

Regulatory Aspects in Launch Services Contracts for Small Satellites

Successful Docking in Legal Space?

Kang Duan*

Abstract

The United Nations space treaties establish the basic legal framework governing outer space activities. While it is through national space legislation that the spirit and schemes in these treaties are further instilled into specific entities undertaking space activities, launch services contracts play a notable role in final stage of rendezvous and docking with the legal infrastructure at international level. For example, allocation of risk/liability mechanism in these contracts is deeply influenced by treaty provisions and national legislation. These arrangements seem to be made all the more complicated in the context of international launch projects. Growing demand from the small satellite sector for ride hitching opportunities in space launch begs the question of whether and how the launch service contracts need to be tailored to accommodate industry demand and regulatory needs. This paper purports to examine some of the regulatory issues surrounding risk/liability management under standard and piggyback launch services contracts, which reflect deliberate compliance on micro-level with the international and national legal framework on macro-level.

I. Introduction

Space projects are high technology and high risk ventures involving a myriad of contracts connecting a plethora of participants, such as launch services providers, satellite operators, their contractors and subcontractors, insurers, governmental entities etc. These contracts are set against the backdrop of domestic laws and regulations which are influenced and reflect the international regulatory framework. Specifically, since space transportation is one of the most critical stages of space exploration adventures, the interplay of international and national space law has shaped the approach to risk/liability management in launch services contracts. This paper begins by a general review of international and national space law aspects relating to

* China Great Wall Industry Corporation

risks and liabilities in space launch activities, then analyzes how these rules flow down to the participants by way of contractual arrangement from the perspective of launch services contracts, and finally discusses how these regulatory issues are addressed in piggyback launch services contracts for small satellites.

II. Setting the Tone—International Space Law

Thanks to commendable joint efforts of the international community, the fundamentals of an international legal framework for space activities were established not long after the Space Age was ushered in following the launch of Sputnik. Space treaties¹ drafted under the auspices of the United Nations by the Committee on the Peaceful Uses of Outer Space, supplemented by relevant UN principles, declarations and resolutions, have firmly enshrined into them generally accepted norms² for human adventures in exploring the wilderness of outer space carried out both by governments³ and non-governmental entities. This part focuses on some of the basic principles laid down in those treaties that are of particular significance to launch services contracts.

1. State's International Responsibility

The first and foremost principle of states bearing international responsibility for their national space activities⁴ stems from the compromise between conflicting approaches of the two major space powers at the time.⁵ Balance was struck by imposing responsibility on the states parties for assuring

* This paper represents the personal views of the author only and not those of any organization with which the author is connected.

1 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty); Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement); Convention on International Liability for Damage Caused by Space Objects (Liability Convention); Convention on Registration of Objects Launched into Outer Space (Registration Convention); Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement). The Outer Space Treaty, Liability Convention and Registration Convention are most relevant to the issues discussed here in this paper.

2 Note that the *Moon Agreement* may be an exception due to its limited number of signatories relative to the other four UN space treaties.

3 International intergovernmental organizations (IGOs) may also declare acceptance of rights and obligations under certain treaties. See current status of UN space treaties, http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2018_CRP_03E.pdf, (last visited on September 8, 2018)

4 See Article VI of the Outer Space Treaty

5 In the Soviet Union's view, space activities should be the reserve of governments only, while the U.S. argued that they could be conducted by the private sector as well.

national activities, including those carried out by non-governmental entities, are carried out in conformity with treaty provisions. In this vein, the Outer Space Treaty further provides that activities of the non-governmental sector shall require authorization and continuing supervision by the appropriate state party.

2. State's International Liability

Apart from responsibility, the Outer Space Treaty also imposes international liability on certain state(s)⁶ for damage caused to another state or to its natural or juridical persons by its space object or its component parts. In furtherance of this general principle, the Liability Convention established a legal regime to regulate such concrete issues as basis of liability, exoneration, damage, compensation, procedures, statute of limitations etc. It is especially notable in introducing a dual system of liability: absolute liability for damage caused by its space objects on the surface of the earth or to aircraft in flight; fault-based liability for damage caused elsewhere than on the surface of the earth.

Despite its monumental achievement, the Liability Convention still left a few definitional issues unsettled⁷, given the understandable generality in the Outer Space Treaty. For example, it is unclear as to whether a particular object shall be considered as "space object" for the purpose of entailing international liability, or which type of involvement in a space activity should constitute "procurement" of launching.⁸ These gaps in international treaties are later filled through municipal laws, though non-uniform, as illustrated in the next part.

3. Registration of Space Objects

The Registration Convention, which requires the launching state to register its space objects launched into outer space in its national registry and with the United Nations, is intended to *inter alia* assist in identification of the space objects, thus creating a legal nexus between them with their state of registration that is conducive to application of the Outer Space Treaty, Liability Convention and Rescue Agreement⁹.

6 See Article VII of the Outer Space Treaty. "Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched..." Such text is incorporated into the Liability Convention and the Registration Convention for the definition of "Launching State".

7 Carl Q. Christol, *International Liability for Damage Caused by Space Objects*, 74 AM.J. INT'LL. 346, 356 (1980)

8 For analysis, see Stephen Gorove, *Major Definitional Issues in the Space Agreements*, in Proceedings of the Thirty-Fifth Colloquium on the Law of Outer Space, 77 (1992).

