

# Risk Assessment in Insuring Space Endeavours: A Legal Approach

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*Risk assessment is part of the underwriting process in any type of insurance, but space insurance has peculiarities requiring a specific approach: the technical nature of space risks, the inability to apply the 'law of large numbers' and the time between risk assessment and risk attachment. It also requires special expertise from space insurers concerning space technology and the related risks. Insurers have to take an individual approach to projects, and the risk assessment process by the space licensing authorities is of invaluable importance and help for insurance underwriting.*

*Information on space projects from the space operator is of critical value for the insurance underwriting and the licensing processes. However, the third party liability risk is the main interest for the licensing authorities, while the space insurance market remains about first party insurance. From an insurance law point of view, the transfer of information between insurers and space operators reflects one of the basic insurance principles – 'utmost good faith'. It seems that this tendency, visible both in civil and common law systems, has led to the standardization of contractual clauses in space insurance contracts, despite insurance coverage being tailored to a project.*

*This article gives a legal perspective of risk assessment in space insurance, looking at the interaction between space law and insurance law, with interesting results for space insurance contracts and the established principles of insurance in risk assessment.*

## 1 UNDERWRITING SPACE RISKS

### 1.1 THE CONCEPT OF UNDERWRITING SPACE RISKS

Underwriting is at the core of the contracting phase in insurance. As the name suggests, its essence is taking a decision on the insurer accepting the risk (and consequently, 'underwriting' the policy). The aim of underwriting is, firstly, to define whether the risk is insurable and can be covered by insurance, and secondly, what terms and rate of premium should be applied.<sup>1</sup>

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<sup>1</sup> C. A. Williams et al., *Risk Management and Insurance* 386 (2002).

According to Lloyd's glossary of insurance terms, to underwrite means '(a) *The process of evaluating, defining and pricing insurance and reinsurance risks, including, where appropriate, the rejection of such risks. (b) The acceptance of the obligation to pay or indemnify the insured or reassured under a contract of insurance or reinsurance*'.<sup>2</sup> The first and core factor of underwriting is, therefore, that the insurer understands the risk it agrees to insure. This highlights the difference between 'classical' insurance and space insurance. This difference arises out of the sophisticated and ultra-hazardous technology of space endeavours, which makes it so different from any other business activity.<sup>3</sup>

Another, related, specific feature of space insurance underwriting is the low number of high value risks compared to other types of insurance. This is caused by the limited number of launches and satellites, and the diverse range of launch vehicles and satellites, which further narrow the possibility to act on the rules of statistical probability. To that, constant and accelerating technological development should be added.<sup>4</sup> These facts do not allow underwriters to apply 'the law of large numbers' – the typical method of risk measurement and statistics – but force them to work on an individualistic approach to risk assessment.<sup>5</sup> As a result, while the statistical analysis of a historical database is sufficient for classical risks, space insurers must work on the basis of a 'technology-based engineering analysis'.<sup>6</sup>

Another factor that complicates space underwriting is the limited access to data on space projects that were not insured. This, even though it does not have any direct influence on rates on the space insurance market, further limits the database for developing meaningful statistics.<sup>7</sup>

<sup>2</sup> <https://www.lloyds.com/common/help/glossary?Letter=U> (accessed 30 Nov. 2016).

<sup>3</sup> In this respect, space activity is limited to the endeavours included in the regime of space law, i.e. mainly launching and operating satellites.

<sup>4</sup> As underwriters indicate, 'as new technology is introduced, reliability tends to decrease initially, but in time regresses to the mean'. C. Kunststadter, *Interview – The Space and Satellite Insurance Sector 2014: A Market Update* (2014); One example of such problems concerns Boeing 702 satellites, which, due to employing a new system of concentrator panels, faced problems of the solar array output power, as the arrays tended to lose optical quality, resulting in a quicker decrease of power than expected.; See also O. Schöffski & A. G. Wegener, *Risk Management and Insurance Solutions for Space and Satellites Projects*, 24 Geneva Papers Risk & Ins. 209 (1999); also C. Kunststadter, *Space Insurance Market Overview*, AIAA Workshop (2013).

<sup>5</sup> E.g. P. Blassel, *Space Projects and the Coverage of Associated Risks*, 10(35) Geneva Papers Risk & Ins. 64 (1985); P. Meredith & G. Robinson, *Space Law: A Case Study for the Practitioner: Implementing a Telecommunications Satellite Business Concept* 337 (Amsterdam: Martinus Nijhoff Publishers 1992); the individualistic approach is adopted in the case of atypical risks, where assets are of high value, e.g. in vessels on the high sea, Williams et al., *supra* n. 1, at 158; the known issue is that in atypical risks, there is a risk assessment but not necessarily risk measurement, W. Ronka-Chmielowiec, *Ubezpieczenia Rynek i Ryzyko* 172 (Polskie Wydawnictwo Ekonomiczne 2002).

<sup>6</sup> I. I. Kuskovelis, *The Space Risk and Commercial Space Insurance*, 111 Space Pol'y 119 (May 1993).

<sup>7</sup> E.g. a Falcon nine failure in 2015 was not covered and it was said that, for this reason, it does not influence the increase of the rates on the market.

Also, statutory impediments are often imposed on the transfer of data concerning space assets. The best known of these are the International Traffic in Arms Regulations (ITAR) of the US.<sup>8</sup> The provisions of ITAR require insurers from outside the US to be granted a licence in order to be allowed to obtain data necessary for a risk assessment, since this is considered an export of technical data.<sup>9</sup> Although the strict regime was slightly loosened recently, data transfer is still far from being freely allowed.

Yet another factor that is crucial for the underwriting process is the methodology used to calculate the maximum probable loss (see section 2).<sup>10</sup>

Finally, the high risk of total losses inherent to space endeavours affects the risk assessment.

## 1.2 TRANSFER OF INFORMATION IN SPACE RISK ASSESSMENT – TECHNICAL APPROACH

Space underwriting includes, first of all, the technical risk selection and assessment – based on technical and engineering information. If the result is positive and the risk proves to be insurable, an analysis of insurance terms and negotiations takes place. This includes the verification of whether the proposed cover is consistent with the project parameters, and a profiling of exclusions, deductibles, loss formulas and claims procedures.<sup>11</sup> Finally, based on the results of the above, the rate of the premium and the insurer's share in the risk is set.<sup>12</sup>

The starting point of underwriting a space risk is identifying the risk on the basis of the 'underwriting information',<sup>13</sup> which includes:

- A presentation of all the technical documentation<sup>14</sup> (such as satellite components, transponders and the launch vehicle, the design

<sup>8</sup> Governed by 22 U.S.C. § 2778 of the Arms Export Control Act.

