concerns in this regard. For instance, the low economic value of small satellites does not allow insurance companies to individually study them to offer specific product-based policies; while another issue is connected to the large number of small satellites and the resulting high number of policies and, potentially, claims if they were to be all singularly insured. Space insurance companies might thus develop new formulas and programmes, and to do so they can get inspired by programmes coming from similar insurance models in other fields. Among them, the Unmanned Aircraft Systems (UAS) or drone industry.

Large satellite constellation also represents an example of this phenomenon. On the one hand, they require new forms of insurance since there are several problems with the current insurance framework. For instance, in terms of property

³⁹ P.B. De Selding, "Space insurers book 3rd straight money-losing year. Market volatility may mean 100% premium hike in 2019 is not enough", December 2020. Link: <https://www.spaceintelreport.com/space-insurers-book-3rd-straight-money-losing-year-market-volatility-may-mean-100-premium-hike-in-2019-is-not-enough/>.



damage insurance, it is difficult to imagine that every single satellite would fall under a different insurance policy. One of the insurance renewability conditions for in-orbit insurance requires the provision of “*a health status report of the insured satellite*” to the space insurer, which makes it infeasible in the presence of an entire constellation of satellites.⁴⁰ Since these factors affect the insurance market in several ways, not necessarily with positive results, solutions must be found. For instance, designing joint multiclass insurance policies for an entire constellation, or lowering insurance premiums for deorbit operators working before the 25 years mark. On the other side, they further increase the risks of an already very dangerous environment by creating orbits overcrowding, increasing collision risks and potentially worsening the issue of space debris. If the cons outweigh the pros, these factors could push insurance companies out of the market as they consider it to be unattractive and insufficiently secure, leaving many uninsured. Although the space and insurance markets have always had a complicated relationship, there have been cases where insurance companies can really contribute to achieving predetermined targets.

Another dimension concerns the **launch sector**. While launches and payloads are usually covered by space and aviation insurers, launchers are commonly not insured. The reasoning behind this relies on two factors. Firstly, launchers are destroyed after their use therefore their cost is covered by the “*launch services costs*”. Secondly, the launch service is usually considered by the launch services agreements to be terminated after the ignition of the launcher. One of the latest developments of NewSpace, however, could lead to an interesting innovation in the insurance market. The re-usability of launchers combined with an adaptation of insurance policies to the new needs, could push companies to start insuring their launchers and this could give a new boost to the space-related insurance market.

The common thread linking all these reflections is that space is a continuously evolving and highly complex environment with special characteristics that require specific knowledge and expertise and NewSpace further affects this reality. On the other hand, the insurance industry, in general, is no stranger to high-risk sectors - such as nuclear - and has always found formulas to meet their necessities. Therefore, now more than ever it is fundamental that insurers draw from their pool of knowledge acquired in other high-risk sectors and partner with experts in the space sector aware of the elements characterising NewSpace and its underlying dynamics to offer new insurance solutions to customers. Down this road, **new forms of involvement** concerning the insurance sector operating in space-related activities might be sought.

Firstly, if space-related insurance companies wish to survive these changes in paradigm, they will have to **comply with partially renovated duties and responsibilities**. For a start, they will need to switch from a passive role to a more active one, being involved since the outset of the value chain. Time and degree of involvement would clearly change depending on the object and type of insurance. This would include investigating clients’ needs, opening communication channels with experts in the sector, and potentially being integrated into the value chain. This approach could lead to an eased identification of coverage needs, potential coverage of insurance gaps based on actual customer needs as well as balancing some of the risks insurers face in the presence of untested technologies and less experienced operators through a continuous and informed exchange. In particular, while brokers play a huge role in getting the space insurance market closer to NewSpace, space insurance and customers should interconnect at earlier stages, for instance for consultations during the development of the product to insure. Secondly, this should be combined with optimisation and modernisation in terms of distribution of the insurance value chain (how they organize the process internally).

In addition, some companies today, such as SpaceX, or Kineis, tend to house all steps of the production chain (mainly, manufacturing, launching, and in-orbit services). These steps of the value chain are often covered by different insurance markets (ground, marine, space and aviation insurers). In this circumstance and excluding other issues, it is difficult to imagine an inclination for companies to insure when each step falls under the competence of different insurance companies. Therefore, insurance companies should more commonly offer **packages which cover the different phases of the space value chain** under one single contract, covering the entire lifetime of the product and if necessary, also for multiple missions and projects.

⁴⁰ *Supra* note 3.



The insurance industry targeting the space sector should also adapt to NewSpace's changing landscape in terms of **developing new ways to employ current insurance instruments and new flexible formulas** (for instance focusing on ensuring the service instead of the asset, as in the case of the large constellation). Hence doing both offering adequate financial coverages to their insured and optimising profits in order to survive the NewSpace market. For instance, designing insurance packages not based on general areas (e.g., macro risks) but detailed on specific risks and characteristics for that type of product, by employing an *"intelligent set of underwriting tools and a reliable rating model"*.⁴¹ This would create competition on the product offered and not only on the price, as it currently happens in the market.