9 As underlined by Niklas Hedman in his presentation "Registration of Space Objects with the United Nations", delivered at United Nations/China/APSCO Workshop on

A problem may arise in an international launch project with multiple launching states as to which state shall register the payload. It is thus important for states to clarify the criteria for including space objects in their national registry when implementing the Registration Convention. In order to achieve the treaty's aforementioned objective, space objects would better be registered by states maintaining *de facto* jurisdiction and control over them. Accordingly, domestic regulation and customs have implications for drafting of launch services contracts with foreign customers.¹⁰

III. Conducting an Orchestra —National Space Law

After becoming parties to the space treaties, states are left with the task of translating treaty obligations into enforceable mechanisms on national level by various means, one of which is to prescribe national space law so that international norms trickle down to non-governmental entities in their jurisdiction. Although a treaty seldom forthrightly speaks about the need for national legislation to ensure adherence or compliance, the UN General Assembly Resolution 68/74¹¹ and the steadily growing number of states enacting regulatory frameworks¹², in particular to embrace the Newspace Age, all testify to the appeal of domestic legislation for the purpose of both treaty implementation and effective governance. This part hence examines one nearly uniform element in national space legislation, i.e. third party liability, as it is shaped by international space law and conversely shapes the risk management in launch services contracts. A typical TPL regime covers the following aspects:

Space Law held in Beijing, China in 2014. <http://www.unoosa.org/documents/pdf/spacelaw/activities/2014/pres08E.pdf>, (last visited on September 8, 2018)

- 10 We now generally include provisions in the launch services contracts or in-orbit delivery contracts obligating foreign customers to register their satellites in whatever state that may exert jurisdiction over the said space activity.
- 11 General Assembly Resolution 68/74: Recommendations on national legislation relevant to the peaceful exploration and use of outer space, adopted on 11 December 2013. Available at http://www.unoosa.org/pdf/gares/A_RES_68_074E.pdf, (last visited on September 8, 2018)
- 12 According to the study of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space established under the Legal Subcommittee of UNCOPOUS, around 25 countries had by then (2011) enacted laws, regulations, decrees or orders relating to space activities. For detailed analysis, see http://www.unoosa.org/pdf/limited/c2/AC105_C2_2011_CRP04E.pdf, (last visited on September 8, 2018).

Since then, Indonesia, Denmark, New Zealand, Luxembourg and Finland have been added to this list. Besides, USA, Japan and UK have all recently complemented their regulatory frameworks with new laws.

1. Basis of Liability and Exoneration

The Liability Convention makes the distinction between absolute liability and fault liability on account of geographical limits where damage occurs. How will treaty rules concerning basis of liability fit into the general picture of domestic tort law? Are space activities of such peculiar nature as to warrant additional tort rules in national TPL regime? Approaches taken in this regard vary among states in light of their different legal systems. Russia¹³, France¹⁴ and the Republic of Korea¹⁵ explicitly stipulate basis for imputation of liability in their national laws, using texts similar to that in the Convention. The U.S. national space legislation does not address this issue specifically, leaving it to be adjudicated pursuant to general tort law rules.¹⁶

As the Convention does¹⁷, many states recognize exoneration from absolute liability to the extent of gross negligence or intentional act or omission of the injured party. It's worth noting that the Space Liability Act of the Republic of Korea also grants exoneration in cases of armed conflicts between countries, hostilities, civil disturbances or mutinies.¹⁸

2. The Party Liable

The Liability Convention does not rule out the possibility of claims being pursued in national courts, it is thus necessary to identify the party liable for paying compensation on the domestic level. Besides, states are concerned with establishing their right to recourse as regards space activities conducted by non-governmental entities.

States' general practice is to channel liability to the operator or the license holder. Moreover, the party held liable statutorily for third party damage is often entitled to be indemnified by the party which has caused the damage.¹⁹ However, if such right of indemnification is pursued against any party involved in such space activity, it is usually limited to cases of gross

13 Article 30.3, Decree 5663-1 About Space Activity, http://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/russian_federation/decree_5663-1_E.html, (last visited on September 8, 2018)

14 Article 13, LOI no 2008-518 du 3 juin 2008 relative aux opérations spatiales (Law No. 2008-518 of 3 June 2008 Related to Space Operations), translated by Philip Clerc and Julien Mariez, Centre National d' Etudes Spatiales (CNES) Legal Department, France. 34-2 J.SPACE L.453 (2008)

15 Act on Compensation for Damage Caused by Space Objects, or the Space Liability Act, http://elaw.klri.re.kr/eng_service/lawView.do?hseq=28237, (last visited on September 8, 2018)

16 In the United States, torts law comprises primarily of common law and subject to civil codes of individual states.

17 Article VI (1) of the Liability Convention

18 These causes are typically listed in the exclusion clause in the TPL insurance policy.

19 See Article 34 (4) of UK Space Industry Act of 2018. <https://www.legislation.gov.uk/ukpga/2018/5/contents/enacted/data.htm>, (last visited on September 8, 2018)

negligence and willful misconduct.²⁰ Domestic rules in this regard will influence the TPL risk management in the launch services contracts.

3. **Mandatory TPL Insurance**

Apprehensive about the potential exposure to international liability, states find relief in imposing legislative TPL insurance requirements²¹, which now has become a standard precondition for authorization.²² Although liability imposed on states under space treaties is limitless, a cap has to be placed on TPL insurance amount in order to maintain the viability of space industry and space insurance business.²³ The United States introduced the concept of maximum probable loss for prescribing insurance amount in each license, many other states follow suit. However, the maximum or minimum level of insurance required varies from state to state.²⁴ Besides, an increasing number of states, in line with their ambitions to attract small satellite operators, are requiring TPL insurance covering satellite in-orbit phase.