<sup>9</sup> According to ITAR, export includes not only the physical export of articles, but also the transfer of relevant data to a foreign person (in the US or abroad). See also R. Whearty, *Intro to Space Insurance. First party*, Marsh Space Projects a History of Leadership and innovation (Aug. 2015); R. G. Bender, *International Arbitration – Satellite Communications: Arbitrator Perspective*, in *International Commercial Arbitration Practice: 21st Century Perspectives* (LexisNexis 2010); Jeff Foust, *One Nation, Over Regulated: Is ITAR Stalling the New Space Race?*, 17(3) *Ad Astra* (Winter 2005), <http://www.nss.org/adastra/volume17/itar.html> (accessed 2 Feb. 2017).

<sup>10</sup> See in particular the US regime concerning the maximum probable loss calculation and efforts to amend it in the Commercial Space Launch Competitiveness Act, Public Law No: 114-90 (25 Nov. 2015).

<sup>11</sup> Kunstadter, *supra* n. 4.

<sup>12</sup> [www.assure-space.com/underwriting-methodology.html](http://www.assure-space.com/underwriting-methodology.html) (accessed 2 Feb. 2017).

<sup>13</sup> P. Montpert, *Space Insurance*, in *Contracting for Space* 285 (L. J. Smith & I. Baumann eds, 2011). The term 'Underwriting information' has been used in the Invitation to Tender of ESA concerning Galileo insurance and was defined as: 'written information provided to the insurers before Attachment of Risk, by and on behalf of the Named Insured with respect to the subject matter of this insurance'; point 31 of Definitions.

<sup>14</sup> The well-recognized structure of the risk analysis, which serves as a checklist for an underwriter includes information on:

documentation, any new technologies introduced,<sup>15</sup> the technical data of the launch, the number and types of satellites to be launched at once, etc.),

- Contractual and financial information (business data of the space project, the risk allocation schemes, etc.), and
- Information on the future policyholder (i.e. historical data, experience and the reliability of the operator, which may mean that ‘newcomers’ can face higher premiums).

As an example, it can be noted that the insurer assesses the technical details and heritage of the launch vehicle (of a specific model), such as flight record, previous failures or anomalies, the integration of new equipment and testing programmes, as well as satellites, such as satellite systems and subsystems (redundancies for bus and payload, etc.) and flight heritage. Information on testing programmes, quality control measures and workmanship screening is also essential in this respect.<sup>16</sup>

For all the above reasons, the risk assessment is in each case an individual endeavour, and the terms of the policy are therefore agreed on an individual basis.<sup>17</sup> In addition, not only is each space project subject to a separate risk assessment, but also each stage of the project (i.e. launch, satellite operation). Consequently separate rates are applied even where one policy covers the launch and in-orbit stages.<sup>18</sup> Slightly different criteria must also be taken into account

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- meeting the launch deadline;
  - time required by the satellite to travel from the apogee eclipse into orbit;
  - the number of comparable satellites in use;
  - number of the transponders, their life expectancy and the reliability;
  - the annual demand for the transponders in use in order to calculate the number of the replacement transponders in order to maintain the uninterrupted service; and
  - costs of the launch period in relation to the costs of the satellite. Schöffski & Wegener, *supra* n. 4, at 212.

<sup>15</sup> R. Bathurst, *No Space for Error When It Comes to Satellite Launches* (2013), <http://www.resilience.willis.com/articles/2013/04/22/no-space-error/> (accessed 2 Feb. 2017). No space for errors ...; see the LV analysis in G. Morgan, *The Space Insurance Market*, The 6th Annual International Conference ‘Aviation and Space Insurance in Russia’ (Moscow 26 Feb. 2015), mentioning and comparing reliability of Ariane 5, Atlas V, Long March 3BE, H011A (H-IIB), Falcon 9, Proton and others. In addition, there is a list of the most popular satellite producers, the satellites of which are insured, i.e. Astrium, Ball Aerospace, CAST, OHB, Orbital, SSTL as well as emerging ones: Planet Labs, SkyBox; A. Gould & O. Linden, *Estimating Satellite Insurance Liability*, Papers on Fall CASAC Conference, 63 (2000).

<sup>16</sup> Quality control and prelaunch testing process is also important, together with the extensive quality control of the satellite. This is related to the manufacturer and operator experience being checked by the insurers and holding a team capable of monitoring the satellite manufacture – all this can reduce the risk profile. The same concerns the skilled and experienced staff able to manage any anomalies and keep the proper performance of the satellite. A. Maletier, *Strategies to Mitigate High Satellite Insurance Premiums*, *Satellite Fin.* 64 (10 Dec. 2003); Whearty, *supra* n. 9; Fourth Quarter 2002 Quarterly Launch Report, Commercial Space and Launch Insurance: Current Market and Future Outlook.

<sup>17</sup> Bathurst, *supra* n. 15.

<sup>18</sup> K. Posner et al., *Mango on Aviation Insurance* 415 (4th ed., LexisNexis 2014). A Comparative Study on Space Technology in the World, 2013.

when underwriting space third party liability insurance. In this case, the risk exposure is measured on the basis of the location of the launch site, the launch site details, the launch trajectory and the impact zone. These criteria are weighed with respect to their remoteness to human locations, the intensity of population in neighbouring areas, etc. (see also section 2)<sup>19</sup>

All this leads to the conclusion that the nature of space risk insurance requires the insurer to play quite a different role to that in classical insurance. The insurer's expertise cannot be limited to analysing statistics and applying the relevant rates, but requires far greater in-depth knowledge and expertise concerning space technology. Having said that, it is clear that space insurance underwriters act more as partners in the space endeavour than as the opposite party to a contract.<sup>20</sup> The question that arises in this case is whether such an approach to assessing the insurance risks changes the legal aspects of declaring risks. In other words, whether there is still a place in space insurance for the utmost good faith principle, with all its consequences. This will be addressed in section 3.

### 1.3 UNDERWRITING AND THE RELEVANCE OF SPACE INSURANCE POLICY TERMS

One issue affecting space underwriting that needs separate attention concerns contractual insurance terms. Though the scope of this article does not allow for a detailed analysis of this matter, at least a short note on this should be made. From a legal point of view, contractual insurance terms, especially those concerning a description of the risk, the scope of coverage and the rights and obligations of the parties, are decisive for the content of the insurance product. Such terms should be assessed and interpreted separately under particular legal systems, and may raise legal concerns where the same standard insurance contractual clauses are applied in different jurisdictions. Despite this, however, the current tendency on the global insurance market, leaning closer towards standardization, should be noticed. Though every space insurance contract is still tailor-made, market maturity has resulted in a certain standardization being observed. Recent insurance coverage taken out by the European Union (EU), acting via the European Space Agency (ESA) as its technical agent for Galileo<sup>21</sup> and Sentinel (Copernicus)<sup>22</sup> satellites, where the industrial practice was followed, can be given as an example.

