This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

The Current Challenges of Liability for Loss of Satellite-Based Services

*Lesley Jane Smith**

Abstract

Doing full justice to the subject of liability for damage from outer space requires a look at the interaction between classic rules of international law, national law and the particular type of damage or loss resulting from in-orbit collision or other form of interference. Collisions between spacecraft, the impact of space-related debris, as well as GNSS service-related issues, can all lead to damage and loss; natural occurrences resulting from space weather may also play a role. The loss itself can range from damage to the environment of outer space, to damage to spacecraft in flight, including the loss of signal in space, and ultimately to the loss of satellite-based services. Much depends on the individual service involved. In the case of telecommunication services, for example, the damage resulting from loss of communication networks may be considerable.

This paper discusses the responses of the various branches of the law to the specific space-based scenarios described above. It thereafter reviews how contractual solutions in the area of telecommunication and beyond contribute to maintaining the balance of interests surrounding risk management in this field. It also discusses the impact of liability for space-based services in the context of newer, integrated satellite-based EO data products and services, and their impact on established contract practice.

1 Introduction

1.1 Increase in Spectrum of Satellite Based Services

Satellite-based services range from telecommunication and broadcasting[1] to the provision of Earth observation (EO) data for general, often governmental

* LL.M., Leuphana University Lueneburg; Weber-Steinhaus & Smith, Cotton Exchange. D-28195 Bremen. ljsmith@barkhof.uni-bremen.de; smith@weber-steinhaus.com. Tel: 0049 421 63 93 60 Fax: 0049 421 63 93 622.

1 For an overview of the law and historical development of telecommunication services, see I. Walden, Telecommunications Law and Regulation (4th Ed., OUO, 2012) on the development of telecommunication and communications regulation in the EU from the nineties, see generally, P. Achilleas, Ed., Droit De L'espace (Paris, Larcier, 2009).

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

administrative purposes,[2] through to recognised global navigation satellite systems (GNSS) operating with integrated precision-timing mechanisms.[3] Other uses include the provision of satellite data in emergency situations, where the data taken of the affected area is made available to disaster-stricken areas by the international community of Disaster Charter member states.[4]

In terms of technological development, satellite-based services and earth observation in particular represent to the twenty-first century what satellite telecommunications and broadcasting stood for in the eighties. The field of satellite-based services is a growth sector. Governments are eager to provide funding for infrastructures for business development across the 'three digital R's':[5] communication, navigation and observation services supported by commercial operations. With the advent of the 21st century era led by Google maps delivering space-based EO data into the private arena, with interactive real time applications ('apps'), the reliance on space-based data information products and services is gaining a strong foothold among the 'essential' services relied on by the second millennium's information society.[6]

These developments are a timely reminder of the demarcation between the various regimes of outer space law, telecommunications and media law, and the law of contract. Space services are not all outer space-based. Outer space law governs the peaceful use of outer space by states and their particular responsibilities. It also regulates incidents of damage to third party states and their nationals.[7] Satellite services and the regulatory basis governing their operations do involve considerations of domestic law and policy. Issues of risk allocation

---

2 The US Landsat programme marked the beginning of remote sensing in that country; in Europe, the Copernicus programme on environment and security, formerly known as GMES, is the dominant focus for research and environmental monitoring projects using the Sentinel satellites; see Proposal For A Regulation Of The European Parliament And Of The Council Establishing The Copernicus Programme Repealing Regulation (EU) No 911/2010 [COM(2013)213 Final] *available at* <http://copernicus.eu/pages-principales/overview/> [last accessed 4th September 2013].

3 For an overview of the EU GNSS system Galileo, see <http://ec.europa.eu/enterprise/policies/satnav/galileo/applications/index_en.htm> [last accessed 4th September 2013].

4 For details of its members, and constitutional text of the International Disaster Charter see <www.disasterscharter.org/web/charter/home> [last accessed 4th September 2013].

5 L. J. Smith, C. Doldirina, Remote Sensing: A case for moving space data towards the public good, Space Policy 22–32 (Vol. 24, 2008).

6 The importance to modern society of space-based assets and technology has been publicised in science programmes such as the BBC's What would happen if all satellites stopped working? *available at* <www.bbc.com/future/story/20130609-the-day-without-satellites>, [last accessed 4th September 2013].

7 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies (1966) UNTS 205 (hereinafter: OST).