4. **Risk-Sharing Regime**

Taking into account the strategic importance of space launch industry, states with launching capabilities have over time developed a risk-sharing regime, under which launch operators' third party liability is limited to the required insurance amount, and the government bears liability above this limit.²⁵ In order to incentivize growth of domestic satellite industry, some countries extend the benefit of government indemnification to satellite operators as well.

20 For example, Article 19 of French Space Operations Act provides that, where a third party is indemnified by insurance, none of the persons having taken part in the space operation or in the production of the space object which caused the damage can be held liable by another of these persons, except in case of willful misconduct.

21 Some states, such as France and U.S., also allow for financial guarantee or demonstration of financial responsibility in their laws and regulations. However, as the U.S. government suggests, the most common and preferred method is to purchase liability insurance. https://www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/mppl_values/, (last visited on September 8, 2018)

22 Note that space activities carried out by the government or their agencies are often exempt from authorization or insurance requirements. See France's Space Operations Act, Finland's Act on Space Activities, Austria's Outer Space Act, US Code of Federal Regulations §400.2 etc.

23 For further analysis, see Kevin M. Costello, *The Commercial Space Launch Act Amendments of 1998 and Launch Industry Insurance Reform*, 14 Suffolk Transnat'l L.J. 492, (1990-1991)

24 To be discussed in details in Part IV.

25 The government risk-sharing regime in space activities could trace back to the age of space shuttle, when NASA required users to obtain maximum liability insurance available, and provided indemnification for any amount in excess of that coverage. Then a similar regime for its private space launch industry was created by enacting CSLA of 1984 and its 1988 amendments.

IV. Risk/Liability Management—LSC’S Approach

Following a general review of regulatory aspects on the international and national level, this part discusses how they influence the launch services contracts (LSC), with a particular focus on contractual risk/liability management.

Broadly speaking, there are two main types of risks associated with space launches that may generate liability: risks of damage to the launch vehicle and/or the satellite as well as personal injury to the employees of launch provider and satellite operator (first party damage); risks of property damage and/or bodily injury caused to non-participating third parties (third party liability). A typical launch services contract contains an “allocation of risks/liabilities” clause to address these risks. As insurance is a critical form of risk management, some contracts include a separate insurance clause.

As for second party property damage involving government (or IGO) launch facilities and/or range services, practice varies depending on management mechanism of the particular government assets.²⁶

1. First Party Damage: Risk Allocation

A. “Best Efforts” Principle

Before delving into the issue of risk allocation regarding first party damage, a premise shall be stressed on the outset that launch providers are operating under the “best efforts” principle, meaning that the launch services shall be deemed to have been fulfilled when launch has taken place, and the launch providers do not undertake to make any representation or warranty as to the success of the launch mission, provided that they have exercised due diligence and conformed to all technical specifications pursuant to the contract.

B. Reciprocal Waiver

Reciprocal waiver in the space launch project means that, the launch provider and customer agree to be responsible for any damage either of them may sustain to its own property and/or employees during launch operations, regardless of which party causes the damage, and regardless of whether such damage arises from negligence or otherwise.

²⁶ For example, the United States requires launch provider to obtain an insurance policy giving protection against damage or loss to property at a federal range facility. FAA prescribes in each license the amount of government property insurance. For further information on Arianespace’s arrangement, see Julian Hermida, *Risk Management in Arianespace Space Launch Agreements*, <http://www.julianhermida.com/dossier/dossierarianespace.htm>, (last visited on September 8, 2018). For Russia’s requirement, see Olga Volynskaya, *Space Insurance Law-A New Step to Space Commercialization in the Russian Federation*, in Proceedings of the Fifty-Fifth Colloquium on the Law of Outer Space, (2012).

Combined with the best efforts principle as mentioned above, this exculpatory clause practically imposes the risk of first party damage on the party sustaining the damage, and thus it is the customer that usually bears the brunt of a launch failure. Plenty has been expounded justifying this purportedly onerous burden²⁷, and earlier projection²⁸ as to the reciprocal waiver possibly being abandoned with growing up of the commercial launch industry does not seem to materialize any time soon.

The concept of cross-waiver of liability was initially developed by NASA to facilitate multi-client use of the space shuttle²⁹ and to simplify allocation of risk.³⁰ Now not only has reciprocal waiver become a standard clause in space launch contracts, but also it has been codified in some national space laws and widely used in international agreements for joint space activities³¹. The United States statutorily provides³² that a launch license duly issued shall contain a provision requiring the licensee to make a reciprocal waiver of claims with applicable parties³³ involved in launch services. There is a question mark over whether an automatic reciprocal waiver is hence created even in absence of such a contract clause.³⁴ France takes one step further in its space law by explicitly exonerating liability for damage caused by one

27 See R. Bender, *Space Transport Liability, National & International Aspects* (Utrecht Studies in Air and Space Law/Nijhoff, Dordrecht, 1995), at 239.

28 For example, Professor Masson-Zwaan predicted in early 1990s that the day would come soon, as pioneering period is clearly coming to an end, and space enterprise seems to flourish. See Tanja L. Masson-Zwaan, *The Martin Marietta Case or How to Safeguard Private Commercial Space Activities*, in *Proceedings of the Thirty-Fifth Colloquium on the Law of Outer Space*, (1992).

29 *Supra* note 27, at 209.