<sup>19</sup> C. Gaubert, *Insurance in the Context of National Authorisation*, in *National Space Legislation in Europe* 169 (Leiden & Boston: Martinus Nijhoff Publishers 2011).

<sup>20</sup> E.g. P. Dauphars, *L'assurance des risques spatiaux*, in *L'exploitation commerciale de l'espace* 281 (P. Kahn ed., Bourgogne 1992).

<sup>21</sup> [http://www.esa.int/Our\\_Activities/Navigation/Galileo/What\\_is\\_Galileo](http://www.esa.int/Our_Activities/Navigation/Galileo/What_is_Galileo); <http://www.galileognss.eu/> (accessed 2 Feb. 2017).

<sup>22</sup> <http://www.sentinel.esa.int/web/sentinel/home>; <http://www.copernicus.eu/main/sentinels> (accessed 2 Feb. 2017).

Standardization (to some extent) seems to be a practical necessity in view of the fact that the coverage is not, as a rule, granted by one insurer, but rather the broker places the risk with several insurers after the insurance programme is structured in cooperation with the prospective policyholder. This was the situation with the Galileo insurance, where several insurers were chosen to provide coverage through public tenders.

There is, however, a risk in standardizing insurance terms, in that the importance of the law applicable to space insurance contracts is overlooked. This is significant as the same contractual clause could have different legal effects under different systems of law. Standard clauses for the declaration and assessment of risk may again be given as an example, and will be further developed in section 3.

## 2 SPACE RISK ASSESSMENT IN INSURANCE LAW AND IN SPACE LAW

### 2.1 SPACE RISK ASSESSMENT IN INSURANCE LAW

Risk assessment seems to be the domain of insurance law and practice, also when it concerns compulsory insurance of a specific industrial activity. In most such cases, the sum insured is fixed at an amount that does not really reflect the long-term dynamics of the industrial, social and technical relations, and once set is rarely changed, even in vulnerable areas such as compulsory– motor third party liability insurance.

One may question whether this should also be the case for space insurance, where, as explained in section 1, the only possible approach is an individualistic one. An analysis of the insurance regulations in this respect reveals that risk assessment is by and large a practical and technical issue and, if regulated by insurance law, involves mostly the solvency regulations of the insurance industry. As a result, with regard to assessing space risks, space law rather than insurance law might provide better answers. This approach is also valid for other types of ultra-hazardous risks, such as in chemical or nuclear industries. In such cases, insurance law and technique must rely on industrial regulations and practice, especially when there are less ‘large numbers’ to be applied by the insurers.

### 2.2 SPACE RISK ASSESSMENT IN SPACE LAW

When analysing the provisions of space law for basic concepts that may serve to define the insurable space risk, in order to set the scope of coverage, the terms of insurance, or the limits of liability and the level of the premium, we should first turn to the UN space treaties. These treaties (the Outer Space Treaty, the Liability

Convention, the Registration Convention, the Rescue Agreement and the Moon Agreement<sup>23</sup>) establish essential guidelines in this respect. The basic function of the treaties in terms of managing the risk of space endeavours is to regulate certain central issues of cooperation between states and to attribute liability to the launching states, rather than to assess the risk. They also answer fundamental questions concerning the entities holding an insurable interest, as well as the subject and scope of activities that can subsequently be covered by insurance.

More sources regarding this issue can be found in other international instruments adopted by the United Nations which, despite being soft law, are helpful in clarifying such concepts as space object, launching state, and outer space, among others.<sup>24</sup>

The importance of all these documents for specifying risk in space projects cannot be overestimated. Certainly they are of a general nature and do not address specific aspects of insurable space risk, but they have subsequently been made more distinct in international bilateral and multilateral agreements, as well as in national space laws. The latter, as far as insurance is concerned, focus on ensuring the safety of space endeavours, allocating the risk thereof to space operators, and setting out and defining the space activities that are subject to space insurance. They also help with the delimitation of the branch of space insurance in general.

Though national space regulation is not uniform around the world, some of the laws are sufficiently precise as to include a definition of space risk for the purposes of insurance (at least compulsory insurance), as well as the factors that are fundamental for the risk assessment. For example, according to the US Code of Federal Regulations (CFR), Chapter 14, part 440,<sup>25</sup> risk is explained as a measure that accounts for both the probability of the occurrence of a hazardous event, and the consequence of that event to persons or property. National space laws also help in applying two notions widely used in insurance law to the evaluation of risk. These are the probable maximum loss (PML), which means the maximum value of loss that may happen due to one occurrence, and the maximum possible loss, which means the 'worst case scenario', i.e. the maximum value of loss that is possible due to one occurrence. Both of these terms are used to measure high value risks.

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<sup>23</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, adopted on 27 Jan. 1967; Convention on International Liability for Damage Caused by Space Objects, adopted on 29 Mar. 1972; Convention on Registration of Objects Launched into Outer Space, adopted on 14 Jan. 1975; Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, adopted on 22 Apr. 1968; Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, adopted on 18 Dec. 1979. <http://www.treaties.un.org/> (accessed 2 Feb. 2017).

<sup>24</sup> See e.g.: General Assembly Resolution 59/115 on application of the concept of the 'launching State'.

<sup>25</sup> See at the US Government Publishing Office, [http://www.ecfr.gov/cgi-bin/text-idx?SID=e97013510f2b651f21674b89e7dbde65&mc=true&tpl=/ecfrbrowse/Title14/14cfr433\\_main\\_02.tpl](http://www.ecfr.gov/cgi-bin/text-idx?SID=e97013510f2b651f21674b89e7dbde65&mc=true&tpl=/ecfrbrowse/Title14/14cfr433_main_02.tpl) (accessed 2 Feb. 2017).