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

are also paramount, details depending on whether the focus of the space programme is scientific or commercial.
As indicated, major public and commercial investment is underway with a view to developing markets for upstream, midstream and downstream services that integrate high-resolution EO data and other satellite-based services such as GNSS, with software tools for a variety of purposes.[8] Weather forecasts and environmental indicators developed from data supplied by meteorological satellites feature among the better known satellite-based products; other examples such as climate monitoring, precision farming and security-based activities such as advanced automatic signal identification (AIS) can all be included in the range of services on offer.[9]

1.2 Regulating Space Activities: Demarcation and Risk

Satellite-based activities are the prerogative of sovereign states; commercial activities can only take place subject to authorisation.[10] Shutter control apart, states can only effectively regulate and control those satellite-based activities undertaken by companies that are subject to their jurisdiction.[11]
Risk control in space operations is assessed during the authorisation procedure and takes technological advancements into account. This is best seen in the requirement to comply with the internationally recognised IADC mitigation guidelines.[12] In some countries, these guidelines have been formally integrated into the national licensing system.[13] Regulatory control of space-based activi-

8 The term originally used for sensing the Earth's surface by satellite was remote sensing, see UN Principles of Remote Sensing, 1986, in: J. Gabrynowicz, Harris, L. Mantl, L. J. Smith, CoCoSL Cologne Commentary on Space Law, eds. Hobe, Schrogl, Schmidt-Tedd (vol III, Cologne, Heymanns, *forthcoming*, 2014). The term earth observation has developed over time to include environmental monitoring.

9 AIS satellites are replacing the predominantly ship radar-based control, currently of relevance in countering piracy on the high-seas.

10 See the individual provisions of the Outer Space Treaty discussed in: S. Hobe, B. Schmidt-Tedd, K.U. Schrogl, CoCoSL (Eds.), Cologne Commentary on Space Law (vol I, Cologne, Heymanns, 2009).

11 It is effectively impossible to subject foreign satellites to the control of the sensed state. For a discussion of position in international law, including shutter control, see e.g. R. Jakhu, *International* Law Regarding the Acquisition and Dissemination of Satellite Imagery, Journal of Space Law (Vol 29, No. 1 & 2, 65-92, 2003).

12 Inter-Agency Space debris Coordination Committee (IADC), Space Debris Mitigation Guidelines, 2002 (revised 2007), IADC-02-01.

13 For France, see P. Clerc, Consequences of the French Space Law on Space Operations (FSOA) on CNES´s Mission as a Contracting Space Agency in: L.J. Smith, I. Baumann (eds), *Contracting for Space* (117-131, Ashgate, 2011); id. Paper, International Astronautical Congress Beijing 2013 (Proceedings of the International Institute of Space Law, Eleven Publishers, Forthcoming, 2014). See also Art 5 of the Austrian Outer Space Act, Federal Law Gazette I No.

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

ties, from the perspective of international law, should be regulated by domestic statute at national level.[14]

Risk-allocation regimes are based on a pre-determined philosophy that takes account of which party is best suited to carry the bulk of risk involved.[15] The ultra-hazardous nature of outer space activities has led to an international system of absolute unlimited liability for the launching states for damage caused by a space object on Earth.[16] In this respect, the pre-requisites for the application of international space law are clear; only state parties are bound by its principles. Given the immunity of states and international organisations from suit, arbitration remains a viable alternative.[17] These rules do not, however, pre-empt applications to domestic courts particularly in cases of commercial disputes involving the space services in question.[18]

More recent questions of regulatory demarcation arise as a result of technological developments in the field of sub-orbital space flights. The licensing of aerospace craft, as well as the legal status of the 'space flight participant' passenger, are currently undergoing deliberation.[19] In some US state jurisdictions, liability disclaimers have been validated for space-flight participants, with a view to encouraging development of a viable commercial sector.[20]

132/2011 of 27 December 2011 and Art 5 of the French Law N° 2008-518 of 3 June 2008 regarding space operations.

14 Article VI OST; Various examples of national space statutes can be seen in France, Netherlands, Sweden, UK, US, see further R. Jakhu, id fn 11 above.