30 H. Peter van Fenema, *The International Trade in Launch Services-the effects of U.S. laws, policies and practices on its development* (Doctoral Thesis, 1999), at 71.

31 According to the draft Report of the Working Group on the Review of International Mechanisms for Cooperation in the Peaceful Exploration and Use of Outer Space, cross-waiver of liability is one of the most significant and complicated provisions with respect to Framework Agreements (in international cooperation), and it should be noted that claims between a Party and its own related entity, contract claims between the Parties, etc. are outside of a cross-waiver of liability (in Framework Agreements). http://www.unoosa.org/oosa/en/oosadoc/data/documents/2017/aac.105c.22017crp/aac.105c.22017crp.15_0.html, (last visited on September 8, 2018)

32 See 51 U.S. Code § 50914-Liability insurance and financial responsibility requirements, available at <https://www.law.cornell.edu/uscode/text/51/50914>, (last visited on September 8, 2018); US Code of Federal Regulations §440.17-Reciprocal waiver of claims requirements, available at https://www.ecfr.gov/cgi-bin/text-idx?SID=58846f75b6f0a2909453007f93547791&mc=true&node=se14.4.440_19&rgn=div8, (last visited on September 8, 2018)

33 “applicable parties” means (i) contractors, subcontractors, and customers of the licensee or transferee; (ii) contractors and subcontractors of the customers; and (iii) space flight participant.

34 *Supra* note 27, at 233.

person taking part in the space operation or in the production of the space object to another person taking part in such operation or production.³⁵ Its reciprocal waiver is not only automatic, but also covers production phase in addition to launch operations.

C. Uncertainties

The first uncertainty concerns enforceability of reciprocal waiver clause in national courts of a jurisdiction where it may contradict with other contract or tort principles and rules. For example, clauses for the purpose of exoneration of responsibility in cases of bodily injury are prohibited under French Law.³⁶ China's Contract Law also stipulates that any provision in a contract shall be held invalid that exonerates liabilities for personal injuries to other party.³⁷ It could be argued that reciprocal waiver is for the mutual benefits of both parties with equal bargaining power and that the object is to shift burden of liability rather than to evade liability. One solution is to add indemnification provisions to the effect that the party whose employees proceed with claims against the other party shall indemnify and hold harmless the other party from such claims. Secondly, it is unclear whether the wording "no-fault", "regardless of fault", "through negligence or otherwise" in a standard inter-party waiver clause³⁸ is intended to preclude claims for damage caused by willful misconduct and gross negligence. If yes, can parties contractually waive liability under these circumstances?³⁹ China's Contract Law straightforwardly invalidates any contract provisions of this kind.⁴⁰ France's space law excludes exoneration of liability in cases of willful misconduct.⁴¹ However, as is demonstrated in earlier cases contested in U.S. courts, results could be rather unpredictable

35 Article 20 of the French Space Operations Act stipulates that, "In the case of a damage caused by a space operation or the production of a space object to a person taking part in this operation or in that production, any other person taking part in the space operation or in the production of the space object having caused the damage and bound to the previous one by a contract cannot be held liable because of that damage, unless otherwise expressly stipulated regarding the damage caused during the production phase of a space object which is to be commanded in outer space or during its commanding in orbit, or in case of a willful misconduct."

36 *Supra* note 26, Julian Hermida. The author made the observation before France enacted the Space Operations Act.

37 See Article 53 of the Contract Law of the People's Republic of China. http://www.npc.gov.cn/wxzl/wxzl/2000-12/06/content_4732.htm, (last visited on September 8, 2018)

38 Drafting of this clause in launch services contracts is rather inconsistent, which is often the conciliatory results of intensive negotiation. Some clauses explicitly rule out its applicability in cases of willful misconduct and gross negligence.

39 It's also worthy of note that the limitation of liability clause may exclude claims based on willful misconduct and gross negligence as well.

40 *Supra* note 37.

41 *Supra* note 35.

given the subtleties of contract/tort law issues involved, especially for claims based on gross negligence.⁴²

A third uncertainty arises when the reciprocal waiver “flows down”⁴³. In order to achieve the objectives conceived for this risk allocation mechanism, parties are also obliged to have their contractors and subcontractors bound to an identical no-fault, no-subrogation inter-party waiver. Nuance of wording in flow down clause sometimes renders it unclear whether they waive liability against their own contractors and subcontractors.⁴⁴ Negotiators have to be cautious about the extent to which liability is waived along the “cross line” chain of actors and along the “straight line” as well.⁴⁵ All the aforementioned uncertainties underline the necessity for parties to pay utmost attention to intricacy of drafting and negotiating the terms under space contracts.

2. Insurance Covering First Party Damage

After identifying allocation of risks with regard to first party damage, we then discuss the approach to managing them. Taking into account high stakes in space activities, parties generally resort to insurance for coverage against these risks. First party insurance policies are offered on the basis of “all-risks”, covering all forms and causes of damage, including incidents of malfunctions and faulty design.⁴⁶

42 In *Martin Marietta v. Intelsat*, the federal court of appeals held that the provisions in the contract were ambiguous when taken as a whole and that CSLA amendments were not intended to protect parties from liability for their own gross negligence. However, it affirmed the trial court holding that the launch service provider did not have a tort duty of due care independent of the parties’ contract relationship. <https://openjurist.org/991/f2d/94/martin-marietta-corporation-v-international-telecommunications-satellite-organization>, (last visited on September 8, 2018). For more analysis, see R. Bender, *The Developing US Law of Liability Applicable to Launch Agreement Parties*, in *Proceedings of the Thirty-Fifth Colloquium on the Law of Outer Space*, 77 (1992).