The PML is used in situations when no private security measures work, while the maximum possible loss is used for situations when no private or public security instrument works.<sup>26</sup> One of the most common definitions says ‘The PML for a specified financial interest is that proportion of the total value of the interest which will equal or exceed, in a stated proportion of all cases, the amount of any financial loss to the interest from a specified event or group of events.’<sup>27</sup> The insurers use PML both for liability and property insurance, and explain it as the anticipated maximum loss of property that could result given the normal functioning of protective features, as opposed to maximum foreseeable loss, which would be a similar valuation, but on a worst-case basis with respect to the functioning of the protective features. Underwriting decisions would typically be influenced by PML evaluations, and the amount of reinsurance ceded on a risk would normally be predicated on the PML valuation.<sup>28</sup>

PML is applied in national space laws as a concept helping to establish the liability risk related to carrying out space activities subject to licensing and the space liability regime, and serves as a measurement of the risk and insurable interest. Thus, it is claimed that an individual calculation of PML is much better than the flat rate of liability, as it takes into account various risk factors,<sup>29</sup> as well as, for example, the emerging industrial use of small satellites, as well as large constellations of satellites, and others. The PML concept should enable an insurance amount to be calculated that is sufficient for the coverage of all losses other than a ‘massive catastrophic accident’.<sup>30</sup> It is not addressed in the space treaties, due to the fact that the liability of the launching state is not limited in value. From an insurance point of view, the basic function of the concept of the PML and maximum possible loss in national space laws is related to the liability risk allocation regime between the launching state and the enterprise pursuing the space activity. While the PML is to be covered by space enterprises, and is usually correlated with the mandatory liability insurance limit, the maximum possible loss is a category of loss usually assumed by the launching state as being extremely

<sup>26</sup> Williams et al., *supra* n. 1, at 95–96.

<sup>27</sup> Estimating maximum probable loss with order statistics Margaret E. Wilkinson & John S. McGuinness, *Is ‘Probable Maximum Loss’ (PML) a Useful Concept?*, LVI Proc. Cas. Actuarial Soc’y (1969).

<sup>28</sup> Munich Re glossary; <https://www.munichre.com/ca/non-life/business-and-solutions/knowledge-and-tools/reinsurance-glossary/index.html> (accessed 27 Aug. 2016).

<sup>29</sup> Such as the launch vehicle or geographic location of the launch site and its proximity to the populated areas. A. Kerrest de Rozavel & Dunk F.G. von der, *Liability and Insurance in the Context of National Authorisation*, in *National Space Legislation in Europe* 134–135 (Dunk F.G. von der ed., Leiden/Boston: Martinus Nijhoff Publishers 2011). M. Schaefer, *The Need for Federal Preemption and International Negotiations Regarding Liability Caps and Waivers of Liability Caps and Waivers of Liability in the U.S. Commercial Space Industry*, 33(1) Berkley J. Int’l L. 239 (2015).

<sup>30</sup> M. Schaefer, *The Intersection of Insurance Market and Liability Regimes Regarding Third Parties and Space Flight Participants in Commercial Space Activities*, Proc. Int’l Inst. Space L. 413 (2014).



unlikely. Therefore, it is also usually no longer related to an obligation of insurance. Only in some limited jurisdictions is the risk of maximum possible loss to be borne by the space operator, for example the US, where the state is liable only for one of the liability tiers, and Russia where the state serves only as a guarantor.

Depending on the jurisdiction, the PML is either pre-set by law, or only indications thereof are mentioned, while an individual PML is calculated for each space activity in the licensing proceedings. The most characteristic sample of basing liability insurance on the PML can be found in US and Australian space law.<sup>31</sup>

The solution included in the Commercial Space Launch Amendment Act adopted in the US (CSLAA),<sup>32</sup> composed of three tiers of liability, correlates the first tier of liability with the calculation of PML, made by the Office of the Associate Administrator for Commercial Space Transportation with the Federal Aviation Administration.<sup>33</sup> The PML is set by the CSLAA at USD 500 million for third party liability, and at USD 100 million for liability for damage to Government property (these numbers are reviewed annually, which allows it to conform to current liability expectations and availability of insurance on the world markets).<sup>34</sup> In practice, the PML for each separate launch (as well as re-entry) is set at a lower level than the above maximum. The PML is determined on an analysis and assessment of the maximum value of loss or damage that can reasonably be expected to result from licensed activities in the event of a mishap.<sup>35</sup> Exactly as in the insurance underwriting process, the main factors set by the law are based on the given launch vehicle's past performance and refer to its failure probability and the

<sup>31</sup> T. J. Brennan, C. Kousky, & M. Macauley, *Public Private Coproduction of Risk: Government Indemnification of the Commercial Space Launch Industry*, 1(1) Risk, Hazards & Crisis Pub. Pol'y Art. 7 (2010).

<sup>32</sup> Initially it was Commercial Space Launch Act (CSLA) of 30 Oct. 1984, Pub. L. 98-575, amended by CSLAA of 23 Dec. 2004 and finally by Commercial Space Launch Competitiveness Act – Public Law 114-90 – 25 Nov. 2015 which foresees the possibility to update the methodology used to calculate the maximum probable loss from commercial space launch liability claims (s. 102).

<sup>33</sup> G. Catalano Sgrosso, *International Space Law* 495 (2011); Kerrest de Rozavel & von der, *supra* n. 29, at 143; S. Ross, *Risk Management and Insurance Industry Perspective on Cosmic Hazards*, in *Handbook of Cosmic Hazards and Planetary Defense* (Switzerland: Springer International Publishing 2015).

<sup>34</sup> After inflation adjustment in accordance with para. 49, now it amounts to approx. USD 2.7 billion; P. S. Dempsey, *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, 36 *Nw. J. Int'l L. & Bus.* 33 (2016); N. Antoni & F. Bergamasco, *To Orbit and Beyond: The Risks and Liability Issues From the Launching Of Small Satellites at 2*, the 65th IAC in Toronto Canada on Oct. 2014, the Proceedings of the 57th (2014) Colloquium on the Law of Outer Space, International Institute of Space Law, 90–91. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/320158/Guidance\\_for\\_applicants\\_-\\_June\\_2014.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/320158/Guidance_for_applicants_-_June_2014.pdf) (accessed 2 Feb. 2017); J. Hermida, *Risk Management in Arianespace Space Launch Agreements*, XXV *Ann. Air & Space L.* 105 (2000); D. Sagar, *Compulsory Insurance Basic Features of National Insurance Regulations*, Project 2001 Plus Workshop – Towards a Harmonised Approach for National Space Legislation in Europe, Berlin (29–30 Jan. 2004).