15 G. Brüggemeier, Haftungsrecht: Struktur, Prinzipien, Schutzbereich, (Springer, 2006).

16 Damage caused on Earth and to aircraft in flight; Art VII OST; Arts II, III LIAB Operators involved in other hazardous enterprises can benefit from systems of limited operator liability in the fields of nuclear, maritime and air law, see details in L. J. Smith, A. Kerrest, CoCoSL, Fn 10 above. International aviation convention law prescribes strict, but limited operator liability for passenger death and damage in the event of aircraft accidents, see The Convention for the Unification of Certain Rules for International Carriage by Air (the Montreal Convention) 1999. This has replaced the Warsaw Convention 1929 governing liability for aircraft passenger death and damage.

17 Permanent Court of Arbitration (PCA), Optional Rules for arbitration of disputes relating to outer space activities (2012), *available at* <www.pca-cpa.org/showpage.asp?pag_id=1188> [last accessed 4th September 2013].
Art XI.2 LIAB means that claims are not excluded from being brought before domestic jurisdiction.

18 M. Marietta, Corp. v. International Telecommunications Satellite Organisation (Intelsat), 978 F.2d 140 (1992).

19 J. B. Marciacq, EASA, Accommodating Sub-orbital and Orbital (SOA) Flights in the EU, 6th IAASS Conference, McGill University, Montreal, Canada (May 2013).

20 P. Sterns, L. Tennen, State and Municipal Regulation of the Aerospace Industry in the United States, in: R. Jakhu, National Regulation of Space Activities (The Netherlands, Springer, 2010).

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

The response of the law here reflects policy considerations how best to sustain such technical progress. Arguments are brought forward in favour of a *sui generis* licensing regime that straddles the divide between air and space law.[21] Sub-orbital flights are tipped as marking the beginning of a new era of transport that could alleviate space traffic management concerns for the future. One of the major issues, however, relates to which liability rules should apply to this sector, and, within the European Union, whether a common approach can be reached.[22]

2 Liability for Space-Based Services

2.1 Basis of Liability

With the exception of international state liability, the conditions of liability and any rights of indemnification between the parties (commercial sector against one another and vis a vis government) is a matter of domestic law and /or contract.

Liability may therefore arise in the context of outer space services where as a result of a breach of a legal duty laid down by the law (Treaty statute), or by agreement,[23] a concomitant duty arises to compensate for the loss suffered. Liability may apply to failures of systems to deliver according to the technically specified standards (sub-standard), as well as where there is failure to perform according to agreement. Without such a rule of law or agreement, there can be no liability. Generally, damage and causation must be proved in all cases, and compensation is made on the basis of *restitutio in integrum*. In some cases, such as damage from spacecraft to Earth, causation is self-evident.[24] In the absence of such proof or rules specifying how fault is to be interpreted and applied, the requirement of fault effectively limits the likelihood of raising damage claims in outer space.

Risk and liability for space-based services may arise across the three domains of navigation, communication and observation. The exact position in law in each case of loss of service depends on the damaged party's role and duties within the chain of service delivery; i.e. whether as system provider (owner/operator), as hosting facility operator or as end-user.

The downstream sector that is not operating with real-time linked data will be one step removed from this chain, both from the perspective of causation, and from space law. A distinction is to be drawn between the immediate parties to the services contracts, who are clients and customers, as well as to those external third parties who are not involved in the operations.

---

21 R. Jakhu, fn 20 above.

22 J. B. Marciacq, id. fn 19 above.

23 Intergovernmental Agreement of the International Space Station (ISS), signed 29 January 1998 (hereinafter: ISS IGA), *available at* ftp://ftp.hq.nasa.gov/pub/pao/reports/1998/IGA.html [last accessed 4 Sept 2013].

24 Cosmos 954; L.J. Smith, A. Kerrest, in: CoCoSL vol I *fn* 10 above 126-145.

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

Liability for third parties can only ever arise in specific cases determined by the law. In various spheres, notably for damage resulting from GNSS failure, no dedicated TPL regime has been developed.[25] The existence of other international third party operator liability rules that could be relied on in a GNSS scenario is a brake on further regulatory effort.

2.2 Licensing: Liability for Satellite Based Information

States with the technological capability relating to the field of earth observation are likely to have dedicated legislation, extending beyond that governing general space activities, to cover space activities involving the acquisition of high-resolution data.[26] Security-related concerns accompany the sale or distribution of high resolution data and determine the level of control involved in the service contracts.