Furthermore, these "intelligent tools" make it possible to focus on higher-risk insurances as well and having a portfolio of contracts targeting both high and low risks activities allows the mutualisation of losses (the *"big pool"* principle). NewSpace forces the insurance sector to make this step forward. In fact, large companies have a low-risk count but are more volatile, while NewSpace companies have a higher risk count but are less volatile and as mentioned, their risk can be mitigated with intelligent tools.

Finally, the space insurance market (including several classes of insurance e.g., Asset & Property or third-party liability insurance) would have to collaborate on the goal to **educate NewSpace companies about the importance and necessity to insure**. The outcome would be allowing the insurance market to adapt its rules and policies to the NewSpace market demand in order to avoid spikes in premiums and disincentive self-insurances. Nonetheless, the study of risks comports a significant amount of time and resources. On NewSpace's side, these companies should embed proactive behaviour, incentivizing the creation of relations with the insurance market, and proving the value of their business.

4.2. Legal perspectives: Does insurance in the NewSpace sector need to be regulated?

The other face of the coin concerns **regulatory challenges**. From the legal perspective, it is then relevant to mention that no uniform framework can be outlined in terms of insurance constraints.

Discipline on the matter is usually the result of either:

- **Bilateral agreements** concerning predetermined activities and binding the nationals of the signatory states; or
- **National space laws** imposing licences or permission requirements on nationals and/or any other stakeholder carry on space activities in the territory of the country in which the national space law imposing licences or permission requirements is in force.

Hence, the issue of insurance regulations for commercial satellites is often linked to the enactment of national space laws, which many states still lack. Regulation is an important tool, but it needs to be flexible enough to be adapted to the market's needs in general and even more to the rapid changes and challenges characterizing NewSpace. In particular, insurance requirements are a **component of attractiveness** and **proof of seriousness** for space nations. In this sense, regulators should need to formulate their laws trying to find the **right balance between remaining worldwide "competitive"** (regarding the benefit of the discipline for private actors), but **also protecting themselves** from the liability for damages incurred by operators they licence. In this context, many governments are reluctant to impose restrictions on the private sector or to impose insurance or licensing obligations of any kind. Otherwise, the risk would be to have strong migration of private capital to countries where such stringent insurance obligations or limits are not imposed, with relevant consequences for the country of origin not only economically speaking but also in terms of technological development, know-how, security, and so forth. In the absence of a clear international or supranational legal framework, competitive national legislations are invaluable and irreplaceable.

In addition, governments should continue to **develop best practices, and standards, and promote responsible behaviours among** relevant stakeholders in the field. This would make the national and international legal framework more certain. Countries might also start requiring insurance fulfilments for specific operations or phases of a mission or

⁴¹ *Volante Global*, New Space deserves New Insurance, March 2021. Link: <https://volanteglobal.com/news/newspace-deserves-new-insurance/>.



of a satellite lifetime.

They should also **play a much more active role and work alongside with the industry** (insurers, private space companies, satellite operators) and providers to incentivize responsible behaviour and best practices among satellite operators, as well as support the coordination and collaboration in the insurance industry.

The achievement of responsible behaviours would require a high level of collaboration between space insurers, and the antitrust regime might limit the realisation of such a scenario. Space insurers have already expressed their concern in this regard. A partial exemption of space insurers from antitrust laws might be required to implement this approach.⁴²

Furthermore, a strategic instrument is represented by the effort of ensuring compliance with these standards and best practices. Countries might also provide **incentives for companies complying with the settled obligations** or displaying appropriate/responsible behaviours (the so-called “good steward” companies).

Moreover, governments can **raise awareness about the complementary role of insurance to mission assurance**, especially targeting NewSpace insurance.

Although, for the space insurance market to be financially equitable, and to achieve a suitable scenario, it would be crucial for spacefaring nations - if not all at least a vast majority of them – to **implement concurrent insurance requirements** targeting all space actors operating in the same operational fields.

To conclude, as a general statement there is a significant role placed by the public sector on taking responsibility and be aware of the challenges the space sector is facing today, also in terms of financial guarantee and insurance.


5. Challenges ahead and conclusions

Insurance is a **key enabler of space commercialisation and new innovative projects**, minimizing the financial impact on insureds in case of loss or damage, letting them focus on innovation and technology development.

The increased interest in new space assets and activities, such as commercial space travel, space tourism, suborbital flights, and on-orbit servicing will likely have an impact on the space insurance sector. New strategies of space-assets insurance should be required to deal with concerns on Space Traffic Management (STM), damage sustained by astronauts while on a mission, with new cybersecurity concerns. This will create new opportunities for the market, but also legal concerns. For instance, a new legal framework will likely have to be developed in relation to the insurance of crew members, and commercial passengers.

To conclude, space insurers would have to find a way to adjust their tools to the changing landscape and continue to support the industry going forward with flexible and intelligent insurance tools.

⁴² Secure World Foundation, “STIMSON”. Link: https://swfound.org/media/206112/2018_stimson_swf_insurance_event_report.pdf.



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