43 For controversy surrounding this uncertainty, see *Appalachian Insurance Co. v. McDonnell Douglas Corporation*, see <https://caselaw.findlaw.com/ca-court-of-appeal/1775639.html>, (last visited on September 8, 2018)

44 Cross waiver clause contained in NASA’s launch services contract using the space shuttle explicitly excludes its applicability with respect to claims between the customer and its contractors or subcontractors and claims between the United States and its contractors or subcontractors.

45 For example, in a typical contract of supply between satellite operator and satellite manufacturer, the flow down cross waiver clause does not prejudice liability that stems from the manufacturer’s warranty obligations (possibly in the form of foregoing performance incentive). In the “turnkey” contract for in-orbit delivery, negotiators have to bear in mind distinction between contractor’s liability as supplier of products and as launch services provider.

46 http://www.aon.com/russia/files/Insuring_Space_Activities_whitepaper.pdf, (last visited on September 8, 2018)

A. Types of Insurance

It is customary that insurance against any risks are to be obtained by the party bearing them with insurable interests. For the purpose of insurance placement, space launch project is now examined in three phases: pre-launch, launch and in-orbit.

During the pre-launch phase, since each party takes care of risks associated with its own property, the launch provider procures launch vehicle pre-launch insurance and the customer procures satellite pre-launch insurance to cover against hazards for transportation to the launch site and pre-launch operations, including assembly, integration, processing, mating, propellant loading etc. Coverage usually extends to ignition of the launch vehicle.⁴⁷

During the critical launch phase, as inferred from previous analysis regarding allocation of risks, the customer takes over the launch risks at the point of ignition (unless terminated ignition occurs), where launch insurance steps in to provide coverage for loss of or damage to the satellite⁴⁸ for a certain period after launch.

At nascent stages of commercial space launch, satellite operators/manufacturers threw their lot with insurance carriers⁴⁹. Later on, launch providers, compelled to share part of the risks due to competition pressure, began to offer launch risk guarantee in the form of a reflight/refund option⁵⁰. Such guarantee can be insured at expense of the customer to cover costs for launch services in the event of a launch failure.

During satellite in-orbit phase, satellite operator typically places “life” insurance to cover risks starting from expiration of the launch insurance policy, and renew it on yearly basis.

B. Waiver of Subrogation

In order to ensure flow down of the no-fault, no-subrogation inter-party waiver of liability, insurers shall waive subrogation rights to the same extent

47 In a ground delivery project, the satellite manufacturer transfers title and risk of loss or damage to the satellite to the satellite operator (customer of the launch services) at this point. In an in-orbit delivery project, the satellite manufacturer (if also the customer of the launch services), who assumes the launch risks, transfers title and risk of loss or damage to the satellite to the satellite operator following satellite in-orbit tests.

48 From the point of ignition on afterwards, parties are not much concerned with risk of loss or damage to the launch vehicle, as launch service is deemed to be performed by the launch provider and launch services cost is included in the insured sum under launch insurance policy. Therefore, in a launch services contract, provisions are not necessary to address the transfer of risk about the launch vehicle, nor is there a need to provide for transfer of risk concerning the satellite, which remains virtually all the time with the customer.

49 Initially, launch insurance available in the market were prohibitively expensive with a premium rate of 30-40%.

50 The customer can only ask for a reflight in the event of total loss or constructive total loss of the satellite.

that the named insured has waived its own rights of recourse against any other participants involved in the space project. It is thus necessary to impose contractual obligations regarding insurance placement and to include waiver of subrogation in the insurance policy accordingly.

Another issue worthy of attention when insuring risks against first party damage is insurers' rights to salvage. Exercise of such right to take title to the satellite after payment of claims in the event of constructive total loss is often subject to applicable export control restrictions and regulations regarding transfer of license for satellite operation.⁵¹

3. Third Party Liability

It is worth recalling here that UN space treaties impose international liability for damage caused by space objects on launching states, and that States parties react by engrafting mandatory TPL insurance into domestic legislation. TPL risk management is thus regulated at national level as it bears on public safety and health. Unlike liability for first party damage, which is generally reciprocally waived contractually, liability for personal injury and property damage to third parties cannot be simply waived by contract. And the shield built by TPL insurance for parties shall not obscure the underlying issue of imputing liability. For this reason we now examine how third party liability caused by space activities or space objects⁵² is addressed in a launch services contract.

a) "*Silent mode*": Some contracts stop short of touching upon this subject on the presumption that TPL insurance provides adequate protection against all the parties' potential liability towards third parties. This silent mode has pitfalls in failing to identify the party responsible for third party damage beyond insurance coverage period, within deductible amount, above insurance amount or excluded in the policy.

b) "*Vibration mode*":⁵³ In the absence of any applicable national legislation to the contrary, the basic allocation principle regarding third party liability in

51 This is also an issue of concern in drafting the Space Assets Protocol to the Convention on International Interests in Mobile Equipment.

52 The Liability Convention is concerned with damage caused by space objects. When the Convention flows down to national legislation, states parties tend to interpret it broadly for practical considerations. For example, France's space law refers to damage as caused by space operations; US legislation requires TPL insurance cover claims by a third party for bodily injury or property damage resulting from a licensed activity; UK Space Industry Act of 2018 clarifies that damage might be caused by (a) any craft or space object being used by a person ("the operator") for spaceflight activities; (b) anything falling from such a craft or object, or (c) any person in such a craft.