<sup>35</sup> K. Hodgkins, *U.S. Commercial Space Transportation Act*, in *Proceedings United Nations/International Institute Of Air And Space Law Workshop On Capacity Building In Space Law* 238 (2003).

proximity of the launch flight trajectory to population and other property, i.e. 'expected loss'.<sup>36</sup>

A similar concept has been adopted in Australia, where the total insurance for each launch and re-entry must reflect the amount of the PML that may be incurred (section 48 (3) of the Space Law). The method of determining the PML in Australia is included in the Regulations and in 'Maximum Probable Loss Methodology',<sup>37</sup> according to which the PML calculation is divided into third-party casualty and third party property losses, the environmental damage and economic loss. It is perceived as the amount of loss that may result from a given launch that results from failure events with a higher chance of occurring than the probability threshold, which is a measure to distinguish between likely and unlikely events and their corresponding losses, using the event probabilities derived from the hazard risk analysis of the flight safety plan.

The concept of calculating the PML seems to be adopted in the majority of other national laws, even where no fixed amounts are specified in the law, or where the factors for the calculation thereof are not so precisely regulated as in the US and Australia. This is the case in Japan, Russia, South Africa, the Netherlands, Belgium,<sup>38</sup> the United Kingdom,<sup>39</sup> Ukraine and South Korea, and it is referred to as an amount capable of compensating the damage possibly occurring in relation to space activities. In some countries, the amount of the PML is pre-set or a fixed amount, or gives regulators some flexibility when imposing an amount of mandatory space liability insurance. This is the case in France, where the financial law (*loi*

<sup>36</sup> According to the § 440.7 the maximum probable loss determination forms the basis for financial responsibility requirements issued in a licence or permit order and is determined by the FAA no later than ninety days after a licensee or permittee has requested a determination and submitted all information required by the FAA; See also T. J. Brennan, C. Kousky & M. Macauley, *More Than A Wing And A Prayer: Government Indemnification Of The Commercial Space Launch Industry* (2009).

<sup>37</sup> *The Maximum Probable Loss Methodology* (2d ed., Department of Industry, Tourism and Resources 1 July 2002).

<sup>38</sup> *Belgium*. The upper limit of the liability of the operator has not been regulated directly by law. It has only been specified that the amount of compensation due to foreign victims, as well as Belgian nationals, may be limited by the King, on conditions that he may determine. In such an event, the state's right of recourse against the operator may not exceed that limit, unless the operator infringes the conditions of the licence granted, or does not comply with the information duties imposed by the law.

<sup>39</sup> The regulation of third party liability has recently been subject to changes in the UK, where the Parliament, responding to the concerns of the space industry, introduced a cap on the liability for licenced UK operators (being so far unlimited). As from 1 Oct. 2015, the operators enjoy a cap on liability (included in the licence), the amount of which is the result of a risk assessment performed for each new launch operation. It is expected that, for most cases involving a single satellite launch with the help of reliable launchers, satellite platforms and operational profiles, the cap will be set at EUR 60 million. The risk of liability towards third parties over this amount will be borne by the government. It should also be mentioned that a draft of a new Spaceflight Bill was announced in Feb. 2017, according to which the insurance requirements are to be set out not by the bill itself, but in regulations issued by authorities, such regulations to 'prescribe – (a) matters to be covered by the insurance; (b) matters that may, or may not, be excluded from the cover required; (c) the amounts of cover required'. (s. 34 of the draft).

*des finances*) mentions the amount of insurance in the amount of EUR 50–70 million,<sup>40</sup> and Austria, where the basic amount of EUR 60 million is provided, where the Minister of Transport has the authority to change or waive the obligation to insure. A direct reference to the concept of maximum probable and maximum possible loss is also made in documents concluded between Arianespace and ESA, where Arianespace assumes liability up to the maximum probable loss, i.e. EUR 60 million.<sup>41</sup> It seems that the concept of PML, rather than fixed sums, is better suited to the challenges of the small satellites industry.

It appears from the above that space risk assessment in terms of third party liability is conducted primarily not by the insurers, but by the licensing authorities, which set the required amount of insurance. The role of the insurer in this case can be limited to applying a specific insurance premium and setting other terms of insurance coverage to the extent not regulated by the national space law, and finally to ‘underwriting’ the space insurance policy. In space property insurance, which is always voluntary, the risk assessment process is fully carried out by the insurer, though the type of information considered by the insurers is at least partially similar to what the licensing authorities analyse.

### 3 RISK DECLARATION IN SPACE INSURANCE

#### 3.1 THE ROLE OF INFORMATION IN SPACE INSURANCE

As shown above, information plays a key role in assessing the risk. It is also one of the bases of any insurance contract. Though it is particularly crucial during the contract formation phase, it also plays a significant role at every subsequent phase. This is also the case with space insurance, where the role of the policyholder in risk declaration, known traditionally as a duty of utmost good faith, is no less significant despite the fact that space insurers are so specialized in space technology themselves. In fact, insurers agree that it is the policyholder, who is familiar with the purpose and criteria of the space project, who determines the success or failure criteria, as well as the reliability factors. In addition, in the event of a loss, it is the insured alone who is able to state whether the malfunction is permanent or can be remedied, and he alone is able to provide proof of loss. In particular, in those cases where the insurer’s access to the technical documentation is limited due to the export control regime, the underwriting information provided by the policyholder may be the main source of

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<sup>40</sup> P. Clerc, *Consequences of French Space Law on Space Operations (FSOA) on CNES’s Mission*, in *Contracting for Space* 124 (J. L. Smith & I. Baumann eds, 2011).

<sup>41</sup> Arrangement between ESA and Arianespace on the launchers exploitation phase of Ariane V, Vega and Soyuz from the Guiana Space Centre which entered into force on 1 Jan. 2009; see also J. Hermida, *Legal Basis for a National Space Legislation*, in *Space Regulations Library* vol. 3, 372 (New York, Boston, Dordrecht, London, Moscow: Kluwer Academic Publishers 2004).

information in the course of the risk assessment.<sup>42</sup> Full control on the subject of insurance and knowledge of the relevant circumstances is in the hands of the insured. This cannot be substituted solely by the insurer's space technology expertise. Thus, though insurers quite often participate in the space project from its beginning, they still have to rely on information provided by the insured.

In conclusion of the above, there is no doubt that the legal provisions concerning the transfer of information and risk declaration at the insurance contract formation are also significant in space insurance. This is the moment where insurance law meets space practice. The question that needs to be answered is what shape it takes in the space insurance contracting phase.