The legal nexus between space data which is integrated within an information product or service and its application in practice represents to the law of liability what defects represented to manufacturers' and product liability in the early twentieth century. These newer services markets do not, however, mean that product or services liability are to be equated with the other forms of liability resulting from space activities. Space law does not regulate product liability. There is a discussion as to whether or not malfunction or failure of satellite signals falls under the definition of damage from a space object under the space treaties; an alternative line of argument is to rely on the law of manufacturer's liability in support of claims relating to satellite malfunction. However, there has been a dearth of cases in support of the arguments offered, with no conclusive results.[27] As indicated, liability can only arise by virtue of a rule of law (international, national) or by agreement on risk allocation. In its absence, parties are required to bear their own loss, a situation not unknown to space law.[28]

2.3 The Role of Disclaimers

Data policies, until recently - and with the exception of space-based data and Global Positioning System (GPS) signals that are publicly available without

25 See UNIDROIT Agenda, Item No. 8: Third party liability for Global Navigation Satellite System (GNSS) Services, *available at* <www.unidroit.org/english/governments/councildocuments/2013session/main2013.htm> [last accessed 4 Sep 2013].

26 Remote sensing constitutes a space activity, requiring national authorisation, see Art VI OST; further M. Gerhard, in: CoCoSL, vol I, Fn 10 above 103-125; Germany has a national statute regulating high-resolution satellite data, see Satellitendatensicherheitsgesetz, Federal Law Gazette, BGBl. I S. 2590 (2007); for the position in Canada, see the Remote Sensing Space Systems Act S.C. 2005, c. 45.

27 L.J. Smith, A. Kerrest, the Convention on International Liability for Damage caused by Space Objects, in: CoCoSL (vol II, Heymanns, Cologne, 2013).

28 See the provisions of Outer Space Treaty and the Liability Convention relating to a party bearing its own loss, e.g. Art IV OST; Art VII LIAB.

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

charge under US law,[29] generally restrict the unauthorised use and re-use of satellite-based data. This is partly dictated by security considerations, partly by the law of liability. Where there is no direct control over subsequent processing, exploitation and distribution of data, no risk can be assumed through the value-added process.
This is indeed why satellite programmes such as the EU Copernicus[30] have been developed with a view to encouraging the development of new digital information markets that allow data to be re-used. This programme requires its registered client-customers to impose disclaimer requirements when satellite-based content is extracted and re-worked in order to develop further commercial services. Further provisions in data policies govern the issue whether extracted data may be re-used for development of commercial applications.[31]
The requirement of such disclaimers underlines the fact that involvement in space activities remains an inherently sovereign prerogative, to be exercised in conformity with international law.[32]
Any further- reaching liability can only be dealt with effectively by contract, whether it is foolproof remaining a question of domestic law.

3 Contracts for Satellite-Based Services

3.1 Service Level Agreements (SLA's)

As indicated above, space activities relating to the three (digital) R's – communication, navigation and observation - are therefore conducted within a hybrid of public and private law rules; the principles of international space law exert their influence on the role of the state in its function as licensing authority; it is the launching state that assumes liability where damage arises from its space object; it is the national state that is responsible for its national space activities, and its rights of recourse and indemnification against the commercial sector in cases of damage governed by national law.
From its acquisition and processing through to development of satellite-based data and services, space-related operations are constructed around the classic parameters of contract. The framework for legal duties and liabilities for those involved in the projects, from the satellite operators providing transponder capacity, to those developing and delivering data-based services, is dictated

29 P. L. Meredith, Space insurance law – a special focus on satellite launch and in-orbit policies, air and space law (2008).

30 Proposal for a Regulation of the European Parliament and of the Council establishing the Copernicus Programme, fn 2 above.

31 See Art 7 of the DIRECTIVE 96/9/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 March 1996 on the legal protection of databases, 1996 O.J. (L 077) 20–28.

32 The scope of national space legislation is dictated by Art VI OST. National approval is generally not required for distribution, as opposed to acquisition, of data, see L.J. Smith, C. Doldirina, Space Policy, fn 5 above.

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

by a contract structure. The contracts reflect the type of funding and contain traditional elements, often agency dictated; a contract of sale or lease (scope of contract), the relevant financial parameters (price), term (short, medium or long term) that include provisions for defects (under-performance, non-performance), as well as the relevant form of dispute resolution and adjudication (competent court; applicable law).