53 It is nicknamed as the vibration mode because it sounds the alarm that is not loud enough.

a contract would be that each party shall be solely and entirely responsible for damage it or its associates cause to a third party in performance of the contract. However, in the event that channeling of liability is provided for in applicable tort rules⁵⁴ as discussed in the previous part, this basic allocation principle needs to be adjusted accordingly.⁵⁵

c) “*Ringling mode*”: It refers to contracts containing articulate provisions that allocate third party liability risks. For example, the principle of each party bearing its own TPL applies to damage caused before risk attaches and after coverage period expires; responsibility is assigned for settling claims under deductible amount and exceeding the insured amount.⁵⁶ For example, under some launch services contracts with foreign customers using the Long March launch vehicles, the launch provider is obliged to settle third party liabilities and claims arising from launch in excess of insurance limit.⁵⁷

4. TPL Insurance

Although TPL insurance is required as a precondition for authorization in most national TPL regime, only a few countries have set out in their laws or regulations detailed conditions for insurance placement. Both legal rules and customary practice need to be taken into account while drafting insurance clauses in space launch contracts.

A. Coverage Period

In space insurance market, TPL insurance is available to cover third parties' claims for bodily injury and/or property damages arising due to space-related activities during the pre-launch⁵⁸, launch or in-orbit operation phases.⁵⁹

54 Besides a law dedicated to torts, torts principles and rules may also be scattered in other laws addressing specific types of activities, such as space activities.

55 *Supra* note 19. It provides that where damages are recoverable from the operator in respect of the injury or damage (to third parties) and a person other than the operator is liable in respect of the injury or damage, the operator is entitled to be indemnified by that other person against any claim in respect of the injury or damage.

56 If the TPL insurance is procured to cover mainly the launch phase, it is usually the Contractor who shall settle all liabilities, and shall indemnify and hold the customer harmless for property damage and bodily injury arising from the launch when caused to third parties by the launch vehicle, and/or the satellite, and/or their components or any part thereof during the coverage period for deductible amount and for any amount in excess of the insured amount. Anyway, the parties need not trouble themselves with drafting these provisions if the launch services provider's country accords the protection of government indemnification.

57 For some of the international launch services projects during 1990s, we were contractually obliged to obtain guarantees from the government to pay for such claims.

58 Duration of this period varies depending on the type of contract. Under launch services contract, pre-launch period often starts upon arrival of the launch vehicle and/or the satellite at launch site. Under satellite manufacture contract and turnkey

Mandatory TPL insurance is required, however, mostly for the launch⁶⁰ phase.⁶¹ It is customary now in space launch projects to obligate the launch provider⁶² to take out TPL insurance at its own cost⁶³, usually from launch until a certain period thereafter.

For example, the United States requires TPL insurance to also cover pre-launch ground operations⁶⁴, which begins with the arrival of a launch vehicle or payload at a U.S. launch site. Launch licenses issued by FAA prescribe separate insurance amounts for covered claims resulting from flight of the launch vehicle and from pre-flight operations respectively. For orbital launch, insurance coverage shall remain until the later of thirty days following payload separation or thirty days from ignition of the launch vehicle.⁶⁵ French Space Operations Act requires that TPL insurance cover both the launch and in-orbit phase. In Arianespace's standard launch services agreement⁶⁶, insurance coverage comes into effect as of the day of the launch, and ends at the earlier of the end of thirty-sixth months⁶⁷ after launch, or as long as a part or all of the combined space vehicle remains in orbit.

B. Insurance Amount

in-orbit delivery contract, pre-launch phase may also cover the whole period of satellite and/or launch vehicle production.

59 *Supra* note 46.

60 Subject to definition under national legislation

61 For example, Section 5 of Finland's Decree of the Ministry of Economic Affairs and Employment on Space Activities (74/2018) provides that, "the insurance referred to in section 8, subsection 2, paragraph 1 of the Space Activities Act shall cover at least the stage of launching the space object and the related operations until the time when the space object has settled into orbit." (translation from Finnish), available at <https://www.finlex.fi/en/laki/kaannokset/2018/en20180074.pdf>, (last visited on September 8, 2018)

62 The launch service provider is in a better position to negotiate with the insurers due to its familiarity with the launch vehicle.

63 As an item of contractor's expenses in rendering launch services, it is ultimately part of what the customer is paying for.

64 "Launch" is defined in CSLA as including activities involved in the preparation of a launch vehicle or payload for launch, when those activities take place at a launch site in the United States. <https://www.law.cornell.edu/uscode/text/51/50902>, (last visited on September 8, 2018). "Launch" is further defined in federal regulations as including pre- and post-flight ground operations in addition to flight of the launch vehicle. <https://www.ecfr.gov/cgi-bin/text-idx?gp=&SID=1f58495405665a030c05e44bca5a8591&mc=true&tpl=/ecfrbrowse/Title14/14chapterIII.tpl>, (last visited on September 8, 2018)

65 https://www.ecfr.gov/cgi-bin/text-idx?SID=b9d9d56f99603986e42f2f00a8031a38&mc=true&node=se14.4.440_111&rgn=div8, (last visited on September 8, 2018)

66 This is based on a previous version. *Supra* note 26, Julian Hermida.

67 Such an insurance policy supposedly covers satellite operator's liability for causing damage to third parties while the satellite operates in-orbit under its control.