### 3.2 UTMOST GOOD FAITH PRINCIPLE

Risk declaration in insurance contracts is a reflection of one of the most basic principles of insurance, namely utmost good faith. Its roots derive from the first judgments of the British House of Lords in eighteenth century confirming the practice of the insurers of these days. According to the famous statement of Lord Mansfield expressed in the case *Carter v. Boehm* (1766), '*insurance is a contract of speculation: the special facts usually lie in the knowledge of the insured only. The underwriter trusts to him that he conceals nothing, so as to make him form a wrong estimate. If a concealment happens without any fraudulent intention by mistake of the principal or its agent, still the policy is void*'. The above was then explicitly included in the Marine Insurance Act of 1906 (MIA), which, in spite of its name, is widely applied in all other kinds of non-marine insurance contracts.<sup>43</sup> The opinion of Lord Mansfield and then section 17 of the MIA<sup>44</sup> resulted in a harsh practice ruling over centuries, and in many cases misshaping the protective goal of insurance.<sup>45</sup> The possibility of imposing sanctions such as *avoiding the policy ab initio* and rejecting all the claims of the policyholder might be applied regardless of the fault of the insured.<sup>46</sup> This

<sup>42</sup> P. L. Meredith, *Space Insurance Law—with a Special Focus on Satellite Launch and In-Orbit Policies*, 21(4) *Air & Space L.* (2008); K. U. Hörl, *Legal Aspects of Risks Involved in Commercial Space Activities* 152 (Montreal: Institute of Air and Space Law, McGill University 2003).

<sup>43</sup> P. Tyldesley, *Utmost Good Faith – Unintended Injustice?*, 86 *Amicus Curiae* 2–3 (2011).

<sup>44</sup> '*A contract of marine insurance is a contract based upon the utmost good faith, and, if the utmost good faith be not observed by either party, the contract may be avoided by the other party.*'

<sup>45</sup> W swym znanym dzisiaj sformułowaniu 'najwyższego zaufania' koncepcja ta została nazwana po raz pierwszy w orzeczeniu *Life Association of Scotland v. Foster* (1873) 11 M. 351, J. Lowry, *Whither The Duty Of Good Faith In UK Insurance Contracts*, *Connecticut Insurance Law Journal*, at vol. 16., Stwierdzono w nim, że umowa ubezpieczenia pomimo innych odmienności jest na tyle szczególna, że wymaga po obydwu stronach najwyższego zaufania. Dlatego też, nawet bez zamiaru popełnienia oszustwa i nawet działając w dobrej wierze, ubezpieczający może ją naruszyć, pociągając uruchomienie związanych z tym sankcji kontraktowych.

<sup>46</sup> *Pan Atlantic v. Pine Top* (1995) 1 AC 501; *Lambert v. Cooperative Insurance Society Ltd* (1975) 2 Lloyd's Report 485.

trend seemed to be common in spite of the acknowledged concept of the ‘prudent insurer’, and, only theoretically its ‘proactive role to play during the disclosure process’.<sup>47</sup> Partially, it resulted from the lack of obligation of the insurer of making an inquiry on the risk underwritten above the information provided by the policyholder. As a result, the duty of the risk declaration included all circumstances that could in any way affect the decision of the insurer as to the risk coverage and rate of the premium due.<sup>48</sup>

The way in which these rules were applied in the UK and in other jurisdictions, following the pattern of the MIA (known as ‘marine insurance culture’), raised an ongoing objection in civil law countries, and consequently this rigid approach was never widely adopted outside the common law systems (known as ‘alpine insurance culture’).<sup>49</sup> However, in spite of the generic differences between the common and civil law systems of insurance law, the duty of the risk declaration by the policyholder was acknowledged everywhere as a basic insurance principle to such an extent that it has been codified in insurance law as an obligatory binding provision of law. While the obligation is common for all, even for very different legal systems, the difference in the manner of carrying out the obligation of declaring the risk, and the consequences of a breach thereof, may give substantially different results and consequences for the binding force and interpretation of the insurance contract.

The essence of the risk declaration common for all jurisdictions is that the insured must disclose to the insurer material facts that are relevant for the risk assessment by the insurer. However, the manner in which the disclosure is to be made differs from country to country. In most systems, the issue of the materiality of information in relation to the risk is of primary importance, but the way of deciding what information is material and who makes that decision is not homogenous. The most restrictive is traditionally US law (e.g. NY Law<sup>50</sup>) and UK law, though with a visibly changing trend to the benefit of the insured. According to the above, assessing the risk as material seems to be imposed on the insured, which should present the risk to the insurer. This manner of declaring risk is characteristic of common law and is known as spontaneous risk declaration. However, with the

<sup>47</sup> *Friere v. Woodhouse* 2 L.R.Q.B. at 1604–05, Lowry, *supra* n. 45, at 109.

<sup>48</sup> E.g. in the case *Joel v. Law Union and Crown Insurance Company* it was claimed that the insured must disclose material facts, regardless of whether he is aware of their materiality, Lowry, *supra* n. 45, at 112.

<sup>49</sup> H. Cousy, *La fin de l’assurance? Considérations sur le domaine propre de l’assurance privée et ses frontières* (w:) *Droit et économie de l’assurance et de la santé: mélanges en l’honneur de Yvonne Lambert-Faivre et Denis-Clair Lambert* (Daloz, Paris 2002).

<sup>50</sup> See e.g. H. Lee, *Insurance Misrepresentation Principles at Work* (2007), <http://www.stepto.com/assets/attachments/2973>, which explains the strict criteria of misrepresentation and assesses the materiality of the information provided to the insurer; New York Insurance Law: the duty to disclose information on an insurance application (2012), a memorandum prepared for the Law Commissions by David W Kenna, Scottish Law Commission.

recently introduced rule of ‘fair presentation’ the burden of assessing the quality of the information received is shifted more to the who, which should act in a prudent way.<sup>51</sup>

Contrary to the spontaneous system, in most continental systems, for example in France, the risk declaration is made upon a questionnaire prepared by the insurer, where the role of the insured is reduced to properly answering the questions. Only the questions asked are deemed as relevant for the insurer’s decision on risk acceptance. Specific provisions, however, are included in the Belgian law on insurance contracts, where the risk declaration is ‘spontaneous’, only with some modifications to the benefit of the insured, as regards the lack of answers to questions asked in writing by the insurer.

Given these differences in risk declaration systems, it is perhaps unsurprising that the consequences of breaching the risk declaration also differ between the major legal systems. Fortunately, a recent trend towards harmonization in this respect can be observed. It consists of introducing a uniform idea of differentiating between material and non-material misrepresentation, as well as wilful<sup>52</sup> and innocent misrepresentation, and consequently a trend of proportionally adjusting the consequences of a breach relative to its severity.<sup>53</sup>

These tendencies have also been the subject of a comparative work planned to take the form of a common frame of reference in insurance, or an optional instrument introducing an additional regime of insurance contract law. It has been issued under the name of Principles of Insurance Contract Law (PEICL).<sup>54</sup>

<sup>51</sup> See part 2, ss 3 and 4 of the UK 2015 Act, which also abolished ss 8, 9, 20 of MIA, being very restrictive, i.e. the right of the insurer to avoid the contract is limited, as in case where only premium has been assessed too low, the right of insurer is limited to demanding higher premium. It concerns also business insurance. See: The Law Commission and the Scottish Law Commission, *Insurance Contract Law: The Business Insured’s Duty of Disclose and the Law of Warranties*, 130.