3.2 Key Performance Indicators (KPI) and Penalty Clauses

Connectivity is of central importance to all real-time satellite-based services and transactions. These are likely to involve secure communication links for inter-banking systems such as SWIFT, telecoms, signal monitoring or navigational services; the SLA contains the major provisions regulating the level of connectivity. Maintenance of connectivity is expressed in an SLA in terms of key performance indicators, or KPIs, in percentage figures. Provision is generally made for the maximum and minimum levels, below which the service should not fall, as well as the consequences of underperformance.

Service level agreements are therefore the appropriate platform for agreeing the satellite-service level in question. The service type and the KPI represent the corner stone of the SLA.

The provisions depend on whether the product or service is an independent – or integrated – up- or downstream service involving use and/or re-use of the data provided. Real-time connectivity is a measure of performance, as is maintenance (justified interruption of service) or unscheduled loss or interruption.

Failure to maintain the agreed connectivity for performance levels leads to a percentage reduction in remuneration charges in proportion to the loss of service.

Damage clauses, often referred to as penalty clauses, are a standard part of such contracts, over and above the KPI. The damages clauses relate to the spread of risk and limitation of liability for the satellite operator in relation to the service in question.

The 'penalty' or level of *per diem* damages agreed between the parties involves an advance assessment of the predicted levels of loss. They are a standard feature in all satellite-related contracts.

4 Risk-Based Solutions

4.1 Loss of Satellite-Based Services

While the contractual structures surrounding satellite-based services do not greatly differ from those used in other commercial sectors, some consideration should be given to the impact of the natural risks of the outer space environment on the satellite-based product or service in question. Such a situation is an example of *force majeure:* a failure occurring that is beyond the sphere of influence on the contract parties. This too features within the contractual provisions of service contracts.

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

4.2 Damages

The issue of damages for breach of contract addresses the legal obligations (statutory and contractual) as a whole and goes beyond the penalty clause itself. Some care, however, is required in relation to damages clauses; these may even prove to be the Achilles heel when assessing the loss for which damages may be claimed. A damages clause should express the loss in relation to the commercial value of the contract. Inflated estimates of loss may lead to the penalty clause being quashed if reviewed by a court of law or arbitration tribunal. The growth in space-based services will encourage the use of the penalty clause as a tool in related up- and downstream contracts. Damages clauses may also assist in clarifying the border line between the rules of international state liability under the international space law treaty rules (e.g. in causes of liability for debris induced damage) and liability for commercial satellite-based services.[33] This point is reverted to further below.

5 From Treaties to Contract

5.1 Self-Insurance

Although liability and risk are traditionally laid down either by the law itself (statute, code) or in terms of party agreement (liquidated damages or penalty clauses), the rules contained in the Outer Space treaties continue to play a significant role. The principles contained therein have been effectively superimposed as standard practice in commercial and inter-state contracts in this sector.[34]

Contracts are scoped with inter-party waivers, hold-harmless clauses and other indemnification provisions. The result is that space operations operate with a high measure of self-risk, often - but not always - on an insured basis.

The new trend towards a hybrid mix of integrated satellite-based services, incorporating integrated information services calls for clear demarcation in risk management in terms of the international law of outer space and the limits of liability under contract; while liability may be limited, if not excluded in commercial contract law, it cannot be limited under international space law.[35]

Governments are conscious of this when authorising commercial space activities; the issue therefore continues to attract attention with the ongoing downsizing of spacecraft and issues of delimitation between air and space.[36]

---

33 These are contained in Articles VI (responsibility) and Article VII Outer Space Treaty, in conjunction with Articles II, III, Liability Convention, see L.J. Smith, A. Kerrest, CoCoSL (vol I, fn 10 above); (vol II [LIAB] fn 27 above).

34 L.J. Smith, The Principles of International Space Law and Their Relevance to Space Industry Contracts in: L.J. Smith, I. Baumann, Contracting for Space, fn 13 Above 45-58.

35 L.J. Smith, A. Kerrest, the Convention on International Liability for Damage caused by Space Objects, in: CoCoSL Vol II, Fn 27 above.

36 For a review of the debate relating to whether the compulsory third party liability insurance requirement under the UK Space Act 1986 with a government right

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

5.2 Liability, Signal Loss and Third Party Liability (TPL)

Firstly, the effect of third party interference on space operations through jamming should be mentioned. Although the International Telecommunication Union (ITU) Constitution contains provisions relating to non-interference (see Article 45), it clearly specifies that states are not responsible for such interference. Jamming is a regulatory question for telecommunications authorities and beyond the scope of contract law; questions of domestic law, however, remain unaffected.