States exert control over the TPL insurance amount partly because it represents the tipping point over which burden of liability shifts to governments. Such amount is determined by assessing types and capacity etc. of launch vehicle as well as location of launch site. Parties to an international launch project shall comply with all applicable requirements of countries concerned.

For example, in the United States, the amount of insurance required with respect to third party damage will not exceed the lesser of \$500 million and the maximum liability insurance available on the world market at a reasonable cost. Russia's insurance amount varies from \$80 million for Start launch vehicles to \$300 million for Soyuz and Proton. France requires an insurance amount up to €60 million for launch and €50-70 million for satellite in-orbit operations. China's current practice is to procure insurance up to \$100 million for a dedicated launch using Long March launch vehicles.

C. Additional Insureds

As TPL insurance is intended to protect all parties involved in the related activities from third party claims, the insurance policy has to name as additional insureds the launch provider, its customer (including third party customers), their respective contractors and subcontractors, the government agencies, and the employees of each of the above.

Moreover, governments of launching states ask for the same protection due to their susceptibility to international liability. Typically a TPL insurance policy for an international launch project names as additional insureds governments of both launch provider and customer's countries. Besides, while governments' authority in disposition of third part claim or suit is acknowledged, insurers are entitled to be consulted with before claims are settled. However, insurers shall not assert a defense of sovereign immunity without the prior written consent of the government against which a suit is filed.

D. Other Conditions of Insurance

Under TPL insurance, since all parties taking part in space activities are accorded insulation from third party claims, they shall mutually waive the right of indemnification to the extent claims are paid from insurance.⁶⁸ Likewise, insurer shall waive rights of subrogation against each of the parties⁶⁹ protected by TPL insurance (including the named insured and additional insureds).

68 For example, see Article 19 of French Space Activities Act

69 According to U.S. Code of Federal Regulations, exceptions are made as to claims resulting from the willful misconduct of the United States or any of its agents. <https://www.ecfr.gov/cgi-bin/text->

TPL insurance shall be of an occurrence basis type, policy limits of which shall apply separately to each occurrence and, for each occurrence to the total of claims arising in connection therewith. It is also worth noting that restrictions may be imposed on insurers underwriting third party liability risks.⁷⁰

V. Risk/Liability Management—Smallsats' Perspective

As gathered from the above analysis, it seems the TPL regulatory framework conceived at international and national level trickles down all the way through to risk management in space projects as reflected particularly in launch services contracts.

Recent years have witnessed booming of small satellite industry⁷¹, which generated growing demand for rideshare launch opportunities⁷². Some space agencies have established formal mechanism or initiative to provide secondary payloads launch services aboard their indigenous launch vehicles. Commercial launch providers are also keen to capitalize on marketing their excess launch capacity. Piggyback launch services thus raise a number of unique legal issues, including launch schedule adjustment, launch delay, launch failure, liability and termination etc. This part focuses on how risk/liability is allocated and managed in piggyback launch services contract.

1. First Party Damage

idx?SID=b9d9d56f99603986e42f2f00a8031a38&mc=true&node=se14.4.440_113&rgn=div8, (last visited on September 8, 2018)

70 For example, the United States requires that each policy must be placed with an insurer of recognized reputation and responsibility that either: (i) is licensed to do business in any State, territory, possession of the United States, or the District of Columbia; or (ii) includes in each of its policies a contract clause in which the insurer agrees to submit to the jurisdiction of a court of competent jurisdiction within the United States and designates an authorized agent within the United States for service of legal process on the insurer. https://www.ecfr.gov/cgi-bin/text-idx?SID=b9d9d56f99603986e42f2f00a8031a38&mc=true&node=se14.4.440_113&rgn=div8, (last visited on September 8, 2018)

71 Some small satellites of greater weight and larger size are launched on dedicated missions. This paper discusses only those launched on piggyback missions. Besides, there is no universally agreed upon definition of the mass and size of nano-satellites, micro-satellites or small satellites. For the purpose of this paper, they are together referred to as small satellites or smallsats.

72 There are basically three types of rideshare space launch opportunities. (i) hosted payloads, referring to the utilization of available capacity on commercial satellites to accommodate additional transponders, instruments (usually belonging to the government) that are affixed to a host spacecraft; (ii) piggyback/auxiliary/secondary payloads, launched as part of a separate satellite launch contract and does not remain with the primary satellite and bus. (iii) dedicated rideshare, where a launch vehicle launches more than one satellite that are co-manifested on the same mission. See Milton Skip Smith and Stephen E. Smith, *Legal Issues Presented by Hosted Payloads*, in Proceedings of the Fifty-Fifth Colloquium on the Law of Outer Space, (2012).

As regards liability and risks for first party damage, the same model of each party bearing and absorbing its own losses is adopted in piggyback launch projects. The primary payload customer has waived liability for first party damage against the secondary payload customer⁷³ (and its contractors/subcontractors) under the cross waiver clause contained in the primary payload launch services contract. By the same token, the secondary payload customer waives liability against the primary customer (and its contractors/subcontractors) under the reciprocal waiver clause in the piggyback launch services contract. In this manner, piggyback payload customers slide themselves into the broader frame of reciprocal waivers.

2. Third Party Liability

A. Launch Phase

Piggyback payload customer might enjoy the benefit of insulation from third party claims arising out of launch, as one of the additional insureds under the TPL insurance purchased by launch provider. Moreover, launch providers do not tend to amortize TPL insurance premium over the costs of piggyback launch services. In the event that small satellites piggyback on government missions that are statutorily exempt from licensing and insurance requirements, piggyback customers are protected by the government's self-insurance. However, small satellites owners/operators shall be liable for third party damage prior to attachment and following expiration of coverage period.