<sup>52</sup> According to Art. L 113-8 of the French Insurance Code, the insurer may terminate the contract and keep the premium in case of intentional misrepresentation; it is also reflected in PEICL (Art. 2:104).

<sup>53</sup> E.g. in case of innocent misrepresentation, French law allows only for a change to the insurance terms; Such an approach seems to be reflected in PEICL, which in some cases provide for the right of the insurer to propose a reasonable variation of the contract instead of terminating it, as well as referring the consequences to the materiality of facts not disclosed to the decision on accepting the risk. In NY insurance law, the lack of questions on the specific circumstances usually deprives the insurer of the right to rescind the contract; C. Cole & K. McCullough, *Material Misrepresentations in Insurance Litigation: An Analysis of Insured’s Arguments and Court Decisions*, 34(3) J. Ins. Reg. (2015). See also part 2, ss 3 and 4 of the UK 2015 Insurance Act, which abolished the very restrictive ss 8, 9, 20 of MIA and now the consequences of misrepresentation, i.e. the right of the insurer to avoid the contract, are limited. The Law Commission and the Scottish Law Commission, *Insurance Contract Law: The Business Insured’s Duty of Disclose and the Law of Warranties*, 130.

<sup>54</sup> Principles of European Insurance Contract Law drawn up by a group of Academics at the order of the EU, which hope to become a parallel insurance contract law regime. See more on: [www.peicl.org](http://www.peicl.org). See also J. Basedow, J. Birds, M. Clarke, H. Cousy, H. Heiss & L. Loacker, *Principles of European Insurance Contracts Law* (2d ed., Koln: Otto Schmidt 2016).

### 3.3 IMPLICATIONS OF THE UTMOST GOOD FAITH PRINCIPLE FOR SPACE INSURANCE

All these tendencies are applicable to space insurance, which, in practice, is inclined to use standard contractual clauses, regardless of which legal system governs the contract.

It is interesting to note that space insurance contracts, though usually based on common law, tend to define risk by responding to the requests of the insurer about the space project (i.e. the questionnaire system), which is more characteristic of civil law countries.<sup>55</sup> It can therefore be assumed that the requested information is material for the insurer, and that misrepresentation within that scope may authorize the insurer to apply remedies, though it can also be presumed that information not requested by the insurer is not material for the risk assessment. In space insurance contracts, the declaration of risk may also come into question at the renewal of the policy in orbit, where the health of the satellite is to be presented to the insurer, together with data on fuel still available, and any problems that affected the same or a similar type of satellite.<sup>56</sup> Also for this stage, the type of the risk declaration obligation should be carefully considered (spontaneous or questionnaire).

Though the risk declaration is relevant mostly during the insurance contract formation phase, there is no doubt that the risk may be subject to some changes during the contract period. The main point of interest for insurers in this respect is obviously the aggravation of the risk. Risk aggravation concerns such changes to the risk that are material and that change the risk for worse, beyond the scope of natural wear and tear.<sup>57</sup> In countries where the aggravation of the risk has been regulated, reference is made to the circumstances included in the risk declaration duties,<sup>58</sup> which are subject to the risk assessment during the contracting phase.

The requirements as to the declaration of the risk changes during the term of an insurance contract, differ between various legal systems.<sup>59</sup> For example, in Germany and France the obligation of the insured to report changes in risk derives

<sup>55</sup> Similar clauses may be found in insurance contracts of private satellites as well as in insurance terms for Galileo, where it was explicitly stipulated that the insured must respond to all reasonable and specific written requests regarding design, test, manufacture, quality control, launch, orbital and performance information concerning the Satellite or Launch Vehicle or the subject matter of Insurance, which is available to the insured; though it should be noted that the insurance contract for Galileo satellites is governed by Belgian law, where the mixed system is binding.

<sup>56</sup> International Space Brokers Ltd, *Memorandum – Risk and Legal Liability in Commercial Space Launches* (2000); G. Lyons et al., *Aviation Underwriting*, General Insurance Convention 399 et seq. (1996); see also Posner et al., *supra* n. 18, at 161.

<sup>57</sup> M. Clarke, *An Introduction to Insurance Contract Law*, in *Research Handbook on International Insurance Law and Regulation* 12 (Edward Elgar Publishing 2012).

<sup>58</sup> Basedow et al., *supra* n. 54, at 199; Y. Lambert-Faivre & L. Leveneur, *Droit des assurances* 274–277 (13<sup>e</sup> édition, Paris: Editions Dalloz 2011).

<sup>59</sup> EU, *Final Report of the Commission Expert Group on European Insurance Contract Law* 47 (2014).

from the law, which means that it does not have to be provided in the contract.<sup>60</sup> A similar regulation exists in Belgium.<sup>61</sup> In other systems, the insured may be obliged by the contract to report changes in risk, since such an obligation does not exist per se. The latter solution is present in common law,<sup>62</sup> where the duty not to aggravate the risk, if included in the contract, is perceived as a continuing warranty that implicates relevant remedies for the insurer, such as the right to increase the premium or even terminate the contract.

As the case law reveals, in the event of risk aggravation, the insurer has the possibility of cancelling the contract.<sup>63</sup> The above mostly concerns the intentional behaviour of the insured with respect to the features of the risk covered, such as the way of performing activity, a change in the purpose of premises, etc. However, no such duty to inform the insurer about the aggravation of risk results from the law (the MIA or case law), so it must be set out in a contract in order to be binding.<sup>64</sup> The issue of risk aggravation has been regulated in PEICL, which makes the information on risk aggravation dependant on an explicit regulation in the insurance contract, and only concerns material aggravation.

The risk aggravation rules have a limited application to space insurance. The information duties concerning the risk changes are only binding at the renewal of the insurance coverage (in in-orbit insurance), where information such as the health status of the satellite is required. However, any changes in risk during the risk period under one policy are not taken into account and cannot be a reason for changes in the premium or the termination of the contract. Such an approach relates to the specifics of the space insurance risk. At the launch stage, the risk period is relatively short, so any aggravation of the risk is to be considered, in practice, before the risk attachment. Information on material changes in this respect is usually requested by the insurers, and respective clauses are included in the insuring agreements with severe consequences of a breach of the notification duty.