Finally, the subject of TPL for damage resulting from GNSS navigation services remains an on-going topic of discussion and the subject continues to find attention on UNIDROIT's current agenda.[37]

International Civil Aviation Organization (ICAO) had earlier discounted the need for regulation of GNSS liability. One reason for this is that strict liability provisions already exist under the major aircarrier conventions; the other is that the ICAO remit focusses on ensuring agreement on the state of the art technical requirements for all GNSS systems within the so-called SARPS- Standard and Recommended Practices. These require to take into account the interoperability of various the GNSS systems that have been made available for use in civil aviation, currently GPS, GLONASS, and in the future Galileo and Beidou.[38]

Similar discussions can be perceived in other systems where liability for loss of signal within GNSS systems has been rejected. In Europe at least, the principles of limited operator liability are used as a flowdown from owner to operator liability at least under the EU (European Geostationary Navigation Overlay Service) EGNOS system. This is generally achieved through contractual solutions by requiring financial guarantees from the operator in favour of the contracting government authority, allowing indemnification to take place to the level of the insured sum generally required in Europe.

6 Conclusions and Outlook

The area of satellite-based services is a growth sector and one that will continue to attract attention in keeping with technological development. As a corollary, further regulation of satellite services will take place through the specific provisions of contract law, subject to national regulatory provisions.

From a liability perspective, the parameters for assessing loss of satellite services will not extend beyond the realms of contractual or tort liability, unless

---

of indemnity should be capped in the case of Cubesats, see Consultation and UK Space Agency Annual report and accounts 2012-13, *available at* <www.official-documents.gov.uk/document/hc1314/hc04/0460/0460.pdf> [last accessed 4th September 2013].

37 See UNIDROIT Fn 25 above.

38 ICAO, Doc. 9849 AN/457, Global Navigation System (GNSS) Manual, 2nd ed., June 2012, *available at* <www.icao.int/Meetings/anconf12/Reference%20Documents/9849_en.pdf> [last accessed 4th September 2013].

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

spacecraft-induced damage occurs; this will automatically lead to application of the rules of international space and aviation law, opening up the possibility of bringing claims before national courts or to arbitration, whether under the Liability Convention's Claim Commission or general arbitration under the optional rules.
From a regulatory perspective, there will be an ongoing need to include technical compliance with all applicable rules and, for civil aviation, SARPs. Beyond this, the validity of penalty clauses in national legal systems as the main method for performance control may well continue to attract attention.

References

Austrian Outer Space Act, Federal Law Gazette I No. 132/2011 of 27 December 2011

BBC's What would happen if all satellite stopped working? *available at* <www.bbc.com/future/story/20130609-the-day-without-satellites>, [last accessed 4th September 2013]

Consultation and UK Space Agency Annual report and accounts 2012-13, *available at* <www.official-documents.gov.uk/document/hc1314/hc04/0460/0460.pdf> [last accessed 4th September 2013]

Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, 1996 O.J. (L 077) 20–28

French Law N° 2008-518 of 3 June 2008 regarding space operations

Gert Brüggemeier, *Haftungsrecht: Struktur, Prinzipien, Schutzbereich*, Springer, 2006

Ian Walden, *Telecommunications Law and Regulation*, 4th Ed., Oxford University OUO, 2012

ICAO, Doc. 9849 AN/457, Global Navigation System (GNSS) manual, 2nd ed., June 2012, *available at* <www.icao.int/Meetings/anconf12/Reference%20Documents/9849_en.pdf> [last accessed 4th September 2013]

Inter-Agency Space debris Coordination Committee (IADC), Space Debris Mitigation Guidelines, 2002 (revised 2007), IADC-02-01

Intergovernmental Agreement of the International Space Station (ISS), signed 29 January 1998, *available at* ftp://ftp.hq.nasa.gov/pub/pao/reports/1998/IGA.html [last accessed 4 Sept 2013]

Jean Bruno Marciacq, EASA, Accommodating Sub-orbital and Orbital (SOA) Flights in the EU, 6th IAASS Conference, McGill University, Montreal, Canada, May 2013

Lesley Jane Smith, Armel Kerrest, *The Convention on International Liability for Damage caused by Space Objects*, in: Stephan Hobe, Bernhard Schmidt-Tedd, Kai-Uwe Schrogl, *Cologne Commentary on Space Law*, Outer Space Treaty Vol II, Cologne, Heymanns, 2013