B. In-orbit Phase

As mentioned in Part III, only a few states require in national laws for TPL insurance to cover satellite in-orbit operation phase, considering the exceptionally low probability of incidents giving rise to third party claims.⁷⁴ However, when it comes to small satellites, licensing authorities are increasingly aware of the fact that most of them will be operating in low earth orbits plagued with rapidly increasing amount of space debris, and the fact that they may soon also turn into space debris due to short life span and high failure rate⁷⁵. Therefore, efforts have been made to incorporate internationally recognized space debris mitigation guidelines relating to small satellites into national authorization conditions. Furthermore, out of concern

73 often referred to as "other or third party customer" in the launch services contract for primary payload.

74 The risk of exposure to third party liability is very small, as reflected by the few incidents or claims, none of which have resulted from an incident in-orbit. *Supra* note 46.

75 Historically, microsats have a relatively high failure rate of 52%. See Alan Shaw & Peter Rosher, *Micro Satellites: The Smaller the Satellites, the Bigger the Challenges?* Air & Space Law 41, no. 4&5 (2016): 311–328, at 320.

for risks of in-orbit collision and ensuing international liability, regulators wish to extend TPL insurance requirement to small satellites' in-orbit phase.⁷⁶ Take China's practice for example. The Interim Measures on the Administration of Licensing for Civil Space Launch Projects (2002)⁷⁷ lists placement of TPL insurance as a precondition for issuing launch license, but does not specify the scope or coverage period of such insurance. When processing applications for launch licenses of small satellites, concerns are raised over government's potential liability arising from their in-orbit performance, since China is the (or one of) launching state(s) in accordance with UN space treaties. Despite controversy as to the criteria in proving fault, smallsats owners/operators are willing to purchase an insurance policy for a period starting from separation of the satellite from the launch vehicle, so as to assuage regulator's misgivings.

C. Equilibrium

Foreseeing the possibility of joint launching where all participating states⁷⁸ are jointly and severally liable for any damage caused, the Liability Convention encourages these states to conclude agreements apportioning the financial obligation in respect of which they are jointly and severally liable.⁷⁹ In the context of an international launch project, equilibrium would be achieved if the state from whose territory launch takes place and the satellite operator's state entered into an agreement splitting liability apart according to the phase of space activity. For example, with respect to several launches for Hong Kong based companies⁸⁰ in early 1990s, China agreed with UK through exchange of Notes to assume liability for damage to other states or their nationals arising during the launch phase⁸¹.

In the event that foreign small satellite developers have so little funding as to secure in-orbit TPL insurance, the aforementioned apportioning agreements

76 Note that Finland's newly enacted space regulation rolls out an innovative way to determine necessity of insurance. It provides, "the Ministry of Economic Affairs and Employment may refrain from requiring the insurance referred to in section 8, subsection 1 of the Space Activities Act if the risk of a collision between the space object and another space object in the orbit is lower than 1/1 000 and if the probability that the space object or its component parts will not burn in the atmosphere is lower than 1/10 000." (Translation from Finnish) *Supra* note 61.

77 Article 19, <http://www.cnsa.gov.cn/n6464349/n6464351/c6588509/content.html>, (last visited on September 8, 2018).

78 A State from whose territory or facility a space object is launched shall be regarded as a participant in a joint launching. See Paragraph 3 of Article V of the Liability Convention.

79 Article V of the Liability Convention

80 Hong Kong was still under British rule at that time. It officially reverted to Chinese sovereignty on July 1, 1997.

81 from ignition of the launch vehicle to the separation of the satellite from the launch vehicle

can bridge the gap. This is the *quid pro quo*: the launch provider obtains TPL insurance to cover damage caused by the launch; its government promises indemnification for claims above the insurance amount; the small satellite operator seeks guarantees from its government to assume liability for damage caused in-orbit.

Pitifully, few states have gone this far in making state-to-state arrangements. Some small satellites are deemed by the operator's state to be too "small" to warrant regulatory oversight, and are thus exempt from authorization⁸². In the absence of both an in-orbit TPL insurance and a government guarantee, the launch provider's state has to come to terms with another alternative-registration. It helps a great deal if the operator's state promises to register the small satellite with the United Nations⁸³. In the piggyback launch contract, it is equally important to obligate the customer to register the satellite with any appropriate state.

VI. Conclusion

Liability regime in UN space treaties flows down to domestic regulatory framework of states parties, which enacted more comprehensive and detailed rules pertaining to risk and liability management in space activities. The intersecting national legislations of all the states involved in a space launch project thus have profound implications for risks/liabilities allocation mechanism in launch services contracts. As piggyback launch sector is struggling to perform a seamless docking with international and national regulatory infrastructure, the same degree of care is called for in drafting launch services contracts of piggyback payloads as in those for dedicated missions.

82 Here it refers to launch license. Still the owner or operator has to comply with any requirements imposed by the national communications authority for use of radio frequencies. The launch provider also has a role to play as sentinel to check that the piggyback payload customer (whether domestic or foreign) has obtained all applicable licenses, authorizations, and permits etc. prior to launch.

83 A state does not have to be a party to the Registration Convention in order to register space objects. Non-states parties can register their space objects in the "Resolution Register" established in accordance with General Assembly resolution 1721 B (XVI) of 20 December 1961.