Space insurance has worked out a specific practice with respect to risk changes revealed during the contract term but before the risk attachment. This seems to be an important part of the terms of cover, and is due to the long period of time

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<sup>60</sup> Art. L 113 of the French Insurance Code; See also Y. Samothrakis, Discussion Paper III Differences in Insurance Contract Laws and Existing EU Legal Framework, 10.

<sup>61</sup> Belgian law provides for the obligation to report changes to risks that are material and fixed (durable) in accordance with the rules for risk declaration at the beginning of the contract (*Article 26: Aggravation du risque*).

<sup>62</sup> Clarke, *supra* n. 57, at 12.

<sup>63</sup> M. A. Clarke, J. M. Burling & R. L. Purves, *The Law of Insurance Contracts* 640 (6th ed., London: Informa 2009).

<sup>64</sup> See e.g. *Hussain v. Brown* (No 1) [1996] 1 Lloyd's Rep. in M. A. Clarke, J. M. Burling & R. L. Purves, *The Law of Insurance Contracts* 652 (6th ed., London: Informa 2009), where the duty of disclosure of the risk alteration was imposed in the contract ('any alteration likely to increase the risk of loss or damage to the property insured') and it was perceived by the court as a continuing duty of good faith.



between negotiating the terms of insurance, the risk assessment and the moment of risk attachment. During this time, as practice shows, there may be substantial changes to the design of the satellite and the launch contract, including the place of the launch and the launch vehicle. All of the above may affect the insurability of the risk, or at least the rate of the premium. In assessing what change is material, the insurance terms usually refer to the underwriting information, i.e. provided at the conclusion of the contract, during the underwriting process. This situation cannot, however, be qualified as an aggravation of risk *sensu stricto*, as it concerns the risk alteration before its attachment, while a classical risk aggravation regulation refers to changes during the risk period.<sup>65</sup> Even where a material change to the risk is revealed after the risk attaches, it usually concerns circumstances that changed before the risk attached (see the terms of Galileo insurance).<sup>66</sup>

Clauses usually included in space insurance contract terms obliging the policyholder to notify material changes before the risk attachment, impose a duty to notify the insurer of any waiver or modification of the technical specification of the satellite. This in turn enables the insurer to review the terms and conditions of the insurance and renegotiate the terms in case the waiver or modification entails changes in the risk or insurable interest.<sup>67</sup> According to space insurance practice, material changes give the insurer the right to renegotiate the terms of the contract.<sup>68</sup> It seems that the insurer does not have the right to terminate the insurance contract, this usually being afforded to the insured. Thus, the main consequence of a material change in risk is that the insurer is liable only to the original risk accepted for coverage, unless the parties renegotiate the terms. The result of a material change in risk may be:

- (1) an agreement between the parties on changing the insurance terms, or
- (2) the exclusion of the changes in risk from the coverage, and to cover only the original risk, or
- (3) the termination of the insurance contract by the insured.

The same result as under point (2) seems to be applicable in the case of not notifying the change of the risk by the insured. The avoidance of liability, however, is not a simple issue and usually depends on the cause of damage,

<sup>65</sup> See e.g. the French and Belgian laws, which refer to changes during term of the contract (Art. 26 of the Belgian insurance contract law).

<sup>66</sup> Galileo Satellites Insurance and Coordination Services, Contract Notice no 2015/S 087-157511.

<sup>67</sup> The wording of the standard insurance clauses provide that, if the insured waives or modifies any technical specifications, the insured should promptly inform the insurer of the waiver or modification and the insurer will have then the right to review all of the terms and conditions of the policy with the insured and, in case the waiver or modification results in an increase in risk, to renegotiate the terms; in S. Tucker, *Some Strategic Defence Initiatives Toward Preventing U.S. Space Insurance Related Disputes and Litigation*, 21(2) J. Space L. 128 (1996); Hörl, *supra* n. 42.

<sup>68</sup> Meredith, *supra* n. 42; Montpert, *supra* n. 13, at 285.

which is sometimes hard to discover. In the event of a change being recognized as material and not reflected in contract terms, it is up to the insurer to prove that the damage resulted from material changes of the risk from before the risk attachment.

Given the importance of the risk declaration in insurance law and its obligatory binding force, as well as the particular importance of the individually tailored 'underwriting information' in space projects, a cautious approach to drafting insurance clauses should be adopted. Even though space insurance contracts seem to be self-regulating, operating on the same standard clauses for various jurisdictions, from a purely legal point of view they are not. Thus, space insurance contracts should not neglect the binding legal provisions of the law applicable to the contract. It may decide the manner of risk declaration (spontaneous or based on questionnaire), whether the clauses agreed by the parties are valid and what their interpretation is under a given law, and, finally, what the consequences are of a breach of duties related to the 'underwriting information'. Though the consequences are mostly regulated in the insurance contract, the legal effects also derive from the national jurisdiction of the insurance contract, and may sometimes prevail over the policy terms (statutory obligation and the consequence of a breach).

#### 4 CONCLUSIONS

The analysis carried out in this article shows that, unlike many other types of insurance, risk assessment in space insurance is strictly dependant on rules specific for the space industry. These rules seem to supplement the insurance underwriting techniques, and space insurers can benefit from the risk assessment methods applied by national space authorities. However, the underwriting tasks of space insurers go far beyond the interests of licensing bodies, as they cover first party risk as well as third party liability risk. As a result, the 'underwriting information' should also be more specific than the risk data collected by the space authorities. The stage of contracting in space insurance is only one example of how space insurance is very different from other types of insurance. Other phases of insuring space risks, such as the loss adjustment phase, also show substantial specificities. What places space insurance closely alongside other areas of insurance, however, is the close cooperation between the parties, and the focus put on utmost good faith at every stage of the process.

On the other hand, however, though space insurance contracts are based upon an established contractual practice, they must also comply with the provisions of the law applicable to the given insurance contract, where the same wording may have a different interpretation depending on the law governing the contract (e.g. French or UK – having a different perspective on the policyholders' rights, or

Belgium – chosen for the Galileo insurance contract). Even though space insurance disputes, if any, are usually resolved in an amicable way, the differences in insurance cultures may affect the way of thinking of the arbitrators or experts. Fortunately, as shown, the standard clauses in space insurance policies are policyholder-friendly, at least as regards the risk declaration methods, risk aggravation and warranties. Even when applying English or New York law to the insurance contracts, the parties tend to apply the continental system of declaring risk. Nevertheless, it is worth considering whether or not the patterns created by the PEICL group as presenting the best solution worked out on the basis of the comparative approach, could be used by space insurers (or brokers drafting the terms of insurance) as a new contractual model.