Lesley Jane Smith, Catherine Doldirina, *Remote Sensing: A case for moving space data towards the public good*, Space Policy 22–32, Vol. 24, 2008

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

Lesley Jane Smith, *The Principles of International Space Law and Their Relevance to Space Industry Contracts* in: Lesley Jane Smith, Ingo Baumann (eds.), *Contracting for Space,* Ashgate, 2011

Martin Marietta, *Corp. v. International Telecommunications Satellite Organisation (Intelsat*), 978 F.2d 140, 1992

Michael Gerhard, *Art VI Outer Space Treaty* in: Stephan Hobe, Bernhard Schmidt-Tedd, Kai-Uwe Schrogl, Eds., *Cologne Commentary on Space Law,* vol I, Outer Space Treaty, Cologne, Heymanns, 2009

Philippe Clerc, *Consequences of the French Space Law on Space Operations (FSOA) on CNES´s Mission as a Contracting Space Agency* in: Lesley Jane Smith, Ingo Baumann (eds.), *Contracting for Space*, Ashgate, 2011

Pamela L. Meredith, *Space insurance law – a special focus on satellite launch and in-orbit policies, air and space law*, 2008

Patricia M. Sterns, Leslie I. Tennen, *State and Municipal Regulation of the Aerospace Industry in the United States* in: Ram Jakhu, *National Regulation of Space Activities,* The Netherlands, Springer, 2010

Permanent Court of Arbitration (PCA), Optional Rules for arbitration of disputes relating to outer space activities (2012), *available at* <www.pca-cpa.org/showpage.asp? pag_id=1188> [last accessed 4th September 2013]

Philippe Achilleas Ed., *Droit De L'espace*, Paris, Larcier, 2009

Proposal for a Regulation of the European Parliament and of the Council establishing the Copernicus Programme Repealing Regulation (EU) No 911/2010 [COM(2013)213 Final] *available at* <http://copernicus.eu/pages-principales/overview/> [last accessed 4th September 2013]

Ram Jakhu, *International* Law *Regarding the Acquisition and Dissemination of Satellite* Imagery, Journal of *Space Law* ,Vol 29, No. 1 & 2, 65-92, 2003

Remote Sensing Space Systems Act S.C., 2005

Satellitendatensicherheitsgesetz, Federal Law Gazette, BGBl. I S. 2590, 2007

Stephan Hobe, Bernhard Schmidt-Tedd, Kai-Uwe Schrogl, Eds., *Cologne Commentary on Space Law*, vol I, Outer Space Treaty, Cologne, Heymanns, 2009

Stephan Hobe, Kai-Uwe Schrogl, Bernhard Schmidt-Tedd, Eds., *Cologne Commentary on Space Law,* vol III, Outer Space Treaty, Cologne, Heymanns, *forthcoming*, *2014*

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies (1966) UNTS 205

The Convention for the Unification of Certain Rules for International Carriage by Air (the *Montreal Convention*) 1999

UNIDROIT Agenda, Item No. 8: Third party liability for Global Navigation Satellite System (GNSS) Services, *available at* <www.unidroit.org/english/governments/councildocuments/2013session/main2013.htm> [last accessed 4 Sep 2013]

This article from International Institute of Space Law is published by Eleven international publishing and made available to anonieme bezoeker

UN Principles of Remote Sensing, 1986, in: J. Gabrynowicz, Harris, L. Mantl, L. J. Smith, *Cologne Commentary on Space Law*, eds. Hobe, Schrogl, Schmidt-Tedd (vol III, Cologne, Heymanns, forthcoming, 2014)

Selected Literature

Lesely Jane Smith, Ingo Baumann Eds. (2011). *Contracting for Space*. Ashgate

Philippe Achilleas. (2009). *De L`Espace*. Paris. Larcier

Ram Jakhu. (2010). *National Regulations of Space Activities*. The Netherlands. Springer

Stephan Hobe, Bernhard Schmidt-Tedd, Kai-Uwe Schrogl Eds. (2009). *Cologne Commentary on Space Law*. Vol I. Cologne. Heymanns

Stephan Hobe, Bernhard Schmidt-Tedd, Kai-Uwe Schrogl Eds. (2013). *Cologne Commentary on Space Law*. Vol II. Cologne. Heymanns